Telephone No. 2419677/2419361
Fax: 0821-2419363/2419301
e-mail : registrar@uni-mysore.ac.in
www.uni-mysore.ac.in

UNIVERSITY OF MYSORE

Estd. 1916

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysuru- 570 005

No.AC6/453/2016-17

Dated: 22.07.2017

NOTIFICATION

Sub: Revision of the Syllabus for the courses which are being run in the Regional Institute of Education (RIE) from the academic year 2017-18.

Ref: 1. Decision of the Faculty of Education Meeting held on 17.03. 2017.
2. Decision of the Academic Council Meeting held on 30.03.2017.

*****

The Board of Studies in Regional Institute of Education (RIE) which met on 06.08.2016 has decided to Revision the Syllabus of the following program from the academic year 2017-18 and also the title of course "Science and Growing Up" is changed to "Understanding the Learner."

1. B.Sc.B.Ed
2. B.A.B.Ed
3. M.Sc.B.Ed (Mathematics)
4. M.Sc.B.Ed (Physics)
5. M.Sc.B.Ed (Chemistry)

The Faculty of Education and the Academic Council at their Meetings held on 17th March 2017 and 30th March 2017 respectively have also approved the above said proposal and is notified.

The contents is uploaded in the concerned may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Draft approved by the Registrar

Sd/-
DEPUTY REGISTRAR(Academic)

To:
1) The Registrar (Evaluation), University of Mysore Mysore.
2) The Dean, Faculty of Education, Department of Studies in Education. Manasagangotri, Mysore.
3) The Chairman, Department of Studies in Education, Manasagangotri, Mysore.
4) The Chairman, Board of Studies in Education (PG), Manasagangotri, Mysore.
5) The Principal, Regional Institute of Education, Manasagangotri, Mysore.
6) The Director, College Development Council, MoulyaBhavan, Manasagangotri, Mysore.
7) The Deputy Registrar/Assistant Registrar/Superintendent, AB & EB, University of Mysore, Mysore.
8) The PA to Vice-Chancellor/Registrar/Registrar (Evaluation), University of Mysore, Mysore.
9) Office Copy.

UNIVERSITY OF MYSORE

REGIONAL INSTITUTE OF EDUCATION
[National Council of Educational Research and Training, New Delhi]

Regulations governing the Programme

1.0 Programme and Duration :

Integrated Programme of Teacher Education titled **'Master of Science Education' (Chemistry)** leading to the post-graduate degree**, M.Sc.Ed. (Chemistry).** The programme will be of six year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of 16 weeks of instruction excluding examination.

1.1 **Equivalence:**

The course content in the subjects, Physics, Chemistry and Mathematics in the first four years are equivalent to course content in the relevant subjects in the B.Sc. (PCM) Programme of the University of Mysore. The course content of the fifth and sixth years are equivalent to the M.Sc. Programme in Chemistry offered by the University of Mysore.

The course content related to Professional education are equivalent to the B.Ed. of University of Mysore and are as per the NCTE Regulations (2014).

In addition, in the last two years of the Programme, Professional Education components required for teaching of Mathematics at senior secondary level are also included. The composite degree, M.Sc.Ed., is thereby equivalent to B.Sc., B.Ed. and M.Sc. degrees of University of Mysore.

2.0 Eligibility for admissionto M.Sc.Ed.

2.1 Candidates seeking admission to the programme should have passed CMSE Senior Secondary examination/ Pre-University examination of Karnataka or an equivalent examination of any state or UT of the Republic of India with 45% marks in the aggregate. Relaxation up to 5% of marks is given to the SC/ST candidates.

2.2 Candidates should have passed the qualifying examination with the following combinations of subjects: Physics, Chemistry, Mathematics/Statistics.

2.3 Admission shall be made by selection on the basis of marks in the qualifying examination and performance in a specially designed national level test (Common Entrance Examination) conducted by the NCERT. It shall be governed by the admission policies of NCERT and the guidelines of the University of Mysore.

It will also be governed by the reservation policies of Govt. of India as prevalent at the time of admission.

3.0 Scheme of Instruction :

Details of courses, scheme of study, credit distribution pattern and method of evaluation, etc. are provided in Table 1.

From semesters I to VIII Courses of Study are organized under the following categories:

a) Core Courses
b) Ability Enhancement Courses

c) Discipline Specific Electives
d) Skill Enhancement Courses
e) Generic Courses
f) Professional Education Courses.

From semesters IX to XII, courses of study are classified under the following categories:
a) Core Courses
b) Professional Education Courses

3.1 Core Courses:

The Programme offers three majors, Physics, Chemistry and Mathematics. Each Major comprises of 6 core courses. The titles of courses in each major and their positions are given in Tables 14 & 15.

3.2 **Ability Enhancement Courses :**

This is mandatory for all students. Comprises of 4 courses, two each in a language of student's choice and two in English
a) Language : Any one of the following: Hindi / Kannada/ Malayalam/ Tamil / Telugu
b) English

3.3 Discipline Specific Elective:

Total of six advanced courses, two in each Major Subject are offered in the VII and VIII semesters of the Programme.

3.4 Skill Enhancement Course:

Two courses are offered in the third and fourth semesters of the Programme. Students can choose any two courses of their choice, cutting across disciplines, from a pool of courses that are being offered in each subject area.

3.5. Generic Course:

Two courses of inter-disciplinary nature are offered in the first and eighth semesters of the programme.

3.6 Professional Education Courses:

In accordance with the NCTE regulations – 2014, the programme includes 23 courses which are positioned in the first 8 semesters. The requirements of the 16 week internship proposed by the NCTE, are met through three rigorous phases of School Attachment Programmes. The first two Phases are of 2 week duration each which will be organized in the Demonstration School and selected schools in Mysore. The longer duration, ten weeks will be held in the third phase of School Attachment Programme, is primarily an internship in teaching Programme which will be organized in selected schools of NVS, Hyderabad Region or other schools.

An additional School attachment Programme is organized in the XI semester for a duration of 4 weeks. This will be organized in selected higher secondary schools where the student trainees will have a specialized internship in teaching experience at the higher secondary level.

4.0 Attendance

Each student has to attend a minimum of 7**5%** classes out of the classes conducted in each course. Failure to meet the minimum requirement renders disqualification from terminal examination and makes him/her ineligible for NCERT scholarship/ free ship. Such a student is deemed to have dropped the course and is not allowed to write the semester end examination (C3) of that course. He has to re-register for the course/s as and when they are offered by the institute.

5.0 Medium of Instruction:

The medium of instruction and examination is English.

6.0 Course Structure

TABLE 1: CREDIT BREAK-UP INTO B.SC., M.Sc. AND B.ED. COMPONENTS AND MODE OF EVALUATION

Semesters	Total Credits	Programme	Credits (Theory) (L)	Teaching hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Assessment C1+C2	Terminal Assessment C3)
I	24	B.Sc.	13	13	5	10	23	50	50
		B.Ed.	4	4	2	4	8	50	50
II	24	B.Sc.	13	13	5	10	23	50	50
		B.Ed.	4	4	2	4	8	50	50
III	23	B.Sc.	11	11	4	8	19	50	50
		B.Ed.	4	4	4	8	12	50	50
IV	23	B.Sc.	11	11	4	8	19	50	50
		B.Ed.	4	4	4	8	12	50	50
V	24	B.Sc.	9	9	3	6	15	50	50
		B.Ed.	7	7	5	10	17	50	50
VI	24	B.Sc.	9	9	3	6	15	50	50
		B.Ed.	6	6	6	12	18	50	50
VII	17	B.Sc.	3	3	6	12	15	50	50
	12*	B.Ed.	4	4	16**	8	8	50	50
VIII	21	B.Sc.	5	5	6	12	17	50	50
		B.Ed.	6	6	4	8	14	50	50
IX	23	M.Sc	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
X	23	M.Sc.	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
XI	20	M.Sc.	16	16	4	8	24	50	50
	4*	PE			4**	4	4	50	50
XII	23	M.Sc.	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
Total	**285**		183	183	102	176	359		

*internship ** includes internship credits

L : Lectures: 1 credit =1hr/week x 16 weeks
T :Tutorial/ 1 credit = 2 hr/week x 16 weeks
P : Practicum/practical = 2 hr/week x 16 weeks
V: Credit value of a course is L+T+P

Tables 2 to 13: Detailed Course Structure for M.Sc.Ed.(Chemistry)

Total Credits = 285 ; B.Sc.Component = 112; M.Sc. 80; B.Ed. Component =80+13

TABLE 2: Semester I (Credits: B.Sc.12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course1A Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2A Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3A Mathematics	3	3	1	2	5	50%	50%
4	3	AEC 1A Language H/K/M/Tam/Tel	2	2	1	2	4	50%	50%
5	3	AEC 2A English	2	2	1	2	4	50%	50%
6	4	Language across the curriculum	3	3	1	2	5	50%	50%
7	2	Environmental Education	1	1	1	2	3	50%	50%
Total	**24**		**17**	**17**	**7**	**14**	**31**	**50%**	**50%**

Note:
Core Courses 1A, 2A & 3A – refer to the major subjects; A refers to the First course in each major; from Sem II to VI, papers in core courses are designated B, C, D, E & F.
AEC – Ability Enhancement Course
GE- Generic Elective

TABLE 3: Semester II (Credits: B.Sc. 12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1B Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2B Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3B Mathematics	3	3	1	2	5	50%	50%
4	3	AEC 1B Language H/K/M/Tam/Tel	2	2	1	2	4	50%	50%
5	3	AEC 2 B English	2	2	1	2	4	50%	50%
6	4	Contemporary Indian Education	3	3	1	2	5	50%	50%
7	2	Yoga Edu., self-understanding & development	1	1	1	2	3	50%	50%
Total	24		17	17	7	14	31		

TABLE 4: Semester III (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1C Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2C Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3C Mathematics	3	3	1	2	5	50%	50%
4	3	Skill Enhancement Course 1	2	2	1	2	4	50%	50%
5	4	Childhood & Growing up	3	3	1	2	5	50%	50%
6	2	Gender School & Society	1	1	1	2	3	50%	50%
7	2	School Attachment Programme 1	0	0	2	4	3 weeks	50%	50%
Total	23		15	15	8	16	31		

*** SEC 1 - Skill Enhancement Course 1 –** Each student will select any one from a list of courses offered.

TABLE 5: Semester IV (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessmet C3
1	4	Core Course 1D Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2D Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3D Mathematics	3	3	1	2	5	50%	50%
4	3	*Skill Enhancement Course 2	2	2	1	2	4	50%	50%
5	4	Learning & Teaching	3	3	1	2	5	50%	50%
6	2	Drama & Art Education	1	1	1	2	3	50%	50%
7	2	School Attachment Programme 2	0	0	2	4	3 weeks	50%	50%
Total	23		15	15	8	16	31		

*** SEC 2 - Skill Enhancement Course 2 –** Each student will select any one from among the courses offered.

TABLE 6: Semester V (Credits: B.Sc. 12; B.Ed. 12; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1E Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2E Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3E Mathematics	3	3	1	2	5	50%	50%
4	4	Assessment for Learning	3	3	1	2	5	50%	50%
5	4	Pedagogy of Physical Sciences	2	2	2	4	6	50%	50%
6	4	Pedagogy of Maths.	2	2	2	4	6	50%	50%
Total	24		16	16	8	16	32		

TABLE 7: Semester VI (Credits: B.Sc. 12; B.Ed. 12; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3

1	4	Core Course 1F Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2F Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3F Mathematics	3	3	1	2	5	50%	50%
4	4	Critical Under-standing of ICT	2	2	2	4	6	50%	50%
5	4	Pedagogy of Physical Sciences	2	2	2	4	6	50%	50%
6	4	Pedagogy of Maths	2	2	2	4	6	50%	50%
Total	**24**		**15**	**15**	**9**	**18**	**33**		

TABLE 8: Semester VII*(Credits: DSE 9; B.Ed. 20; Total 29**)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	3	DSE 1 A Physics	1	1	1+1	2+2	5	50%	50%
2	3	DSE 2 A Chemistry	1	1	1+1	2+2	5	50%	50%
3	3	DSE 3 A Mathematics	1	1	2	4	5	50%	50%
4	4	Creating an Inclusive School	2	2	2	4	6	50%	50%
5	2	Health & Physical Education	1	1	1	2	3	50%	50%
6	2	Reading & Reflections On Text	1	1	1	2	3	50%	50%
7*	6	Internship in School Subject 1 : Physical Sciences	0	0	6		10 weeks	50%	50%
	6	Internship in School Subject 2 : Mathematics	0	0	6			50%	50%
Total	**29**		**7**	**7**	**22**	**20**	**27**		

*Semester duration 24 weeks; Instructional duration -14 weeks; Engagement in field -10 weeks:

**includes Internship 12 credits; DSE – Discipline Specific Elective

TABLE 9: Semester VIII (Credits: DSE 9; GE 2; B.Ed. 10; Total 21)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	3	DSE 1 B Physics	1	1	1+1	2+2	5	50%	50%
2	3	DSE 2 B Chemistry	1	1	1+1	2+2	5	50%	50%

3	3	DSE 3 B Mathematics	1	1	2	4	5	50%	50%
4	2	GE 2 Indian Const. & Human Rights	2	2	0	0	2	50%	50%
4	4	Knowledge & Curriculum	2	2	2	4	6	50%	50%
5	4	Guidance & Counseling	3	3	1	2	5	50%	50%
6	2	Value & Peace Education	1	1	1	2	3	50%	50%
Total	**21**		**11**	**11**	**10**	**20**	**31**		

TABLE 10: Semester IX (Credits: M.Sc. 20: Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Chemistry 1	4	4	0	0	4	50%	50%
2	4	Core Chemistry 2	4	4	0	0	4	50%	50%
3	4	Core Chemistry 3	4	4	0	0	4	50%	50%
4	4	Core Chemistry 4	4	4	0	0	4		
5	2	Lab.I	0	0	2	4	4	50%	50%
6	2	Lab.II	0	0	2	4	4	50%	50%
7	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 11 : Semester X (Credits: M.Sc. 20 Prof. Edu. 3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Chemistry 5	4	4	0	0	4	50%	50%
2	4	Core Chemistry 6	4	4	0	0	4	50%	50%
3	4	Core Chemistry 7	4	4	0	0	4	50%	50%
4	4	Core Chemistry 8	4	4	0	0	4		

5	2	Lab.III	0	0	2	4	4	50%	50%
6	2	Lab.1V	0	0	2	4	4	50%	50%
7	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 12: Semester XI (Credits: M.Sc. 20 Prof. Edu. 4; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Chemistry 9	4	4	0	0	4	50%	50%
2	4	Core Chemistry 10	4	4	0	0	4	50%	50%
3	4	Core Chemistry 11	4	4	0	0	4	50%	50%
4	4	Core Chemistry 12	4	4	0	0	4		
5	2	Lab.V	0	0	2	4	4	50%	50%
6	2	Lab .VI	0	0	2	4	4	50%	50%
7	4	Professsional Edu.-Internship	0	0	4	-	4 weeks	50%	50%
Total	**24**		**16**	**16**	**8**	**8**	**24**		

TABLE 13: Semester XII (Credits: M.Sc. 20 ; Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Chemistry 13	4	4	0	0	4	50%	50%
2	4	Core Chemistry 14	4	4	0	0	4	50%	50%
3	4	Core Chemistry 15	4	4	0	0	4	50%	50%
4	4	Core Chemistry 16	4	4	0	0	4	50%	50%
5	2	Lab.VII	0	0	2	4	4	50%	50%
6	2	Lab. VIII	0	0	2	4	4	50%	50%

7	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 14: PANORAMA OF COURSES IN THE EIGHT-SEMESTERS

Sl.No.	COURSE	CREDITS (L+T+P)								Credits	Total Credits In Prog.	Total Contact Hours per week (×16)
		I	II	III	IV	V	VI	VII	VIII			
	CORE COURSES:											
1	Physics	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24	30
2	Chemistry	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24	30
3	Maths	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	--	--	18+0+6	24	30
	ABILITY ENHANCEMENT COURSES											
1	Language H/K/M/Tam/Tel	2+1+0	2+1+0	--	--	--	--	--	--	4+2+0	6	8
2	English	2+1+0	2+1+0							4+2+0	6	**8**
	SKILL ENHANCEMENT COURSES											
1	Courses 1 & 2	--	--	2+0+1	2+0+1	--	--	--	--	4+0+2	6	8
	DISCIPLINE SPECIFIC ELECTIVE											
1	Physics							1+1+1	1+1+1	2+2+2	6	10
2	Chemistry							1+1+1	1+1+1	2+2+2	6	10
3	Maths							1+1+1	1+1+1	**2+2+2**	**6**	**10**
	GENERIC ELECTIVE											
1	Environmental Education	1+1+0								1+1+0	2	**3**
2.	Indian Constitution & Human Rights	1+1+0								1+1+0	2	3
	PROFESSIONAL EDUCATION COURSES											
1	Language across Curriculum	3+1+0								3+1+0	4	5
2	Contemporary Indian Education		3+1+0							3+1+0	4	5
3	Yoga Edu., self-understanding & development		1+0+1							1+0+1	2	3
4	Childhood &Growing up			3+1+0						3+1+0	4	5
5	Gender School & Society.			1+1+0						1+1+0	2	3
6*	School Attachment Programme 1			0+0+2						0+0+2	4	3 weeks
7	Learning & Teaching				3+1+0					3+1+0	4	5
8	Drama & Art Education				1+1+0					1+1+0	2	3
9*	School Attachment Programme 2				0+0+2					0+0+2	4	3 weeks
10	Assessment for Learning					3+1+0				3+1+0	4	5
11	Pedagogy of Physical Science					2+2+0				2+2+0	4	6
12	Pedagogy of Maths					2+2+0				2+2+0	4	6
13	Critical Under-standing of ICT						2+2+0			2+2+0	4	6
14	Pedagogy of Physical Science						2+2+0			2+2+0	4	6
15	Pedagogy of Maths.						2+2+0			2+2+0	4	6
16	Creating an Inclusive School							2+2+0		2+2+0	4	6
17	Health & Physical Education							1+0+1		1+0+1	2	3

18	Reading & Reflection on text							1+1+0		1+1+0	2	3
19*	Internship in School Subject 1: Physical Science							0+0+6		0+0+6	6	10 Weeks
20*	Internship in School Subject 2: Mathematics							0+0+6		0+0+6	6	
21	Knowledge & Curriculum								2+2+0	2+2+0	4	6
22	Guidance & Counselling								3+1+0	3+1+0	4	5
23	Value & Peace Education								1+1+0	1+1+0	2	3

***=** courses which do not have C3 Theory examination

TABLE 15: Semesters IX to XII

SL. NO.	COURSE	CREDIT BREAK UP				Total No. of credits	Total No. of contact hours (×16)
		IX L+T+P	X L+T+P	XI L+T+P	XII L+T+P		
	Core papers						
1	Methods of Chemical Analysis	4+0+0				4	4
2	Concepts and Models Of Inorganic Chemistry	4+0+0				4	4
3	Stereochemistry and Organic Reaction Mechanism	4+0+0				4	4
4	Chemical Thermodynamics And Statistical Thermodynamics	4+0+0				4	4
5	Lab I -Analytical Practical – I	0+0 + 2				2	4
6	Lab II - Physical Chemistry Practical – I	0+0 + 2				2	4
7	Spectroscopy		4+0+0			4	4
8	Advanced Inorganic Chemistry		4+0+0			4	4
9	Synthetic Organic Chemistry and Chemistry Of Natural Products		4+0+0			4	4
10	Quantum , Nuclear and Radiation Chemistry		4+0+0			4	4
11	Lab III - Organic Practical –I		0+0 + 2			2	4
12	Lab IV - Inorganic Practical – I		0+0 + 2			2	4
13	Solid State Chemistry			4+0+0		4	4
14	Organometallics, Catalysis & Frontiers in Inorganic Chemistry			4+0+0		4	4
15	Spectroscopy			4+0+0		4	4
16	Electrochemistry and Surface Chemistry			4+0+0		4	4
17	Lab V - Organic Practical – II			0+0 + 2		2	4
18	VI - Analytical Practical – II			0+0 + 2		2	4
19	Instrumental Methods of Chemical Analysis				4+0+0	4	4
20	Bio-inorganic Chemistry				4+0+0	4	4

21	Heterocyclics, Molecular Rearrangements, Green Chemistry, Synthetic Drugs and Antibiotics				4+0+0	4	4
22	Chemical Kinetics				4+0+0	4	4
23	Lab VII - Inorganic Practical – II				0+0 + 2	2	4
24	Lab VIII - Physical Chemistry Practical – II				0+0 + 2	2	4
	Sub-total					**80**	**96**
	PROFESSIONAL EDUCATION						
25	Foundations of higher secondary education	2 + 1+0				3	4
26	Teaching of chemistry		2 + 1+0			3	4
27	Internship Programme 2 (senior secondary level)			4 weeks		4	4
28	Research in Chemistry Education				2 + 1+0	3	4
	Sub-Total					**13**	**16**
	GRAND TOTAL					**93**	**112**

L : Lectures: 1 credit =1hr/week x 16 weeks
T :Tutorial/ 1 credit = 2 hr/week x 16 weeks
P : Practicum/practical = 2 hr/week x 16 weeks
V: Credit value of a course is L+T+P

Note : VII Semester consists of 22 weeks out of which 10 weeks of School Attachment Programme-internship in Teaching will be organized in schools outside Mysore. 12 weeks are available for classroom instruction.

7.0 Change to another programme

Candidates admitted to M.Sc.Ed.(Chemistry) programme have the option of changing to M.Sc.Ed. Physics or Mathematics programme in the beginning of IX semester, after successful completion of first eight semesters without dropping any course, and subject to conditions laid down by the Academic Commmittee constituted for the purpose.

TABLE 16 : SUBJECTS AND TITLES OF COURSES IN THE PROGRAMME

SEMESTER	COURSE	CODE	SUBJECT	TITLE
FIRST	**Core course 1A**	MSE I.1	Physics	Mechanics
	Core Course 2A	MSE I.2	Chemistry	Atomic Structure and Bonding
	Core Course 3A	MSE I.3	Mathematics	Calculus – I and Matrices
	AEC 1A	MSE I.4A MSE I.4B MSE I.4C MSE I.4D MSE I.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2A	MSE I.5	English	
	GE 1	MSE I.6		Environmental Education
	Professional Education	MSE I.7		Language Across Curriculum
SECOND	**Core course 1B**	MSE II.1	Physics	Elasticity, Waves, Heat and Thermodynamics
	Core Course 2B	MSE II.2	Chemistry	States of Matter and Nuclear Chemistry
	Core Course 3B	MSE II.3	Mathematics	Calculus – II , Analytical Geometry and

				Number Theory
	AEC 1B	MSE II.4A MSE II.4B MSE II.4C MSE II.4D MSE II.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2B	MSE II.5	English	
	Professional Education	MSE II.6		Contemporary Indian Education
		MSE II.7		Yoga Edu., self-understanding & development
THIRD	**Core course 1C**	MSE III.1	Physics	Electricity and Electromagnetism
	Core Course 2C	MSE III.2	Chemistry	Organic Chemistry – I
	Core Course 3C	MSE III.3	Mathematics	Real Analysis
	SEC 1	MSE III.4A MSE III.4B MSE III.4C	Physics Chemistry Mathematics	Basic Instrumentation Skills Industrial Chemicals and Environment Combinatorics, Statistics & Basic Probability
	Professional Education	MSE III.5		Childhood &Growing up
		MSE III.6		Gender School & Society
		MSE III.7		School Attachment Programme 1
FOURTH	**Core course 1D**	MSE IV.1A	Physics	Optics
	Core Course 2D	MSE IV.2	Chemistry	Thermodynamics, Equilibrium and Solutions
	Core Course 3D	MSE IV.3	Mathematics	Differential Equations
	SEC 2	MSE IV.4 MSE IV.4C MSE IV.4D MSE IV.4E	Physics Chemistry Mathematics	Computational Physics Industrial Inorganic Materials Data Handling
	Professional Education	MSE IV.5		Learning&Teaching
		MSE IV.6		Drama & Art Education
		MSE IV.7		School Attachment Programme 2
FIFTH	**Core course 1E**	MSE V.1	Physics	Atomic and Molecular Physics
	Core Course 2E	MSE V.2	Chemistry	Transition Elements, Coordination Compounds and Chemical Kinetics
	Core Course 3E	MSE V.3	Mathematics	Multivariate Calculus and Vector Calculus
	Professional Education	MSE V.4		Assessment For Learning
		MSE V.5		Pedagogy Of Physical Sciences
		MSE V.6		Pedagogy of Mathematics
SIXTH	**Core course 1F**	MSE VI.1	Physics	Classical and Quantum Mechanics and Special Theory of Relativity
	Core Course 2F	MSE VI.2	Chemistry	Organic Chemistry II
	Core Course 3F	MSE VI.3	Mathematics	Groups and Rings
	Professional Education	MSE VI.4		Critical Understanding of ICT
		MSE VI.5		Pedagogy of Physical Science
		MSE VI.6		Pedagogy of Mathematics

SEVENTH	**Discipline Specific Elective 1**	MSE VII.1	Physics	Nuclear and Particle Physics
		MSE VII.2	Chemistry	Electrochemistry and Photochemistry
		MSE VII.3	Mathematics	Linear Algebra
	Professional Education	MSE VII.4		Creating an inclusive school
		MSE VII.5		Health & Physical Education
		MSE VII.6		Reading & reflection on text
		MSE VII.7A		Internshipin School Subject 1 : Physical Science
		MSE VII.7B		Internship in School Subject 2: Mathematics
EIGHTH	**Discipline Specific Elective 2**	MSE VIII.1	Physics	Solid State Physics
		MSE VIII.2	Chemistry	Spectroscopy, Natural Products and Heterocyclics
		MSE VIII.3	Mathematics	Complex Analysis and Numerical Analysis
	Generic Elective 2	MSE VIII.4		Indian Constitution and Human Rights
	Professional Education	MSE VIII.5		Knowledge & Curriculum
		MSE VIII.6		Guidance & Counselling
		MSE VIII.7		Value & Peace Education

Semesters IX to XII:

Semester	**Course**	**Code**	**Title of the Paper**
NINTH	**Core Chemistry**	MSE(C)-IX.1	Methods of Chemical Analysis
		MSE(C)-IX.2	Concepts and Models Of Inorganic Chemistry
		MSE(C)-IX.3	Stereochemistry and Organic Reaction Mechanism
		MSE(C)-IX.4	Chemical Thermodynamics And Statistical Thermodynamics
		MSE(C)-IX.5	Analytical Practical – I
		MSE(C)-IX.6	Physical Chemistry Practical – I
	Professional Education	MSE(C)-IX.7	Foundations of Higher Secondary Education
TENTH	**Core Chemistry**	MSE(C)-X.1	Spectroscopy
		MSE(C)-X.2	Advanced Inorganic Chemistry
		MSE(C)-X.3	Synthetic Organic Chemistry and Chemistry Of Natural Products
		MSE(C)-X.4	Quantum , Nuclear and Radiation Chemistry
		MSE(C)-X.5	Organic Practical –I
		MSE(C)-X.6	Inorganic Practical – I
	Professional Education	MSE(C)-X.7	Teaching of Chemistry
ELEVENTH	**Core Chemistry**	MSE(C)-XI.1	Solid State Chemistry
		MSE(C)-XI.2	Organometallics, Catalysis &Frontiers in Inorganic Chemistry
		MSE(C)-XI.3	Spectroscopy
		MSE(C)-XI.4	Electrochemistry and Surface Chemistry
		MSE(C)-XI.5	Organic Practical – II
		MSE(C)-XI.6	Analytical Practical – II
	Professional Education	MSE(C)-XI.7	Internship Programme 2 (Senior Secondary Level)
Twelfth	**Core Chemistry**	MSE(C)-XII.1	Instrumental Methods of Chemical Analysis
		MSE(C)-XII.2	Bio-inorganic Chemistry
		MSE(C)-XII.3	Heterocyclics, Molecular Rearrangements, Green Chemistry, Synthetic Drugs and Antibiotics
		MSE(C)-XII.4	Chemical Kinetics
		MSE(C)-XII.5	Inorganic Practical – II
		MSE(C)-XII.6	Physical Chemistry Practical – II
	Professional Education	MSE(C)-XII.7	Research in Chemistry Education

8.0 Scheme of Examination

8.1 There shall be a terminal (C3) Examination conducted by the University of Mysore at the end of each semester in Theory and/or Practical as the case may be.

8.2 Detailed Scheme of Examination along with course titles and breakup of marks is given below.

- All the courses will be evaluated for a total of 100 marks in the C1, C2 and C3 pattern.
- C1= 25; C2 = 25 and C3 = 50 will be followed uniformly for all the courses.
- In Courses with both theory and practicals, Theory C3 = 50 & Practical C3 =50
- Courses without a C3 theory are separately indicated in the Table 14

X is the marks scored out of 50 in C_3 in Theory

Y is the marks scored out of 50 in C_3 in Practical

Z is the marks scored out of 50 in C_3 in Tutorial

8.3 Duration of semester end examination for all theory courses will be 2 hours and for practical examination, it is 3 hours.

Each theory paper comprises of 9 questions of 10 marks each. Each Unit will have two questions with internal choice. Question 9will consist of objective type questions drawn from all the units.

9.0 Question paper setting, valuation, declaration of results, challenge valuation and all other examination related issues will be as per the rules and procedures followed by the University of Mysore.

9.1 Question paper setting for C_3.

(i) There shall be a separate Board of Examiners for each subject approved by the University, for preparing, scrutinizing and approving the question papers and scheme of valuation for use in the examination/s.

(ii) The question papers shall be drawn from the question bank, through a computer.

(III) For Semesters IX to XII, a separate PG board approved by the University will be constituted. All question papers will be set by the internal examiner but valuation shall be done only by external examiners.

9.2 Coding of Answer Scripts:

Before valuation, the answer scripts shall be coded using false numbers. For each paper code separate false number shall be given.

9.3 Valuation and Classification of Successful Candidates

All papers including practicals will be valued by an internal examiner and there will be single valuation.

The performance of a student in a course will be assessed for a maximum of 100 marks as explained below.

A semester is divided into three discrete components namely C_1, C_2 and C_3.

The evaluation of the first component C_1 will be done during the first half of the semester while the first the I and II units of the syllabus is covered. This will have a weightage of 25%. This will be consolidated during the 8[th] week of the semester.

The evaluation of the second component C_2 will be done during the second half of the semester when units III and IV of the syllabus is covered. This will have a weightage of 25%. This will be consolidated during the 16[th] week of the semester. In general C_1, and C_2 should be evaluated through Test/seminar/dissertation/presentation/assignment.

Between the 18th and 20th week of the semester, the semester end examination will be conducted by the University and this forms the third component of evaluation C_3 with weightage of 50%.
If a candidate has not scored at-least 30% in C_1 and C_2 put together, he/she is **not allowed** to appear for C_3.
It should be noted that evaluated papers/assignments of C_1 and C_2 of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.

For the courses that has both Theory and Practical components, as part of C_3, both theory and practical examinations shall be conducted for 50 marks each.

The final marks of a course, M of C_3,will be computed as per the following table :

	Probable Credit Distribution patterns	**Formula for calculating M**
1.	L : T : P	M = ((L+T)*X+ (P*Y)) / (L+T+P))
2.	L : T : P = 0	X
3.	L : T = 0 : P	(L*X + P*Y) / (L+P)
4.	L = 0 : T : P	Y
5.	L : T = 0 : P = 0	X
6.	L = 0 : T = 0 : P	Y
7.	L = 0 : T : P = 0	Z

Where,
X is the marks scored out of 50 in C_3 in Theory
Y is the marks scored out of 50 in C_3 in Practical
Z is the marks scored out of 50 in C_3 in Tutorial

The total marks in a course is $P = C_1 + C_2 + M$ (after rounding to nearest integer. The grade (G) and grade point (G.P) will be calculated as follows where V is the credit value of the course.

P	G	GP = V × G
90 – 100	10	V × 10
80 – 89	9	V × 9
70 – 79	8	V × 8
60 – 69	7	V× 7
50 – 59	6	V × 6
40 – 49	5	V × 5
30 – 39	4	V ×4
0 -29	0	V × 0

If a candidate scores in $\mathbf{C_1 + C_2 \geq 30\%, M \geq 30\%M}$ **and** $\mathbf{G \geq 5}$ in a course, then he is considered to be successful in that course.

After successful completion of the required number of credits, then the overall cumulative grade point average (CGPA) of a candidate is calculated using the formula CGPA = ΣGP / Total number of credits and the class is declared as follows :

	FGP	
CGPA	Numerical Index	Qualitative Index
$4 \le CGPA < 5$	5	Second Class
$5 \le CGPA < 6$	6	
$6 \le CGPA < 7$	7	First Class
$7 \le CGPA < 8$	8	
$8 \le CGPA < 9$	9	Distinction
$9 \le CGPA \le 10$	10	

Overall percentage = 10 * CGPA or is said to be 50% in case CGPA < 5.

However, if **$C_1 + C_2 \ge 30\%$, $M \ge 30\%$ and with grade G = 4,** then a candidate has three options namely conditional success or make up of a course or dropping a course.

A. **Conditional Success**: A candidate is said to be successful conditionally in a course if his score in $C_1 + C_2 \ge 30\%$, $M \ge 30\%$ and grade G = 4. But this benefit will be available upto a maximum 48 credits for the entire programme of M.Sc.Ed. of 6 years. The candidate has to exercise this option within 10 days from the date of notification of results.

B. **Make Up of a Course**: Under the following circumstances, a candidate can have option to choose MAKE-UP OPTION for C_3:

1. scores $\ge 30\%$ in $C_1 + C_2$ and $M < 30\%$
2. scores $\ge 30\%$ in $C_1 + C_2$; $M \ge 30\%$ but with grade G = 4

The candidate has to exercise this option within 10 days from the date of notification of results. Once he has chosen the option he has to write the examination which will be conducted within 25 days from the date of notification of results or as directed by the University. There can be two or more examinations on the same day and they may be held on Saturdays and Sundays also.

If the candidate is unsuccessful in make up, also then he/she is deemed to have withdrawn / dropped the course.

C. **Dropping a Course**

Under the following circumstances a candidate is said to have DROPPED a course,
If the candidate :

1. fails to put in 75% attendance in a course,
2. decides to discontinue/ withdraw from the course,
3. scores less than 30% in $C_1 + C_2$ together,
4. scores in
   i) $C_1 + C_2$ is $\ge 30\%$ and $M < 30\%$ or
   ii) $C_1 + C_2$ is $\ge 30\%$, $M \ge 30\%$ and Grade G = 4 and exercises option to drop the course within 10 days from the date of notification of final results,
5. is unsuccessful in the MAKE-UP examination.

A candidate who has dropped a course has to **re-register** for the course when the course is offered again by the Institute.

9.4 Each student can go with a normal pace of 24 credits per semester. However, he/she has provision to go with a slow pace of 20 credits per semester or an accelerated pace of 28 credits per semester. In any case it should not exceed 28 credits in a semester including re-registered courses.

9.5 The tuition fee and the examination fee of a semester will be in accordance with the number of credits registered by each student in that semester.

9.6 The student may avail a maximum of two blank semesters in one stretch. However, he has to pay a nominal fee for maintaining a semester blank to the institution.

9.7 The Institute shall follow the CBCS guidelines of the University and its amendments thereof provided they are beneficial to the system.

10.0 Provision for Appeal

A candidate, if dissatisfied with the grades that he/she has got with a feeling that he/she is unnecessarily penalized can approach the grievance cell with the written submission together with all facts and all the assignments, test papers etc. which were evaluated. He/She can do so before the semester-end examination (based on 2 continuous assessment components already completed) or after the semester-end examination. The grievance cell is empowered to review the grades if the case is genuine and is also empowered to penalize the candidate if his/her submission is found to be baseless and unduly motivated. This Cell may recommend to take disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the Grievance Cell is final.

The Registrar (Evaluation) will be the Chairman and Convenor of the Grievance Cell. The composition of the Grievance Cell is as follows:

1. The Principal
2. The Dean of instruction
3. Heads of DESM, DESSH, I/c Sections and an external expert from the University of Mysore in the concerned subject.
4. The Registrar (Evaluation) ex-officio Chairman/Convenor.
5. Additional lady faculty member (in case not covered by 1,2,3,4,6 and 7).
6. Additional faculty member from a minority community (in case not covered by 1,2,3,4,5 and 7) and

The appropriate fee as fixed by the University shall be collected from the candidate who goes for an appeal to the Grievance Cell.

11.0 Marks Cards:

11.1 The marks card shall be laminated after affixing the hologram only when a candidate passes all the courses/papers of a particular semester.

12.0 Barring of Simultaneous Study

12.1 No student admitted to a degree course in a college under the jurisdiction of this university, shall be permitted to study simultaneously in any other course leading to a degree (regular/ evening/ morning) offered by this/any other university.

12.2 If a candidate gets admitted to more than one course, the university shall without giving prior notice, his/her admission will be cancelled to all the courses to which he/she has joined.

13.0 Miscellaneous:

13.1 These revised regulations will apply to the candidates admitted for the academic year 2016-17 and onwards for the course mentioned in Regulation No.1.0 above.

13.2 Other regulations not specifically mentioned above are as per the Regulations of the University as applicable from time to time.

13.3 Any other issue not envisaged above, shall be resolved by the Vice-Chancellor in consultation with the appropriate Bodies of the University, which shall be final and binding.

SYLLABUS

FIRST SEMESTER

Core course 1A: Physics

MSEI.1 :MECHANICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- The students will be able to understand Newtonian mechanics and apply its principles to explain natural physical phenomena.
- The teacher will be able to enable the students to identify and modify alternative conceptions in the domains of Newtonian Mechanics.

COURSE CONTENT:

Unit I

Vectors: Vector and scalar products. Scalar triple product and Vector triple product. Differentiation of a vector with respect to scalars (such as time). Gradient, Divergence, Curl-definitions, physical meaning, and operations, Laplacian, Line, Surface, and Volume integrals. Gauss', Stokes, and Greens theorem.
Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II

Laws of Motion: Newton's Laws of motion. Frames of reference, inertial and non inertial, pseudo forces, Galilean transformations; Galilean invariance, Dynamics of a system of particles. Centre of Mass.
Momentum and Energy: Principle of conservation of momentum for a system of particle, Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Conservation of energy. Momentum of variable-mass system: motion of rocket.

Unit III

Rotational Motion: Angular velocity and angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum.
Gravitation: Newton's Law of Gravitation. Central force and motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). two-body central force problem and reduction to the equivalent one body problem, inverse square law potential and different forms of orbit, Kepler's laws of planetary motion. Satellitein circular orbit and applications. Geosynchronous orbits. Weightlessness.

Unit IV

Oscillations: Simple Harmonic Motion (Basic idea), Differential equation of SHM and its solutions (simple pendulum, compound pendulum, loaded spring), Kinetic and Potential Energy, Total Energy and their time averages. Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats), Lissajous figures with equal an unequal frequency and their uses. Damped vibrations. Forced vibrations.

Reference Books:

1. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6^{th} Edition, John Wiley and Sons Inc.
2. Harris Benson,University Physics, Revised Edition, John Wiley and Sons, Inc.
3. FW Sears, MW Zemansky and HD Young,University Physics, 1986. Addison-Wesley.
4. K. R. Symon, Mechanics, Addison Wesley, 1971.
5. Basudeb Bhattacharya,Engineering Mechanics, 2^{nd} edn., 2015, Oxford University Press
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
7. Y. R. G. Takwale and P. S. Puranik,Introduction to classical mechanics, Tata McGraw Hill.
8. Charles Kittel et. al., Mechanics Berkeley Physics course, 2007, Tata McGraw-Hill.
9. H C Verma,Concepts of Physics, Bharati Bhawan; Revised Reprint 2015 edition

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following)

1. Study of the motion of an air bubble.
2. Study of the motion of a freely falling body.
3. Study of the acceleration of a body subjected to different unbalanced forces.
4. Study of accelerations of different masses under a constant unbalanced force.
5. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
6. Study of conservation of momentum and energy of a collision in a plane.
7. Conservation of momentum in a mechanical explosion.
8. To study the relation between length and time period of a simple pendulum.
9. To study the relation between force and extension produced in a stretched spring.
10. Study of the variation of the time period of a bar pendulum with different length and determination of ‘g’ at the given place.
11. Study of the dependence of the period of oscillation of a spring-mass system on mass

12. The Spiral spring: Determination of the acceleration due to gravity by the graphical method.
13. Determination of moment of Inertia, mass and density of the flywheel.
14. Moment of inertia of a disc supported on strings.
15. The moment of inertia of a wheel and axle.
16. The Bifilar Suspension

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11^{th} Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7^{th}Edition, Cengage Learning, 2009.

Core Course 2A- Chemistry

MSEI.2 :ATOMIC STRUCTURE AND BONDING

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

- To understand and appreciate the development of various atomic theories
- To develop an understanding of principles of Atomic structure
- To justify the need for quantum mechanical structure of atoms
- To develop an understanding of the periodic trends, preparation and uses of s- and p-block
- elements and their compounds in terms of structure and bonding
- To understand the nature of bonding and to predict the shapes of molecules
- To construct MO energy level diagrams and predict the properties of molecules

COURSE CONTENT:

Unit I: Atomic Structure

History of an atom. List the Characteristics of Black-body radiation- Planck's radiation law, photoelectric effect, Compton effect and their explanation using quantum theory. Bohr's model of hydrogen atom and its limitations. Summarise the evidence for the wave nature of matter. State de Broglie hypothesis and Heisenberg uncertainty principle.

Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of $\boldsymbol{\psi}$ and $\boldsymbol{\psi}^2$, postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals , Multi-electron atoms, Aufbau and Pauli exclusion principles and Hund's multiplicity rule- Electronic configurations of the elements(s,p,d blocks), effective nuclear charge.Explanation for the stability of completely filled and half filled shells with examples. Screening effect: Slaters' rule, Energy level diagram for multi –electron atoms.

Unit II: Periodic Properties and s -and p-Block Elements

Atomic radii, Covalent radii, ionic radii and Vander waal's radii- definition with explanation with examples in a group and period Explanation of oMSErved trwends.Comparision of the ionic size of atoms with the corresponding anion and cation. Variatioin of ionic radii in isoelectronic ions. Additive nature of covalent radii.
Ionization energy: Definition,the factors influencing ionization energy, variation in a group and period. Effect of the size and electronic configuration on successive ionization energies.

Electron affinity :Definition, variation in a group and in a period (oMSErved trends in the values to be accounted for).
Electronegativity: Definition,variation in a group and in a period (oMSErved trends in the values to be accounted for), calculation of electronegativity by Pauling and Mulliken methods.
s- and p-block elements: Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls –salient features of hydrides, Action of Liquid Ammonia , Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium.
To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Unit III: Chemical Bonding - I
Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule, Metallic bond-free electron, valence bond and band theories. Weak interactions – Hydrogen bonding, van der Waals forces. Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICl_2, and H_2O.

Unit IV: Molecular Orbital theory, boranes and Xenon compounds

Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO – H_2^+ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ*, π, π* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. Models.

Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and NO) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, silicates (structural principle), - Chemistry of xenon: structure and bonding in xenon compounds.

References :

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee , fifth Edition,Wiley Publishers
3. An Introduction to Inorganic chemistry Mackay and Mackay
4. Advanced Inorganic Chemistry Satya Prakash, G.D.Tuli,S.K.Basu,R.D.Madan
5. S.Chand & Company Pvt. Ltd.Principles of Physical Chemistry Puri, Sharma,Pathania 47th Edition,Vishal Publishing Co.
6. Text book of Inorganic Chemistry P.L. Soni Sultan Chand & sons.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To develop the concept of good lab practices including safety, glasswares handling,
- chemicals handling, chemical/glassware waste management, error analysis, note
- book maintenance
- To strenghten the concepts of mole and stoichiometry
- To develop analytical skills of volumetric technique

COURSE CONTENT :

1. Calibration and handling of balances, pipette, burette, and standard flask. Basic principles underlying the preparation of solutions, knowledge of primary and standard substances, Indicators used intitrations, their working principles range and their uses. Concept of Molarity, Normality, Molality, Equivalent weight and related calculations.
2. Stoichiometry of neutralization reactions of Sulphuric, Hydrochloric and Nitric acid using sodium hydroxide solution.
3. Preparation of standard Sodium Carbonate solution, Standardisation of Hydrochloric acid andestimation of Sodium hydroxide present in the given solution.
4. Estimation of carbonate and hydroxide present in a mixture.
5. Estimation of Carbonate and Bicarbonate in a given mixture by double indicator method.
6. Estimation of ammonium chloride in a given solution by back titration

7. Estimation of oxalic acid present in the given solution using sodium hydroxide solution and purecrystals of potassium hydrogen phthalate.
8. Estimation of Ferrous ammonium sulphate present in the given solution using potassium
permanganate solution and pure crystals of oxalic acid.
9. Estimation of iron(II) using Potassium dichromate with internal and external indicators.
10. Estimation of ferrous and ferric ions in a given mixture using potassium dichromate solution.
11. Standardisation of Sodium thiosulphate using potassium dichromate and estimation of copper by Iodometry.
12. Estimation of Copper in the given Copper salt by Iodimetry.
13. Estimation of total hardness of water using EDTA solution and pure crystals of Zinc sulphate.

References :

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Systematic Experiments in Chemistry Arun Sethi New Age International (p) Ltd. Cochin.

Core Course 3A Mathematics

MSEI.3 : CALCULUS - I AND MATRICES

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
At the end of the course students will be able to understand and to apply the concepts, principles and techniques of calculus and matrix theory in problem solving.

COURSE CONTENT:

Unit I: Differential calculus:
Limits revisited, Continuous functions, Discontinuous functions and types. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem.Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection. Angle of intersection between two curves.
Differentiability theorems, Rolle's theorem, Mean Value theorems,Taylor's theorem, Maclaurin's theorem, Taylor's and Maclaurin's infinite series, Indeterminate forms.

Unit II: Integral Calculus:
The integral of a function, Techniques of integration, Integration of Rational Functions, Rationalizable Integrals.
Definite Integral, Properties, Definite integral as the limit of a sum,The fundamental theorem of Calculus, Reduction formulae, Area, Volume and Length.

Unit III: Matrices – I

Matrices of order mXn, Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants, Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

Unit IV : Matrices - II

System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems and their uniqueness.

Characteristic equation of a square matrix, Eigen values and Eigen vectors, Finding them for a real symmetric matrix,Diagonalization of a real symmetric matrix, Cayley – Hamilton theorem and its applications.

References :

1. Calculus by Anton, Addison-Wiley.
2. First Course in Calculus, Serge Lang, Addison-Wiley
3. Calculus by Lipman Bers, Vols. 1 and 2, IBH.
4. Advanced Calculus, Frank Ayres, Schaum Publishing Co.
5. Higher Algebra by Bamard and Child, MacMillan India Ltd.
6. Integral Calculus by Shanthinarayan, S.Chand and Co.Ltd.
7. Differential Calculus by Gorakhprasad, Pothishala Ltd.
8. Calculus and Analytical Geometry by Thomas – Finney, Narosa Publishing House.
9. Algebra by Natarajan, Manicavachagon Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
10. Matrices by Frank Ayres, Schaum Publishing Co.
11. Textbook of Matrix Algebra by Suddhendu Biswas.

Ability Enhancement Course 1 A : Language

MSEI.4A :HINDI

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I: Functional language
Prayojanmoolak Hindi: Saidhantik Pakchh
Prayojanmook Hindi: Zaroorat, Swaroop, Visheshtayen, Prayukti ke Madhyam, Mukhya tatwa-Paribhashik Shabdavali aur Anuvad, Simayen aur Smabhavnayen,

Unit II: Communication skills
Samooh Charcha (Group discussion): Introduction – Definition – Characteristics – Types of Discussion –Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.
Sachhatkar (Interview): Characteristics – Definition – Types of Interviews – Preparation for Interview –Models – Exercises.

Unit III: Collection of Poetries:
Maithilisaran Gupt- Nar Ho Na Nirash Karo Man ko
Jayshankar Prasad- Himadri Tung Sring Se Prabudh Sudhha Bharti
Suryakant Tripathi Nirala- Joohi ki Kali
Sumitranandan Pant- Drut Jharo Jagat Ke Jirn Patra
Mahadevi Verma-Mai Neer Bhari Dhukh Ki Badli,
Sacchidanand Heeranad Vatasyayan Aggey-Kalgi Bajre Ki
Gajanan Madhav Muktibodh- Bhool Galti,
Kedarnath Agrawal- Chandra Gahna Se Lautati Ber
Nagarjun- Aakal Aur Uske Bad
Kedarnath Singh- Aakal Me Saras

Unit IV: Collection of Short Stories:
Chandradhar Sharma Guleri- Usne Kaha Tha
Jayshankar Prasad- Puraskar
Premchand- Panch Parmeshwar
Aggey-Gaingreen (Rooj)
Phanishwar Nath Renu- Teesari Kasam
Bhism Sahani- Cheef ki Dawat
Krisna Sobti-Dadi Amma
Sudha Aroda-Annapurna Mandal Ki Aakhiri Chitthi

Maitreyee Pushpa- Goma Hasti Hai
Omprakash Valmiki- Shavyatra

References:

1. Bhasha, Yugbodh aur Kavita: Dr Ramvilas Sharma, Vani Prakashan, Delhi
2. Kavita ka Vartmaan: Dr P Ravi, Vani Prakashan, Delhi
3. Hindi Kvaya ka Itihas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
4. Kavita ki Zameen aur Zameen ki Kavita: Namvar Singh, Rajkamal Prakashan, Delhi
5. Naee Kavita aur Astitvawad: Ramvilas Sharma, Rajkamal Prakashan,Delhi
6. Chhayavad: Namvar Singh, Rajkamal Prakashan, Delhi
7. Hindi Kavita ka Atit aur Vartmaan: Maneger Panday, Vani Prakashan, Delhi
8. Hindi Kahani- Antarang Pahchan: Dr Ramdars Mishra, Vani Prakashan, Delhi
9. Hindi Kahani-Sanrachana aur Samvedana: Dr Rachna Saah, Vani Prakashan, Delhi
10. Galp Ka Yatharth-Kathaloochan ke Aayam: Suvas Kumar, Vani Prakashan, Delhi
11. Hindi Ka Gadyaparva: Namvar Singh, Rajkamal Prakashan,Delhi
12. Sahitya ki Pahchan: Namvar Singh, Rajkamal Prakashan,Delhi
13. Katha Vivechan aur Gadyashilp: Ramvilas Sharma, Vani Prakashan, Delhi
14. Kahani Anubhav aur Abhivyakti: Rajendra Yadav, Vani Prakashan, Delhi
15. Kahani- Swaroop aur Samvedana: Rajendra Yadav, Vani Prakashan, Delhi
16. Kahani-Sankramansheel Kala: Khagendra Thakur, Vani Prakashan, Delhi
17. Aadhoonik Hindi Kahani: Laxminarayan Laal, Vani Prakashan, Delhi
18. Hindi Kahani-Vakt Ki Shinakht aur Srijan ka Raag: Rohini Agarwaal, Vani Prakashan, Delhi
19. Kahani Samkaleen Chunautiyan: Dr Sambhoo Gupt, Vani Prakashan, Delhi
20. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
21. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
22. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
23. Sarkari Karyalayon mein Hindi ka Prayog- GopiNath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
24. Hindi Prayog: Ramchandra Verma, Rajkamal Prakashan Samooh, Delhi
25. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
26. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
27. Effective Communication Skills, by Omkar N Kour
28. http://www.hindisamay.com

MSEI.4B :KANNADA

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive Grammar
Sandhi (Agama, Adesa, Dwitva, etc) A suitable grammar book on Sandhi will be followed in the classroom.

Unit II: Functional Language
Group Discussion: Introduction – Definition – characteristics – types of discussions – round-table sy lecture forum etc. – relevance of Group Discussion – exercises.

Conversation: Definition – styles of conversation – formats of conversation – telephonic conversation, etc. – Exercises

Unit III: Modern Poetry
i) Kalki – Kuvempu
ii) Thilisaru-Videhi
iii) Balegaarana Haadu –K S Narashimha Swamy
iv) Nanna nayi- Pu Thi Na
v) Nanna avathara – M Gopalakrishna Adiga
vi) Puttavidhave –DA. RA.Bendre
Selected from Aunika Kannada Kavya Part I, University of Mysore.

Unit IV: Prose: Collection of short stories
Collection of Short Stories
i) Danbaru Banbudu- Devanuuru Mahadeva
ii) Kallina Kolalu – Chaturanga
iii) Rotti- P Lankesh
iv) Cappaligalu – Sara Abubakkar
Selected from Sanna Kathegalu, Mysore University, Mysore

References:

1. Kannada Kaipidi, Prasaranga Publication, University of Mysore.
2. Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company(Publishers).

MSEI.4C :MALAYALAM

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I :Descriptive Grammar - Sandhi

Unit II: Functional Language

Group Discussion- Introduction – Definition – characteristics – types of discussions – round-table symposium – panel – lecture forum etc. – relevance of Group Discussion – exercises

1. Conversation - Definition – styles of conversation – formats of conversation– telephonic conversation, etc. – Exercises

Unit III: Modern Poetry

Lessons from " Kavya Mala, University of Kerala publications,Kerala

1. Mazhuvinte Katha
2. Sabhalamee yaatra
3. Shanta
4. Kochiyile Vrikshangal
5. Bharatheeyam

Unit IV:Literature

Collection of Short Stories:

From Katha malika, University of Kerala publications

1. Kadal theerathu
2. Shavadaham
3. Ammayum makanum
4. Perumazhayude pittennu
5. Chaya

References:

1. Kerala Panineeyam by A R Rajaraja Varma, NBS, Kottayam
2. Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

MSEI.4D :TAMIL

Credits :3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive grammar – Sandhi

Unit II: Functional Language
Group Discussion: Introduction-Definition-Characteristics-types of discussions-round table-symposium-panel-lecture forum etc.-relevance of group Discussions –Exercises
Conversation: Defination-styles of conversation-formats of conversation-telephonic conversation, etc-Exercises
.
Unit III: Poetry:Modern Poetry
Ikkalak Kavithaikal, Kannan En Sevegan, Thiru Arutpa, An Anthology of Tamil Poetry

Unit IV: Prose: Collection of Short Stories
Naatru – (Collection of Short Stories)

References:
1. Tamil Ningalum Thavarillamal Ezuthalam- Dr. Porko
2. Efective Group Discussion – Theory and Practice,Gloria J. Galanes, McGraw Hill Company (Publishers)
3. Naatru, Vaanathi Pathippagam, 13 Deenadayalu Street, T. Nagar, Chennai 600 017

MSE I.4E: TELUGU

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs.	**C 3: 50**

Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I : Functional language (Styles and Registers):
1. Letter writing: Characteristics – Definition – Types of Letters – E-mails – Language of Letters –Exercises
2. NEWS Reporting: Characteristics – Definition – Language of NEWS Reporting - Models – Role of Median NEWS Reporting – Exercises.

Unit II: Communication skills (Effective speaking and effective writing) in language:

1. Group discussion: Introduction – Definition – Characteristics – Types of Discussion – Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.
2. Interview: Characteristics – Definition – Types of Interviews – Preparation for Interview – Models – Exercises.

Unit III: Modern Poetry and Folk literature

1. Desha Charitralu – Sree Sree (From Maha Prasthanam, Visalandhra Publications, Hyderabad).
2. Folk Songs from 'Rayalaseema Raagalu' & 'Triveni' Published by Telugu Academy, Hyderabad

Unit IV: Genre of literature (Piece of a Drama/Portion of Autobiography)

Selected scenes from drama '**Kanyashulkam'** by Gurazada Apparao (available at Visalandhra Publication, Hyderabad.

References:

1. A Hand book of writing activities, Prasaranga, University of Bangalore.
2. The perfect Interview by Max Eaggert, Random House, UK.,
3. Interview Secrets by Heather Salter, Publications: Collins, London,
4. Effective Group Discussion – Theory and Practice be Gloria J.Galanes, McGraw Hill Company.
5. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
6. Effective Communication Skills, by Omkar N Kour

Ability Enhancement Course 1B : English

MSEI.5 :LANGUAGE PROFICIENCY IN ENGLISH

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs.	**C 3: 50**

Objectives:

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: Descriptive Grammar

1. Tenses:

a) Simple Present: Habitual action, General truths, Future time, Verbs of state, Verbs of perception, Verbs of sensation, Narration, Use of simple present for demonstration and commentaries, Present perfect, present perfect continuous, Present continuous also indicative of future action.

b) Simple past: Past time reference, Present time reference, Future time reference, Past continuous, Past perfect, past, perfect continuous

Unit II: Skills in Communication

1. Negotiating a point of view – learning to talk persuasively so as to get across one's perspective.
2. Debating on an issue – agreeing / disagreeing.

Unit III: Study and Reference Skills

Note making; Note- taking; Summary writing.
Comprehension Skills
Extracts from literary, scientific and educational journals.

Unit IV: Skills of Communication

Advanced Writing Skills, writing advertisement copy; Writing a project proposal and Writing Resume, sending an application.

Listening effectively; Talking about one self (likes, dislikes, interests, beliefs, personality traits, ambitions); Expressing an opinion about personal belief on a current issue. (Ability to speak fluently for 3-4 minutes. Focus would be on organized, logical, sequential presentation of thought through spontaneous speech).

Suggested Activities:

- Politeness competitions- students with partners take turns in using a given number of utterances for negotiation / requests/complaints/small talk.

- Students introduce themselves though using symbols/ metaphors.
- Students collect newspaper/magazine cuttings on topical and/ or cultural issues of interest-write and share their opinion with peers.

References:

1. Block, C.C. (1997). Teaching the Language Arts, 2 nd Ed. Allyn and Bacon
2. Mckay. et al. (1995). The Communication Skills Book, 2 nd Ed. New Harbinger Publications.
3. Hornby,A.S.(2001).Oxford Advanced Learner’s Dictionary,OUP
4. Thomsan,A.J. & Martinet.(2002).A Practical English Grammar.OUP

GENERIC ELECTIVE 1

MSEI.6 : ENVIRONMENTAL EDUCATION

Credits: 2 (1L+ 1T +0P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student-teacher will be able to:

- Develop awareness and concern for environmental issues and sustainable development.
- Acquaint with the concept, objectives and importance of Environmental Education (EE).
- Introduce multi-disciplinary approach to environmental problems.
- Acquaint how to design, develop and implement strategies for Environmental Education (EE).
- Acquaint with the different methods and techniques of teaching Environmental Education (EE).
- Undertake practical activities for school cleanliness, neighbourhood cleanliness drive, and healthy personal hygiene in relation to Swachh Bharat and healthy living. (These activities would have been oMSErved and practiced during the 16-week Internship in schools)
- Inculcate environment friendly values through EE.

COURSE CONTENT :

Unit I : Meaning and Concepts

Meaning as evident from Indian literature and contemporary texts, Definition, Objectives, Importance of EE with special reference to Indian view of life and sustainable development Sustainable Development Goals.

Unit II: Basic Environmental Concepts

Ecosystem, Biotic and Abiotic factors, Inter-relationship, Factors affecting environment, population, air, water, soil, noise; Acid rain, Greenhouse effect, Extinction of species, Soil erosion, Energy crisis, Environment and sustainable development; Role of specially designed strategies for cleanliness, Role of mass media and technology in developing awareness about nvironmental problems and its prevention, Role of NGO and governmental organizations in developing EE.

Unit III: Curriculum, Methods and Techniques of EE

Designing, developing strategies for EE, Evaluation of EE resources materials; Field trips, Role play, Poster presentation, Quiz, Debate, Projects, Swachh Bharat Abhiyan sustainability

Unit IV: Value Development through EE as in Indian View of Life

Practical work in relation to school cleanliness and neighbourhood watch, Text book evaluation for contents on environment and cleanliness, Field trip on environmental degradation, and school and neighbourhood cleanliness, Visit to nature park, industry polluted areas.

Practicum

- Study sustainable development initiative in the country.
- Visits to polluted sites and preparation of report.
- Interviewing people and reporting the inconveniences due to any of the environmental problems.
- To study innovations done by to improve the environment of that area.
- To study the implementation of Environmental Education Programmes in schools/stated country.
- To prepare models and exhibits for general awareness of public regarding environmental hazards.
- To prepare a programme for environmental awareness and school cleanliness, and to conduct the same with school children.
- To visit industries and study alternative strategies of Environmental pollution management.
- To prepare a resource material on any of the environmental problems along with a suitable evaluation strategy. To prepare quizzes and games on environmental issues.
- Organise Swacch Bharat Abhiyan as sustainable activity.
- To study the contribution of NGOs in improving the environment of the city. Classroom. Prepare posters/chart on Sustainable Development Goals.

* In addition, school and community based activities may be organised.

Evaluation Strategies

1. Assignments/sessional work.
2. Unit tests.
3. Portfolio assessment of exhibits, model of charts prepared by student teachers.
4. Seminar presentations followed by group discussion.

References:

1. Trivedi, M.M. and Pathak, Y.P. (1994). *Manav ane Paryavaran: Bhaugolic Paripekshma, Universitygranth Nirman.* Board Publication, Ahmedabad, Gujarat.
2. Garg, B. and Tiwana (1995). *Environmental Pollution and Protection*. New Delhi: Deep & Deep Publication.
3. Sharma, R.C. (1981). *Environmental Education.* New Delhi: Metropolitan Publication.
4. UNESCO, Environmental Education in the light of the Tbilisi Conference, UNESCO.
5. NCERT (2009), *Project Book in Environmental Education from Class I-X*. New Delhi: NCERT.
6. NCERT (2004), *Environmental Education in Schools.* New Delhi: NCERT.
7. **Web Resources**Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT
8. http://www.ncert.nic.in/departments/nie/dee/publication/pdf/Towards%20A%20green%20School.pdf
9. Swachh Bharat Swachh Vidyalaya: A National Mission, Clean India: Clean Schools A Handbook, MHRD, http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/Eng_Swachch-Bharat-Swachch-Vidhalaya.pdf

PROFESSIONAL EDUCATION COURSES

MSEI.7 :Language Across Curriculum

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The student teacher will be able to:

- Understand nature, function and role of different kinds of languages in curriculum transaction
- Acquaint with obstacles in language usage while using the language and ways to overcome them.
- Understand importance and use of first and second language, multilingualism and impact of culture.
- Acquire knowledge about the communication process and verbal and nonverbal communication skills.
- Familiarize the students with of barriers to (Listening, Speaking, Reading, Writing) LSRW skills and activities for developing these skills.

COURSE CONTENT :

Unit I Nature and Functions of Language

Language – Meaning and Concept, Functions of Language, Role of Language in Curriculum Transaction, Theories of Language Learning, Barriers in Using a Language & Strategies to Overcome them, Verbal and Non-verbal communication

Unit IILanguage across Curriculum in the Indian Context

Language as a determinant of Access, Language proficiency and students' attitude towards

Learning and Schooling/ dropouts, Language/oral proficiency and critical thinking

Unit IIIStrategies for Multilingual Classrooms

Role Plays and Discussions as tools for learning, 'Questioning' to stimulate thought and to encourage and motivate to respond, Preparing Subject/content based exercises in reading, comprehension and usage, Sensitizing, Reflecting and Facilitating, Understanding the learner and his/her language background, Creating sensitivity to the language diversity, Using oral & written language in the classroom for optimal learning

Unit IVDeveloping Receptive Skills and Productive Skills

Barriers to Listening Skills, Activities for Developing Listening Skills, Barriers to Reading Skills, Activities for Developing Reading Skills, Barriers to Writing Skills, Activities for Developing Writing Skills, Need and Importance of Classroom Discourse. Barriers to Speaking Skills, Activities for Developing Speaking Skills

Practicum

1. School Visit to Find out Communication Problem/Apprehension in Students
2. Designing Games and Exercises for Developing Listening, Speaking, Reading and Writing Skills
3. Assignments on Developing Writing Skills- Summary, Letter, Paragraph, Essays, Speech
4. Assignments on Developing Speaking Skills – Oral Presentations, Debate, Elocution, Discussion, Brain-storming

Assignments on Developing Listening Skills – Listening to speech, directions

***** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.

References:

1. Akmajian, A. et al. (2010). *Linguistics: Introduction to Language and Communication.* (6th ed.). Cambridge: MIT Press.
2. Fasold, R. & Connor-Linton, J. (2013). *An Introduction to Language and Linguistics*. (6th ed.). Cambridge: Cambridge University Press.
3. Floyd, K. (2009). *Interpersonal Communication*. New York: McGraw Hill Companies Inc.
4. Fromkin, V., Rodman, R. & Hyms, N. (2011). *Introduction to Language.* (9th ed.). Canada: Cengage Learning.
5. Pearson, J.C. et al (2011). *Human Communication.* (4th ed.). New York: McGraw Hill Companies Inc.

Web Resources

6. First and Second Language Acquisition – A Brief Comparison. Retrieved from https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf
7. Similarities and Differences between First and Second Language Acquisition Retrieved from http://multilingualism.pbworks.com/w/page/21913433/Similarities%20and%20Differences%20between%20First%20and%20Second%20Language%20Acquisition
8. Activities for Developing Speaking Skill Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm
9. http://www.educ.ualberta.ca/staff/olenka.Bilash/best%20of%20bilash/speaking.html

10. Activities for Developing Listening Skill Retrieved from http://www.educ.ualberta.ca/staff/olenka.bilash/best%20of%20bilash/listening.html
11. https://blog.udemy.com/listening-skills-exercises/
12. Learning curves: Language Education (2009), by Azim Premji Foundation http://azimpremjifoundation.org/pdf/LCIssue13.pdf
13. Courses on Communication Skills, http://nptel.ac.in/courses/109104030/

SECOND SEMESTER

Core Course I B Physics

MSEII.1 :ELASTICITY, WAVES, HEAT, AND THERMODYNAMICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- The students will be able to understand principles of elasticity, waves, heat, thermodynamics and classical statistical mechanics and apply its principles to explain natural physical phenomena.
- The teacher will enable the students to identify and modify alternative conceptions in the domains of elasticity, waves, heat, thermodynamics and classical statistical mechanics.

COURSE CONTENT:

Unit I: Elasticity

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli- Dependence of Young's modulus on temperature and its applications, Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Elastic potential Energy, Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, η and σ by Searle's method.

Unit II: Waves

Review of Mechanical waves, types of waves, travelling waves, the superposition principle, wave speed, power and intensity in wave motion. Transverse waves on a string- travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, interference of waves, standing waves, resonance, Doppler effect. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave.

Unit III: Thermodynamics-I

Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P& C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient. Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem.

Unit IV: Thermodynamics-II

Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams.Third law of thermodynamics, Unattainability of absolute zero. Thermodynamic potentials. Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations& applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (C_P – C_V), C_P/C_V, TdS equations.

References:

1. David Halliday, Robert Resnick and Jay Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons, Inc.
2. Harris Benson, University Physics, Revised Edition, John Wiley and Sons Inc.
3. Zeemanskyand R. Dittman, Heat and Thermodynamics, McGraw Hill, 7th edition, 1996.
4. H J Pain, Physics of Vibration and Waves, Wiley; Sixth edition, 2006.
5. Brijlal and Subramaniam, Heat and Thermodynamics, S Chand, 2008.
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S.Chand (G/L) & Company Ltd., 2010.
8. A. B. Gupta and H. Ray, Heat and Thermodynamics, New central publications.
9. D. S. Mathur, Heat and Thermodynamics, SultanChand.
10. M. N. Saha and B. N. Srivastava, Treatise on Heat, The Indian Press.
11. A. Kumar and S.P. Taneja,Thermal Physics, R. chand Publications, 2014.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following).

1. Study of the oscillations of a column of water as a function of its length and study of damped oscillation.
2. To determine the velocity of sound at 0^o C and the end correction by setting up a resonance column (first resonance length).
3. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire.
4. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method.
5. Study of Newton's law of cooling.
6. Determination of solar constant.
7. J by Joules Calorimeter.
8. Study of the rate of flow of water through a capillary tube under different pressure heads.
9. Study of the relation between pressure and volume of a gas at constant temperature
10. Study of variation of pressure and temperature of a gas at constant volume.
11. To study the variation of thermo emf across two junctions of a thermocouple with temperature
12. Surface Tension-capillary rise method-radius by vernier microscope

13. Study of the motion of a steel sphere in a viscous liquid and determination of the coefficient of viscosity of the liquid.
14. Melde's experiment – determination of frequency.
15. Lees and Charlton disc – Thermal conductivity of a bad conductor.
16. Specific heat of a solid by the method of mixtures.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7thEdition, Cengage Learning, 2009.
7. D.P. Khandelwal,A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication, 1985.

Core Course 2 B :Chemistry

MSEII.2 :STATES OF MATTER AND NUCLEAR CHEMISTRY

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

- Illustrate how a scientific model can be constructed based on the experimental oMSErvations of the behaviour of gases and to explain the properties in terms of microscopic organization.
- To develop an understanding of properties of Gases, Liquids, colloids and Solutions.
- To understand the shapes of molecules in terms of symmetries and to relate the properties of matter in solid state to the structure.
- To develop an understanding of the concept of acids and bases, characteristics of non-aqueous solvents.
- To familiarize radioactivity as a nuclear phenomenon in understanding the nuclear reactions

COURSE CONTENT

Unit I : Gaseous and Solid State

Review of kinetic theory of gases and van der walls equation. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liqefaction of gases based on Joule-Thomson effect.

Explanation of the macroscopic properties of solids in terms of structure, bonding and defects. Definition of space lattice, unit cell.

Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystals.

X-ray diffraction by crystals. Derivation of Bragg equation. Predicting crystal structure . Defects in solids , Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of state. Critical Phenomena : P-V isotherms of real gases, continuity of states, the isotherms of van der Waals equation, Derive a relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).

Unit II : Liquids and Colloids

Accounting the Isotropic and intermediate behaviour of liquids as a link between solids and gases. Also tracing the role of liquids as solvents and reaction regulators Intermolecular forces, structure of liquids (a qualitative description).

Structural differences between solids, liquids and gases.

Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

Definition of colloids, classification of colloids.

Solids in liquids (sols) : Properties – kinetic, optical and electrical; stability of colloids, protective action, Hardy – Schulze law, gold number.

Liquids in liquids (emulsions) : Types of emulsions, preparation. Emulsifier.

Liquids in Solids (gels) : Classification, preparation and properties, inhibition, general applications of colloids.

Unit III : Acids and bases

A discussion on changing concepts of acids and bases involving concentrations and effects of solvent medium. Arrhenius, Bronstead-Lowry and Lewis concepts of acids and bases.

Hard and Soft Acids and Bases (HSAB) -Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Non-aqueous Solvents- Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Unit IV : Nuclear Chemistry

Fundamental particles of nucleus, Concept of Nuclides, isotopes, isobars and isotones (with specific examples), nuclear forces,qualitative idea of stability of the nucleus (n/p ratio), binding energy, packing fraction,Natural and artificial radioactivity, Radioactive Disintegration series, half life, average life,nuclear reactions, artificial transmutation, nuclear fusion and fission. Nuclear fusion as a future source of energy ,Nuclear reactors, Application of Radioactivity and Radio isotopes as tracers in chemistry, , biology,medicine, agriculture and industry.Isotope dilution analysis,Neutron activation analysis.

References :

1. Essentials of Physical Chemistry Arun Bahl B.S.Bahl, G.D.Tuli, S.Chand & Company Ltd.
2. Principles of Physical Chemistry : Marron and Prutton
3. Elements of Physical Chemistry : Samuel Glasstone and Lewis
4. Physical Chemistry : P W Atkins

5. Nuclear Chemistry V.N.Darls Sultan Chand & sons.
6. Essentials of Nuclear Chemistry Arnikar, Hari jeevan, 4^{th} edition, New age international.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To evolve a scheme of qualitatively analyzing an inorganic mixtureclassification of anions and cations.
- Quantitative inorganic analysis of mixtures containing four radicals.
- To develop skills of synthesizing coordination compound

COURSE CONTENT:

1. To arrive at a scheme of analysis of anions and cations based on solubility products and common ion effect: Systematic qualitative analysis by micro-scale methods of a mixture containing two acidic and two basis radicals from the following list(not more than one interfering radical):
   Cations: lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, sodium potassium, ammonium.
   Anions: carbonate, bicarbonate, acetate, fluoride, chloride, bromide, iodide, nitrate, sulphate,
   borate, oxalate, phosphate.
2. Preparation of the complexes:
   Tris(thiourea)copper(I)sulphate monohydrate, Mercury tetra thiocyanato cobaltate(II), simple cobalt and chromium complexes and their analysis.

References:

1. A Text Book of Quantitative Inorganic Analysis, A .I . Vogel
2. Advanced Practical Inorganic Chemistry, Gurudeep

Core Course 3 B Mathematics

MSEII.3 :CALCULUS – II, ANALYTICAL GEOMETRY AND NUMBER THEORY

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
At the end of the course students will be able to understand the concepts of number system and analytical geometry and principles and techniques of calculus of several variables in problem solving.

COURSE CONTENT:

Unit I: Partial Derivatives – I
Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Linear approximation theorem. Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Directional Derivative, Partial Derivatives of higher order, Taylor's Theorem, Derivative of Implicit functions, Jacobians.

Unit II: Analytical Geometry – I
Cartesian coordinates in three dimensional spaces, Relation between Cartesian coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations of straight lines (Cartesian and Vector form).

Unit III: Analytical Geometry – II
Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Shortest distance between two skew lines.
Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Classification theorem on second degree equation.

Unit IV: Theory of Numbers
Division Algorithm – Prime and Composite Numbers – proving the existence and uniqueness of GCD and the Euclidean Algorithm – fundamental theorem of Arithmetic - the least common multiple – congruences – linear congruences – Wilson's theorem – Simultaneous congruences – Theorem of Euler – Fermat and Lagrange.

References :

1. Calculus by Anton,Wiley.
2. Calculus with Analytic Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.
4. First Course in Calculus by Serge Lang, Addison-Wiley.
5. Calculus, Vols. 1 and 2 by Lipman Bers, IBH.
6. Introduction to Calculus and Analytical Geometry by Courant and John, Narosa Publishing House.

7. Advanced Calculus by Frank Ayres, Schaum Publishing Co.
8. Higher Algebra by Bamard and Child, Macmillan India Ltd.
9. Integral Calculus by Shanthinarayan, S.Chand and Co. Ltd.
10. Differential Calculus by Gorakhprasad, Pothishala Ltd.
11. A Course in calculus and Real Analysis-Iby Ghorpade S R and Limaye B V (2006), Springer Verlag
12. Elementary Number Theory by David M. Burton.
13. Elementary Number Theory with applications (2nd edition) by Thomas Koshy, Academic Press.

ABILITY ENHANCEMENT COURSE AEC 1B : LANGUAGE

MSEII.4A: HINDI

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I : Functional Language
Prayojanmoolak Hindi: Prayog ke Chhetra
Prayojanmoolak Hindi: Rajbhasha Hindi-Samvaidhanik Pravdhan, Raajbhasha Adhiniyam Aadi**,** Sarkari Karyalayon mein Prayukt Hindi-Karyalayee Aalekhan, Tippan, Patrachar, Sanchhepan

Unit II :**Communication skills**
Varta (Conversation): Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.
Bahas (Debate): Characteristics – Definition – Need of Debate – Technique to conduct Debates,etc. Exercise.

Unit III :DramaandNovel :
Hanoosh by Bhishm Sahani Published by Rajkamal Prakashan, Delhi
Karmbhoomi by Premchand, Swaraj Prakashan, Delhi

Unit IV : Modern Literature
Collection of Essays:
a) Baalkrisna Bhatt- Manusya Ke Jivan Ki Sarthakta
b) Mahaveer Prasad Diwedi- Sahitya Ki Mahatta
c) Sardar Purn Singh- Aacharan Ki Sabhyata
d) Hajari Prasad Diwedi- Kutaj

e) Harishankar Parsai- Thithurta Hua Gantantra
f) Nirmal Verma- Dharm Aur Dharmnirpechhata

References:

1. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
2. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
3. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
4. Hindi Nibandh Sahitya ka Sanskritik Addhyan: Dr Baburam,Vani Prakashan, Delhi
5. Hindi Gadhya-Vinayas aur Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
6. Aadhunik Hindi Ka Gadhya Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
7. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Maneger Panday, Vani Prakashan, Delhi
9. Bhakti Ke Aayam: Dr P Jayraaman, Vani Prakashan, Delhi
10. Bhartiya Bhakti Sahitya: Dr Rajmal Bora, Vani Prakashan, Delhi
11. Bhaktikavya ka Samajdarshan: Dr Premshankar, Vani Prakashan, Delhi
12. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
13. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
14. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
15. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
16. Sarkari Karyalayon mein Hindi ka Prayog- GopiNath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
17. Alankar Mimansh: Murlimanohar Prsad Singh, Swaraj Prakashan, Delhi
18. Saral Hindi Vyakaran: Swaraj Prakashan, Delhi
19. Upanyas aur Lokjeevan: Railph Fox, Vani Prakashan, Delhi
20. Upanyas ka Uadai: Aayan Waat, Hariyana Grantha Academy,Haryana

MSEII.4B:KANNADA

Credits 3 (2L+1T+0P) — **Max. Marks: 100**
Contact Hours per week: 4 — **C1+C2:50**
Exam duration: 2 Hrs — **C 3:50**

Objectives*:*

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive Grammar
Samasa and Alankara

Unit II: Functional Language
a) News reporting: Characteristics – definition – language of news reporting–model of news report-patterns – role of media in news reporting – exercises.
b) Interview: Characteristics – definitions – preparation for interview – various types of interviews (business – employment – literary etc) – exercises.

Unit III: Medieval Poetry
i) Enna Devange Jagavella Hennu Noada - Akkamahadevi
ii) Kaayuttirdanirulu Hagalennade-Raghavanka
iii) Parahimseyam Madi Manavam Baldapane – Lakshmeesha
(Kaavya Sanchaya – 3- Mysore University, Mysore).

Unit IV: Collection of Essays
i) Prajle Mattu Parisara-U R Ananthamurthy
ii) Samakalina Prajne– G S Shivarudrappa
iii) Samaanaavakaasha – S L Bhairappa
iv) Namma Prachinara Jivana Moulyagalu- T V Venkatachalashastri
(Selected from Gadya Vihara Part III) Mysore University, Mysore

References:

1. Kannada Kaipidi, Prasaranga Publication, University of Mysore
2. Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, MarquetteBooks LLC, Washington.
3. The Perfect Interview by Max Eggert, Random House, UK.

MSE II.4C: MALAYALAM

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Unit I. Descriptive Grammar
Samasa and Alamkara

Unit II :Functional Language

1. News reporting- Characteristics –definition – language of news reporting– model of news report- patterns – role of media in news reporting – exercises
2. Interview- Characteristics – definitions – preparation for interview – various types of Interviews(business – employment – literary etc) – exercises.

Unit III:Poetry - Medieval

VEENA POOVU by Kumaaran ashan, Published by Devi Book Stall, Kodungalloor

Unit IV:Collection of Essays

Lessons from “Bharatha Paryatanam By Kutti Krishna Maraar, Published by Maraar Sahitya Prakasha, Kozhikode

1. Yudhathinte parinaamam
2. Amba
3. Karnante arangettram
4. Markandeyante chiri

References:

1. Bhashaa bhushanam and Kerala Paanineeyam, NBS, Kottayam
2. Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, MarquetteBooks LLC, Washington.
3. The Perfect Interview by Max Eggert, Random House, UK.

MSE II.4D: TAMIL

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: **Aspects of Style**

Styles of writing

Idioms, Phrases and Proverbs

Unit II: Functional Language:

News Reporting: Characteristics-Definition-language of news reporting-model of news reporting-patterns-role of media in news reporting –exercises.

Interview: Characteristics-definition-preparation for interview-various types of interviews (business-employment-literary etc.)-exercises

Unit III: Medieval Poetry

Periya Puranam Selection of poems

Naladiyar – Selection of poems

An Anthology of Tamil Poetry

Unit IV:Collection of Essays
Ariviyal Tamilzhakkam-S. V. Shanmugam (3 Essays), New Century Book House (P) Ltd, 41 – B SIDCO Industrial Estate Chennai 600 017, Tamil Nenjam-Dr. M. Varadharajan (3 Essays)

References:

1. Tamil Ningalum Thavarillamal Ezhuthalam, Dr. Porka
2. Fundamentals of journalism, Report Writing and editing by R. Thomas Berner, Maruette BooksLLC, Washington.
3. The perfect Interview by Max Eggert, Random House, UK.

MSEII.4E: TELUGU

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I: Functional language (Styles and Registers)
1. Essay Writing: Characteristics – Definition – Format of Essays – Types of Essays (Literary, Scientific, etc.) – Models – Exercises.
2. Translation: Characteristics – Definition – Need of Translation – Translation Models – Exercises (From English to Regional Languages).
.

Unit II : Communication skills (Effective speaking and effective writing) in language
1. Conversation: Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.
2. Debate: Characteristics – Definition – Need of Debate – Technique to conduct Debates, and other Exercise.

Unit III: Ancient Poetry and medieval poetry
1. Damayanthee Swayamvaram by Nannaya (First 18 Poems)
2. Sathyabhama Santhwanam by Nandi Timmana (Poems 82 to 104)
(From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

Unit IVGenre of literature (Prose: Literary Work)

1. Andrula Sanghika Acharamulu by Khandavalli Lakshmi Ranjanam.
2. Telugu Samethalu by Nayani Krishna Kumari
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

References:

1. A Hand book of writing activities, Prasaranga, University of Bangalore.
2. About Translation by Peter Newmark, Multi lingual Motters, Clavedon, UK,
3. The art of Translation (A Symposium), Ministry of Scientific Research and Cultural Affairs, Govt.of India.
4. Effective Group Discussion – Theory and Practice be Gloria J.Galanes, McGraw Hill
5. Anuvada Samsyalu by Rachamallu Ramachandra Reddy, Published by Visalandhra Books, Hyderabad
6. Aspects of Translation, Prof K V V L Narasimha Rao, CIIL Publication, Mysore

Ability Enhancement Course AEC 2B : English

MSEII.5 :LANGUAGE PROFICIENCY IN ENGLISH-1I

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives :

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: **Descriptive Grammar**
Function of Auxiliaries; Modals; Question form
Clauses: Noun Clause; Reported Speech and Change of Voice.

Unit II:Development of Language Competence
To be based on the use of multiple texts which address issues of multiculturalism, gender, racism and texts which relate with current issues and contemporary trends. Short stories, comic strips, cartoons and animations (both print and non-print media) to be used. Speeches of famous persons, diaries, travelogues can also be used.

Unit III:Writing for Functional Purposes
Letter-writing (Professional / Personal)

Unit III: Creative Skills in Writing
Writing dialogues, poems and essays

Unit IV: Basic Phonetics
Sounds of English language, intonation and transcription using IPA.

References:

1. Chan. et al. (1997) Professional Writing Skills, San Anselma, CA
2. Fiderer, A. (1994) Teaching Writing: A Workshop Approach. Scholastic.
3. Block, C.C. (1997). Teaching the Language Arts, 2 nd Ed. Allyn and Bacon
4. Mckay. et al. (1995). The Communication Skills Book, 2 nd Ed. New Harbinger Publications.
5. Merrriam, E. (1964). It Doesn't Always Have to Rhyme. Atheneum.
6. Hyland, Ken (2004) Second Language Writing. University of Michigan Press.
7. Graves,D (1992). Explore Poetry: The reading /writing teacher's companion.Heinemann
8. Stone Douglas (1999). Difficult conversations: How to discuss what Matters Most, New York.:Penguin Books.
9. Gabor Don (2001). How to start a Conversation and Make Friends, New York: Fireside.

PROFESSIONAL EDUCATION COURSES

MSE II.6: CONTEMPORARY INDIAN EDUCATION

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
The course enables the student teachers to:
- Understand different perspectives of Education.
- Analyse the concept of Education and its related terms
- Analyse the Aims of Education and their determinants
- Reflect on the educational ideas and systems of various thinkers and develop the ability to theorize educational practices;
- Collect evidences for the influence of socio-cultural aspects on Education
- Analyse the role of Education on society by gathering various evidences and illustrations
- Understand and appreciate the need of autonomy to teacher and learners
- See the relationship between autonomy, accountability, and commitment
- Arrive at a list of qualities of a committed teacher through discussions.

COURSE CONTENT:
Unit I: Education: Concept, Nature, and Purpose

Education as concept and its distinct nature; Classical, Liberalists and Progressivists view on Education; Analytical concept of education - education as a normative concept; Education as a family of Processes; Education as worthwhile activity; Cognitive and normative dimensions of education; Education and Educated person;
Education as System; Modes of education- formal, informal, non-formal;

Education and its related concepts- Training, Instruction and teaching
Education: Purpose(s) and Determinants - Determinants of Purpose-individual, Community, Religion, State and Market; Brief historical inquiry into purposes and determinants of education (from ancient India to contemporary India); social context of purposes of education
Education as a Discipline and Interdisciplinary in nature
Aims of Education from ancient to contemporary Indian society
Education as value development
Determinants of Aims of Education in emerging India

Unit II: Education and Socio-cultural context
Education as an instrument of social change; Influence of education on society and family; Socio-cultural influences on the aims of education; Emerging trends in societies and their influence on education
Education and Development
Globalization and Internationalization of education

Unit III: Educational thoughts and practices
Critical reflection on the educational thoughts of Indian and Western thinkers and on their relevance to the present education system
Indian: Mahatma Gandhi, Rabindranath Tagore, Aurobindo, Swami Vivekananada, Jiddu Krishnamurthy, Gijju Bhai Badheka; B R Ambedkar; Vinova Bhave
Western: Plato, Rousseau, John Dewey, Froebel, Montessori, Ivan Iliach, Paulo Frieri

Unit IV: Autonomy of Teacher and Learner

Autonomy: Meaning and extent
Teacher autonomy: Meaning, extent and nature; Teacher as autonomous professional; Areas of teacher autonomy: Their limit-situations - Curriculum making; Learning resources and material selection and use; Pedagogical practices; Assessment modalities;Limit-situations: Structures- Structured curriculum, and examination system; Time-tables;
Learner Autonomy: Meaning, extent and nature; Learning as an autonomous act; Meaning making and learners' autonomy-opportunities and constraints
Autonomy and Accountability: Teacher Accountability; Teacher commitment

Sessional Activities:
- Presentations on Educational thoughts of Various thinkers
- Preparation of an Album or posters on different thoughts of great thinkers
- Analysis of aims of education from ancient Vedic times to modern times
- Collection of examples/evidences to show the influence of Education on social change and the socio-cultural influences on Educational aims
- Comparative study of National curriculum frameworks of NCERT on aims of education
- Readings on Position paper on " Aims of Education"-NCF 2005
- Comparative study of Aims of Education of few countries
- Collection of case studies that exemplifies teacher accountability and commitment

References:
1. Alfred North Whitehead (1967), 'The Aims of Education and Other Essays', The McMilan Company, New York. .
2. Debra Hayes, Martin Hills, Pam Christie & Bob Lingard (2007) Teachers & Schooling: Making a Difference, Allen and Unwin, Australia.

3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
4. Diane Tellman (2000), Living Values: An Educational Program, Sterling Publishing Private Limited, USA.
5. Freiri, Paulo (1968). Pedagogy of the Oppressed, Sea burry Press, New York, USA
6. Hirst,Paul(1970). The Logic of Education, Taylor & Francis, London
7. JJ Rousseau, (1956) Emile
8. John S Brubacher, (1969) Modern Philosophies of Education. Tata McGraw Hill Pub., Co.,Pvt., Ltd, New Delhi.
9. Krishna Murthy, J. (1947) On Education, Orient Longman, New Delhi.
10. Mani, R.S. (1964). Educational Ideas and Ideals of Gandhi and Tagore, New Book Society, New Delhi.
11. Manoj Das (1999). Sri Aurobindo on Education, National Council for Teacher Education, New Delhi.
12. Margaret (1999). The Open Classroom: A Journey through Education, Orient Longman, New Delhi.
13. Mathur S.S. (1988). A Sociological Approach to Indian Education, Vinod Prakashan, Agra.
14. NCERT (2013). Basics in Education, National Council of Educational Research and Training, New Delhi.
15. NCERT, (2005). National Curriculum Framework-2005. National Council of Educational Research and Training, New Delhi.
16. O'Connor,J (1958) Philosophy of Education, pub by Duke university Press on behalf of philosophical review.
17. Peters, R.S. (1967), The Concept of Education, Routledge, United Kingdom.
18. Peters, RS (1968). Ethics and education.(5th edn), George Allen & Unwin Ltd, London
19. Prema Clarke (2001). Teaching & Learning: The Culture of pedagogy, Sage Publication, New Delhi.
20. Scheffler, Israel (1966).Philosophy and Education: Modern Readings, Allyn and Bacon, Boston, US
21. Stella Van Petten Henderson (1960) Introduction to Philosophy, The University of Chicago press, Chicago.
22. Steven H. Cahn (1970). The Philosophical Foundation of Education, Harper & Row Publishers, New York.

MSEII.7: YOGA EDUCATION, SELF UNDERSTANDING AND DEVELOPMENT

Credits: 2 (1L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

The student teacher will be able to:

- Understand the meaning and importance of self-concept and self-esteem.
- Be aware of different factors related to self-concepts and self-esteem. Record a brief history of development of yoga through the ages. Discuss how yoga and yoga practices are important for healthy living.
- Explain some important principles of yoga.
- Explain the different limbs of *Astañga* yoga.
- State the different types of yoga.
- Derive how Hatha yoga and *Astañga* yoga are complementary to each other.
- Enable the student to have good health.
- Practice mental hygiene.
- Possess emotional stability.
- Integrate moral values.
- Attain higher level of consciousness.
- Demonstrate some important *asanas* and *pranayama*.

COURSE CONTENT :

Unit I : Introduction to Yoga and Yogic Practices

Yoga: meaning and initiation, What is Yoga? Misconnects of Yoga, History of development of yoga, The streams of Yoga: Astanga yoga Raja yoga, Yogic practices for healthy living

Unit II Introduction to Yogic Texts

Historicity of yoga as a discipline, Classification of yoga and yogic texts, Hatha yogic practices, Meditational processes

Unit III: Yoga and Health

Need of yoga for positive health, Role of mind in positive health as per ancient yogic literature, Concept of health, healing and disease: yogic perspectives, Potential cause of ill health, Yogic principles of healthy living

Unit IV: Personality Development and Stress Management through Yoga

Yogic Practices for Personality Development : Surya Namaskar, Asanas : Tadasana, Simhasana, Kukkutasana, Akarna Dhanurasana, Matsyasana, Prnayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Banda, Uddiyana Bandha, Dhyana (Meditation), Meditation, What is Stress, Yoga as a Way of Life for Stress Management: Ahara, Vihara, Achara, Vichara, Vyavahara, Yogic Practices for Stress Management ; Asanas, Hastottanasana, Padahastasana, Trikonasana, Shashankasana, Ushtrasana, Ardhamatsyendrasana , Bhujangasana, Makarasana, Sarvangasana, Matsyasana, Shavasana;

Pranayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Sheetali Pranayama; Meditation, Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs **C_3 : 50 marks**

Practicum

- General guidelines for performance of the practice of yoga for the beginners

1. Guidelines for the practice of *āsanas*
2. Guidelines for the practice of *prāṇāyāma*
3. Guidelines for the practice of *meditation*

- Select yoga practices for persons of average health for practical yoga sessions

5. Supine position
6. Prone position
7. Sitting position
8. Standing position
9. Mudras
10. Prāṇāyāmas

*** In addition, school and community based activities may be organised.**

Evaluation Strategies

The evaluation will be done through practicals/ assessment of ability to develop and design softwares for selected contents.

References:

1. Adair, J. and Allen, M. (1999). *Time Management and Personal Development.* London: Hawksmere.
2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
3. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi. (Also available in Hindi)
4. Rohrer, J. (2002). *ABC of Awareness.* Oberurnen: UTD Media.
5. Simanowitz, V. and Pearce, P. (2003). *Personality Development.* Beckshire: Open University Press.
6. Stevens, N. (2008). *Learning to Coach.* United Kingdom: How to books.

THIRD SEMESTER

Core Course 1 C : Physics

MSEIII.1 : ELECTRICITY AND ELECTROMAGNETISM

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable students to acquire a broad conceptual framework of electrostatics electromagnetic phenomena.

COURSE CONTENT:

Unit I: Electrostatics

Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss's theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere and continuous charge distributions (charged rod, ring, disk). Calculation of electric field from potential.

Unit II: Electric Fields in Matter and DC circuits

Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Combination of capacitors, energy stored in a capacitor, Energy per unit volume in electrostatic field. Atomic view of dielectrics, Polarization, Displacement vector. Gauss's theorem in dielectrics. Dielectric constant, Parallel plate capacitor completely filled with dielectric. Polarizability and susceptibility, Clausius-Mossotti equation.
DC Circuits: Kirchhoff's laws, Voltage and Current dividers, Mesh analysis and Loop analysis, RC circuits, Maximum power transfer theorem.

Unit III: Magnetism

Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Magnetic force between two parallel current carrying conductors. The Divergence and Curl of **B**, Magnetic vector potential. Ampere's circuital law. Magnetic field due to a very long solenoid and a toroidal coil.
Magnetism in matter: Magnetic intensity, magnetic induction,, Magnetic susceptibility, permeability. Classification of magnetic substances- a brief introduction of dia-, para- and ferro-magnetic materials.

Unit IV: Electromagnetic Induction and AC Circuits

Electromagnetic Induction: Review of Faraday's law of induction, Lenz's law, Motional EMF. Inductance: Self inductance, energy in a magnetic field, magnetic energy density.

AC circuits: The *j* operator.sinusoidal voltage, current voltage relation in resistance, capacitance and inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance. Mutual inductance and transformers.

Reference Books:

1. David J. Griffiths, Introduction To Electrodynamics, 4th Edition, Pearson
2. D C Tayal, Electricity and Magnetism, 1988, Himalaya Publishing House.
3. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley, Inc.
4. A N Matveev, Electricity and Magnetism, Mir Publishers, Moscow.
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.
6. A F Kipp, Fundamentals of Electricity and Magnetism, McGraw Hill.
7. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill Education, 1986.
8. J.H. Fewkes & J. Yarwood, Electricity and Magnetism, Vol. I, Oxford Univ. Press, 1991.
9. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To study the variation of Magnetic field along the axis of a circular coil.
2. To determine M & H using deflection magnetometer & vibration magnetometer.
3. To determine horizontal component of Earth's magnetic field using a Tangent galvanometer.
4. To calibrate an ammeter using a potentiometer and Daniel cell.
5. Mapping of magnetic field due to a current carrying straight conductor.
6. Determination of resistance & resistivity using Meter Bridge.
7. Charging & Discharging of a Capacitor.
8. Deflection magnetometer-Tan A, Tan B positions.
9. Deflection magnetometer -Tan C Position-moment of moments.
10. Mapping of magnetic field lines for a current carrying solenoid.
11. Searle's vibration magnetometer-moment & ratio of moments.
12. Box type vibration magnetometer- M &B_h.
13. Caparison of emf and determination of internal resistance of a cell using a potentiometer.
14. Determination of resistance & resistivity using PO Box.

15. Comparison of capacitance by Desauty's bridge using BG.
16. Determination of frequency of AC mains using Sonometer & electromagnet.
17. Variation of phase angle with capacitance for a RC circuit.
18. Conversion of Galvanometer to Voltmeter.
19. Unknown resistance by Carey Foster bridge.
20. Induced emf.
21. Maximum power transfer theorem.
22. To verify the Thevenin's and Norton's theorem

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 CChemistry

MSEIII.2 :ORGANIC CHEMISTRY – I

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To review the concept of isomerism and its types
- To develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.

COURSE CONTENT:

Unit I: Stereochemistry of Organic Compounds
Review of Concept of Isomerism and Types of isomerism with examples.

Optical Isomerism: Structural changes responsible for properties: elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization and asymmetric synthesis.
Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism: Determination of configuration of geometric isomers. Cis – trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism: Difference between configuration and conformation. Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives. Review of Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

Unit II: Aliphatic Hydrocarbons
Alkanes: Review of IUPAC nomenclature of branched and unbranched alkanes. Isomerism in alkanes and industrial source. Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes: Nomenclature, methods of formation (from acetoacetic ester / malonic ester and Dieckmann reaction), chemical reactions (halogenation), Baeyer’s strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Alkenes: Accounting for Reactions due to unsaturation in compounds. Nomenclature of alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism. Regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanism of hydrogenation, electrophilic and free radical additions, Markownikoff’s rule, hydroboration followed by oxidation, oxymercuration – reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$. Polymerization of Alkenes. Substitution at the allylic and vinylic positions of alkenes.

Cycloalkenes: Methods of formation and chemical reactions of cycloalkenes.

Alkadienes: Nomenclature and classification of dienes: Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions. Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding in alkynes. Methods of formation (alkylation of acetylene and by elimination reactions). Acidity of alkynes. Chemical reactions of alkynes: Mechanism of electrophilic and nucleophilic addition reactions, hydroboration, oxidation, metal-ammonia reductions, oxidation and polymerization.

Unit III: Aromatic Hydrocarbons

Factors responsible for the characteristic reactions of Aromatic compounds. Nomenclature of benzene derivatives. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity: The Huckel rule, aromatic ions.

Aromatic electrophilic substitution: General pattern of the mechanism, role of σ- and π-complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/ para ratio. Side chain reactions of benzene derivatives. Birch reduction.

Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.

Unit IV:Alkyl and Aryl Halides

Alkyl halides: A study of Alkyl halides highlighting its synthetic applications. Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanism of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams. Polyhalogen compounds: chloroform, carbon tetrachloride.

Aryl halides: Methods of formation of aryl halides, nuclear and side chain reactions. The addition- elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

References :

1. Organic Chemistry : Seyhand N Ege
2. Organic Chemistry : Morrison and Boyd
3. Organic Chemistry : I L Finar
4. Organic Chemistry : Hendricson, Cram and Hammond
5. Organic Chemistry : Stanley H. Pine

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop basic skills in organic synthesis and purification of organic compounds

COURSE CONTENT:

1. Calibration of Thermometer using naphthalene / acetanilide / urea
2. Determination of melting point of Benzoic acid / cinnamic acid / m – dinitro benzene / p-dichlorobenzene
3. Determination of boiling point of aniline / nitrobenzene / chlorobenzene
4. Distillation of water – alcohol mixture using water condenser; Distillation of chlorobenzene –nitrobenzene mixture using air-condenser
5. Cystallization: Benzoic acid from hot water, naphthalene from ethanol
6. Sublimation of camphor / phthalic acid / succinic acid

Organic synthesis:

1. Preparation of Iodoform from ethanol / acetone using sodium hypochlorite and KI
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration
3. Preparation of *p*-bromoacetanilide from acetanilide by bromination
4. Preparation of 2,4,6-tribromo phenol from phenol / 2,4,6-tribromoaniline from aniline
5. Preparation of Acetanilide from aniline by acetylation
6. preparation of benzoic acid from benzamide by base hydrolysis
7. preparation of aspirin from salicylic acid by acetylation
8. preparation of p-bromoaniline from acetanilide
9. preparation of 0-iodobenzoic acid from anthranilic acid
10. preparation of p-nitroacetanilide from acetanilide by nitration

References :
A Text Book of Qualitative organic Analysis, A .I . Vogel

Core Course 3 C :Mathematics

MSEIII.3 :REAL ANALYSIS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
At the end of the course students will be able to understand the concepts of real number system, real sequences, infinite series and the convergence tests. Also understand the concept of Riemann integration and its properties.

COURSE CONTENT:

Unit I:
The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important suMSEts, Intervals, Countable and Uncountable sets. Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness.

Unit II:
Introduction to sequences, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, SuMSEquences.

Unit III:

Introduction to Infinite Series, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Maclaurin's integral test.

Unit IV:

Riemann Integration: Upper and lower sums, Criterion for inerrability, Inerrability of continuous functions and monotone functions, Fundamental theorem of Calculus, Change of variables, Integration by parts, First and Second Mean Value Theorems of Integral Calculus.

References:

1. Real Analysis by J.M.Howie, Springer 2007.
2. Real Analysis by Malik, Wiley Eastern.
3. Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.
4. Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
5. Real Analysis by Royden, Prentice Hall of India Pvt. Ltd.
6. Mathematical Analysis by T M Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition.
7. Introduction to Real Analysisby Bartle R G & Sherbert , Wiley India
8. Kumar Ajit & Kumaresan S, *Real Analysis*, CRC Press
9. Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.
10. Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006.
11. Elementary Analysis – The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International Ltd.
14. Textbook of Mathematical Analysis by Leadership Project, Bombay University, Tata McGraw Hill Publishing Media Pvt. Ltd.

Skill Enhancement Course- 1 Physics

MSEIII.4A :BASIC INSTRUMENTATION SKILLS

Credits: 3 (2L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

Unit I: Basic of Measurement

Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

Unit II: Cathode Ray Oscilloscope and its uses

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Unit III:

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Unit IV:

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

References :

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. , U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

(A minimum of EIGHT experiments to be selected from the following)

1. Circuit tracing of a given laboratory electronic equipment.
2. Use of Digital multimeter/VTVM for measuring voltages.
3. Winding a coil / transformer.
4. Study the layout of receiver circuit.
5. Trouble shooting a circuit.
6. To oMSErve the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
7. To oMSErve the limitations of a multimeter for measuring high frequency voltage and currents.
8. To measure Q of a coil and its dependence on frequency, using a Q- meter.
9. Measurement of voltage, frequency, time period and phase angle using CRO.
10. Measurement of time period, frequency, average period using universal counter/ frequency counter.
11. Measurement of rise, fall and delay times using a CRO.
12. Measurement of distortion of a RF signal generator using distortion factor meter.
13. Measurement of R, L and C using a LCR bridge/ universal bridge.

References:

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

Skill Enhancement Course 1 :Chemistry

MSEIII.4B : INDUSTRIAL CHEMICALS AND ENVIRONMENT

Credits: 3 (2L+ 0T +1P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:
- To understand the basic techniques of chemical industry
- To gain idea about the energy sources
- To understand the properties and application of lubricants
- To study the effects of green house phenomena
- To study the water quality parameter and waste water management
- To acquire the basic knowledge about commom pesticides

COURSE CONTENT:
Unit I:
Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology.

Unit II:
Fuel Chemistry: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and non fuel) in various industries, its composition, carbonization of coal.Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro Gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Unit III:
Air Pollution: Pollutants and their sources, pollution by SO2, CO2, CO, NOx, H2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Green House effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluent from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

Unit IV:

Pesticides General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil) , Anilides (Alachlor and Butachlor).

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To monitor the water quality parameters
- To prepare simple indusrial products
- To analyse food adultrants

COURSE CONTENT:

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method.
   ($AgNO_3$ and potassium chromate)
6. Estimation of total alkalinity of water samples (CO_3, HCO_3) using double titration method.
7. Preparation of borax/ boric acid.
8. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
9. Preparation of simple organophosphates, phosphonates and thiophosphates
10. Preparation of Magnesium bisilicate (Antacid).
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

References:

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
3. B.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut.
4. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
5. R. Cremlyn: Pesticides, John Wiley. 7. William O. Foye, Thomas L., Lemke , David A. William:
6. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.

7. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
8. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
9. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi. 10. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.

Skill Enhancement Course 1 : Mathematics

MSEIII.4C : COMBINATORICS, STATISTICS AND BASIC PROBABILITY

Credits :3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives:
To enable the students to understand the basic concepts of combinatorics, statistics and probability, to obtain the skills and apply them in problem-solving and teaching.

COURSE CONTENT:
Unit I:
Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complements, Boolean Algebra, Boolean expressions, Application to switching circuits.

Unit II:
Permutations and Combinations, Pigeon-hole principle, Principle of inclusion and exclusion. Solving real life problems based on them.

Unit-III:
Introduction to statistics, Mean, Mode and Median of grouped and ungrouped data, Graphical representations; Pie Charts, Line Graphs, Bar Graphs, Histographs, frequency polygon. Measures of dispersion; Range, Mean deviation, Variance and Standard deviation, Analysis of frequency distribution.

Unit-IV: Random experiment, Concept of probability, Sample space, Events- different kinds Probability definitions – Mathematical or Classical or Statistical, Conditional probability, Independent events, Baye's theorem.
Random variable, Discrete and continuous random variables, Probability function, Probability density function, Distribution function. Mean Variance and standard deviation of a random variable.

References:
1. Elements of Discrete Mathematics by C. L. Liu , McGraw-Hill, 1986.
2. Discrete Mathematics and its Applications by Kenneth H. Rosen, McGraw-Hill, 2002.
3. Introduction to the Theory of Statisticsby Alexander M. Mood and Others (1988), New York, McGraw Hill.
4. Introduction to Probabilityby Charles M. Grinstead and Laurie Snell J. (1991), Rhode Island, American Mathematical Society.
5. Fundamentals of Mathematical Statistics by Gupta S.C and Kapur (2011), New Delhi, Sultan Chand and Co.
6. Basic Probability Problemsby Richard Serfozo (2003), London, Springer.

7. Introduction to Mathematical Statisticsby Robert V. Hogg and Allen T. Craig (1978), McMillan Publishing Co.

PROFESSIONAL EDUCATION COURSES

MSE III.5: CHILDHOOD AND GROWING UP

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the salient features and problems of growth and development during childhood to adolescence.
- Understand the dynamics of personality development in order to facilitate student trainees' and their students' personal growth.
- Develop the ability to apply the knowledge provided by Educational Psychology to classroom problems of various kinds.
- Understand the intra and inter individual differences in the learners and their Implications for organizing educational programmes.
- Acquire the skills of understanding the needs of all the learners in the classroom and meeting their needs.
- Appreciate the contribution of psychology in realizing the objectives of education.

COURSE CONTENT

Unit I : Nature of Human Development and Educational Implications

Concept and Branches of Psychology; Importance of Study of Psychology by Classroom Teachers, Meaning of Growth and Development. Differences between growth and development, importance of growth and development for the teachers. Principles of Development, Factors Influencing Growth and Development; Role of Heredity and Environment in Determining individual Differences in Development. Developmental Stages and Tasks, Development during Early Childhood, Late Childhood and Adolescence- Characteristics, Factors Influencing and Educational Implications: (a) Physical (b) Psychomotor (c) Intellectual (d) Language (e)Emotional (f) Social and (g) Moral and Value Development

Unit II : Management of Issues and Concerns of Adolescent Students

Factors Affecting Adolescent development; Issues and Concerns during Adolescence - Physical and Health concerns,Emotional Issues, Social Issues, Socio-cultural diversity, Adverse Life experiences, Identity Vs Role Confusion; Adolescent Cognition and its effect on Adjustment, Need and Importance of Adolescence Education, Significance of Life Skill Education for Adolescence, Role of Schools for the Balanced Personality

Unit III: Individual Differences in Learners

Individual Differences in - Psycho-Motor skills, Intelligence, Aptitude, Personality, Learning styles and Cognitive Preferences, Self concept and Self esteem, Social-Emotional Development, Aptitude, Interest,Attitude and Values and Study Habits.

Unit IV :Assessment of Individual and Intra Individual Differences in Learners

Tools and Techniques: Psychological Tests, OMSErvation Schedules, Inventories, Checklists, Anecdotal Records, Cumulative Records, Sociometry, Interview Techniques,Achievement and Diagnostic Tests.

Meeting the Individual Differences in the Classroom- General Approaches; Remedial Instruction, Guidance and Counseling, Whole School Approach.

Practicum

Administering Group Tests
Conducting Case Studies
Diagnosing the deviations
Studying School Record and preparing Reports.
Getting Famililiarised with Individual Psychological Tests.

References:

1. Bigge, M.L. (1982). *Learning Theories for Teachers,* (4th edition). New York, Harper and Row Publishers, pp. 89-90.
2. Bolles, R.C. (1975). *Learning Theory*. New York, Holt, Rinehart and Winston, pp. 18-19.
3. Chauhan, S.S. (1978). *Advanced Educational Psychology,* Vikas Publishing House Pvt. Ltd., New Delhi.
4. Dandapani, S. (2001). *A textbook of Advanced Educational Psychology*. New Delhi: Anmol Publications.
5. Dunn, R. (1983). *Can students identify their own Learning Styles?* Educational Leadership, 40, pp. 60-62.
6. Dash, M. (1988). *Educational Psychology*. Delhi: Deep and Deep Publication.
7. Duric, L. (1975). *Performance of Pupils in the Process of Instruction*. Bratislava, SPN, pp. 54-90.
8. Duric, L. (1990). *Educational Sciences: Essentials of Educational Psychology*. International Bureau of Education, UNESCO, New Delhi, Sterling Publishers, p. 81.
9. Fontana, D. (1995). *Psychology for Teachers* (3rd edition). The British Psychological Society, London: McMillan in association with BPS Books.
10. Kumar, S. (2014). Child Development and Pedagogy, Pearson.
11. Kundu C.L. and Tutoo, D.N. (1993). *Educational Psychology,* Sterling Publishers Pvt. Ltd.
12. Lindgren, H.C. (1967). *Educational Psychology in Classroom* (3rd edition). New York: John Wiley and sons.
13. Mohan J. and Vasudeva P.N. (1993). *Learning Theories and Teaching, In Mohan Jitendra (ed.) Educational Psychology,* New Delhi, Wiley Eastern Limited, P. 146.
14. Murthy, CGV and Rao, AVG. (2005). *Life skills Education: Training Package,* Mysore: Regional Institute of Education.
15. NCERT (2013) *Training and Resource materials in Adolescence Education*, New Delhi
16. Oza, D.J. and Ronak, R.P. (2011). *Management of behavioral problems of children with mental retardation*. Germany: VDM publication.
17. Papalia D.E., and Sally, W.O. (1978). *Human Development*. McGraw Hill Publishing Company.

18. Phens, J.M., and Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational Psychology*. New York: Holt Rinehart and Winston Inc.
19. Tessmer, M., and Jonassen, D. (1988). *Learning Strategies: A New Instructional Technology*. In Harris Duncun (1988) Education for the New Technologies, World Year Book of Education. London: Kogan page Inc.
20. Skinner, E.C. (1984). *Educational Psychology*-4th Edition. New Delhi: Prentice Hall of India Pvt. Ltd.
21. Spinthall, N., and Spinthall, R.C. (1990). *Educational Psychology* 5th Edition. McGraw Hill Publishing Company.

Web Resources

- Animated Videos from Study.com, http://study.com/academy/course/educational-psychology-course.html
- Seifert, K. and Sutton, R. 2011). Educational Psychology Third Edition http://www.oercommons.org/courses/educational-psychology/view
- Introduction to Psychology, Open Textbook, http://open.lib.umn.edu/intropsyc/
- Generic Issues, NCERT, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/PDF/generic.pdf
- www.aeparc.org

MSEIII.6 :Gender, School and Society

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
This course enables the student teachers to

- Understand and contextualize ideals of the Constitution of India;
- Appreciate humanistic agenda of the Constitution of India;
- Value and recognize the role of education in realizing the ideals of the Constitution;
- Analyse various educational contexts to see whether the child's rights are ensured
- Understand and develop positive attitudes towards various forms of exclusions;
- Appreciate the measures taken at the national level to universalize elementary and secondary education;
- Analyse the contextual examples to understand the gender issues and concerns;
- Develop positive attitude and values towards promoting gender equality;
- Evolves strategies and mechanisms as a teacher to ensure equality in school and learning contexts

COURSE CONTENT:
Unit I: Education as Fundamental Right

Constitution of India : Fundamental rights; Education as Fundamental right; Human Rights: Meaning, Nature, and classification;Rights of Children: International covenants and Indian Constitution; Education as Fundamental Right of Children: 2009, Rights of girl child

Unit II: Policy framework for public Education in India and its implementation

Education in Post-Independent India: Significant recommendations of commissions and committees, National Policy on Education-1986,Revised 1992, Delors Report: learning the treasure within, Universalization of elementary education: Need and significance; Government schemes and efforts with special focus on Sarva Shiksha Abhiyan, Issues in implementing RTE-2009: A critical understanding.Issues that affect and negate the children's right to education(Child labour: Street children, abandoned and orphans; Differently abled children; Attitude towards the girl child and her participation in schooling; Punishment, abuse and violence in schools). alternative schooling, Secondary education: Universalization of secondary education; universal access, universal enrollment, universal retention, universal success; Issues and Quality concerns- Recommendations of CABE; interventions of RMSA, Initiatives and measures taken at national level to improve teacher education at secondary level: Role of NCTE and NCERT

Unit III: Contemporary Indian Schooling: Concern and Issues

Equality of Educational Opportunity: Meaning and nature; Forms of inequality: Caste, Gender, Transgender, regional, religious and other marginalized groups;

Inequality in Schooling: Public- private schools, Rural-urban schools,Mass-elite schools, single teachers' schools and many other forms of in equal school systems. Positive discrimination: concept and issues and policy intervention;

Understanding Exclusion in schooling: Exclusion: Meaning, and nature; Forms of Exclusion:

Physical/physiological Exclusion; Different kinds/types of differently abled children: Measures to address the issues of leaning of differently abled children and professional preparedness of institutions;

Socio-cultural and economic exclusion

Understanding different forms of socio-cultural and economic exclusion in schooling—Caste, Class, Gender, Minority, and other Marginalized sections of the society;

Critical understanding of 'ascribed identities' on educational opportunities;

Unit IV: Gender: Issues and concerns

Basic Gender concepts: Difference between Gender and Sex; Social construction of Gender; Gender roles as viewed in Indian context; Concept of Transgender

Gender roles in society through various institutions such as family, caste, religion, culture, media and popular culture (films, advertisements, songs etc), law and State; stereotype in gender roles

Issues related to women/girl child: female infanticide and feticide, sex ratio, honour killing, dowry, child marriage, property rights, divorce, widowhood.

Gender bias in school enrolments, household responsibilities, societal attitude towards girl's education

Issues related to gender in school: sexual abuse, sexual harassment, perception of safety at school, home and beyond

Representation of gendered roles, relationships and ideas in textbooks and curricula.

Role of schools, peers, teachers, curriculum and textbooks in challenging gender inequalities or reinforcing gender parity

The Indian constitution and provisions accorded to women; women's rights; legal aspects related to women, indecent representation of women (Prohibition act), cybercrime:

Educational and Employment provisions for Transgender: Legal aspects; social recognition

Sessional activities

- A critical study, with the help of survey and oMSErvational study, of alternative schools- child labour schools, night schools, mobile schools and boat schools.
- Critical analysis of different committees and commissions on Education
- Readings on National Policy on Education, RTE Act 2009, Delors Report

- Survey of schools to see the implementation of various incentives of government to equalize educational opportunities
- Textbook analysis for identifying integration of gender issues.
- Prepare presentation on laws related to women harassment, early marriage, property inheritance, trafficking etc.
- Prepare presentations on constitutional provisions and other government measures to promote girl child's education
- Presentation of Case study reports on girl child's problems in schools and at home.

Suggested Readings

- Anand, C.L. et.al. (1983). Teacher and Education in Emerging in Indian Society, NCERT, New Delhi.
- Govt. of India (1986). National Policy on Education, Min. of HRD, New Delhi.
- Govt. of India (1992). Programme of Action (NPE). Min of HRD.
- Mistry, S.P. (1986). Non-formal Education-An Approach to Education for All, Publication, New Delhi.
- Mohanty, J., (1986). School Education in Emerging Society, sterling Publishers.
- Mukherjee, S.N. (1963). Secondary School Administration, Acharya Book Depot, Baroda.
- Mukherji, S.M., (1966). History of Education in India, Acharya Book Depot, Baroda.
- Naik, J.P. & Syed, N., (1974). A Student's History of Education in India, MacMillan, New Delhi.
- NCERT (1986). School Education in India – Present Status and Future Needs, New Delhi.
- Salamatullah, (1979). Education in Social context, NCERT, New Delhi.
- Sykes, Marjorie (1988): The Story of Nai Talim, Naitalim Samiti: Wardha.
- UNESCO; (1997). Learning the Treasure Within.
- Dr. Veda Mitra. Education in Ancient India, Arya book Depot, New Delhi – 1967
- Reports of SSA and RMSA
- NCTE (2009) National curriculum framework for teacher education
- Agarwal, N (2002). Women and Law in India. New Delhi: New century Pub
- Sen,S.(2013). Women's rights and empowerment. New Delhi: Astha Pub.
- Siddiqi, F.E.& Ranganathan,S.(2001). Handbook on women and human rights, New Delhi: Kanishka Pub

Web Resources: Video on improving Gender Equality- EFA Crowdsourcing Challenge, 2012, UNESCO, Pub by The Pearson Foundation, 3 minutes.

MSEIII.7 :School Attachment Programme 1

Credits : 2 **Marks: 100**
Duration: 3 Weeks **C1+C2 : 50**
C3 : 50

Objectives

- To familiarize the student teachers to school environment, its structure, functions and processes.
- To familiarize the student teachers with different types of schools existing in the community.

COURSE CONTENT:

1. The student teachers will visit the neighbourhood schools for one week to get acquainted with the school environment and its functions and processes and submit the report.

2. The student teachers will familiarize themselves with school structure and administration.
3. The student teachers will visit different types of schools such as Government, Government aided and private schools to study their governing norms, regulations and participation in the community.
4. The student teachers will visit the schools run by community/NGO or other organizations like minority run schools, schools in SC/St dominated areas, schools in slum areas, special and inclusive schools and submit the report.

Evaluation:

C1 – Report 1
C2 – Report 2
C3 – Presentation through PPT.

FOURTH SEMESTER

Core Course 1D :Physics

MSEIV.1 :OPTICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable students to

- understand that light is a wave phenomenon.
- apply the understanding of wave phenomenon to light.

COURSE CONTENT:

Unit I: Nature of Light and Scattering

Brief discussion on theories of light. Dual nature of electromagnetic radiation, electromagnetic spectrum, energy and monmentum of em wave. Electromagnetic nature of light. Definition and Properties of wave front. Huygen's Principle.
A brief discussion on Tyndall, Rayleigh and Raman scattering of light. A qualitative account of fluorescence and phosphorescence, the Raman Effect experiment and its explanation, intensity and polarisation of Raman lines, some applications of Raman Effect.

Unit II: Interference

Definition of Coherence, Methods of production of Coherent sources by division of wavefront and division of amplitude. Theory of interference (condition for constructive and destructive interference). Young's double slit experiment, Lloyd's Mirror and Fresnel's Biprism. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.
Michelson and Fabry-Perot interferometers: determination of wavelength of light. Wavelength difference, Refractive index and Visibility of fringes

Unit III: Diffraction

Fraunhoffer Diffraction, Diffraction at a single slit, double slit, multiple slits, Diffraction grating, Resolving power – Rayleigh's criterion, Resolving power of a grating and telescope.
Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge, a slit and a wire using half-period zone analysis.

Unit IV: Polarisation

Polarization by reflection, Brewster's law, Malus law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polariods, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity, Fresnel's theory, Rotatory polarization, use of biquartz.

Reference Books:

1. F A Jenkins and H E White, Fundamentals of Optics, McGraw-Hill, 1976.
2. B.K. Mathur, Principles of Optics, Gopal Printing, 1995.
3. H.R. Gulati and D.R. Khanna, Fundamentals of Optics, R. Chand, 1991.
4. Eugene Hecht,Optics, Pearson Education India, 2012.
5. N. Subramaniam, Brijlal, and M. N. Avadhanulu Textbook of Optics, S. Chand Limited, 2004.
6. A K Ghatak, Optics, Tata McGraw-Hill Education, 2009.
7. Ariel Lipson,Stephen G. Lipson,Henry Lipson, Optical Physics, Cambridge University Press, 2010.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To determine the refractive index (n) of a liquid by Liquid Lens.
2. Determination of 'R' of a Lens using the Newton's ring arrangement.
3. Determination of thickness of a paper foil using Air wedge setup.
4. Refractive index (n) of the material of Prism by Spectrometer- measuring angle of minimum deviation.
5. To determine the refractive index (n) of glass & water by apparent depth method.
6. Specific rotation of sugar solution using Polarimeter.
7. Spectrometer- i_1- i_2 curve.
8. Refractive index of glass prism (i-d curve).
9. Spectrometer-solid prism- Dispersive power.
10. Wavelength of sodium D1 & D2 lines using Diffraction grating.
11. Newton's rings-wavelength of sodium light.
12. Cauchy's constants A & B using spectrometer.
13. p– n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.

3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 D :Chemistry

MSEIV.2 :THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermochemical equations.
- Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts.
- Apply the concept of equilibrium to construct and interpret the phase diagrams.
- To understand the colligative properties of solutions and the behaviour of immiscible liquids.

COURSE CONTENT:

Unit I: Thermodynamics – I

Concept of Energy, Historical perspectives, Generalisation of laws of Thermodynamics based on human experience with Nature and natural Processes. Language of thermodynamics : system, surroundings, etc. Types of system, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics **:**Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule, Joule–Thomson coefficient and inversion temperature. Calculation of w.q. dU and dT for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry : Standard state, standard enthalpy of formation. Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoff's equation.

Unit II : Thermodynamics – II

Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics , different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.
Concept of Entropy : Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical changes, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.
Third law of thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.

Unit III : Chemical Equilibrium and Phase Equilibria

Recognising a system at Chemical Equilibrium. Attributes of Chemical Equilibrium, Thermodynamic derivation of law of mass action, Equilibrium constant and free energy. Factors that affect the chemical equilibrium and Le Chatelier's principle. Calculations involving equilibrium constant Ionic equilibria in aqueous solutions, sparingly soluble salts, solubility product common ion effect, selective precipitation, applications in qualitative analysis.
Ionisation of water, pH scale, weak acids and bases, hydrolysis, buffer solutions, acid base indicators, acid base titrations and multi stage equilibria. Reaction isotherm and reaction isochore.
To establish a systematic way of discussing the changes systems undergo when they are heated and cooled and when their composition is changed. Clapeyron equation and Clausius – Clapeyron equation, applications.
Statement and meaning of the terms–phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system–water, CO_2 and Sulphur systems. Phase equilibria of two component system–solid-liquid equilibria–simple eutectic–Bi–Cd. Pb-Ag Systems, desilverisation of lead. Simple eutectics, systems forming compounds with congruent melting points.

Unit IV: Solutions

To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction.
Dilute Solution : Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.
Solid solutions – compound formation with congruent melting point (Mg – Zn) and incongruent melting point (NaCl– H_2O), ($FeCl_3$–H_2O) and ($CuSO_4$–H_2O) system. Freezing mixtures, acetone dry ice.
Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes–HC– H_2O and ethanol–water systems.
Partially miscible liquids– Phenol-water, trimethylamine– water, nicotine– water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.
Immiscible liquids, steam distillation. Nernst distribution law – thermodynamic derivation, applications.

References :

1. Principles of physical chemistry : Puri,Sharma and Pathania, 47^{th} edition
2. Physical Chemistry : Atkins
3. Phase rule: Gurdeep Raj, Goel Publishing house.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the energetics of chemical reactions
- To find out the equilibirium constants of selected systems
- To study the behaviour of immiscible liquid systems
- To appreciate the physical properties of liquids and liquid mixtures

COURSE CONTENT:

1. Determination of heat of neutralization of acids and bases .Verification of Hess's law of constant heat summation.
2. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
3. pH titration of acid versus base (oMSErvation of change in pH
4. Determination of equilibrium constant of hydrolysis of an ester(ethyl acetate/methyl acetate)
5. Determination of dissociation constant of a weak acid.
6. Determination of solubility product constant (K_{sp}) of a sparingly soluble salt
7. Determination of dissociation constant of phenolphthalein/methyl orange by colorimetric method.
8. Determination of molecular weight of a given liquid by steam distillation.
9. Determination of percentage composition of the given NaCl solution by miscibility temperature method (phenol-water system).
10. Determination of distribution coefficient of benzoic acid between water and toulene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
12. Determination of molecular weight of a given substance by Rast's method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.
14. Determination of refractive index of pure liquids and liquid mixtures.

.**References :**

Systematic Experiments in Chemistry by Arun Sethi.

Core Course 3D :Mathematics

MSEIV.3 :DIFFERENTIAL EQUATIONS

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

By the end of the semester the students will be able to understand the concept of ordinary and partial differential equations, and their uses in solving real life problems.

COURSE CONTENT:

Unit I:
Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form – Reducible to homogeneous form, Linear equations, Bernoulli's equation, Exact equations, Equations reducible to exact equations.

Unit II:
Equations of the first order and higher degree, Clairaut's equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendre's differential equations, Simultaneous differential equations.

Unit III:
Equations which do not contain x, Equation whose one solution is known, Equations which can be solved by changing the independent variable and dependent variable, Variation of parameters, Total differential equation :$Pdx + Qdy + Rdz = 0$, Simultaneous equations of the form $dx/P = dy / Q = dz / R$.

Unit IV:
Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrange's linear equations $Pp + Qq = R$, Standard types of first order non-linear partial differential equations, Charpit's method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

References :

1. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
4. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
7. Differential Equations by Ayres, Schaum Publishing Company.
8. Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co.
9. Differential Equations by Vasishta and Sharma, Krishna Prakashan Mandir.
10. A Textbook of Differential Equations by Mittal, Har Anand Publications

Skill Enhancement Course - SEC 2 Physics

MSE IV.4A : COMPUTATIONAL PHYSICS

Credits: 3 (2L + 0T +1P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics.

- To use of computational methods to solve physical problems.
- To use computer language as a tool in solving physics problems (applications).

COURSE CONTENT:

Unit I: Introduction

Importance of computers in Physics, paradigm for solving physics problems for solution. Algorithms and Flowcharts, Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples (Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal).

Unit II: Scientific Programming

Concept of high level language, steps involved in the development of a Program, Compilers and Interpreters. Development of C, Basic elements of C. Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Data types, Type declaration of variables, Symbolic constants, Arithmetic operators, Increment and decrement operators, Conditional operator, Bitwise operators, Hierarchy, Arithmetic expressions, Logical operators and expressions, Assignment operators, Arithmetical and assignment statements, Mathematical functions, Input/output statements (unformatted/ formatted), Relational operators, Decision making and branching, Go to, if, if…else, switch statements, Looping, While, do and for, Arrays (Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Handling characters and strings, Functions and voids, structures, Pointers (elementary ideas only), File operations(defining and opening, reading, writing, updating and closing of files, Enough examples from physics problems.

Unit III:Scientific word processing

Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. Equation representation: Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors.

Unit IV:Visualization

Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot.

References:

1) S.S. Sastry, Introduction to Numerical Analysis, 5th Edn., 2012, PHI Learning Pvt. Ltd.
2) V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3) Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4) J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.

5) J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6) F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7) Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8) Leslie Lamport, LaTeX– A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9) Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10) R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11) U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12) K.E. Atkinson, Elementary Numerical Analysis, , 3rd edition, 2 007, Wiley India.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics and to provide hands on training on the Problem solving on Computers.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To print out all natural even/ odd numbers between given limits.
2. To find maximum, minimum and range of a given set of numbers.
3. Calculating Euler number using exp(x) series evaluated at x=1
4. To compile a frequency distribution and evaluate mean, standard deviation etc.
5. To evaluate sum of finite series and the area under a curve.
6. To find the product of two matrices
7. To find a set of prime numbers and Fibonacci series.
8. To write program to open a file and generate data for plotting using Gnuplot.
9. Plotting trajectory of a projectile projected horizontally.
10. Plotting trajectory of a projectile projected making an angle with the horizontally.
11. Creating an input Gnuplot file for plotting a data and saving the output for seeing on the screen. Saving it as an eps file and as a pdf file.
12. To find the roots of a quadratic equation.
13. Motion of a projectile using simulation and plot the output for visualization.
14. Numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
15. Motion of particle in a central force field and plot the output for visualization.

References:

1. S.S. Sastry, Introduction to Numerical Analysis, 5th Edn, 2012, PHI Learning Pvt. Ltd.
2. V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3. Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4. J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5. J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6. F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7. Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8. Leslie Lamport, LaTeX– A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9. Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10. R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11. U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12. K.E. Atkinson, Elementary Numerical Analysis, 3rd edition, 2 007, Wiley India.

Skill Enhancement Course - SEC2 Chemistry

MSE IV.4B : INORGANIC MATERIALS

Credits : 3 (1L + 0T +1P) **Marks: 100**
Contact hrs per week: 3 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 50**

Objectives :

- To understand the production, handling and storage of indusrial gases
- To gain knowledge about the manufacture, application and hazardous in handling the inorganic chemicals
- To know the composition, properties and application of silicate minerals in indusry
- To acquire the knowledge of simple fertilizers, surface coatings, alloys, and chemical explosives

COURSE CONTENT

UNITI : Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate. Industrial Metallurgy - Preparation of metals (ferrous and nonferrous) and ultra pure metals for semiconductor technology.

UNITII : Silicate Industries

Glass: Glassy state and its properties, classification (silicate and non silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, super conducting and semi conducting oxides, fullerenes carbon nanotubes and carbon fiber.

Cements : Classification of cement, ingredients and their role, Manufacture of cement and the settingprocess, quick setting cements.

UNIT III

Fertilizers: Fertilizers: Different types of fertilizers. Manufacture of the following fertilizers: Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphates; Polyphosphate, Super phosphate, Compound and mixed fertilizers Potassium Chloride, Potassium sulphate.

Surface Coatings: Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electroless), metal spraying and anodizing

UNITIV

Alloys: Classification of alloys, Ferrous and Non-Ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, Page 39 of 80 demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.

Chemical Explosive: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction of rocket propellant.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To analyse the chemical composition, properties of simple fertilizer and alloys
- To familiarise with the preparation of inorganic salts, dyes and pigments

COURSE CONTENT:

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Estimation of Cu-Zn in brass
5. Determination of composition of dolomite (by complexometric titration).
6. Analysis of Cu-Ni or (Cu, Zn) in alloy or synthetic samples.
7. Analysis of Cement.
8. Preparation of pigment (zinc oxide).
9. Estimation of Available Oxygen in Hydrogen Peroxide.
10. Determination of phosphoric acid in commercial sample of phosphoric acid.
11. Preparation of chrome alum.
12. Preparation of potash alum from alluminium scarp
13. Preparation of mthyl orange.

References:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.

2. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, NewDelhi.
3. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
5. A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
6. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New

Skill Enhancement Course –SEC 2 : Mathematics

MSE IV.4C :DATA HANDLING

Credits : 2 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives:
On completion of this course, the students will be able to:

- understand the types of educational data, procedures of data validation and its analysis.
- appreciate the analysis of educational data by using statistical tests.
- Develop skill of using the application software for data analysis and computation of various statistical measures.
- Compute the different statistical measures by using computerized application software.
- Drawing meaningful conclusions based on the interpretation of analysed data.

Unit I: Data Collection- Nature and types of data
Data collection- primary sources and secondary sources; Scales of measurement (NOIR)
Coding: Variable names; Coding responses; Coding open-ended questions
Tabulation, Constructing frequency distribution table, Graphical representation of data – Pie diagram, Histogram, frequency curve.

Unit II : Descriptive Analysis of Data-1
Measures of dispersion – Range; Quartile deviation; Standard deviation; Coefficient of dispersion; Skewness and Kurtosis.

Unit III: Descriptive Analysis of Data-2
Normal Probability Curve – Meaning, Purpose and Applications, Derived Scores (Z & T Scores).
Measures of Reltionships: Meaning of Correlation and Methods of computing correlation - Product Moment Correlation; Rank Difference Method of Correlation

Unit IV: Inferential Statistics
Sampling Procedures –Random sampling, Systematic Random sampling, (with and without repetitions), Stratified random sampling, Cluster sampling, Snow ball sampling.
Hypothesis – Meaning and types; testing of hypothesis – one sample t-test, independent samples t-test, paired samples t-test, Chi-square test.

Practicum:

1. Collect data live – class test scores/ survey data and generate frequency distribution table and represent it graphically.
2. Collect test scores of any school subject of any class and compute Mean, Quartile Deviation and Standard Deviation.
3. Compute coefficient of correlation among language subject papers and core subject papers like – English and History, Mathematics and Science, etc.
4. Study the sampling procedures adopted by taking various school contexts like selecting a team for school reports, team for debate competition, etc.

PROFESSIONAL EDUCATION COURSES

MSE IV.5: LEARNING AND TEACHING

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The student teacher will be able to:

- Gain the knowledge about the scientific knowledge about the process of learning.
- Understands the Conditions Essential for Facilitating Learning and Retention.
- Apply the Principles and Strategies of Major Approaches to Learning in Classroom Environment.
- Understands the Process of Effective Teaching and Qualities of Effective Teachers.
- Understands various Approaches to Teaching and will be able to apply them in the relevant situations.
- Understands the Principles and Strategies for Creating Conducive Classroom Environment.
- Appreciates the role of a teacher as leader, organizer, a facilitator & a humane reflective practitioner.
- Realize the difficulties in learning and teaching.

COURSE CONTENT

Unit I : Concept and Nature of Learning

Factors Associated with Learning
Maxims of Learning and their Educational Implications
Approaches to Learning(Concept, Associated Concepts Basic Principles and Educational Implications)-Habitual Learning, Associative Learning (Classical and Instrumental Conditioning), Spatial Learning/Cognitive Maps, oMSErvational Learning, Learning by Insight, Information Processing Approach, Humanistic Approach, Constructivist Learning Approach
Types of Learning-Concept Learning, Skill Learning, Verbal Learning, Learning of Principles and Problem Solving (Meaning, Nature, Stages, Principles and Approaches/Strategies)

Unit II

Attention-Meaning, Factors Influencing Attention, Strategies for Enhancing Attention; Perception-Meaning, Laws of Perceptual Organization (Gestalt Psychologists' View) and Educational Implications.
Process of Memory- Sensory Registration, Retention(Storing), Recognition, Recall;

Factors Influencing Retention; Strategies for Enhancing Memory.
Transfer of Learning- Concept, Types, Theories; Strategies for Enhancing Positive Transfer of Learning
Achievement Motivation- Concept, Intrinsic and Extrinsic Motivation; Strategies for enhancing Achievement Motivation in Students.

Unit III: Understanding the process of Teaching-Learning

Teaching as a Profession
Teaching as an Art and Science.
Understanding the Process of Teaching as a Profession
Identifying the need and importance of classroom teaching-learning
Reflective teaching
skillful teaching
Applying the knowledge of Maxims of Teaching
Role of teacher in identifying classroom related problems

Unit IV: Teacher and Teaching as a profession

Various Approaches to Teaching: Behaviourist, Cognitivist, Constructivist, Connectionist, Participatory, Cooperative, Collaborative, Personalized, and Holistic
Teacher as a Facilitator and Guide/Philosopher/Friend
Teachers commitment towards fulfilling Felt Need of Learners
Professional Characteristics of Teacher in Classroom Management.
Skills & Competencies of a TeacherCommunication:Meaning,mode: input/process/output
Basic Model of Communication: Sender, Message, Medium, Receiver & Reach;Factors facilitating communication
Effective Classroom Management-Principles and Strategies
Leadership Qualities in Teachers

Practicum

Conducts Projects on –
Identifying the Learning Difficulties of Students in Different School Subjects and the Possible Reason for them;
Providing Remedial Instruction to the Students with Learning Difficulties;
Study the Qualities of Effective Teachers through oMSErvation, interview, case study etc.,
Visiting Model Schools and Prepare Reports

References:

- Benjamin S., Bloom et al. (1964). *Taxonomy of educational objectives*. Longman Group.
- Bruce Joyce (1985) *Models of teaching* (2ndDed.) Prentice Hall**.**
- Encyclopaedia of Modern Methods of Teaching and Learning (Vol. 1-5).
- Gage N.L. Scientific Basis of art of Teaching
- Gavriel Salomon (1981) *Communication and education* Sage.
- Lieberman, M. (1956) *Education as a profession*. Prentice Hall, Inc.
- Karthikeyan, C. (2004). *A Text book on instructional technology*, RBSA.

- Kumar, S. (2014). Child Development and Pedagogy, Pearson.
- Ohles, J.F. (1970). *Introduction to Teaching*. New York: Random House, INC.
- Siddiqui, Mujibul Hasan (2005). *Techniques of classroom teaching* A.P.H
- Skinner, E.C.(1984). *Educational Psychology. 4th Edition.* New Delhi: Prentice Hall of India Pvt. Ltd.
- Snowman & Baihler (2006). *Psychology Applied to teaching*. Boston: Houghton Mifflin Company.
- Stephens, L.M. & Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational psychology*. New York: Holt, Rinehart and Winston, Inc.
- Tanner, L.N. & Lindgren, H.C. (1971). *Classroom Teaching and Learning*. New York: Holt, Rinehart and Winston, Inc.

Web Resources

- Courses on Communication Skills, http://nptel.ac.in/courses/109104030/
- Jane Ciumwari Gatumu, Reflective Teaching, http://oer.avu.org/bitstream/handle/123456789/155/REFLECTIVE-TEACHING.pdf?sequence=1
- School leadership (2011), http://azimpremjifoundation.org/pdf/learning-curve-16.pdf

MSE IV.6 :DRAMA AND ART EDUCATION

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the use of 'Drama' as a Pedagogy.
- Use 'Role play' technique in the teaching learning process.
- Understand the importance of dramatic way of presentation.
- Integrate singing method in teaching learning process.
- Understand various 'Dance forms' and their integration in educational practices.
- Use art of drawing and painting in teaching learning process.
- Develop creativity through different creative art forms.
- Understand the efficacy of different art forms in education.

COURSE CONTENT

Unit I : Drama and its Fundamentals

Creative writing – Drama writing, Drama as a tool of learning, Different Forms of Drama Role play and Simulation, Use of Drama for Educational and social change (Street play, Dramatization of a lesson), Use of Drama Techniques in the Classroom: voice and speech, mime and movements, improvisation, skills of oMSErvation, imitation and presentation

Unit II: Music (Vocal & Instrumental)

Sur, Taal and Laya (Sargam), Vocal - Folk songs, Poems, Prayers, Singing along with "*Karaoke*", Composition of Songs, Poems, Prayers, Integration of *Vocal & Instrumental* in Educational practices

Unit III: The Art of Dance

Various Dance Forms - Bharat Natyam, Kathakali, Kuchipudi, Yakshagana- Folk dance and various other dances
Integration of Dance in educational practices
(Action songs, *Nritya Natika*)

Unit IV: Drawing and Painting

Colours, Strokes and Sketching- understanding of various means and perspectives, Different forms of painting- Worli art, Madhubani art, Glass painting, Fabric painting and various forms of painting, Use of Drawing and Painting in Education -Chart making, Poster making, match-stick drawing and other forms, Model making – Clay modeling, Origami, Puppet making, Decorative – Rangoli, Ekebana, Wall painting (Mural), Kalameshuthu or any other local art

Transactional Strategies

Lecture cum Discussion for each Unit (Unit 1 to 4) followed by simulated/ authentic practices, Workshop schedule, Slide / Film show, Project work, Demonstration, Simulation, Group work and field trips involving meetings with folk singers and other skilled practitioners will especially form part of the transaction scheme. In addition to the above any one or more of the following:

Practicum

Suggestive List:

1. Developing a script of any lesson in any subject of your choice to perform a Play / Drama.
2. Developing a script for the street play focusing on "Girl's education and Women empowerment".
3. Preparing a pictorial monograph on "Various folk dance of South India.
4. Preparing a pictorial monograph on "Various Classical Dance forms in India".
5. Preparing a calendar chart on "Various Musical Instruments in India".
6. Develop an Audio CD based on newly composed Poems of any Indian language.
7. Preparing some useful, productive and decorative models out of the waste materials.
8. Visit the Faculty of Performing Arts in your city and prepare a detailed report on its multifarious functioning.
9. Development a Review of a theatre programme if possible
10. Organize a competition on some Decorative / Performing Art forms in the school during your School Internship programme and prepare a report on it.
11. Organizing a workshop on some selected Creative Art forms in the school during your School Internship programme and prepare a report on it.

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc.Action research based on teaching learning and school and community could be conducted.**

Evaluation Strategies

Sessional, practicum, unit test project work related presentations.

Suggested Readings

1. Natyashastra by Bharathamuni
2. Deva, B.C. (1981). An Introduction to Indian Music. Publication Division, Ministry of Information and Broadcasting, Government of India.
3. NCERT (2006). Position Paper by National Focus Group on Arts, Music, Dance and Theatre
4. Theory of Drama by A. Nicoll

Web Resources

Position Paper National Focus Group on Arts, Music & Dance, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/art_education.pdf
Arts in school education, (2012), http://azimpremjifoundation.org/pdf/LCXVIII.pdf
Online courses on Arts, http://www.dsource.in/course/index.php
Learning Indicators and Learning Outcomes at the Elementary Stage, (2014), NCERT
http://www.ncert.nic.in/departments/nie/dee/publication/pdf/LI_Final_Copy_Revised_29.12.14.pdf

MSE IV.7 : School Attachment Programme 2

Credits : 2 | **Marks: 100**
Duration : 3 weeks | **C1 + C2:50**
C3: 50

Objectives:

- To familiarize student teachers with classroom processes and skills employed in teaching-learning process
- To provide field experience of assessment practices including record maintenance and report cards followed in schools at elementary and secondary levels.

COURSE CONTENT:

1. The student teachers will observe minimum 3 classes of regular teachers for understanding the skills and strategies used in teaching by them.
2. The student teachers will visit schools and interact with teachers to know about the assessment practices like CCE, grading patterns and reporting the performance of students and submit the report
3. Students will analyse the assessment records and the report cards to study the models of assessment and procedures followed in reporting students' performance. The students will attend the PTA meetings where feedback about students' performance is given by the teachers and submit the report.

Community Based Activities:

Objectives

- To develop an awareness and understanding of educational status of the community.
- To create an awareness of the implementation of various progrmmes of the government related to school education through field experiences and community participation.

Activities

- The student teachers will visit the local community to study the drop out/ out of school children and the modes of alternative education received by them.
- Organize awareness programmes in the selected community on literacy, human rights, gender sensitization, environmental conservation etc through street play, role play and dramatization.
- To interact with community members like zilla parishat members, SDM and PTA members to study about their participation in school development programmes

Evaluation:

C1 – Report 1
C2 – Report 2
C3 – PPT presentation of community based activities

FIFTH SEMESTER

Core Course 1 E : Physics

MSE V.1 : ATOMIC AND MOLECULAR PHYSICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Physics-I

The Electron: Determination of e/m of an electron by Thomson method, Determination of charge of an electron by Millikan's oil drop method.
Atomic Spectra: Inadequacy of Bohr atomic model, correction due to finite mass of the nucleus, Rydberg constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, relativistic mass correction, vector model of an atom, Electron spin, space quantisation, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

Unit II: Atomic Physics-II

Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valence electron and a brief mention of L-S and J-J coupling for multi electron atoms. Fine structure lines of Sodium Zeeman effect.Explanation of Zeeman effect on the basis of vector model of atom, Expression for Zeeman shift and experimental details. Mention on anomalous Zeeman effect, A qualitative mention of Paschen – Back and Stark effects.

Unit III : Molecular Spectra

Molecular formation, the H_2^+ molecular ion, H_2 – molecule. Salient features of molecular spectra. Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules.Theory of pure rotation and rotation- vibration spectra, Raman and Infrared (IR) spectra, simple applications. UV-Visible, Fourier Transform IR, Nuclear Magnetic resonance (NMR) and Laser Raman spectra of organic molecules and their interpretations.

Unit IV: X-Rays

Electromagnetic spectrum, production of X-rays, X-ray spectra, Continuous X-ray spectra Characteristic X-ray. Duanne and Hunt limit. Moseley's law and its significance, X-ray energy levels.Bragg's law and Bragg spectrometer. A brief mention of different types of crystals. Structures of NaCl and KCl crystals. Compton Effect, Expression for Compton Shift.X-ray diagnostics and imaging

Reference Books:

1. H. S. Mani and G. K. Mehta, Introduction to Modern Physics, Affiliated East-West Press,India, 1990.
2. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
3. J.R. Taylor, C.D. Zafiratos,Modern Physics, M.A. Dubson, PHI Learning, 2009.
4. R.A. Serway, C.J. Moses, and C.A.Moyer, Modern Physics, Cengage Learning, 2005.
5. G. Kaur and G.R. Pickrell, Modern Physics, McGraw Hill, 2014.
6. Rich Meyer, Kennard, Coop, Introduction to Modern Physics, Tata McGraw Hill, 2002.
7. R. Murugeshan and K. Sivaprasath Modern Physics, S. Chand Publisher, 1994.
8. J. R. Reitz, F. J. Milford, and R. W. Christy, Foundations of Electromagnetic Theory, Addison-Wesley; 4 edition, 2008.
9. Banwell and E. Mccash, Fundamentals for Molecular Spectroscopy, McGraw Hill Education; 4 edition, 1994.
10. H. E. White, Atomic Spectra –, MacGraw-Hill, 1954.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Franck-Hertz experiment.
2. Study of sodium lines using discharge tubes.
3. Study of hydrogen lines using discharge tubes.
4. Study of helium lines using discharge tubes.
5. Dissociation energy of Iodine.
6. Hartmann's formula for wavelength.
7. Benzene IR spectrum.
8. Rydberg Constant – Solar Spectrum
9. Excitation of Brass spectrum using Arc method
10. Rutherford model – Simulation technique.
11. Zener diode characteristics.
12. Transistor characteristics and transfer characteristics in Common Base configuration-current gain.
13. Transistor characteristics and transfer characteristics in Common Emitter configuration-current gain.
14. CE Transistor Amplifier-Frequency response.

15. Basic operational amplifier.
16. Energy gap of a semiconductor.
17. Bi-prism experiment.
18. Resolving power of grating.
19. Current balance experiment- the effects of a magnetic field on a current carrying conductor.
20. Resolving power of a telescope.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2EChemistry

MSE V.2 : TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To develop an understanding of Principles of Chemical Kinetics and Surface Chemistry.
- To explain the properties of d and f block elements and their compounds in terms of their electronicconfiguration and bonding.
- To understand the properties of coordination compounds in terms of bonding theories.

COURSE CONTENT:

Unit I: d-block and f-block elements

To relate the electronic configuration to the properties and structure of transition metals and their compounds. Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. Powder metallurgy – extraction of tungsten. Position of lanthanides and actinides in the periodic table, lanthanide contraction and its consequences, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides. General properties of actinides: Extraction of Thorium, Uranium and Plutonium from burnt nuclear fuels.

Unit II : **Coordination Compounds**

To apply theories that explain certain properties and structure of transition metal complexes. Werner's coordination theory and its experimental verification, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of VBT. Elementary treatment of crystal field theory, splitting of d-orbitals in square planar, tetrahedral and octahedral complexes, factors affecting crystal field parameters, Explanation of magnetic behavior and color of complexes using CFT, effective atomic number concept.Metal carbonyl, 18 electron rule, Preparation, structure and reactions of $Ni(CO)_4$, $Fe(CO)_5$ and $V(CO)_6$, nature of bonding in metal carbonyls.

Unit III: Chemical Kinetics

Understanding the factors that influence a chemical reaction and rationalising them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method. Radioactive decay as a first order phenomenon.

Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy, Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Unit IV : Surface Phenomena

Adsorption: Introduction-Absorption and adsorption (definition, examples and differences) types of adsorptions-physical and chemical (definition, examples and differences between them), factors influencing the adsorptionof gases on solids. Adsorption isotherms: definition, Mathematical expression for Freundlich and Langmuir's adsorption isotherms. applications of adsorptions.

Catalysis: Definition, general characteristics, action of catalytic promoters and inhibitors. Homogeneous catalysis (definition and examples),Heterogeneous catalysis(definition and examples) mechanism of hetwerogeneous catalysis(based on adsorption theory) enzyme catalysis (definition and examples) Mechanism of enzyme catalysed reaction(lock and key mechanism)

References :

1. Inorganic Chemistry : James Huhey

2. Essentials of physical chemistry Arun Bahl,B.S. Bahl,G.D. Tuli
3. Concise Inorganic Chemistry J.D.Lee 5th edition,Wiley publishers.
4. Advanced Inorganic Chemistry Satya Prakash G.D. Tuli S.K. Basu, R.D. Madan S.Chand and company pvt. Ltd.
5. Principles of Physical Chemistry Puri,Sharma and Pathania.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To understand the kinetics of chemical reactions
- To familiarise with the analysis of ores
- To prepare and analyse inorganic complexes
- To study the adsorption phenomena

COURSE CONTENT:

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar
8. Colorimetric study of kinetics of oxidation of Indigo carmine by Chloromine-T.
9. To study the adsorption of acetic acid on activated charcoal
10. To determine the relative strength of Hydrochloric acid and sulphuric acid by studying thekinetics of hydrolysis of ethyl acetate.
11. To study kinetically the reaction rate of decomposition of iodine by hydrogen peroxide.
12. Determination of Copper by colorimetric method using ammonia as the complexing agent.
13. Determination of Ferric ion by colorimetric method using potassium thiocyanate as the complexing agent.
14. Estimation of Manganese in pyrolusite by volumetric method
15. Preparation of a complex: potassium trioxalato aluminate(III) trihydrate or potassium trioxalato cobaltate(III)
16. To determine the rate constant for the inversion of sucrose using polarimeter.

References :

1. Advanced practical inorganic chemistry by Gurdeep Raj, Goel Publication House, Meerut-India.
2. Systematic Experiements in chemistry by Arun Sethi, New age International Pvt.Ltd, New Delhi.

Core Course 3E : Mathematics

MSE V.3 : MULTIVARIATE CALCULUS & VECTOR CALCULUS

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
To enable the students to understand the concepts of multi-variate calculus and vector clculus, and also to compute the areas of plain regions, surfaces and volume of solids.

COURSE CONTENT:

Unit I:
Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral.

Unit II:
Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula.

Unit III:
Quadratic Curves, surfaces, sphere, cylinder, cone, Ellipsoid, Hyperbloid, Parabloid, Ruled surfaces.

Unit IV:
Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane.

References
1. Calculus by Lipman Bers, Vols 1 and 2.
2. First Course in Calculus by Serge Lang
3. Calculus – Single and Multivariable by Hughes Hallet
4. Calculus and analytic geometry by Thomas and Finny.
5. Advanced Calculus by David Widder

PROFESSIONAL EDUCATION COURSES

MSE V.4 : ASSESSMENT FOR LEARNING

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
This course is designed to help student teachers to:

- Understand the nature of assessment and evaluation and their role in teaching- learning process.
- Understand the importance of assessment in continuous and comprehensive manner
- Plan assessment tasks, techniques, strategies and tools to assess learner's competence and performance in curricular and co-curricular areas,
- Devise marking, scoring and grading procedures,
- Analyse, manage and interpret assessment data.
- Devise ways of reporting on student performance
- Develop the skills of reflecting-on and self-critiquing to improve performance.

COURSE CONTENT:

Unit I: Introduction to Assessment & Evaluation

(a) Concept of test, measurement, Assessment, examination, appraisal and evaluation in education and their inter relationships.
(b) Purpose and objectives of assessment/ Evaluation- for placement, providing feedbacks, grading promotion, certification, diagnostic of learning difficulties.
(c) Importance of assessment & evaluation for Quality Education – as a tool in Pedagogic decision making (writing instructional objectives, selection of content, teaching learning resources, methodology, strategies & assessment procedures followed).
(d) Forms of assessment : -
  (i) (Formative, Summative, diagnostic; prognostic, placement; Norm referenced; Criterion referenced based on purpose)
  (ii) (Teacher made tests Standardizedtests: based on nature & scope)
  (iii) (Oral, written, performance: based on mode of response)
  (iv) (Internal, External, self, peer, & teacher, group Vs individual- based on context)
  (v) Based on nature of information gathered (Quantitative, Qualitative)
  (vi) CCE, school based assessment ; Standard Based- based on Approach
(e) Recent trends in assessment and evaluations:
  - Assessment for learning, assessment of learning and assessment as learning; Relationship with formative and summative, Authentic assessment.
  - Achievement surveys- State, National and International; Online assessment; On demand assessment/ evaluation.
  - Focus on Assessment and Evaluation in Various Educational commissions and NCFs

Unit II: Developing Assessment Tools,Techniquesand Strategies -1

(a) Concept of Cognitive, Affective, Psychomotor domain of learning
(b) Relationship between educational objectives learning experiences and evaluation.
(c) Revised taxonomy of objectives (2001) and its implications for assessment and stating the objectives-
   - Knowledge dimensions:- factual, conceptual, procedural and meta-cognition.
   - Cognitive, Affective, Psychomotor domains – Classification of objectives
(d) Stating objectives as learning out comes: General, Specific.
(f) Construction of achievement tests- steps, procedure and uses (Teacher made test/Unit Tests)
   - Constructing table of specifications & writing different forms of questions –(VSA, SA, ET & objective type, situation based) with their merits and demerits; assembling the test, preparing instructions, scoring key and marking scheme; and question wise analysis
(g) Construction of diagnostic test – Steps, uses & limitation; Remedial measures- need types and strategies
(h) Quality assurance in tools – Reliability: Meaning &Different methods of estimating reliability (Test-retest; equivalent forms, split- half); Validity: Meaning &Different methods of estimating reliability (Face, content, construct), Objectivity and Practicability/ Usability
(i) Inter dependence of validity, reliability and objectivity

Unit III: Developing Assessment Tools,Techniquesand Strategies -II

(a) Concept of CCE, need for CCE its importance; relationship with formative assessment and problems reported by teachers and students
(b) Meaning & construction of process-oriented tools- Interview; Inventory; oMSErvation schedule; check-list; rating scale; anecdotal record;
(c) Assessment of group processes-Nature of group dynamics; Socio-metric techniques; steps for formation of groups, criteria for assessing tasks; Criteria's for assessment of social skills in collaborative or cooperative learning situations.
(d) Promoting Self assessment and Peer assessment – concepts and criteria's
(e) Portfolio assessment – meaning, scope & uses; developing & assessing portfolio; development of Rubrics

Unit IV: Analysis, Interpretation, Reporting and Communicating of student's performance

a) Interpreting student's performance
   (i) Descriptive statistics (measures of central tendency & measures of variability, percentages, rank correlation)
   (ii) Graphical representation (Histogram, Frequency Curves)
(b) Grading – Meaning, types, and its uses
(c) Norms – Meaning, types, and its uses
(d) Reporting student's performance – Progress reports, cumulative records, profiles and their uses, Portfolios, Using descriptive Indicators in report cards
(e) Role of feedback to stake holders (Students, Parents, Teachers) and to improve teaching – learning process; Identifying the strengths & weakness of learners.

Sessional Works

1. Discussion on existing assessment practices in schools and submitting the report.
2. Constructing a table of specification on a specific topic (subject specific)

3. Constructing a unit test using table of specifications and administering it to target group and interpreting the result.
4. Construction of any one of the process oriented tools and administering it to group of students & interpreting it.
5. Analysis of question papers:teacher madeandvarious Boards
6. Analysis of report cards-State and Central (CMSE)
7. Analysis of various education commission reports and NCFs for knowing various recommendations on Assessment and Evaluation

References:

1. Ebel, R.L. and Fresbie, D.A. (2009).Essentials of Educational Measurement. New Delhi: PHI Learning PVT. LTD.
2. Garrett, H.E. (2008). Statistics in Psychology and Education. Delhi: Surjeet Publication.
3. Gupta, S.K. (1994). Applied Statistics for Education. Mittal Publications.
4. Mehta, S.J. & Shah, I.K. (1982).Educational Evaluation. Ahmedabad: Anand Prakashan (Gujarati).
5. NCERT (2015) Learning Indicator, New Delhi
6. NCERT (2015) CCE Packages, New Delhi
7. Rani, P. (2004).Educational Measurement and Evaluation. New Delhi: Discovery Publishers.
8. Rawat, D.S. (1970). Measurement, Evaluation and Statistics in Education. New Delhi: New Raj Book Depot.
9. Reynolds, C.R., Livingston, R.B., and Willson, V. (2011).Measurement and Assessment in Education. New Delhi: PHI Learning PVT. LTD.
10. Ten Brink, T.D. (1974). Evaluation – A Practical Guide for Teachers. New York: McGraw Hill Book Co.
11. Thorndike, R.M. (2010). Measurement and Evaluation in Psychology and Education. New Delhi: PHI Learning Pvt. Ltd.
12. Yadav, M.S. and Govinda, R. (1977). Educational Evaluation, Ahmedabad: SahityaMudranalaya.
13. Linn, Robert and Norman E Gronland (2000); Measurement and Assessment in teaching, 8th edition, by Prentice Hall, Inc, Pearson Education, Printed in USA
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi
15. Tierney, R. J., Carter, M. A., & Desai, L. E. (1991). Portfolio Assessment in the Reading – Writing Classroom. Norwood, MA: Christopher-Gordon Publishers
16. Glatthorn, A. A. (1998). Performance Assessment and Standards-based Curricula: the Achievement Cycle. Larchmont, NY: Eye no Education
17. Gredler, M. E. (1999). Classroom Assessment and Learning. USA: Longman.
18. Likert, R. (1932). A technique for the Measurement of Attitudes. Archives Psychology, 40.
19. Mehrens, W. A. & Lehmann, I. J. (1991). Measurement and Evaluation in Education and Psychology (8th ed.): Chapter 10: Describing Educational Data.
20. Oosterhof, A. (1994). Classroom Applications of Educational Measurement (Second Edition). New York: Macmillan College Publishing Company Inc.
21. Payne, D.A (2003).Applied Educational Assessment. Australia: Wadsworth: Thomson Learning.
22. Popham, W.J. (1981). Modern Educational Measurement. New Jersey, Engle Wood Cliffs: Prentice-Hall Inc.
23. Popham, W. J. (2002). Classroom Assessment: What teachers need to know (Third Edition). Boston: Allyn& Bacon.

Web Resources

1. Assessment in school education, (2013) http://azimpremjifoundation.org/sites/default/files/userfiles/files/Issue%20XX%20Section%20C.pdf
2. Compendium of Tools, (2013), CMSE
3. http://cMSE.nic.in/ePub/webcMSE/webcMSE/Revised%20Compendium%20of%20Tools/Revised%20Compendium%20of%20Tools/docs/Revised%20Compendium%20of%20Tools.pdf
4. http://www.cMSE.nic.ib/cce/index.html
5. www.ncert.nic.in
6. http://nroer.in/home/

MSE V.5 : Pedagogy of Physical Science 1

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
Student teachers will be able to

- Explain the nature of science.
- Specify the goals and objectives of science teaching.
- Review the contributions of major scientists.
- Explore several methods of teaching science.
- Apply various theories science learning and analyze the implications for teaching science.
- Review the science curriculum, syllabus, and text books.
- Explore constructivist practices in teaching of science.
- Create unit plans, lesson plans in an artistic and scientific way.
- Explore the inter-relation between science and other subjects.

COURSE CONTENT:

Unit I: Nature of Science

Nature of science -Scientific method, how science works, science as a process and product. Science as a way of thinking: inquiry, oMSErvation, problem-solving, rational thinking, reasoning, science as an empirical body of knowledge.Structure of knowledge: facts, concepts, principles, generalizations, theories.Historical development of physical science with illustrations from topics such as structure of atoms, laws of chemical combinations, stoichiometry, equivalent mass, models of the universe, nature of light, electricity and magnetism etc.Contributions of Indian and international figures in science to the knowledge domain of physical science. Basic branches of physical science and applications of physical science to human life.Evolution of Physical Science as a knowledge field; science and technology; science and society; inter-relation between science and other subjects, sole of science teacher.

Unit II:

a. Aims and learning objectives of Physical Science

Aims of teaching physical science in the school curriculum.

Development of process skills of science, scientific attitude and temper by learning Physics and Chemistry as experimental sciences.

Nurturing curiosity, creativity and aesthetic sense.

Science and society– relating physical science with the natural and social environment and technology, relating science to daily life, social interaction and science.

Values through science teaching-open mindness, objectivity, truthfulness, critical thinking, logical thinking, development of problem solving skill, social learning.

Ethics of using the knowledge of science and technology.

b. Physical Science Curriculum

Recommendations of major commissions in India and policies on science teaching.
The school science curriculum with regard to NCF 2005: major themes in secondary school science.
Brief study of famous curricular reform projects such as Nuffield, STEM, PSSC, Chemical Bond Approach, CHEMSTUDY etc.
Comparison of international secondary schools science syllabus- Singapore, Oxford, CIE (Cambridge).

Unit III: Pedagogical shift, Approaches and Strategies of learning Physical Science

Role of prior knowledge in constructing new knowledge (Ausubel), Piaget's theories of learning (schema- disequilibrium).
Development of concepts in Science- real-life as the basis of conceptions; personal vs. verified knowledge of science. Conceptions, alternate concepts, and misconceptions in science.
Teaching concepts and generalizations, inductive approaches, using advance organizers, problem solving approach, investigatory approach, project method, cooperative learning method.
Vygotsky's theories of role of language and context in learning, Van Glasersfeld's theory. Development of constructivist practices in science teaching, 5E learning model, 7E model, conceptual change model of teaching, challenges in using constructivism in the classroom.
Collaborative learning approach, problem solving approach, concept mapping, experiential learning, cognitive conflict, inquiry approach, analogy strategy.
Facilitating learning: teacher's role as a facilitator, grouping students, multiple learning experiences, discussing ideas, scaffolding, consolidating students' ideas, questioning-techniques and strategies, higher order and metacognitive questioning.
Maintaining positive learning environment. Catering to children with varied needs and abilities, context in learning, gender and science.
Scope and importance inclusiveness in science class room.
Role of learner: each learner as unique individual, involving learner in learning process, role of learner in negotiating and mediating learning, encouraging learner to raise and ask questions.

Unit IV: Planning for Physical science Teaching-learning

Importance of planning, unit plan and lesson plan.
Anderson and Krathwohl's revised Bloom's taxonomy: knowledge domains and cognitive processes, action words. types of knowledge- factual, conceptual, procedural and metacognitive knowledge.
Identification and organization of concepts.
Elements of physical science lesson plan: learning Objectives, introduction, development, assessment, extended learning, assignment.
Designing learning experiences, pre-existing knowledge, selecting approach/strategy, arrangement of teaching learning materials, group learning, formation of groups, organizing activities.
Planning the lesson by using ICT applications and laboratory materials.
Reflective planning; unit plan; developing lesson plans on different topics and through various approaches taking examples form upper primary, secondary and higher secondary stage (physical and chemical changes, redox reaction, light, magnetic effect of electric current, etc.).

Sessional Activities:

- Presentation on historical development of science concepts with a view to understand the nature of science.
- Pedagogical analysis (units for pedagogic analysis: any unit from VIII, IX or X physical science textbook).
- Drawing concept-maps for secondary level concepts.
- Presentation on the contributions of Physicists and Chemists to physical science.
- Readings on curriculum initiatives in secondary science with a special reference to NCF 2005.
- Comparison of different science curricula.
- Lab demonstration/exploration of science experiments.
- Exploring common mis-concepts in Physical Science by oMSErving science classes or interviewing science teachers or using VIII and IX textbooks.
- Stating learning objectives for teaching a topic in science.
- Demonstration of different methods of teaching of Physical Science.
- Experimentation of different methods of teaching of Physical Science.

References :

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for

Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSE V.6 : Pedagogy of Mathematics 1

Credits: 4 (2L+ 2T +0P) | **Marks: 100**
Contact hrs per week: 6 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:
On completion of the course the students will have

- understanding of nature of mathematics and its branches
- ability to analyse the relationship of mathematics within itself and with other subjects
- ability to categories mathematical knowledge into factual, conceptual, procedural and meta cognitive knowledge
- Appreciates the contributions made by Indian and other country mathematicians contribution
- ability to apply logical reasoning and problem solving ability in solving various mathematical problems

UnitI: Knowledge about Mathematics
Nature of mathematics- abstractness, preciseness, brevity, language and symbolism; Nature of mathematical propositions; Quantifiers- necessary and sufficient conditions(one and two way); structure of mathematics- undefined terms, defined terms, definitions, axioms, postulates and theorem; mathematical theorem and its variants- converse, inverse and contra positive; Pure and Applied mathematics; branches of mathematics- Arithmetic, algebra, geometry and their diversities; mathematization through- oMSErvation, conjecturing, hypothesing, testing and verifying; creation of conceptual knowledge and its importance; creation of procedural knowledge- derivation of laws/ theorems/ generalizations in mathematics; relationship of mathematics among different branches of science; relationship within and among branches of mathematics; Contribution of Indian and other Mathematician- Aryabhatta, Bhaskara, Ramanujuam, Guass, Euclid, Descarte, Cantor, Pythagarous;
Organization of Mathematical content- horizontal and vertical linkage (within and between classes IX and X); linkage between upper primary, secondary and senior secondary mathematics.

Unit II: Aims and objectives of teaching Mathematics

Aims of mathematics- Cultural, disciplinary, moral, social and utilitarian aims; General objectives of teaching mathematics Vis-a-Vis the objectives of secondary education; Major shifts in classroom teaching (societal and technological influence); characteristics of a good instructional objectives; Writing specific objectives of different content categories in mathematics; Unit plan and Lesson plan-its importance and writing unit plan and lesson plan for mathematics lessons using the format.

Unit III: Strategies for learning mathematical concepts

Nature of concepts, types of concept, process of concept formation; Moves in teaching concepts- a) Exemplar moves- giving examples and non-examples (with or without reasoning); comparing and contrasting ; giving counter example b) Characterization move-definition, stating necessary and/or sufficient condition; concept Attainment Model (Bruner); Advance Organizer Model (Ausubel); Planning and implementation of strategies for teaching various mathematical concepts(secondary level maths)

Unit IV: Teaching of Generalization

Teaching by exposition- Moves in teaching generalization:- Introductory move, focus move, objective move, motivation move, assertion move, application move, interpretation move, justification move; Planning for expository strategies of teaching generalization.

Teaching by guided discovery- nature and purpose of learning by- discovery, inductive, deductive, guided discovery strategies; maxims for planning and conducting discovery strategies; planning strategies involving either induction or deduction or both.

Sessional work:

Analysis of secondary level mathematics text books to identify various categories of mathematical knowledge presented and its horizontal and vertical linkage among 8, 9 and 10 standard text books.

Analysing the structure of mathematics present in selected chapter/unit.

Writing a unit plan for selected unit

Writing of specific instructional objectives for selected unit

Writing a lesson plan on selected content area

Writing a plan for teaching a concept of a generalization using the appropriate moves to teach them.

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc
6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education,Syndey, Croom Helm Australia Pty Ltd
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal publications Pvt Ltd

SIXTH SEMESTER

Core Course 1F : Physics

MSE VI.1 : CLASSICAL & QUANTUM MECHANICS AND SPECIAL THEORY OF RELATIVITY

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives: To enable students to understand the essentials of classical mechanics, quantum mechanics, quantum statistics and relativity.

COURSE CONTENT:

Unit I: Lagrangian formulations of Classical Mechanics

Constraints- sclerenomic and rheonomic constraints, holonomic and non holonomic constraints, Generalized co-ordinates and velocities, Principle of virtual work, D'Alembert's principle, Euler- Lagrange equations, Cyclic co-ordinates, Conservation laws and symmetry properties, applications of Lagrangian formulation (simple pendulum). Canonical momenta & Hamiltonian of a system. Hamilton's equations of motion. Hamiltonian for a harmonic oscillator.

Unit II: Special Theory of Relativity

Galilean transformation, Earth as an inertial frame of reference, Constancy of speed of light, Ether hypothesis, Michelson-Morley experiment, Postulates of Special Theory of Relativity, Lorentz transformations. Simultaneity and order of events. Length contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.

Unit III: Origin of Quantum Theory

Qualitative discussions on inadequacies of Classical Physics– black body radiation and photoelectric effect, Planck's hypothesis and explanation of black body radiation, Einstein's explanation of photoelectric effect with derivation, Wave-particle duality, de Broglie's hypothesis of matter waves, concept of group velocity and phase velocity and their relationship, experimental evidence for matter waves– Davisson and Germer experiment, electron diffraction experiment. Uncertainty Principle.

Unit IV: Development and application of Schrodinger Equation

Wave function, interpretation of wave function, postulates of quantum mechanics, probability density, Eigen functions and eigen values, expectation values, Normalization of wave functions, development of time dependent and time independent Schrodinger wave equation, operator method of deriving Schrodinger equation. Applications of Schrodinger wave equation– one dimensional infinite potential well, finite potential well, phenomenon of tunneling, one dimensional harmonic oscillator, hydrogen atom (only qualitative discussion).

Reference Books:

1. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
2. H.Goldstein, C.P. Poole, J.L. Safko, Classical Mechanics 3rd Edn., Pearson Education, 2002.
3. L. D. Landau and E. M. Lifshitz, Mechanics, Pergamon, 1976.
4. P.S. Joag, N.C. Rana, Classical Mechanics 1st Edn., McGraw Hall.
5. R. D. Gregory, Classical Mechanics, Cambridge University Press, 2015.
6. L. I. Schiff, Quantum Mechanics, 3rd Edn., Tata McGraw Hill, 2010.
7. R. Shankar, Principles of Quantum Mechanics 2nd edition, Springer, 2014.
8. David J Grififth, Introduction to Quantum Mechanics, Addison Wesley; 2 edition, 2004.
9. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
10. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
11. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
12. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Stefan’s constant.
2. Planck’s constant using LED’s (3no.s).
3. Absorption spectra.
4. Photoelectric effect.
5. Variation of resistance with temperature of copper wire (10 mts).
6. Laser Diffraction.
7. Laser-wavelength using transmission grating.
8. Photo conductivity using LDR.
9. Photovoltaic cells.
10. Numerical aperture of an optical fibre by semiconductor laser.
11. BG Absolute Capacity.
12. BG-High resistance by leakage method
13. BG Mutual inductance
14. e/m of electron.
15. Verification of inverse square law for light using photodiode.

16. Diffraction of light. Determination of wavelength λ.
17. Characterization of photo diode.

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2FChemistry

MSE VI.2 :ORGANIC CHEMISTRY – II

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
To develop an understanding of the chemistry of Functional groups and mechanism of Organic Reactions.

COURSE CONTENT:

Unit I: Alcohols and Phenols
Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).
Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols-oxidative cleavage [$Pb(OA_c)_4$ and HIO_4] and Pinacol-pinacolone rearrangement.
Trihydric alcohols: Nomenclature and methods of formation(from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI).
Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2- naphthols (one method each). Physical properties and acidic character of phenol. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit II: Carbonyl Compounds
Aldehydes and Ketones

Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic addition to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketones. An introduction to σ, β unsaturated aldehydes and ketones.

Carboxylic Acids and their Derivatives

Nomenclature, structure and bonding. Preparation of carboxylic acids – by oxidation, using Grignard reagents and hydrolysis of nitriles. Physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Reactions of carboxylic acids: HVZ reaction, synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions hydroxy acids – malic, tartaric and citric acids.

Unsaturated monocarboxylic acids: Methods of formation and chemical reactions
Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.
Carboxylic acid derivatives: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acid, base conditions).

Unit III: Organic synthesis via Carbanions

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of α – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; α,β – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.
Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; α, β – unsaturated acids – crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes, Alkylation and acylation of enamines.

Unit IV: Organic Compounds of Nitrogen

Nitro Compounds: Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Aliphatic and Aromatic amines: Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsberg's method). Structural features effecting basicity of amines. Amine salts as phase – transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts and azo coupling.

References :

1. Advanced organic chemistry Arun Bahl and B.S. Bhal
2. Organic Chemistry:Reagents and Reactions Agrawal, Goel Publishing House 53rd edition 2015
3. Organic Chemistry John Macmumy 9th Edition 2016.
4. Organic Chemistry J.Clayden,N.Greeves and S.Warren 2nd Edition 2012 Oxford University Press.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

- To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification
- To develop skills of separation techniques

COURSE CONTENT:

1. Qualitative organic analysis

1. Separation of organic mixtures containing two solid components using water , $NaHCO_3$, NaOH

2. Analysis of an organic compound: Detection of extra elements (N,S and X) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides) in simple organic compounds. Identification of organic compound based on functional group analysis, determination of physical constant (mp / bp).

2. Chromatographic Techniques

(i) Thin Layer Chromatography

(a) Determination of R_f values and identification of organic compounds:
(b) Identification of plant pigments by thin layer chromatography
(c) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone using toluene : light petroleum (2:3 ratio)
(d) Separation of mixture of dyes

(ii) Paper Chromatography

Determination of R_f values and identification of organic compounds:

(a) Separation of mixture of amino acids

(b) Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water 4:5:1) ; Spray reagent: anilinehydrogenphthalate

(iii) Column Chromatography

Separation and identification of ortho and para nitro anilines

References :

1. A Text Book of Qualitative Organic Analysis, A I Vogel
2. A Text Book of Quantitative Organic Analysis, A I Vogel
3. Systematic experiments in Chemistry Arun Sethi, New Age International(P) Ltd.

Core Course 3F Mathematics

MSE VI.3 :GROUPS AND RINGS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

By the end of the semester the students will be able to develop understanding of the abstract concepts of groups and rings, and special classes of rings and to appreciate modern mathematical concepts.

COURSE CONTENT:

Unit I:

Groups, Examples, Properties and types, Sub-groups. Cyclic groups and properties, Cosets, Lagrange's theorem and its Consequences, Dihedral groups, Normal subgroups, Quotient groups.

Unit II:

Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, , Fundamental theorem of Homomorphism, Cauchy's theorem for abelian groups, Permutation group, Alternating Group, Cayley's Theorem.

Unit III:

Rings, Integral Domains, Division Rings, Fields, Properties, Field of quotients. Ideals, Quotient rings Maximal, Prime and Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

Unit IV:

Homomorphism of a ring, Kernel, Isomorphism, Fundamental theorem of Homomorphism, Polynomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorisation Theorem, Eisenstein'sCriterion of irreducibility.

References :

1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
3. Modern Algebra by Vasishtha, Krishna Prakashan Media Pvt. Ltd.
4. Higher Engineering Mathematics by Kreyszig, Wiley
5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
6. Basic Abstract Algebra, 2nd Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.
7. Modern Algebra – An Introduction by Durban, 5th Edition, Wiley.
8. Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
9. A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

PROFESSIONAL EDUCATION COURSES

MSE VI.4 : CRITICAL UNDERSTANDING OF ICT

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

On completion of the course the students will be able to:

- Appreciate the historical, current and future trends in ICT and its implications to education
- Explain the meaning of ICT and its application in Education
- Demonstrate an understanding of the computer hardware and software fundamentals
- Use various digital hardware and software for creating resources and providing learning experiences
- Use a word processor, spread sheet, drawing and presentation software skillfully and intelligently to produce various teaching learning resources for educational use
- Use internet technologies efficiently to access remote information, communicate and collaborate with others
- Model collaborative knowledge construction using various web 2.0 tools and technologies
- Design and develop technology integrated learning experiences using ICT tools
- Develop skills in using various e-learning and e-content tools and technologies
- Plan, develop, and use multimedia based learning content using open source authoring software
- Use ICT for designing learning experiences using innovative pedagogical approaches
- Explain the role of ICT in authentic and alternative assessment
- Understand the social, economic, security and ethical issues associated with the use of ICT
- Appreciate the scope of ICT for improving the personal productivity and professional competencies
- Appreciate the use ICT in improving educational administration

- Explain the emerging trends in information and communication technology

COURSE CONTENT:

Unit I: ICT and Education

Information and Communication Technology: meaning and nature. Learning theories and its implications for ICT integration in education. National ICT policy, curriculum and schemes

Historical account of the development of various educational media (audio, print, video, storage, display, projection)

Role of technology in emerging pedagogical practices. Visual literacy, media literacy, and new media literacy

Computer hardware fundamentals, computer network-LAN, WANand Internet. Software – meaning and types: proprietary software and open source software, System software and application software

Emerging Trends in ICT and its educational applications: Augmented reality, e-books and rhizomatic learning, learning analytics, ubiquitous computing and mobile learning, Game based learning, cloud computing and software as service, 3D printing, and marker space

Unit II: E-content and e-resources

Educational applications of word processing, spreadsheet, presentation, and drawing tools – diagrams, concept maps, timelines, flow charts.

Reusable Learning Objects (RLO), e-content standards, authoring tools- open source and proprietary alternatives

Multimedia: meaning and types, multimedia tools-audio editing, video editing, screen casting, graphic editing, basics of animation, and creating interactive media. Evaluation of multimedia resources.

Open Educational Resources – Meaning and importance, various OER initiatives, creative common licensing

Locating internet resources – browsing, navigating, searching, selecting, evaluating, saving and bookmarking

Use of digital still and video camera, digital sound recorder, scanner, printer, interactive white board, visualizer, and multimedia projector for creating and using multimedia resources

Unit III: ICT and Pedagogy

Techno pedagogical content knowledge (TPCK). Approaches to integrating ICT in teaching and learning

Web 2.0 tools for creating, sharing, collaborating, and networking: Social networking, social book marking, blog, wiki, instant messaging, online forums/discussion groups and chats, and media streaming.

E-learning: concept, types, characteristics, e-learning tools and technologies, Learning Management Systems (LMS)

Subject specific ICT tools for creating and facilitating learning. Designing technology integrated authentic learning designs and experiences

ICI integrated Unit plan – Web 2.0 for creating constructivist learning environment

Technology for pedagogical innovations: web quest, PBL, virtual tours, MOOC, flipped classroom

Assistive technology for special needs and inclusion: tools and processes, ICT and Universal design for Learning (UDL)

Unit IV: ICT for Assessment,Management, and professional development

ICT and Assessment**:** e-portfolio, electronic rubrics, online and offline assessment tools – rubrics, survey tools, puzzle makers, test generators, reflective journal, and question bank.

Use of web 2.0 tools for assessment,

ICT for professional development - tools and opportunities: electronic teaching portfolio, web 2.0 technologies, technology and design based research, ICT for self-directed professional development, web conferencing, role of OER and MOOCs
ICT for personal management: email, task, events, diary, networking. ICT for educational administration: scheduling, record keeping, student information, electronic grade book, connecting with parents and community, school management systems.
Managing the ICT infrastructure: software installation, troubleshooting of hardware, seeking and providing help, storage and backup, updating and upgrading software

Computer security: privacy, hacking, virus, spy ware, misuse, abuse, antivirus, firewall, and safe practices, fare use and piracy

Sessional Work

1. Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices
2. Using word processor, spread sheet, drawing and presentation software to produce various teaching learning resources and sharing it online
3. Locating internet resources – navigating, searching, selecting, saving, evaluating(use standard internet evaluation criteria), and bookmarking using social bookmarking
4. Creating digital concept maps, flow charts, timelines, and other graphics for a particular content
5. Creating screen cast video and podcast of a lesson
6. Shooting, editing, and sharing of videos segment on any educational topic
7. Creating account in YouTube/slide share and sharing the video/presentation. View and comment on others contributions
8. Creating account in wikispace/wikipedia/mediawiki and adding/editing content
9. Developing an educational blog in www.blogger.com, www.wordpress.com, or www.edublog.com
10. LMS experience- hands on various features of LMS – the ICT course may be provided through LMS
11. Enrolling and completing some MOOC courses of interest
12. Creating resources for flipped classroom and Practicing flipped learning in school during internship
13. Evaluating OER resources. Creating and sharing OER materials- may be in NROER
14. Developing technology integrated unit/lesson plan and trying out this in the school during internship
15. Hands on experience on subject specific software tools like Geogebra, PhET
16. Developing a multimedia e-content for a topic using eXe Learning
17. Field visit to the Edusat center and take part in teleconferencing
18. Planning and creating digital rubrics for any topic and create an e-portfolio
19. Organize web conferencing using Skype or any other tools
20. Review of ICT labs (plans and equipments/resources) in school from internet
21. Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
22. Readings on emerging ICT trends in education
23. Review of national ICT policy and curriculum
24. Using FOSS tools for timetabling, grade sheet

References:

1. Andrew A Kling(2010).Web 2.0 (Technology 360). Lucent Books : New Delhi.
2. Andrew M. St. Laurent. (2004). Understanding Open Source and Free Software Licensing. Oreilly:Cambridge

3. Athanassios Jimoyiannis (Editor) (2011). Research on e-Learning and ICT in Education. Springer: USA
4. Barbara B. Levin, Lynne Schrum.(2012). Leading Technology-Rich Schools (Technology & Education, Connections (Tec). Teachers College Press: New York
5. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi
6. Bruce M. Whitehead, Devon Jensen, Floyd A. Boschee.(2013). Planning for Technology: A Guide for School Administrators, Technology Coordinators, and Curriculum Leaders.Corwin:New Delhi
7. Cabmbridge, D.(2010).E-Portfolios for Lifelong Learning and Assessment.John Wiley and Sons
8. Christopher Moersch(2009). Beyond Hardware-Using Existing Technology to promote Higher-Level thinking. Viva Books: New Delhi.
9. Conrad, Keri (2001). Instructional Design for Web based Training. HRD Press
10. Costantino,P.M., DeLorenzo,M.N., Kobrinski,E.J.(2006).Developing a professional teaching portfolio: a guide for success. Pearson
11. Crumlish Christian (1999). The Internet No Experience Required. BPB Publications: New Delhi
12. Curtis J. Bonk (2011).The World Is Open: How Web Technology Is Revolutionizing Education. Jossey- Bass: San Fransisco
13. Imison,T., Taylor,P.H.(2001). Managing ICT in the Secondary Schools. Heinemann:Oxford
14. James,K.L. (2003). The Internet: A User's Guide. Prentice Hall of India Pvt.Ltd: New Delhi
15. Jane Hunter (2015).Technology Integration and High Possibility Classrooms: Building from TPACK
16. Jean-Eric Pelet (2014).E-Learning 2.0 Technologies and Web Applications in Higher Education (Advances in Higher Education and Professional Development (Ahepd)).Idea Group: U.S.
17. Liz Arney (2015.)Go Blended!: A Handbook for Blending Technology in Schools
18. Loveless Avril(2001). ICT-pedagogy and the curriculum-Subject to change.RoutledgeFalmer: London.
19. Lynne Schrum, Barbara B. Levin. (2010).Leading 21st-Century Schools: Harnessing Technology for Engagement and Achievement. Corwin: New Delhi
20. ManojkunarDash(2010). ICT in teacher development. Neelkamal Publications: New Delhi.
21. Mary Webband Margaret Cox (2014). Information and Communication Technology-Assessment for Learning in the ICT Classroom (Inside the Black Box).Learning Sciences :US.
22. M. D. Roblyer, Aaron H. Doering (2012). Integrating Educational Technology into Teaching (6th Edition)
23. Michael Thomas (2009). Handbook of Research on Web 2.0 and Second Language Learning. Information Science Reference: US.
24. Rena M. Palloff, Keith Pratt (2011).The Excellent Online Instructor: Strategies for Professional Development. Wiley: San Francisco
25. Ronghuai Huang and Kinshuk(2014). ICT in Education in Global Context: Emerging Trends Report 2013-2014 (Lecture Notes in Educational Technology). Springer: New York.
26. Rosemary Papa.(2010).Technology Leadership for School Improvement. Sage:New Delhi.
27. Sarkar, S.K. & Gupta, A.K.(1998). Elements of Computer Science. S.Chand& Company: New Delhi

28. Semenov, Alexy (2005). Information and Communication Technologies in Schools. A handbook for Teachers. UNESCO
29. ShalinHai-Jew. (2012). Open-Source Technologies for Maximizing the Creation, Deployment, and Use of Digital Resources and Information. Information Science Reference:USA
30. Theodore Lee(2008). Professional Development of ICT Integration for Teachers.VDM Verlag : Germany.
31. W.J. Pelgrum and N.Law(2003). ICT in Education around the world-Trends ,Problems and Prospects . UNESCO : Paris.
32. Viva Lachs (2000). Making Multimedia in the Classroom-A Teacher's Guide. Routlegde Farmer :London.

MSE VI.5: PEDAGOGY OF PHYSICAL SCIENCE 2

Credits: 4 (2L+ 2T +0P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

- Enable the students to write the unit plans and lesson plan as per the norms of NCF 2005.
- Applying the different teaching methods based on a constructivist point of view.
- Enable the students to oMSErve the lesson systematically.
- Selecting the learning resource and effective use of the same.
- Using of ICT in physical science teaching and learning.
- Explore various assessment strategies for evaluating learning in Physical science.
- Explore various professional development opportunities.
- Plan and conduct action research in secondary schools.
- Identify various teaching- learning resources.
- Develop skills of facilitation as they teach in simulated situations.
- Reflecting the methods in the class.

Unit I: Learning Resources in Physical Science

Print resources: Textbook as a learning resource, criteria for evaluation of a textbook, handbooks, teacher resource books, laboratory manuals, science journals and magazines, encyclopedia, newspaper.
Dale's cone of experience and its use in teaching- learning.
Developing and using resources such as charts, models, science kits, posters, science parks.
Science laboratories: designing, management, and safe practices.
Making low-cost equipment from locally available resources, using the immediate environment and the community resources for teaching of physical science.
Exploring and using digital resources: websites, videos, games, simulations, mobile apps, presentations, OER, interactive multimedia resources, e-books, podcasts, digital concept maps, and digital graphics.
ICT integration in physical science teaching: different forms of ICT and its application in science education.

Unit II: Need and Importance of Assessment for Learning Physical Science

Learning standards in science, process and product assessment in Physical Sciences, importance of metacognition and reflection in assessment, importance feedback in facilitating learning.

Meaning of the terms test, examination, measurement, assessment and evaluation in proper context, Continuous and Comprehensive Evaluation (CCE) and its features.
Assessment and evaluation as intertwined process of classroom experiences performance based assessment, planning assessment framework, Learning Indicators (Lis) and its types, developing LIs for activity, presentation, group work, assignments etc.
Recording and reporting of learning evidences – measurement of students' achievement – marks and grading.

Unit III: Tools and Techniques Assessment for Learning Physical Science

Tools and technique of assessment-- assessment of written and oral work, project work, laboratory work, field trips, journal writing, concept map; assessment of learners with special needs.
Use of oMSErvation, questioning, concept mapping, rating scales, worksheets, reflective journals/diary, peer and self-assessment in physical science.
Use of rubrics, and portfolio assessment in Physical Science, diagnosing learning difficulties and misconception in Physical Science.
Use of ICT in assessment.
Constructing different types test items in Physical Science at different levels of taxonomy, preparation of blue print/table of specification and constructing unit test.

Unit IV: Professional development of Physical Science teachers

Professional competencies of a physical science teacher.
Need for updating content and pedagogical competencies, pre-service and in-service courses and initiatives, agencies to nurture the best teachers, NCERT activities for teachers.
Participation in science fairs, exhibitions, and science club activities
Planning contextual activities- celebration of science day, birthdays of great physicists and chemists, seminars, conferences, online sharing, distance learning, membership to organisations- NSTA, IPA, IAPT, Indian Chemical Society, INSC. NCERT publications and journals
Meaning, nature, scope, designing and implementing innovative approaches to teaching science.
Teacher as a Researcher: meaning of research and its importance, action research versus research, selecting the problem for action research, format of research plan, action research in physical sciences, steps in action research, examples of action research from the primary, secondary, and higher secondary levels.

Sessional Activities:

(Any TEN from the following)

- Design and development of unit test.
- Developing rubrics for laboratory work, assignment, field trip, project etc.
- Facilitating the development of digital portfolio by a couple of school students.
- Designing and implementing science lab experiments.
- Text book analysis for content organization/ validness of curriculum mentioned in NCF 2005.
- Analysis of process skills and planning lessons for developing process skills.
- Identifying, selecting, and evaluating various media for chosen unit.
- Case studies of successful teacher leaders.
- Presentation and discussion on sample action research studies.
- Planning and conducting an action research.

- Debates on various ethical issues.
- Visit to a special school, oMSErvation of inclusion strategies in regular classroom.
- Development of teaching portfolio.
- Analysis of teacher competency framework of various organization.
- Study of a science professional organization.
- Review of an action research article/teaching of Physical science related research article.
- Organizing a science exhibition.
- Formation of a science club and conducting various activities.
- School visit to study the CCE practice.
- Conducting field trips to science muesuem, science park, botanical garden.
- Writing unit plan for at least 2 units of secondary science.
- Writing lesson plan for at least 2 topics of secondary science.
- Classroom Experience 2: Classroom OMSErvation for studying teacher's facilitation skills and how student work is distributed (with emphasis on pedagogical aspects-strategies/materials used).
- Preparing and demonstrating low cost/improvised teaching aids based on Class VII, VIII and IX class Physical Science.
- Simulated teaching of class VII-X topics.
- Developing and analysing a Physical Science achievement test.
- Develop an assessment rubric in Physical Science.
- Visit to a Science museum / Science park /Science teacher resource centres.
- Organize a seminar related to Science day. Developing an action research plan for teaching-learning Physical Science.

References:

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.

13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSE VI.6 : PEDAGOGY OF MATHEMATICS 2

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

On completion of the course the students will have

- understanding of nature of teaching proof and problem solving in mathematics
- ability to analyse the purposes of teaching algebra and geometry
- ability to select suitable tools for mathematical construction and measurements
- Appreciates the usefulness of mathematics in day today activity in various fields
- adopt different strategies to meet the diversified needs of learners and appreciates the availability of various learning resources in mathematics
- Decision making ability to use appropriate assessment tools for mathematical assessment

COURSE CONTENT:

Unit I : Teaching of Proof and Teaching of Problem-solving

Meaning and nature of Proof; kinds of proof- direct, proof by mathematical induction, proof by contradiction, proof by contrapositive, proof by cases, proof by counter examples ; planning and teaching of various theorems in mathematics (secondary level)

Problem-solving

Definition of problem, problem solving; Meaning and nature of PrOblem solving, strategies of problem solving- Means-ends analysis, backtracking, backward movement, heuristics; Polya's Problem solving steps; solving various mathematical problems

Unit II: Teaching of Algebra and Geometry

Introduction of basic ideas of algebra- variable, constant, coefficient, expression, equation; nature and purpose of teaching algebra; Contextualization of practical situation into algebraic expressions or equations(mathematization); solving various algebraic relations problems of secondary level.

Nature of geometry; purpose of teaching geometry; construction of different geometrical figures; Role of geometry in comprehending mathematics as whole; developing skills in selecting, drawing, using appropriate geometrical instruments and its utility in real life situation; scale drawing; topology and its application in mathematics.

Unit III: Meeting diverse needs of learners (Gifted and Slow learners) and Learning resources in mathematics

Gifted child in mathematics- their characteristics, identification and enrichment programmes slow learners in mathematics- their characteristics, identification and remedial measures; overcoming dyscalculia and dysgraphia problems in mathematics and their remediation.

Creation of **visual aids**-charts, models, graphs; usage of **graphical tools**- calculator, logo, cabri, geogebra, sketch pad, ready reckoners; selection and integration of tools in relation to content and learning environment; **Audio-visual aids**- animations, film shows; mathematics lab; mathematics club; e-resources and open and free software; **community resources**-library, museum, theatre, knowledgeable person or experts

Unit IV: Assessment of learning in mathematics

Selection of appropriate tools for formative and summative assessment; diagnosing the learning difficulties of learners (Error analysis- procedural errors, conceptual errors, computational errors) and providing remedial measures (Peer tutoring, direct instruction, mentoring); creation of rubric, portfolios, Criterion reference test, Norm referenced test based on set criteria; construction, administration, scoring, interpretation of a unit test and providing feedback to learners.

For all the Pedagogical transactions the following content knowledge (8^{th}, 9^{th} , 10^{th}, 11^{th}, and 12^{th} standard syllabus) to be made use of, and these can be revised as per the change in curriculum of respective state or changes in CMSE syllabus or in NCERT text books.

Arithmetic: Number system, Ratio and Proportion, Fractions, Commercial mathematics and Data handling, sets, Matrices

Algebra: Polynomials, Graphical representations of various equations, trigonometry,

Geometry: Lines and angles; Triangles and its related theorems; polygons; analytical geometry,

Differential calculus; Integration, Trigonometry; graph theory; computing using ICT.

Sessional work:

Selecting any one of the theorem and teaching it by adopting the strategies of teaching proof
Selecting any one kind of problem in mathematics and demonstrate its procedure of solving
Selecting a topic in algebra or in geometry and teaching it using appropriate learning resources
Construction of unit test (administration, scoring, statistical analysis and reporting) on a selected unit
Analysing the errors committed by learners at secondary level, in regular test (FA1or FA2) and analysing its causes and suggesting various remedial measures for it

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc
6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education, Syndey, Croom Helm Australia Pty Ltd

10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal Publications Pvt Ltd

SEVENTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

DSE 1 A : Physics

MSE VII.1 : NUCLEAR AND PARTICLE PHYSICS

Credits: 3 (1L + 1T +1P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:
To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Nucleus
Nuclear structure, Failure of proton-electron hypothesis– neutron, its discovery and properties, Proton-neutron hypothesis, Constituents of nucleus and their Intrinsic properties, Basic properties of nucleus– charge, spin, radii, mass, magnetic moment. Nuclear forces and their characteristics. Yukawa's Theory (Qualitative), Packing fraction and binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, Nuclear stability, Segre chart.

Unit II: Nuclear Models

Nuclear Models– Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Unit III: Radioactivity

Review: Radioactive decay – Half life, mean life, Activity-decay constant. Radioactive displacement laws. Theory of α decay, α-emission, Gamow factor. Geiger-Nuttal law. Beta decay, energy kinematics for Beta decay, positron emission Beta spectra. Neutrino hypothesis, K electron capture, internal conversion, Gamma decay, pair production, successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions, nuclear fission and fusion. Energy liberated in nuclear fission, energy production in stars, Nuclear reactors.

Unit IV:

Particle Accelerators and Detectors: Cockroft– Walton voltage multiplier, LINAC, Cyclotron, Betatron.
Nuclear Detectors: GM counter, scintillation detector, bubble chamber, principle of semiconductor detector.
Particle Physics: Particles and anti-particles, Classification of particles, Symmetries and Conservation Laws, Qualitative introduction to quarks, Structure of hadrons.

References:

1. I. Kaplan, Nuclear Physics, Narosa, 2002.
2. Kenneth S. Krane, Introductory nuclear Physics, Wiley India Pvt. Ltd., 2008.
3. Bernard L. Cohen, Concepts of nuclear physics, Tata Mcgraw Hill, 1998.
4. Subramanyam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.
5. R.A. Dunlap, Introduction to the physics of nuclei & particles, Thomson Asia, 2004.
6. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
7. D. Griffith, Introduction to Elementary Particles, John Wiley & Sons, 2008.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. GM Counter characteristics.
2. GM Counter– Absorption coefficient.
3. Determination of Half life of Co-60.
4. Simulation experiment on radioactive decay.
5. Verification of inverse square law for beta rays.
6. Verification of inverse square law for gamma rays.
7. Rutherford model– Simulation technique.
8. Ionization potential of Xenon.
9. Measurement of Mercury spectrum wavelength.
10. Spectrometer-Quartz prism-Refractive indices of quartz for the ordinary and extra-ordinary rays.
11. LCR Parallel resonance
12. LCR Series resonance.
13. FET characteristics.
14. Hartley oscillator.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.

4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2AChemistry

MSE VII.2 : ELECTROCHEMISTRY AND PHOTOCHEMISTRY

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- Explain the nature of Electrolytic conduction involving theories of electrolytes.
- Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.
- To have knowledge about the commercial cells and their applications
- To obtain information about the basic photophysical and photochemical processes

COURSE CONTENT:

Unit I: Electrochemistry – I

To study the behaviour and reactions of ions in a variety of environments through the laws that govern them. Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

Applications of conductivity measurements : Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit II: Electrochemistry – II

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-metal insoluble salt, Amalgam and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes– standard electrode potential, sign conventions, electrochemical series and its significance.

To draw up a scheme for discussing the equilibrium position for an ionic reaction in terms of the electrode potential. Electrolytic and Galvanic cells–reversible and irreversible cells, conventional representation of electrochemical cells.
EMF of a cell and its measurements. Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), Chemical cells with and without transport.

Unit III : Electrochemistry – III

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.
Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods, polarization, over potential and hydrogen over voltage Power storage, Lead Battery,Ni-Cd cells, Fuel Cells, Hydrogen–Oxygen cell. Thermodynamic and Kinetic basis of corrosion, methods of inhibition of corrosion

Unit IV : Photochemistry
Discussing the Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram showing various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radioactive processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples), Chemiluminescence.

References :

1. Photochemistry Gurudeep Raj Goel Publishing House
2. Principles of Physical Chemistry Puri, Sharma, Pathania 47^{th} Edition
   Vishal Publishing Co.
3. Elements of Elecrochemistry by Samuel Glasstone and Lewis
4. Principles of Physical chemistry -Marron and prutton

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the elecrical behaviour of weak and strong electrolytes
- Quantitative estimation of electrolytes by conductometric and potentiometric titration

COURSE CONTENT:
1. To determine the equivalent conductance of a strong electrolyte at several concentrations and verify Onsager's equation.
2. Conductometric titration of a strong acid Vs. strong base, strong base Vs. weak acid, strong base Vs mixture of acids (strong and weak) to determine the concentration of acids in a given solution and in mixture.
3. To determine the concentration of the given acid solution and concentration of acids in a mixture by potentiometric titration using sodium hydroxide solution.
4. Determination of Pka value of a weak acid by potentiometry.
5. Determination of the dissociation constant of a weak acid by conductometry
6. To determine the equivalent conductance of a weak electrolyto at different

concentrations and verify Ostwald's dilution law.Also to find out the dissociation constant of a weak electrolyte.

7. To determine the solubility and solubility constant of a weak electrolyte conductometrically.
8. To find the composition of the complex formed between iron(III) and salicylic acid by Job's method.
9. To find out the amount of copper sulphate in the given solution by titrating with standard alkali by conductometry.
10. To determine the amount of FAS in the given solution by potentiometric titration with standard potassium dichromate and potassium permanganate solutions.
11. Estimation of Silver nitrate by potentiometric titration with standard potassium chloride solution.

References :

1.Systematic experimentas in chemistry Arun Sethi New Age International (P) Ltd New Delhi.

DSE 3AMathematics

MSE VII.3 :LINEAR ALGEBRA

Credits: 3 (1L + 2T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable the students to understand and apply the concepts of linear algebra in solving appropriate problems.

COURSE CONTENT:

Unit I:

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space – some properties. Quotient spaces, Homomorphisms and Isomorphisms of vector spaces, Direct sums.

Unit II:
Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Cauchy-Schwarz inequality, Orthogonal and orthonormal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

Unit III:
Matrices of Linear maps, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

Unit IV :
Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation, Characteristic polynomial, Cayley - Hamilton Theorem, Minimal Polynomial.

References :

1. Theory and Problems of Linear Algebra, Saymour Lipschitz, Schaum Outline Series.
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
3. Modern Algebra, Vol.II, by Narayanan and Manicavachagam Pillay, S. Vishwanathan and Co.
4. Brief Survey of Modern Algebra, Brikhoff and Maclane, IBH
5. Linear Algebra by Serge Lang, Addison Wesley Publishing company Inc.
6. Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.
7. Linear Algebra by Larry Smith, Spinger Verlag.
8. Elementary Linear Algebra with Applications, Keith Nicholson, PWS – Kent Publishing Company
9. Linear Algebra, Surjith Sinth, Vikas Publishing House Pvt. Ltd.
10. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.
11. Linear algebra – a geometric approach by Kumaresan. S

PROFESSIONAL EDUCATION COURSES

MSE VII.4 : CREATING AN INCLUSIVE SCHOOL

Credits: 4 (2L+ 2T +1P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understanding the meaning and significance of inclusive education.
- Appreciate the special needs of Individuals with diverse needs.
- Get Familiarized themselves with the concept of Inclusive Education.
- Understand the nature and needs of different categories of disabled children.
- Understand the concept of Special Education, Integration and Inclusion.
- Understand the different considerations and provisions for facilitating inclusion.
- Understand and Acquire the Skills of Adapting Curriculum to meet the need of the Students with Diverse needs

COURSE CONTENT

Unit I : Basic Concepts and Introduction to Inclusive Education

Meaning of Impairment, Disability and Handicap;Concept of Special Educational Needs and Diverse Needs, Difference between Special Education, Integration and Inclusive Education. Significance of Inclusive Education;Factors Affecting and Promoting Inclusion.

Unit II : Nature and Needs of Diverse Learners-Identification of Diverse Learners in the Classroom

Sensory Impairment: Hearing impairment and Visual impairment

Physical Disabilities: Orthopaedic impairment, Cerebral Palsy, Special Health Problems, Congenital defects; Slow Learners and Under Achievers; Intellectual Disability; Learning disabilities and ADHD; Autism Spectrum Disorders; Multiple disabilities ; Emotional and Behavioural Problems; Gifted and Creative; Socially Disadvantaged, Economically Deprived, Religious and Linguistic Minorities, Inhabitants of Geographically Difficult Areas

Unit III: Preparing Schools for Inclusion-General Considerations and

ProvisionsConcept of Inclusive School, Competenciencies and Characteristics of inclusive Teacher

Physical Consideration, Socio-Emotional Considerations, Curricular Considerations

Provision of Assistive devices, equipment's and technological support. Special provisions in Evaluation

Unit IV : Inclusive Practices in Classroom

Making learning more meaningful: Responding to special needs by developing strategies for differentiating content, curriculum adaptation and adjustment, lesion planning and TLM. Pedagogical strategies to respond to needs of individual students: Cooperative learning strategies in the classroom, peer tutoring, buddy system, reflective teaching, multisensory teaching. Use of IT suitable for different disabilities.

Practicum

- Collection of data regarding children with special needs.
- Visit to Inclusive Schools and to oMSErve classroom transaction of any one of such school and make a report of the same.
- Identifying one/two pupils with special needs in the primary schools and preparing a profile of these pupils.
- Preparation of teaching aids, toys, charts, flash cards for children having any one type of disability. (Visit to Resource Room)
- Preparation of Lesson Plan, instruction material for teaching students with disability in inclusive school.
- Developing list of teaching activities of CWSN in the school.

Visits to different institutions dealing with different disabilities and OMSErvation of their Classroom.

* In addition, school and community based activities may be organized.

References:

1. Fimian, M.J., Fafard, M., and Howell, K.W.: *A Teacher's guide to Human Resources in Special Education: Para Professionals, Volunteers, and peer tutors.* Boston: Allyn and Bacon, Inc.
2. Furth, H. (1964). *Thinking without Language.* New York: Free Press.
3. Hallahan, D.P. and Kauffman, J.K. (1988). *Exceptional Children: Introduction to special Education.* N.J.: Englewood Cliffs.
4. Jangira, N.K. (1986). *Special Education Scenario in Britain and India*. Gurgaon: The Academic Press.
5. Jangira, N.K. (2013). NCERT: The Mother of Inclusive Education, Regional Institute of Education NCERT, Ajmer. (Also available on Google search Jangira special education).
6. Julba, A. (2014) Teachers creating Inclusive classrooms: Issues and challenges – A research study
7. Kapoor, S. (2015). Index of Inclusive School Quality, Brotherhood, Delhi.
8. Kothari, R.G. and Mistry, H.S. (2011). *Problems of students and Teachers of the special schools – A study of Gujarat state*. Germany: VDM Publication.
9. Maitra, K. & Saxena, V. (ed)(2008) *Inclusion: Issues and Perspectives,* Kanishka.
10. Meadow, K.P. (1980*). Deafruss and child development.* Berkley, C.A.: University of California Press.
11. Messily,K. (2012). Confronting Marginalisation in Education: A Framework for Promoting inclusion, Routledge, London.
12. Mithu, A. and Michael, B. (2005). *Inclusive Education: From rhetoric to Reality*, New Delhi: Viva Books Pvt. Ltd.
13. NCERT (2006) Position Paper: National Focus Group on Education of Children with Special Needs, NCERT, New Delhi.
14. NCERT (2013) Training and Resuorce Material on Adolescence Education, New Delhi, available on www.aeparc.org
15. Oza, D. and Pandit, R. (2011). *Management of behavioural problems of children with mental retardation*. Germany: VDM publication.
16. Premavathy, V. and Geetha, T. (2006): Integrated and Inclusive Education DSE(VI) Manual: New Delhi, Krishana Publication.
17. Reed, M. (1984). *Educating Hearing Impaired Children.* Milton Keynes: Open University Press.
18. Sharma, P.L. (1988). *A Teacher's Handbook on Integrated Education of the Disabled*. New Delhi: NCERT.
19. Ramaa S : Website: s-ramaa.net (for various publications)
20. Voluntary Health Association of India. *Disabled 'Village Children' – A Guide for Community Health Workers, Rehabilitation Workers, and Families*.
21. World Bank (2003) Inclusoive Education: Achieving Education for all including those with Disabilities and special Education Needs

Web Resources

- IBE-UNESCO (2016). Training Tools for Curriculum Development - Reaching Out To All Learners: a resource pack for supporting Inclusive Education, Ibe.training@unesco.org, http.//www.ibe.unesco
- Video on A World for Inclusion (2007) by UNESCO, directed by David Atrakchi, 20 minutes,http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=213
- Children with Disabilities (2012), by UNESCO, 23 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2758
- Inclusive Education: Approaches, scope and Content (2008), by UNESCO, produced by International Bureau of education, 11 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3314

- Inclusive Education: Learners and Teachers (2008), by UNESCO, produced by International Bureau of education, 14 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3316
- Preparing Teachers in Asia-Pacific for Inclusive Education, (2012), by UNESCO, 3 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2030
- Preparing teachers for inclusive education: Part 3 & 4, by UNESCO, produced by Lesotho, Ministry of Education, 21 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=418
- Toward Inclusive schools - Special needs in the classroom, by UNESCO, directed by Mike Fowler, 6 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=488
- Training Video: Special Needs in the Classroom, (1992), by UNESCO, directed by Mel Ainscow, 46 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=405
- Including Children with Special Needs Primary Stage (2014), NCERT,http://www.ncert.nic.in/pdf_files/SpecialNeeds.pdf
- Including Children with Special Needs Upper Primary Stage, (2015), NCERT, http://www.ncert.nic.in/gpPDF/pdf/tiicsnups101.pdf
- Julka, A. (2007) Meeting Special Needs in Schools: A Manual, NCERT, http://www.ncert.nic.in/html/pdf/inclusive_education/COVER.pdf
- Position Paper National Focus Group on Education of Children with Special Needs, NCERT, http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/special_ed_final1.pdf
- Learning Curves, Inclusive education (2014), Azim Premji Foundation, http://www.teachersofindia.org/en/periodicals/learning-curve-issue-xxiii

MSE VII.5 : HEALTH AND PHYSICAL EDUCATION

Credits: 2 (1L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- to build a scenario of Health Education in India.
- to develop a Knowledge Base of the Most Common and Uncommon Diseases in India; their Diagnosis & Remediation.
- Prospective Teacher Educators to learn the Techniques Related to Health Risks & Learn How to Fix these.
- Prospective Teacher Educators to study the Health Education Vision & Mission of India.
- To acquire the skills for physical fitness, correct postures, habits and activities for development
- Acquire skills to practice yogasanas and meditation and learn the skills of concentration, relaxation, dealing with stress and strain
- Understand and develop psychological abilities as life skills to deal with growing up issues like HIV and AIDS and prevention of substance issues
- Understand the process of assessment

COURSE CONTENT

Unit I: Health Education Scenario in India

Introduction to the concept of health, significance and importance in the context of ancient and modern Indian perspective
Identity of Educational Institutional Plants: Structure, Infra-Structure and Environment, Time-Space-Personnel-Material Constellation Educational Management System, Emerging Health & Total Quality of the Educational Institutions, Status of Health Education in India from Pre-Natal Education through Higher Education, Yoga & Yog, Health & Hygiene, Clean Toilets, Work & Leisure, Quality of Health – Role of Education, Administrators, Teachers, Students, Supporters,

Unit II: Tech-related Health Risks

Identification of the technological health hazards – Smartphone Stress, Acne caused by the Cell Phones, Blackberry Stress Injuries to the Thumb, Radiation from the cell phones, Cell Phone Sickness, Cell Phone & Car Accidents, Allergies & Phones, Crazy Phones, Computers Causing Wrist Pain, Back & Neck Pain, Decreased Sperm Count from the WIFI, Laptop Burns, Laptop Headaches, Sleeping Problems from the Laptops, Decreased attention span from using Face-book, The Internet Causing Anxiety, Headphone Use leading to Accidents, Hearing Loss from Headphones, Visual Impairment, Death from Social Networking, Environmental Degradation, Aggression, Social Crimes--- Evolving Controlling & Regulatory Mechanisms.

Unit III: Approaches to Sound Health

Games, Sports & Athletics.
Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.
Games and sports – athletics (general physical fitness exercises), games (lead-up games, relays and major games) rhythmic activities, gymnastics and their impact of health.
Fundamental skills of games and sports; Sports for recreation and competition; Rules and regulation of sports; sports ethics; sports awards and scholarships, sports- personship.
Yoga – Raja Yoga, Karma Yoga, Bhakti Yoga, Jnana Yoga.
Safety and security – disasters in and outside schools, ways of prevention, safety from snake and dog bites, animal attacks, prevention and treatment.
Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhabitation.
Libraries, Laboratories, Classrooms, Halls, Play Fields, Water Tanks, Swimming Pools, Community Pools, Roads Human Development Index (HDI), Health: Vision, Goals and Objectives of Government of India, Experiments on Influence of Surroundings & Thought, Science of Laughter & Smiles, Health OMSErvation Programs, Impact of TV Serials.
Role of Institutions (schools, family and sports), health services, policies and major health and physical education-related programme, blood banks, role of media.

Unit IV: First Aid – Principles and Uses

Structure and function of human body and the principles of first aid., First aid equipments.
Fractures-causes and symptoms and the first aid related to them, Muscular sprains cause, symptoms and remedies, First aid related to hemorrhage, respiratory discomfort, First aid related to Natural and artificial carriage of sick and wounded person, Treatment of unconsciousness, Treatment of heat stroke, General disease affecting in the local area and measures to prevent them.

Practicum

Surfing to know the diseases in India.
Preventive & Ameliorative measures for health hazards.
Playing Games.
Athletics.
Yoga.
Reflective Dialogues on Serials, such as, Satyamev Jayate on Health of the People.
Preparation of inventories on myths on exercises and different type of food.
Make an inventory of energy rich food and nutritious food (locally available) indicating its health value.
Make an inventory of artificial food and provide critical oMSErvations from health point of view.
Home remedies as health care.
Role of biopolymers (DNA) in health of child.
Medicinal plants and child health.
Strategies for positive thinking and motivation.
Preparation of first aid kit.

*** In addition, school and community based activities may be organised.**

References:

1. Arora,P. (2005) Sex Education in schools, Prabhat Prakashan
2. K..Park "Preventive and Social Medicine" Banarsidas Bhanoth, Publishers Nagpur Road, Jablapur, India.
3. NCERT(2013). Training and Resource materials on Adolescence Education, NCERT, New Delhi (This material is also available on www.aeparc.org.www.ncert.nic.in
4. NCERT(2014). Population Education, Source Material, NCERT, New Delhi.
5. Stephen, J. Williams, Paul R. Torrents, "Introduction to Health Service", Delmore Publications.

Physical Education

1. Deboarh, A. Wuest, Charles, A. Bucher: "Foundation of Physical Education Exercise Science and Sports", Tata McGraw Hill Pvt. Ltd., New Delhi.
2. John, E. Mixton, Ann, E. Jewett: "An Introduction to Physical Education, W.B. Saunders Company, London.
3. John, Cheffers; Tom, Evaul: "Introduction to Physical Education – Concept of Human Movement". Prentice Hall Engle Wood: New Jersey.
4. Bette J., Logdson & Others, "Physical Education for Children", Lea and Febiger, Philadelphia..
5. Roberts, S. Weinberg & Daniel Gould, "Foundation of Sports and Exercise Psychology", Human Kinetics Publication.
6. A.K. Uppal, Lawrance Gray Kumar, "Biomechanics in Physical Education and Exercise Science: Friends Publication, New Delhi.
7. Jack, H. Wilmore, David, L.. Costil, W. Larry Kenney, "Physiology of Sports and Exercise: Human Kinetics Publication.

Yoga

1. Swami Satyanand Saraswati, "Asana Pranayama Mudra Bandh", Bihar School of Yoga, Munger.

2. M.M. Ghore, “Anotomy and Physiology of Yogic Practices”. Lonavala Yoga Institute, Lonavala.
3. Gharote, M.L. (2004). Applied Yoga, Kaivalyadhama S.M.Y.M. Samiti, Lonavala.
4. “Yogasana” Morarji Desai National Institute of Yoga, New Delhi.
5. “Pranayama” Morarji Desai National Institute of Yoga, New Delhi.
6. MDNIY (2010). “Yoga Teachers Manual for School Teachers, New Delhi.
7. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi.
8. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi.
9. Agarwal, Satya P. (1998). The social role of the Gītā: how and why, Motilal Banarsidass, ISBN 978-81-208-1524-7, retrieved 17 June 2010.
10. Goel, Devraj & Goel, Chhaya (2013). Universe of Swami Vivekananda & Complete.
11. Wholistic Social Development, CASE Publication under UGC SAP, The M.S. University of Baroda, Vadodara.
12. Jason Liu and Dr. Gwendalle Cooper (2009) *Scientific Analysis of the Effects of Falun Dafa* Presented at International Conference of Psychologists, February 27, 2009 by Catherine Hennessy.
13. Mehroo D. Bengalee (1976).*Child Guidance*. Sheth Publishers, Educational Publishers, 35, Everest, Pedder Road, Bombay.
14. Ministry of Health & Family Welfare, Government of India, *Annual Report to the People on Health*, December 2011.
15. Porter, Noah (2003). *Falun Gong in the United States*: An Ethnographic Study, Master Thesis, Department of Anthropology, College of Arts and Sciences, University of South Florida.
16. Wu JY, Feng, L, Park , H-T, Havlioglu N, Wen L, Tang H, Bacon KB, Jiang Z, Zhang X, Rao Y. (2001). *Molecule that guides Nerve Calls Directs Immune Cells*, Science Daily, Apr. 20.

Web Resources

Position Paper National Focus Group on Health and Physical Education, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/health_prelims_final.pdf
Learning curves: sports in education, (2013) Azim Premji Foundation
http://azimpremjifoundation.org/pdf/learning-curve-17.pdf
www.FalunDafa.org
www.http://greatist.com/health/*19-worst-tech-related-health-risks*

MSE VII.6 : READING AND REFLECTING ON TEXT

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understand the meaning, process, importance and characteristics of reading.
- Understand and apply different levels, types, techniques and methods of reading.
- Acquaint with the skills of reading different types of texts.
- Develop different types of reading skills through various activities and met cognition
- Learn the skills of reading comprehension and to enhance vocabulary.
- Acquaint with the problems of reading across curriculum.

COURSE CONTENT

Unit I: Introduction to Reading

Reading – Meaning and Process, Importance of Reading across Curriculum, Characteristics of Reading, Developing reading skills.Role of libraries in promoting reading habits

Unit II: Techniques and Methodology of Reading

Levels of reading – literal, interpretative, critical and creative, Types of reading – intensive and extensive reading, oral & silent reading, Reading techniques – skimming and scanning. Methodology of reading

Unit III: Reading the Text

Types of Texts – Narrative, expository, descriptive, suggestive, empirical, conceptual, ethnography, policy documents, field notes; Importance of Different Texts in Curriculum

Unit IV : Developing Reading Skills and Reading Comprehension

Developing Critical Reading Skills, Developing Reflective Skills, Activities for Developing Reading Skills, Developing Metacognition for Reading, Developing Reading Comprehension Developing Vocabulary for Reading, Problems of Reading

Practicum

- Divide the class in small group and provide different kinds of texts and instruct them to read and reflect according to the nature of text.

- Divide the group and provide one text and suggest students to make different interpretations.
- Design vocabulary games to enhance vocabulary.
- Read the text and provide a five words summary to each paragraph.
- Reading and comprehension exercises.
- Skim through the text and give suitable title to the text.
- Complete given text in stipulated time and summarize it in 6/7 lines with a suitable title.
- Making an oral presentation
- Organising a debate, discussion based on their reading
- Preparation of a poster
- Making a collage
- Displaying appropriate texts/graphic on bulletin board
- Addressing morning assembly during their internship in schools
- Making a power point presentation on selected topic
- Submission of written articles/assignments
- Writing maintaining reflective journals

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.**

References:

1. Bright, J.A., and McGregor, G.P. (1970). *Teaching English as a Second Language.* ELBS: Longman.
2. Doff, A. (1988). *Teach English: Training Course for Teachers.* Cambridge: Cambridge University Press.
3. Hill, L.A., and Dobbyn, M.A. (1979). *Training Course, Trainer's Book.* London: Cassell.
4. Hubbard, P., and Hywel, J. et al (1983). *A Training Course for TEFL.* Oxford University Press.
5. Joseph, K.S. (2004). *Self Instruction in English Grammar and Figures of Speech.* Vadodara: Gold Rock Publications.
6. Mukalel, J.C. (1998). *Approaches to English Language Teaching.* New Delhi: Discovery Publishing house.
7. Mukalel, J.C. (1998). *Creative Approaches to Classroom Teaching.* New Delhi: Discovery Publishing house.
8. Mukalel, J.C. (1998). *Psychology of Language Teaching.* New Delhi: Discovery Publishing House.
9. Mukalel, J.C., and Ahmed, S. B. (1984). *Teaching English in India.* New Delhi: Arya Book Depot.
10. Nagaraj, G. (1996). *English Language Teaching Approaches, Methods and Techniques.* Calcutta: Orient Longman.
11. Richard, J.; Theodore, S. and Rodgers, T.S. (1968). *Approaches and Methods in Language.* Cambridge University Press.
12. Venkateswaran, S. (1995). *Principles of Teaching English.* New Delhi: Vikas Publishing House.
13. Wilkins, D.A. (1982). *Linguistics in Language Teaching.* London: Edward Arnold.
14. Willis, J. (1981). *Teaching English through English ELBS.* England: Longman Ltd.
15. Yule, G. (1985). *The Study of Language.* Cambridge: Cambridge University Press.
16. My experiments with the truth – *Autobiography of Mahatma Gandhi*

17. The Little Prince – *Antain de Saint* – Exupery
18. Cultural Heritage – Dr. S. Radhakrishnan
19. Periodicals Like – Outlook, India Today, Economic and Political Weekly, Business Today, Journals of Education, Organiser – weekly
20. Recognizing Different Types of Text

Web Resources

- http://www.bbc.co.uk/skillswise/factsheet/en03text-l1-f-different-types-of-text

Models of Reading Process

- http://people.ucalgary.ca/~mpeglar/models.html
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/
- http://www.tarleton.edu/Faculty/gentry/reading%20models.html

Reflective Skills

- http://www.skillsyouneed.com/ips/reflecting.html
- http://www.skillsyouneed.com/ps/reflective-practice.html

MSE VII.7A INTERNSHIP IN SCHOOL SUBJECT 1 – PHYSICAL SCIENCE
&
MSE VII.7B : INTERNSHIP IN SCHOOL SUBJECT 2 – MATHEMATICS

Credits : 6+6	**Marks: 100**
Duration : 10 Weeks	**C1 + C2 : 50**
	C3 : 50

The activity is divided into three phases:

A. Pre – internship - 2 weeks
B. Internship - 6 weeks
C. Post internship - 2 weeks

A. Pre internship

Objectives:

- To facilitate student teachers in designing and executing lessons in each pedagogy.
- To develop in student teachers the skills of obserrvation and evaluating teaching of their peers

Activities
The student teachers will
- plan and teach minimum 3 lessons in each pedagogy
- observe minimum 5 lessons of their peers in each pedagogy
- participate in the mentoring sessions to plan lessons under the guidance of mentors.

B. Internship

Objectives:

To provide the student teachers with the field experience of getting attached to a school for a long duration and develop professional skills of teaching, participate in various day to day functions of schools, and in organizing various activities.

Activities

- The student teachers will teach 20 lessons at secondary level in each pedagogy.
- The student teachers will observe minimum of 5 lessons at upper primary level and 10 lessons at secondary level of their peers in each pedagogy.
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records
- The student teachers will carry out action research project, analyse and write the report

C. Post Internship

Activities

- Submission of internship records - evaluation records, activity record, observation records, reflective diary.

- PPT Presentation of reflectiions

Evaluation in each pedagogy is as follows:
C1 – Pre-internship activities
C2 – Internship records and post-internship presentation
C3 – Internship in teachin g

EIGHTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

PHYSICS

MSE VIII.1 : SOLID STATE PHYSICS

Credits: 3 (1L + 1T +1P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics for an understanding of physics of nuclei and of solids.

COURSE CONTENT:

Unit I: Crystal Structure

Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices.Brillouin Zones. Coordination number, packing fraction for cubic crystals (sc, bcc and fcc). Diffraction of X-rays by Crystals. Bragg's Law.

Unit II:

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law.

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Curie-Weiss Law, Discussion of B-H Curve. Hysteresis and Energy Loss.

Unit III:

Electrical Properties: Free electron model of a metal, solution of one dimensional Schroedinger equation in constant potential, Density of states. Fermi energy, Energy bands in solids, Distinction between metals, semiconductors and insulators. Kronig- Penney model. P and N type Semiconductors. Conductivity of Semiconductors, mobility. Hall effect- Expression for Hall coefficients. Applications of Hall effect.

Dielectrics: Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation.

Unit IV:Superconductivity

Superconductivity: Qualitative description,. Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. High temperature superconductors Applications

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, 8^{th} Ed., Wiley India Pvt.Ltd., 2004.
2. A J Dekker, Solid State Physics, Macmillan, 1965.
3. J.P. Srivastava, Elements of Solid State Physics, 2^{nd} Ed., Prentice-Hall of India, 2006.
4. Leonid V. Azaroff, Introduction to Solids, Tata Mc-Graw Hill, 2004.
5. M. A. Wahab, Solid State Physics: Structure and Properties of Materials,Alpha Science International, Ltd., 2005.
6. Neil W. Ashcroft and N. David Mermin, Solid State Physics, Cengage Learning, 1976.
7. S O Pillai, Solid State Physics, NEW AGE, 2009.
8. G. I. Epifanov, Solid State Physics, Central Books Ltd., 1979.
9. M. Ali Omar,Elementary Solid State Physics, Pearson India, 1999.
10. H. Ibach and H Luth, Solid-state Physics, Springer, 2009.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Measurement of susceptibility of a paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. Determination of Hall coefficient in semiconductors.
5. Determination of Curie temperature– ferromagnet.
6. Determination of work function of a metal using R-D equation.
7. To measure the Dielectric Constant of a dielectric Materials with frequency.
8. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR).
9. To determine the refractive index of a dielectric layer using SPR.
10. To study the PE Hysteresis loop of a Ferroelectric Crystal.
11. To draw the B- H curve of iron using a Solenoid and determine the energy loss from Hysteresis.
12. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150^{o} C) and to determine its band gap. Franck-Hertz experiment.
13. Powder XRD pattern of KCl.
14. Powder XRD pattern of NaCl.
15. Powder XRD pattern of $CaCl_2$.
16. Solar cell experiment.
17. Frequency resonance of LR circuit.
18. Polarisation by reflection-Brewster's law.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2BChemistry

MSE VIII.2 : SPECTROSCOPY, NATURAL PRODUCTS AND HETEROCYCLICS

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To develop an understanding of the

- basic principles of Spectroscopy and apply the principles in the structural elucidation of simple organic compounds.
- chemistry of natural products, dyes and drugs, macromolecules and heterocyclic compounds

COURSE CONTENT:

Unit I : Spectroscopy

UV and Visible spectroscopy: Introduction, absorption laws, instrumentation, formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward – Fieser rules for calculating absorption maximum in dienes and α,β-unsaturated carbonyl compounds.

IR spectroscopy: Introduction, theory of molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, finger print region and applications of IR spectroscopy.

NMR spectroscopy: Introduction, instrumentation, number of signals, position of signals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts-inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemical exchange and coupling constant.
Structural determination of simple organic compounds using UV, IR and NMR spectral data.

Unit II: Natural Products
Carbohydrates: Introduction, classification and nomenclature. Configuration of monosaccharides. Erythro and threo diastereomers. Interconversions in carbohydrates – glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation. Constitution of disaccharides - maltose, sucrose and lactose. Introduction to polysaccharides (starch and cellulose) without involving structure determination.
Alkaloids : Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine
Terepinoids : Introduction, isoprene rule, structural elucidation of Citral and Menthol
Amino acids, Peptides, Proteins and Nucleic acids
Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α-amino acids.Classification of proteins. Peptide structure determination - end group analysis, selective hydrolysis of peptides. Solid-phase peptide synthesis. Primary and secondary structures of proteins. Protein denaturation.
Nucleic acids : Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. The double helical structure of DNA. Types of different RNA and their functions in the synthesis of protiens. Genetic code.

Unit III: Dyes, Drugs and Macromolecules
Dyes: Introduction, Classification of dyes, Colour and constitution (electronic concept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.
Drugs: Introduction, classification, structure and synthesis of sulpha drugs- sulphapyridine, sulphathiazole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials – plasmaquin, mepacrine and chloroquin.

Macromolecules: Introduction, Classification, Types of polymerization – chain polymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers – buna S , butyl rubber and neoprene. Synthetic fibres – nylon 6, nylon 6,6, terylene. Conducting polymers – polypropylenes and polyanilines. Bio-degradable polymers.

Unit IV: Heterocyclic Compounds

Introduction, methods of formation of five membered heterocycles – furan, thiophene and pyrrole. Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and their chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Six membered heterocycles: methods of formation of pyridine, mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles, preparation and reactions of Indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

References :

1. Organic Spectroscopy by P S Kalsi
2. Organic Chemistry : I L Finar Vol II
3. Application of absorption Spectroscopy to Organic Compounds : John R Dyer
4. Organic Spectroscopy : William Kemp
5. Fundamentals of Molecular Spectroscopy : C N Banwell

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop skills of synthesis and Estimation of organic compounds

COURSE CONTENTS:

1. Two step organic synthesis

1. Synthesis of p-bromoaniline from acetanilide
2. Preparation of o-iodobenzoic acid from anthranilic acid
3. Preparation of m-nitrobenzoic acid from methyl benzoate
4. Preparation of Paracetamol
5. Synthesis of Quinoline

2. Quantitative organic analysis

1. Estimation of aniline/ phenol by bromate-bromide method
2. Estimation of glucose by Fehlings method/ Spectrophotometry using 3,5 dinitro salicylic acid
3. Determination of iodine value of an oil by Wij's method/ Chloramine-T method
4. Determination of saponification value of an ester / oil
5. Estimation of amino acid by formal titration method
6. Estimation of ascorbic acid in Vitamin C tablets by Volumetry
7. Estimation of Paracetamol by titrimetric and spectro photo metric methods.
8. Colorimetric Estimation of proteins by Biuret method

References :

1. Organic synthesis-special techniques V.K. Ahluwalia, 2nd Edition Narosa Publishing House
2. Organic Synthesis A.I. Vogel

DSE 3BMathematics

MSE VIII.3:COMPLEX ANALYSIS& NUMERICAL ANALYSIS

Credits : 3 (1L + 2T + 0P) | **Marks: 100**
Contact hrs per week: 5 | **C_1 + C_2: 50**
Exam Duration : 2 hrs | **C_3 : 50**

OBJECTIVES:
To develop the understanding & application of the concepts of complex analysis in problem solving situations. To enable and apply Numerical methods in solving problems related to real life situations with help of computers, which have become indispensable in modern world.

COURSE CONTENT:

Unit I:
Functions of a Complex Variable, Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions, Conformal Mappings.Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations.

Unit II:
Complex Integration: Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula, Higher Derivatives. Power Series**:** Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions.

Unit III:
Numerical Methods: Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Iteration method, Newton-Raphson method.
Finite differences, Forward and Backward differences, Weierstrass theorem, Interpolation, Newton-Gregory forward and backward interpolation formulae, Divided differences, Lagrange's interpolation formula.

Unit IV:
Numerical Differentiation: Finding first and second derivatives using interpolation formulae, Difference equations.
Integration: General quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Newton-Cotes quadrature formula, Gauss quadrature.

References:

1. Complex Analysis by Ahlfors McGraw Hill International Edition.
2. Introduction to the Theory of Functions of a Complex Variable by Palka, Springer Verlag.
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
5. Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.

6. An Introduction to the Theory of Functions of a Complex Variable by Copson, OxfordUniversity Press.
7. Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
8. Functions of One Complex Variable by Conway, Narosa Publishing House.
9. Theory and Problems of Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
10. Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.
11. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
12. Finite Differnece and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
14. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
15. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
16. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
17. Numerical Calculus by William Edmund Milne, Princeton University Press.
18. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
19. Numerical Analysis by Schield, Schaum's Outline Series.
20. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.

GENERIC ELECTIVE 2

MSE VIII.4 : INDIAN CONSTITUTION AND HUMAN RIGHTS

Credits 2 (2L+0T+0P)	**Max. Marks: 100**
Contact Hours per week: 2	**C1+ C2: 50**
Exam duration: 2 Hrs	**C3: 50**

Objectives:
On completion of this course, the student teacher will be able to
- know the importance, preamble and salient features of Indian Constitution
- appreciate the significance of Fundamental Rights, Duties and Directive Principles of State Policy.
- develop an understanding of the strength of the Union Government.
- understand the functioning of the State Government for the unity and the strength of the Democracy.
- know the importance of local self-Government and Panchayati Raj Institutions in India.
- know the meaning, significance, the growing advocacy of Human Rights.

Transaction Mode:
Through Lectures, Group discussions, Interactive sessions, field activities and use of Education Technology.

COURSE CONTENT:

Unit I: Meaning and Importance of the Constitution
Preamble, Salient features, Constituent Assembly and the Spirit of the Indian Constitution.

Unit II: Fundamental Rights, Duties and Directive Principles
Fundamental Rights, Fundamental Duties, and the Directive Principles of the state policy of the Indian Constitution.

Unit III: Union, State and Local Self Governments
Union Government: Parliament, the President and Prime Minister: State Government: Governor and the Council of Minister: Judiciary: Functions and Powers: Panchayat Raj System.

Unit IV: Human Rights
Origin and Development of Human Rights, Growing Advocacy and Declining Trends of Human Rights, Rights of Scheduled Casts, Scheduled Tribes, Minorities, Children and Women, Human Rights Defenders, Human Rights Violation and Human Rights Organizations.

References:
1.M.V.Pylee, **Indian Constitution**, OUP, New Delhi
2.Granveille Austin, **Indian Constitution**, OUP, New Delhi
3.Rajani Kotari, **Politics in India**, OUP, New Delhi
4.Johari, J C, **Indian Government and Politics**.
5.S R Maheswari, **Local Governments in India (Latest Edition)**
6.R K Arora and Rajani Goyal, **Indian Public Aministration 1995.**
7.C P Bhambri, **Introduction to Indian Constitution**.
8.Subash C Kashyap, **The Working of Indian Constitution,** NBT, New Delhi
9.Subash C Kashyap,**Our Parliament**, NBT, New Delhi
10.Granveille Austin, **Functioning of the Indian Constitution**, NBT, New Delhi.
11.Bipan Chandra**, India after Independence**. Roopa, New Delhi 2000.
12.Arjun Dev, **Source Book on Human Rights**, NCERT, New Delhi.
13.**Human Rights in India: Theory and Practice**, National Book Trust, 2001.

PROFESSIONAL EDUCATION COURSES

MSE VIII.5 : KNOWLEDGE AND CURRICULUM

Credits: 4 (2L+ 2T +0P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

This course is designed to help student teachers to

- Understand the concept and the need for curriculum in schools.
- Explore the influences of the knowledge categories, social, cultural, economic and the technological aspects in shaping the present school curriculum and the text books.
- Analyze the principles employed in sequencing the school curriculum and the syllabus at different levels.
- Identify various learning sites and resources operating as curriculum supports in the system.
- Analyze the multiple roles of schools in implementation of curriculum.
- Discuss the roles and responsibilities of curriculum stakeholders.
- Analyse the role of teachers in operational sing the curriculum.
- Examine the processes and criteria commonly used to evaluate curriculum in pursuit of improvement.
- Explore the evaluation approaches adopted to revise the curriculum at the national and state levels.
- Analyze the national curriculum frameworks for necessary reforms proposed and their implications at school level.
- Develop an image of oneself as a curriculum informant, designer, agent, and evaluator.

COURSE CONTENT:

Unit I: Concept and the nature of curriculum

a) Meanings of curriculum; different perspectives of curriculum; need for curriculum in schools.
b) Educational policy reforms leading to curriculum reforms; Relationship between curriculum framework, curriculum , syllabus and text books- their significance in school education.
c) Meaning and concerns of core curriculum-its need and significance in Indian context; Meaning and concerns of Hidden curriculum and spiral curriculum and their relevance to learning.
d) Types of curriculum: subject-centered, activity-centered, environmental centered, and community-centered and their relevance.

Unit II: Foundations of Curriculum Development

a) **Forms of knowledge & Curriculum:** Forms of knowledgeand structure of a Discipline, and their characterization in different school subjects; Logical grammar of different school subjects
b) **Nature of learner& learning:** Nature of learner - needs and interests, and different perspectives on learning (behaviourists, cognitivists and social constructivists) and their implications to curriculum development

c) **Socio –cultural**: Importance of society-school relationships ; Societal factors that affect the curriculum ; Multiculturalism, multilingual aspects, and societal aspirations; Social reconstruction, social efficiency, inequality in educational standards, need for common goals and standards;
d) **Technological determinants** : Science and technological advancements, Using the resources of the information society in curriculum development
e) **Some of the critical issues**: environmental concerns, gender concerns .inclusiveness, value concerns, social sensitivity, and globalization.

Unit III: Process of curriculum Development

a) Understanding shifts in emphasis in approach to curriculum; from subject centered and behaviouristic learning to integrated approach involving development of perspectives, activity centered and constructivist orientation;
b) **Behaviouristic orientation**: Formulating aims and objectives – (general, specific - subject wise and level wise); Selecting content and learning experiences – Principles involved; Organizing the content and learning experiences- Principles (continuity, sequence and integration: organizing elements- concepts, skills, and values); breadth of coverage and depth of understanding; applicability and relevance to school curriculum planning
c) **Constructivists orientation**: curriculum embedded in real life contexts; authentic learning in real life contexts leading to knowledge construction; applicability and relevance to school curriculum planning

Unit IV Curriculum Implementation and Curriculum evaluation

a) Operationalising curriculum into learning situations; Planning and converting curriculum into syllabus and curriculum engagement activities.
b) Role of teachers in operationalising curriculum in generating dynamic curricular experiences through i) flexible interpretation of curricular aims ii) concept mapping iii) contextualization of learning v) selecting varied experiences and long range and daily planning, choice of resources, planning assessment etc.
c) Planning and use of curricular materials: Text book; teachers hand book, source book, work book, manuals, and other learning materials such as kits, AV and software materials..
d) School culture and climate in implementing the curriculum.
e) Supports to curriculum engagement: available infrastructure and curriculum sites and resources (library, laboratory, playground, neighbourhood etc); Use of community resources in curriculum engagement .
f) Role of external agencies – National, Regional and State in developing the learning supports (including training of teachers) for curriculum implementation.
g) Meaning of curriculum evaluation; Need for curriculum evaluation
h) Process of curriculum evaluation and renewal: collecting opinions and views on school curriculum and text books from different stakeholders; students' attainability of curricular standards as one of the criterion; evaluation of the discrepancies oMSErved between anticipated and oMSErved inputs, transactions and outputs; critical analysis of text books ;evaluation of other curricular materials;
i) Role of National, Regional and State bodies in empowering the teachers in evaluating curriculum

Sessional Work:

- Review of national curriculum frame works and write a report for presentation and discussion

- Analysis of teachers’ handbooks, text books, workbooks, source books followed by Presentations.
- Readings of certain curriculum reviews and articles bearing significance to the course outlined and reflections on them

References:

1. Olivia, P (2004): Developing the curriculum (6th Ed). Allyn & Bacon, Inc. ISBN: 0205412599.
2. Curriculum planning for better teaching and learning by J.G. Saylor and W Alexander (Holt, Rinehart and Winston).
3. Yashpal Committee (1993): Learning without Burden, MHRD, and India.
4. Position paper: National Focus Group on ‘Curriculum, Syllabus, Textbooks’, NCERT.
5. Lewy, Arieh (1977): Handbook of Curriculum Evaluation, International Institute for educational Planning, France and Longman Inc.
6. Giroux, Henry et.al (1981): Curriculum and Instruction: Alternatives in Education by MC Cutchan Public Corp, Printed in USA.
7. Dewey, John (1959): The Child and the Curriculum, Chicago, the University of Chicago Press.
8. Hilda T (1962): Curriculum and Development- Theory and Practice; Harcourt, Brace and World, Inc.
9. Howson, Geoffrey (1978): Developing a New Curriculum, London: Heinmann
10. NCERT (1988) National Curriculum for Elementary and Secondary Education: A framework.
11. NCERT (2000) National Curriculum Framework For school Education.
12. NCERT (2005) National Curriculum Framework. NCERT publications
13. Schubert W (1986): Curriculum Perspectives, Paradigms and Possibilities, New York: Macmillan.
14. Zias, R (1976): Curriculum Principles and Foundations; New York; Thomas Crowwell.
15. Hirst, Paul (1975) : Knowledge and curriculum, (International Library of the Education volume 12): A collection of Philosophical papers, International library of Philosophy of Education, Routledge publishers
16. Kumar, Krishna and Malla Reddy : Curriculum Development and Educational Technology.

MSE VIII.6 : GUIDANCE AND COUNSELLING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- appreciate the nature, purpose and need for guidance and counselling;
- sensitise the student-teachers with the need and relevance of Guidance and counselling.
- demonstrate an understanding of educational, vocational and personal guidance
- develop an understanding of the process of Guidance and Counselling
- understand the process of organization of guidance services in schools
- develop capacity of applying the techniques and procedures of guidance and counselling
- describe various testing and non- testing techniques
- develop the skill of administration and interpretation of psychological tests
- understand the concept and importance of career development.
- analyse the role of the teacher in the provision of Guidance and Counselling
- know the qualities required for good Counsellor

COURSE CONTENT

Unit I: Meaning and Nature of Guidance

Guidance: Concept, aims, objectives, functions and principles.
Need & Procedure for (Educational, Psychological and Social) guidance.
Purposes and Principles of organization of different guidance Services
Organization of guidance services at Secondary Level: Need and Importance
Group Guidance: Concept, Need, Significance and Principles, Organization of Guidance programs in schools.
Role of Guidance Personnel in organization of guidance services in School : Counsellor, Career Master, Psychologist, Doctor, Teacher Counsellor, Head of the Institution, Teacher, Social Worker

Unit II: Meaning and Nature of Counselling

Counselling: Meaning,and nature; Difference between Guidance &Counselling; Principles and approaches of counselling, Individual and Group Counselling; Skills in Counselling-Skills for Listening, Questioning, Responding, & Communicating, Listening Attentively to the concerns of the counselee, Negotiating Self Discovery, Decision Making, Problem Solving etc and values such as Patience, Empathy etc.; Methods and Process of Counselling
Academic, Personal, Career and Behaviour problems of students with special needs, viz. socio-emotional problems of children with disabilities and deprived groups such as SC, ST and girls, need for Counselling; Professional Ethics and Code of Conduct ; Qualities and Qualifications of an effective Counsellor

Unit III:Tools and Techniques of Guidance

Testing and Non-Testing Techniques for Studying and Appraisal of students : a) Testing Techniques: Intelligence/Mental Ability tests, Aptitude tests, attitude scales, Interest inventories, and Personality Tests, b) Non-testing Techniques: Interview, OMSErvation,and Case Study, c) Tools-Questionnaire, anecdotal record, Cumulative Record Cardsetc,
Role of the teacher in Assessment and Testing.

Unit IV: Career Guidance and Counselling

Educational and Career Information in Guidance and Counselling: Meaning, Importance, collection, types, classification of occupational information; Dissemination of Occupational Information: Class talk, career talk, Group discussion, Preparation of Charts and Poster, Career Exhibition, Career conference; Guidance for gifted, slow learner, socio-economically disadvantaged children; Career development: Meaning and Importance; Teacher's role in Career planning, Vocational training and placement opportunities for CWSN.Broad outline with respect to the emerging courses and career options available in India; Guidelines for Establishment of Guidance Cell or Career Corners in Schools

Suggestive List of Activities:

- Group Guidance-Preparation of Class Talk and One Career Talk
- Visit to different Guidance Centre
- Design a checklist/Questionnaire to collect information on students and classify them under educational, psychological or social problem.
- Preparation of Cumulative Record
- To prepare a Case study and Analysis of Case study
- Administration, Scoring & interpretation of at least two tests: One Mental Ability Test and One Aptitude Test
- Job Analysis of a Counsellor
- Preparation of list of problem behaviours based on oMSErvation. Detailed study of the Guidance and Counselling Services available in a given School
- Prepare a Chart and Poster for dissemination of Career Information
- Familiarise and write a report of any one of the Personality Tests used in Guidance and Counselling

References:

1. Aggarwal, J. C. (2004). Educational Vocational Guidance and Counselling, Delhi: Doaba House.
2. Asch, M. (2000). Principles of Guidance and Counselling, New Delhi: Sarup and Sons.
3. Bhatia, K. K., (2002). Principles of Guidance and Counselling, Ludhiana: Vinod Publications
4. Bhatnagar, R. P.; Rani. S. (2001); Guidance and Counselling in Education and Psychology.
5. Chauhan, S. S. (2008). Principles and Techniques of Guidance. UP: Vikas Publishing House Pvt. Ltd.
6. Coorey,S.M (1953).Action Research to Improve School Practices, New York:Teacher's ,Columbia University
7. Gibson, R.L. and Mitchell (2008). Introduction to counselling and Guidance. New Delhi:PHI Learning Pvt. Ltd.
8. Granz, R. M. (2005). Foundation and Principle of Guidance, Boston: Allyn& Bacon.
9. Gupta, V. K. (2004). Educational Guidance and Counselling, Ludhiana: Ankur Publications.
10. Jones, J. A. (1970). Principles of Guidance, Bombay: Tata, New York: McGraw Hill.

11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication
12. Kakkar, S.B (2015) Educational Psychology, *PHI Learning: Publications*
13. Kocher, S. K. (2007). Educational Guidance and Counselling, New Delhi: Sterling.
14. Myres, G. E. (2005). Principles and Techniques of Vocational Guidance, New York: McGraw Hill.
15. Nanda, S. K.andSagar, S. (1972). Fundamentals of Guidance. Chandigarh: N.B.S. Educational Publishers.
16. Nayak A.K. (2004); Guidance and Counseling
17. NCERT (2008). Counselling Process and Strategies (Module 2). New Delhi: NCERT.
18. NCERT (2008). Guidance for Human Development and Adjustment (Module3) New Delhi: NCERT.
19. NCERT (2008). Introduction to Guidance (Module 1). New Delhi: NCERT.
20. NCERT (2005). National Curriculum Framework-2005,NCERT,New Delhi

Web resources

- Introduction to Guidance and Counseling African Virtual university http://oer.avu.org/bitstream/handle/123456789/153/GUIDANCE%20AND%20COUNSELING.pdf?sequence=1
- Ethical Principles of Psychologists and Code of Conduct by APA, http://www.apa.org/ethics/code/principles.pdf
- Guidance and Counselling, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/pdf/guidelines_for_guidance_and_counseling.pdf
- http://www.egyankosh.ac.in/

MSE VIII.7 : VALUE AND PEACE EDUCATION

Credits: 2 (1L+ 1T +0P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the need and importance of education for peace and values.
- Understand the nature, characteristics and types of human values.
- Understand the five core values of Truth, Righteous conduct, Peace, Love and Non-Violence.
- Appreciate the developments in Peace Education in India and Abroad.
- Understand various methods, techniques and approaches of value development.
- Appreciate the preamble to the constitution and values inherent in it.
- Understand various models of value education.
- Appreciate the importance of living together and imbibe in their attitude and behaviour.

COURSE CONTENT

Unit I: Concept, Meaning and Nature of value

Concept and meaning of value and Peace:
Indian and Western perspectives on value and Peace.
Reflections of great Indian thinkers on values and Peace(Gandhiji, Swami Vivekananda,Sri Aurobindo, Rabindratha Tagore, J. Krishmamurthi)
Understanding Peace in the individual, Social, National and International context
Nature and characteristics of values
Sources and selection of values -culture and human needs

Unit II : Concept, Meaning and Nature of Peace

Historical development of Peace education in India and in the world
Preamble to the Indian Constitution and values inherent in it
Exposition of the five human values of Truth, Righteous Conduct, Peace, Love and Non-Violence with illustrations from life and literature.
Creation of United Nations, UNESCO, UNICEF and their role in promoting value and Peace Education.
Judgement of the Supreme Court on Value Education

Unit III : Concept and need for Value-based Education and Education for Peace

Concept of value based education and Education for Peace with special reference to peace to Indian view of life;
Paradigm shift from Peace education to Education for Peace.
Need for and importance of value based education and Education for Peace in the present scenario.
Aims and objectives of value based and Peace education
Recommendations of Sri Prakasha Committee (1959) on value education.
Recommendations of Parliamentary Committee of HRD on Values Education (1996-90) headed by Shri S.B. Chauhan.

Curriculum development and Models of Value Education.

Models of value education; Rationale building model, the consideration model, valuing process and clarification model.
Curriculum development; State specific approach – Elementary, Secondary, Higher Secondary and Higher Education.
Integration of human values with all (school) academic subjects.

Unit IV :Pedagogy of Value Education and Education for Peace

- Approaches and Techniques of teaching human values:-
  Direct approach: value based Story-telling, Group activities (dramatization, literary activities, games and sports, service activities), Counselling, organizing value based co-curricular activities.

  Indirect Approach; Incidental Approach with illustrations

  Integrated approach: Integration into curricular, co-curricular activities and subjects (with illustrations of integration from Language, Mathematics, science and social science , art and aesthetics , Yoga and health education,
- Teacher as Role Model.
- Role of school ambience and environment in development of values.

Practicum

- Develop / compile stories with values from different sources and cultures, organize value based co-curricular activities in the classroom and outside the classroom, develop value based lesson plans, integrating values in school subjects.
- Study of any Model of integrated value education – case study of models expressed by Sri Sathya Sai, J. Krishnamurti, etc.
- Visit to Ramakrishna Institute of Moral and spiritual Education

In addition, school and community based activities may be organised.

Evaluation Strategies

1. Reflective reading based presentations.
2. Unit tests.
3. Quiz based evaluation
4. Seminar presentation
5. Submission of case reports on violation of peace as reported through mass-media.

References:

1. Barash, P. David (2000). Approaches to Peace, Oxford University Press, New York.
2. Bernard, Jessie (1957). The Sociological study of conflict. International Sociological Association, The Nature of Conflict, UNESCO Paris.
3. Galtung, J. (2003). Searching for Peace – The road to TRANSCEND, Sterling Virginia.
4. Galtung, Johan (1996). Peace by Peaceful Means: Peace and Conflict, Development and Civilization. Sage Publications, New Delhi.
5. Galtung, Johan (1984). The Struggle for Peace Gujarat Vidyapith, Ahmedabad.
6. Gandhi, M.K. (1944). Non-Violence in Peace and War Navajivan Publishing House, Ahmedabad.
7. Govt of India (1983). Report on Education in Human Values in Teacher Training Programmes, New Delhi, Ministry of Human Resource Development.
8. Harris Ian. M. (1998). "Peace Education" Mc Farland & Company, Inc Publisher London
9. Howlett, Charles F., John Dewey and Peace Education, Encyclopedia of Peace Education, Teacher College, Columbia University 2008.

10. Kapani, Madhu (2000). Education in Human Values – concept and practical implications, New Delhi; Sterling Publishers.
11. Krishnamurti, J.: "Total Freedom", Krishnamurti Foundation Chennai.
12. NCERT National Curriculum Framework (2005). Position Paper, National focus Group on Education for Peace, NCERT, New Delhi (2006).
13. National Curriculum Framework (2005) position paper, National Focus group on Education for Peace, NCERT, New Delhi.
14. NCTE (1998). Curriculum Framework for Quality Teacher Education, NCTE, New Delhi.
15. Pandey, S. (2004). Education for Peace, Self Instructional Package for Teacher Education, NCERT, New Delhi.
16. Sri Sathya Sai Bal Vikas Education Trust (1985). Curriculum and Methodology for integrating Human Values Education, Prashanthi Nilayam (International Education).
17. Sri Sathya Sai International Center for Human Values (2009). Education in Human Values: Course Book for Training of Master Trainers, New Delhi.
18. The Curriculum framework for Quality Teacher Education (1998) NCTE, New Delhi
19. UNESCO (2001) Learning the way of Peace, "A Teacher Guide to Education for Peace", UNESCO, New Delhi.

Web resources

Education for values in schools- a framework, NCERT
http://www.ncert.nic.in/pdf_files/Framework_educationCOMPLETEBOOK.pdf

Values Education A Handbook for Teachers (2012), CMSE
http://cMSEacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf

Position Paper National Focus Group on Education for Peace, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/education_for_peace.pdf

NINTH SEMESTER

MSE(C)-IX.1 Methods of Chemical Analysis

Credits: 4 (4L+0T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **C1 + C2 : 50**
Exam. Duration: 2 Hrs **C3 : 50**

COURSE CONTENT:

Unit - I

Analytical Chemistry - Meaning and analytical prospective, scope and function: Analytical problems and their solutions, trends in analytical methods and procedures.

Language of analytical chemistry - Analysis, determination and measurement. Techniques, methods, procedures and protocols. Classifying analytical techniques. selecting an analytical method - accuracy, precision, sensitivity, selectivity, robustness and ruggedness. Scale of operation, equipment, time and cost. Making the final choice

Basic laboratory operations, Sampling, weighing, drying, dissolving, Acid treatment, Flux treatment, Difficulties in using fluxes, Decomposition of organic matter, Requirement for suitability of reaction for use in chemical analysis, Rules of work in analytical laboratory, General rule for performing quantitative determinations (volumetric, gravimetric), Safety in analytical laboratory, Rules of fire prevention, Prevention of accidents and First aid.

Acid-base titrations in non-aqueous media: Role of solvent in acid-base titrations, solvent systems, differentiating ability of a solvent, some selected solvents, titrants and standards, titration curves, effect of water, determining the equivalence point, typical applications determination of carboxylic acids, phenols and amines.

Unit-II

Standardization and calibration: Comparison with standards-direct comparison and titrations. External standard calibration-the least squares method, regression equation, regression coefficient. Internal standard methods and standard-addition methods. Figures of merit of analytical methods-sensitivity and detection limit, linear dynamic range.

Obtaining and preparing samples for analysis: Importance of sampling, designing a sample plan-random, judgement, systematic-judgement, stratified and convenience sampling. Type of sample to collect-grab and composite samples. Insitu sampling. Size of sample and number of samples. Implementing the sampling plan-solutions, gases and solids. Bringing solid samples into solution-digestion and decomposing.

Unit III

Titrimetric analysis: An overview of titrimetry. Principles of titrimetric analysis. Titration curves. Titrations based on acid-base reactions - titration curves for strong acid and strong base, weak acid and strong base and weak base and strong acid titrations. Selecting and evaluating the end point. Finding the end point by visual indicators, monitoring pH and temperature. Quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity and free CO2 in water and waste waters, nitrogen, sulphur ammonium salts, nitrates and nitrites, carbonates and bicarbonates.

Precipitation titrations: Titration curves, feasibility of precipitation titrations, factors affecting shape - titrant and analyte concentration, completeness of the reaction, titrants and standards, indicators for precipitation titrations involving silver nitrate, the Volhard, the Mohr and the Fajan's methods, typical applications.

Complexometric titrations: Complex formation reactions, stability of complexes, stepwise formation constants, chelating agents, EDTA - acidic properties, complexes with metal ions, equilibrium calculations involving EDTA, conditional formation constants, derivation of EDTA titration curves, effect of other complexing agents, factors affecting the shape of titration curves - completeness of reaction, indicators for EDTA titrations - theory of common indicators, titration methods employing EDTA - direct, back and displacement titrations, indirect determinations, titration of mixtures.

Unit IV

Precipitation : Desirable properties of gravimetric precipitates. Formation of gravimetric precipitates. Conditions for quantitative precipitation. Contamination in precipitates. Methods for removing impurities in precipitates. Organic precipitants (oxine, cupeferron,dimethyl glyoxime) in chemical analysis. Precipitation from homogeneous solution.

Errors and treatment of analytical data: Limitations of analytical methods – Error: determinate and indeterminate errors, minimization of errors. Accuracy and precision, distribution of random errors, the normal error curve. Statistical treatment of finite samples - measures of central tendency and variability: mean, median, range, standard deviation and variance. Student's t-test, confidence interval of mean. Testing for significance - comparison of two means and two standard deviations. Comparison of an experimental mean and a true mean. Criteria for the rejection of an observation - Q-test. Propagation of errors: determinate errors and indeterminate errors.

References:

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Principles and Practicals of Analytical Chemistry, F. W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.

MSE(C)-IX.2 CONCEPTS AND MODELS OF INORGANIC CHEMISTRY

Credits: 4 (4L+0T+0P) | **Max.Marks :100**
Contact Hrs per week : 4 | **C1 + C2 : 50**
Exam. Duration: 2 Hrs | **C3 : 50**

COURSE CONTENT:

Unit I

Structures and energetics of ionic crystals: Introduction, radius ratio rules, structures of some ionic crystals, MX (NaCl, CsCl, ZnS) and MX_2 (fluorite, rutile, β-crystobalite and cadmium iodide) types. The perovskite and spinel structures. Thermodynamics of ionic crystal formation. Lattice energy, Born-Lande's equation, Born-Haber cycle and its applications, Kapustinskii equation. Applications of lattice energetics. Covalent character in ionic bonds and solubility of ionic solids.

Structures and energetics of inorganic molecules: Introduction, Energetics of hybridization.VSEPR model for explaining structure of AB, AB2E, AB3E, AB2E2, ABE3, AB_2E_3, AB_4E_2, AB_5E and AB_6 molecules. M.O. treatment for homonuclear and heteronuclear diatomic molecules. M.O. treatment involving delocalized π-bonding (CO32- , NO3- , NO2-, CO_2 and N3 -). M.O. correlation diagrams (Walsh) for triatomic molecules.

Unit II:

Chemical Periodicity: Review of periodic properties.

Metallic bonding: Characterization of metallic states, VB approach, band theory, conductors, insulators, semiconductors, defects in solids.

Modern concept of acids and bases: Lux-Flood and Usanovich concepts, solvent system and leveling effect. Hard-Soft Acids and Bases, Classification and Theoretical backgrounds.

Non-aqueous solvents: Classification of solvents, Properties of solvents (dielectric constant, donor and acceptor properties), Reactions studied in liquid ammonia, anhydrous H2SO4, HF, liquid SO_2, BrF3 and N_2O_4. Super acids.

Unit III:

Chemistry of main group elements: Diborane and its reactions, polyhedral boranes (preparation, properties, structure and bonding). Wade's rules, carboranes and borazines. Inorganic chains, rings and cages of boron and carbon.

Silicates: Structure, classification - silicates with discrete anions, silicates containing chain anion, silicates with layer structure, silicones with three dimensional net work and applications.

Silicones: General methods of preparation, properties. Silicone polymers - silicone greases, silicone resins, silicone rubbers and their applications.

Heterocyclic inorganic ring system: Sulphur-nitrogen ring, nitrogen-phosphorous ring.

Phosphonitrilic or phosphazine polymers: Preparation, properties, structure and applications.

Interhalogen compounds and pseudohalogens.

Noble gas compounds: Preparation and structure of noble gas compounds (oxides and fluorides).

Unit IV:

Lanthanides: Correlation of electronic structures, occurrence and isolation, lanthanide contraction and its consequences, separation - Chemistry of separation of Np, Pu & Am from U & fission products. Oxidation states and general properties – Comparison with 'd' block elements, Lanthanide contraction and its significance, Coordination compounds of lanthanides - Spectral and magnetic characteristics of lanthanides, Uses: lanthanides as shift reagents, high temperature super conductors.

Actinides: Occurrence and preparation of elements, Isolation of the elements: thorium and uranium, enrichment of uranium for nuclear fuel, uranium hydrides, oxides and chlorides. Chemistry of trans-uranium elements.

References:

1. Advanced Inorganic Chemistry, 5th Edn.-F. A. Cotton and G. Wilkinson, John-Wiley and Sons.
2. Inorganic Chemistry-4thEdn. J. E. Huheey, E.A. Keiter and R. S. Keiter. Addission-Wesley (1993)
3. Inorganic Chemistry, 5th Edn. P.Atkins, T. Overton, J. Rourke, M. Weller and Fraser Armstrong, Oxford University Press (2010).
4. Introduction to Modern Inorganic Chemistry, K.M. Mackay and R.A. Mackay, Blackie Publication (1989).
5. Concepts and Models of Inorganic Chemistry 3rd edn. B.E. Douglas, D.H. McDaniel and Alexander, Wiley (2001).
6. Concise Inorganic Chemistry-J. D. Lee, 5th Edn, New Age International (1996).

MSE(C)-IX.3 : STEREOCHEMISTRY AND ORGANIC REACTION MECHANISM

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:

Unit-I

Stereoisomerism: Review of Projection formulae [Fly wedge, Fischer, Newman and Saw-horse], enantiomers, diasteroisomers, racemic mixture and their resolution, configurational notations of simple molecules, DL and RS configurational notations.

Stereoselectivity: Sterioselective reactions, diastereselective reactions, stereospecific reactions, regioselective & regiospecific reactions.

Optical Isomerism: Conditions for optical isomerism, optical isomerism due to chiral centres and molecular dissymmetry, allenes and biphenyls, criteria for optical purity.

Geometrical isomerism: Geometrical isomerism due to C=C, C=N and N=N, E,Z conventions, determination of configuration by chemical methods.

Conformational Isomerism: Elementary account of conformational equillibria of ethane, butane and cyclohexane.

Conformational analysis: Conformation of cyclic compounds such as cyclopentane, cyclohexane and decalins. Conformational analysis of 1,2-; 1,3-, 1,4-disubstituted cyclohexanes. Effect of conformation on the course and rate of reactions.

Unit-II:

Structure and reactivity: Acids and Bases, Structural effects on acidity and basicity, hydrogen bonding, Resonance, inductive and hyperconjugation effects.

Reaction Intermediates: Formation, structure, stability, detection and reactions of carbocations (classical and non-classical), carbanions, free radicals, carbenes, nitrenes, nitrile ylides and arynes.

Substitution reactions: Mechanism of nucleophilic substitution reactions-Kinetics, Mechanism and stereochemical factor affecting the rate of SN1, SN2, SNi reactions, neighboring group participation.
Aromatic nucleophilic substitution: SN_1, SN_2 and benzyne mechanisms, Bucherer reaction.
Aromatic electrophilic substitution: Mechanism of nitration, halogenation, sulphonation, Friedel- Crafts alkylation and acylation with evidences, Mannich reaction, chloromethylation and Vilsmeier-Haack reaction.

Unit III:
Reaction Mechanism I: Classification of reactions, meaning and importance of reaction mechanism.
Determination of reaction mechanism by kinetic and non-kinetic-methods:
Kinetic Method: Mechanistic implications from rate laws, the transition state theory, ambiguities in interpreting kinetic data, solvent effect, ionic effect, isotopic effect, solvent isotopic effect, substituent effect, steric effect, linear free energy relationships – Hammett equation and Taft treatment.
Non-kinetic methods; Energy profile diagram, identification of products, testing possible intermediates, trapping of intermediates, cross over experiments, isotopic labeling, sterochemical studies, limitations.
Aromaticity: Concept of aromaticity, Huckel's rule, Polygon rule, annulenes.

Unit IV:
Reaction Mechanism II: Mechanism of Addition reactions: Addition to C-C multiple bonds involving electrophiles, nucleophiles and free radicals. Markownikoff's rule and anti-Markownikoff's rule, Hydroboration and its application.
Typical additions to carbonyl compounds: Addition of hydrides, water, alcohol, thioalcohol, bisulphate, HCN, Grignard reagents and amino compounds.
Mechanism of reactions of carboxylic acids and their derivatives: Mechanism of ester hydrolysis, formation and hydrolysis of amides, decarboxylation mechanisms.
Mechanism of electrophilic substitution reactions-Kinetics, mechanism and stereochemical factor affecting the rate of SE1 & SE2.
Elimination reactions: Mechanism and stereochemistry of E1, E2, E1cb reactions, cis elimination, Hofmann and Saytzeff eliminations, competition between elimination and substitution, Chugaev reaction.

References:

1. E. L. Eliel and S. H. Wilen, Stereochemistry of Organic Compounds, John Willey and Sons, New York. 1994.
2. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, McGrow Hill, New York, 1987.
3. Organic Chemistry-Morrison & Boyd
4. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II 1984.
5. Basic Principles of Organic Chemistry-Robert & Casereo
6. N. S. Issacs, Reactive intermediates in Organic Chemistry, John Willey and Sons, New York. 1974.
7. R. K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
8. J. March, Advanced Organic chemistry, Willey Interscience, 194.
9. E. S. Gould, Mechanism and structure in Organic Chemistry, Halt, Rinehart & Winston, New York, 964.
10. A Guide book to mechanism in Organic Chemistry-Petersykes
11. F. A. Carey and Sundberg, Advanced Organic Chemistry-Part A & B, 3rd edition, Plenum Press, New York, 1990.

12. P. S. Kalsi, Stereo Chemistry of Organic compounds and solved problems.

MSE(C)-IX.4 : CHEMICAL THERMODYNAMICS AND STATISTICAL THERMODYNAMICS

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:

Unit I:

Concept of Entropy and Free-energy,Entropy as a measure of unavailable energy. Entropy change during spontaneous process.Helmholtz and Gibbs energies as criteria of spontaneity and equilibrium,their variations with P,V and T. Maxwell's relations and their applications. Partial molar properties: Determination of partial molar volume by density measurement and by intercept method. Chemical potential and its significance, its variation with pressure and temperature. Formulation of Gibbs-Duhem equation, derivation of Duhem-Margules equation and its applications.

Unit II:

Fugacity: Determination of fugacity of gases, variation of fugacity with pressure and temperature. Activity and activity coefficient, variation of activity with pressure and temperature. Determination of activity coefficient by: vapour pressure, depression in freezing point, solubility measurement and emf methods.

Thermodynamics of dilute solutions: Raoult's law and Henry's law. Ideal and non- ideal solutions.Thermodynamic derivation–cryoscopy, ebullioscopy and osmotic pressure, determination of molecular weights using these methods. Donnan membrane equilibrium-thermodynamic treatment using chemical potential.

Heat capacity of solids: Einstein and Debye models of heat capacity of solids, Debye characteristic temperature and its significance.

Phase rule: Recapitulation of the terms: phase, component and degrees of freedom and Gibbs phase rule. Application of phase rule to the system of two components involving the formation of continuous series of solid-solutions-Roozeboom's classification. Systems of three components: Formation of one pair, two pairs and three pairs of partially miscible liquids.

Unit III:

Non-equilibrium thermodynamics: Basic principles of non-equilibrium thermodynamics, rate laws, second law for open system, law of conservation of mass, charge and energy, phenomenological equations for single and coupled flows. Onsager reciprocity relation. Theorem of minimum entropy production. Curie-Prigogine principle. Application of non-equilibrium thermodynamics: thermoelectricity, electrokinetic phenomenon and expression for streaming potential, electro-osmotic pressure difference, streaming potential using linear phenomenological equations and to biological membrane system-qualitative insight.

Unit IV:

Statistical thermodynamics: Basic definitions, probability, Phase spaces, micro and macro states, thermodynamic probability, statistical weight, ensemble, principle of equipartition of energy, Maxwell-Boltzmann distribution equation, partition function, translational, rotational and vibrational partition functions, evaluation of molar entropies, entropy of monatomic gas(Sackur-Tetrode Equation). Evaluation of internal energy, enthalpy, Helmholtz and Gibbs free energies, equilibrium constants, partition functions of atoms and diatomic molecules.

Distribution equations: Bose-Einstein and Fermi-Dirac. Free energy function and its use in evaluating the equilibrium constant, entropy of water and hydrogen.

References:

1. Textbook of Physical Chemistry by S. Glasstone.
2. Physical chemistry by P. W. Atkins.
3. Thermodynamics for Chemists by S.Glasstone.
4. Nonequilibrium thermodynamics by C. Kalidas.
5. Nonequilibrium thermodynamics by I. Progogine.

MSE(C)-IX.5 : LAB I - ANALYTICAL PRACTICAL – I

Credits : 2(0L+0T + 2P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2:50**
Exam. Duration: 4 Hrs	**C3:50**

COURSE CONTENT:

Quantitative Analysis: (Any ten of the following experiments)

1. Determination of iron in haematite ore using cerium(IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.
3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/mixture:
5. Copper volumetrically using KIO3.
6 Nickel gravimetrically using DMG
7 Determination of lead and tin in a mixture: analysis of solder using EDTA titration.
8 Complexometric determination of calcium and lead in a mixture.
9 Quantitative analysis of chloride and iodide in a mixture:
10. Iodide volumetrically using KIO3
11 Total halide gravimetrically.
12 Determination of chlorate in commercial samples by iodometric method.
13 Determination of borax by neutralization titration.
10. Gravimetric analysis of molybdenum with 8- hydroxyqunoline.
11. Titrations of amino acids with HClO4 in CH3COOH medium.

References:

1. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 3rd edition.
2. Vogel’s Text Book of Quantitative Chemical Analysis – 5th edn, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.

3. Spectrophotometric determination of elements – Z. Marczenko.
4. Quantitative Chemical Analysis – Daniel C. Harris, 7th edition, (2006)

MSE(C)-IX. 6 : LAB II - PHYSICAL CHEMISTRY PRACTICAL – I

(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2:50**
Exam. Duration: 4 Hrs	**C3:50**

COURSE CONTENT:

1. Study of kinetics of hydrolysis of an ester using HCl/H2SO4 at two different temperatures, determination of rate constants and energy of activation.
2. Study of kinetics of reaction between K2S2O8 and KI, first order, determination of rate constants at two different temperatures and Ea.
3. Conductometric titration of a mixture of HCl and CH3COOH against NaOH.
4. Conductometric titration of a mixture of HCl, CH3COOH and CuSO4 against NaOH.
5. Potentiometric titration of KI vs KMnO4 solution.
6. Determination of dissociation constant of a weak acid by potentiometric method.
7. Potentiometric titration of AgNO3 vs KCl.
8. To obtain the absorption spectra of coloured complexes, verification of Beer's law and estimation of metal ions in solution using a spectrophotometer.
9. Spectrophotometric titration of FeSO4 against KMnO4.
10. Determination of heat of solution of benzoic acid by variable temperature method (graphical method).
11. Thermometric titration of hydrochloric acid with a NaOH.
12. Determination of molecular weight of a compound using Bekmann's cryoscopic method using benzene or/and water as solvent.
13. Potentiometric titrations of (a) Fe(II) vs V(V).
14. Kinetics of photodegradation of indigocarmine (IC) using TiO2 as photocatalyst and study the effect of [TiO2] and [IC] on the rate of photo degradation.
15. Conductometry –To determine the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
16. Conductometric titration of potassium iodide with mercuric perchlorate.
17. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

References:

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry –F. Daniels et al.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments –J. Rose.
7. Practical Physical Chemistry –S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry –D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry –Das. R.C. and Behera B, Tata Mc Graw Hill.

MSE(C)-IX.7 FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits : 3(2L + 1T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs	**C_3 : 50**

Objectives:

- Understand the concept of Education and its Epistemological premises
- Analyses the Discipline categories and their Logical distinctions
- Understands Education as a Discipline and its contribution to curriculum courses
- Analyses the societal problems and the necessity for Peace Education in schools
- Explores the possible sources of value conflicts , crisis among Higher secondary learners and teacher's role in helping to resolve value conflicts
- Analyses various perspectives and thoughts on Peace and Peace Education
- Analyses the role of Education in a Pluralistic society like India and a need for culture-specific pedagogy in School Education
- Reflects on the social discriminations , inequalities and the oppressed groups,as a teacher, as well as a member of the society and develops responsible attitude and commitment
- Understands the school as a sub system of society and its responsibilities in reflecting the cultural and social ethos in its aims and functions
- Examines the concerns and issues of contemporary Indian Society and their bearing upon Education

Transaction Mode:

Lectures followed by Discussions; Group Discussions; Seminars; Collaborative Presentations; Assignments

COURSE CONTENT:

Unit I :

Education as a critical concept and criteria of educative process; Knowledge and disciplines; Logical distinction between Scientific and Mathematical Knowledge; Education as a discipline; Multidisciplinary nature of education; Concept and nature of value and value education; Factors contributing to value development; Value shifts; Need for education for peace; Value crises in adolescent learners; Methods of resolving value conflicts; Human rights; Role of education in promoting peace; Use of curricular and co-curricular areas in promoting peace as a value; Rationality as a value to be developed in learners.

Unit II :

Styles of learning and thinking – implications for understanding the adolescent learner; Sociocultural factors influencing learning.

The process of adult learning – cognitive changes (Praget and Elkind); role of feedback and incentives; learner's experience in the construction of knowledge.

Personality and development of self; The intra and interpersonal realm – self perception, self-defeating behaviour, self presentation, impression and management, self-monitoring; search for identity (Erikson), time of turmoil.

Mental health and management – Issues and concerns; adjustment and adjustment mechanisms; role of teacher in management.

Unit III :

Characteristic of Indian society : Multicultural, Multilinguistic and Multireligion system and role of senior Secondary Teacher

Socialization and acculturation, etc. influence on personality development in education.

Modernisation, its attributes and effect on present system of education.

Democratic values, equality and social justice, its importance in classroom teaching at higher secondary level.

Unit IV : Issues and Concerns of Senior Secondary Education

Gender equality, Inclusive Education for Children with Diverse Needs. Environmental Concerns, Sustainable Education, Quality Teacher Education, Globalization and its Effect over Education System.

References:

1. Dewey,John(1956): The School and the Society, The University of Chicago,ptd in USA,1990.
2. Carnoy, Martin (1974): education as Cultural Imperialism, Longman Inc. London
3. Bruner,S,J(1972): the Relevance of Education,Pub by Redwood press Ltd, ptd in Great Britain.
4. Gross,R,B(1970): Analytical Philosophy- An Historical Introduction, Western Publishing company, Inc. USA
5. O'Connor.D.J(1956): Philosophy Of Education
6. Dewey, J(1916): Democracy and Education: An Introduction to Education, New York
7. Peters, R.S: The concept of Education
8. Peters, R.S: Education and Education of Teachers
9. Pathak, Avijit (2002), Social Implications of Schooling, Rainbow Publishers, Delhi
10. Introduction: Life at School, need for critical enquiry Ch. 2 Sociology of School Knowledge Ch 3. Looking Beyond Texts, culture of school and formation of consciousness
11. Kumar Krishna (2004), What is Worth Teaching? 3rd edition, Orient Longman Ch 3. Implications of a Divisive School System Ch. 6 Growing Up Male

12. Saraswathi, T.S. (1999), Culture, Socialization and Human Development, Sage Publications
13. Bhattacharjee, Nandini, Through the Looking Glass: Gender Socialization in a Primary School (Ch14)
14. Krishnamurti, J., Education and the Significance of Life, KFI Publications (Ch. 6)
15. Readings from 'The Social Character of Learning' by Krishna Kumar and from 'Inner World' by Sudhir Kakar could also be considered
16. Krishnamurthi.J (2002): Why are you being educated? Talks at Indian Universities Krishnamurthy Foundations of India, Ptd by Chennai
17. Banks, James A. and C. A. McGee Banks, eds(1989): Multicultural Education: Issues and Perspectives. Needham Heights, Mass.: Allyn & Bacon
18. Boocock, S. S(1980): Sociology of Education: An Introduction. Lanham, MD: University Press of America
19. Chesler, Mark A. and W. M. Cave(1981): A Sociology of Education. New York: Macmillan
20. Dreeben, Robert(1968): On What is Learned in School. Reading, Mass.: Addison-Wesley
21. Durkheim, Emile(1956): Education and Sociology. Tr. Sherwood D. Fox. New York: Free Press
22. Eggleston, John(1977): The Sociology of the School Curriculum. Boston: Routledge & K. Paul
23. Jackson, P.W.(1968):Life in Classrooms. New York: Holt.
24. Rayner Steve (2007): Managing Special and Inclusive Education. New Delhi : Sage Publications.
25. Woodfolk Anitha (2004) : Educational Psychology. Boston : Pearson.
26. Snowman, S and Bidher, R. (2004): Psychology Applied to Teaching. California : Wadsworth.
27. NCERT (2005) : Education of Children with Special Needs – Position Paper by National Focus Group. New Delhi: NCERT.
28. NCERT (2005): Education for Peace- Position Paper by National Focus Group. New Delhi : NCERT.
29. Byrne, D. and Baron, R. (2008): Social Psychology. Boston : Allyn and Bacon.
30. Palmer, Joy, A. (2003) : Environmental Education in the 21st Century – Theory, Practice, Progress and Promise. New York : Routledge.

TENTH SEMESTER

MSE(C)-X.1 : SPECTROSCOPY

Credits: 4 (4L+0T+0P) | **Max.Marks :100**
Contact Hrs per week : 4 | **C1 + C2 : 50**
Exam. Duration: 2 Hrs | **C3 : 50**

COURSE CONTENT:
Unit-I:
Basic concepts and Introduction:
Properties of electromagnetic radiation: Wave property- interference, diffraction.
Particle property- Photoelectric effect. Regions of the electromagnetic spectrum, energies corresponding to various kinds of radiation. Interaction of electromagnetic radiation with matter (absorption, emission, transmission, reflection, dispersion, polarisation and scattering). General applications.
Electronic spectroscopy:Molecular electronic absorption spectroscopy(UV-Visible) Electronic spectra of diatomic molecules, electronic transitions, selection rules, assignment of transition band intensities, substituent and solvent effect, change transfer transitions, Application to organic and inorganic molecules.
Photoelectron spectroscopy:
Basic principles; Photo-electric effect. ionisation process, Koopman's theorem. Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA. Instrumentation.
Auger electron spectroscopy, basic ideas.

Unit-II:
Vibrational spectroscopy:
Infrared spectroscopy-Vibrational energy levels, infrared spectra of diatomic and polyatomic molecules, Normal modes of vibration, force constant, selection rules, anhormonicity, the vibration-rotation spectroscopy.
Infrared spectra of simple molecules and coordination compounds, changes in infrared spectra of donor molecules upon coordination (N,N-dimethylacetamide, urea, DMSO, pyridine N-oxide, ammine, cyano, cyanato and thiocyanato complexes), mono and multinuclear carbonyl complexes, nitrosyls, phosphine and arsine complexes. Change in spectra accompanying change in symmetry upon coordination (NO3-, SO42-,NO2- etc), hydrogen bonding, instrumentation including FTIR.
Raman spectroscopy:
Theory, relation with IR spectroscopy, resonance Raman stimulated hyper and inverse Raman effects. Experimental techniques, structure determination from IR and Raman spectra.

Unit-III
NMR Spectroscopy: Magnetic properties of nuclei (magnetic moment, g factor, nuclear spin), effect of external magnetic field on spinning nuclei, Larmor precession frequency, resonance conditions, population of nuclear magnetic energy levels, relaxation processes, relaxation time. Chemical Shift: Standards employed in NMR, factors influencing chemical shift: electronegativity, shielding and deshielding, van der Waals deshielding magnetic anisotropy, H-bonding, diamagnetic and paramagnetic anisotropies, spin-spin coupling, chemical shift values and correlation for protons bonded to carbon and other nuclei, Instrumentation. Chemical shift equivalence and magnetic equivalence, effects of chiral centre, Karplus curve-

variation of coupling constants with dihedral angle. Complex NMR Spectra: Simplification of complex spectra-isotopic substitution, increased magnetic field strength, double resonance and lanthanide shift reagents; Nuclear Overhauser Effect (NOE), variable temperature probe, FT-NMR,

Spectroscopy and advantages.13C-NMR Spectroscopy: Comparison of 1H-NMR and 13CNMR,multiplicity-Proton decoupling-Noise decoupling-Off resonance decoupling-Selective proton decoupling - Chemical shift, application of CMR. NMR of 19F,

31P, 11B and 15N Applications of NMR: Structural diagnosis, conformational analysis, keto-enol tautomerism, H-bonding. Two dimensional NMR Spectroscopy: COSY, NOESY, MRI.

Unit-IV

Electron Spin Resonance Spectroscopy: Basic principles, hyperfine couplings, the 'g'values, factors affecting 'g' values, isotropic and anisotropic hyperfine coupling constants, Zero Field splitting and Kramer's degeneracy. Measurement techniques and Applications to simple inorganic and organic free radicals and to inorganic complexes.

NQR Spectroscopy: Quadrupolar nuclei, electric field gradient, nuclear quadrupole coupling constants, energies of quadrupolar transitions, effect of magnetic field. Applications.

Mössbauer spectroscopy:The Mössbauer effect, chemical isomer shifts, quadrupole interactions, measurement techniques and spectrum display, application to the study of Fe2+ and Fe3+ compounds, Sn2+and Sn4+compounds, nature of M-L bond, coordination number and structure), detection of oxidation states and inequivalent Mössbauer atoms.

References:

1. Fundamentals of Molecular Spectroscopy-C. N. Banwell
2. Physical Methods in Chemistry-R .S. Drago, Saunder college
3. Structural Methods in Inorganic Chemistry-E. A. Ebsworth, D. W. H. Ranbin and S.Cradock, ELBS.
4. Infrared Spectra of Inorganic and Coordination Compounds, K. Nakamoto.
5. Infrared Spectroscopy-C.N.R. Rao.
6. Electron Absorption Spectroscopy and Selected Techniques-D. N. Satyanarayana, University Press. India Ltd. Hydrabad
7. Introduction to Spectroscopy-Pavia, Lampman and Kriz.
8. Spectroscopy of Organic Compounds-3rd Ed.-P.S. Kalsi (New Age, New Delhi) 2000.
9. Organic Spectroscopy-3rd Ed.-W. Kemp (Pagrave Publishers, New York), 1991.X

MSE(C)-X.2 : ADVANCED INORGANIC CHEMISTRY

Credits: 4 (4L+0T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **C1 + C2 : 50**
Exam. Duration: 2 Hrs **C3 : 50**

COURSE CONTENT:

Unit-I:
Molecular symmetry and group theory: Symmetry elements and symmetry operations. Concept of a group, definition of a point group. Classification of molecules into point groups.Subgroups. Schoenflies and Hermann-Maugin symbols for point groups. Multiplication tables (Cn, C2V and C3V). Matrix notation for the symmetry elements. Classess and similarity transformation.
Representation of groups: The Great Orthogonality theorem and its consequences.
Character tables (C2v, C2h and C3v). Symmetry and dipole moment.
Preparation of coordination compounds: Introduction, Preparative methods – simple addition reactions, substitution reactions and oxidation-reduction reactions, Geometries of metal complexes of higher coordination numbers (2-12).
Stability of coordination compounds: Stepwise and overall formation constants, trends in stepwise stability constants, factors influencing the stability of metal complexes with reference to the nature of metal ion and ligands, the Irving-William series, chelate effect. Determination of stability constants of metal complexes by spectrophotometric and polarographic methods.

Unit II:
Crystal field theory: Salient features of CFT, d-orbital splitting in octahedral, tetrahedral, square planar and tetragonal complexes, Jahn-Teller distortions. measurement of 10 Dq and factors affecting it. Spectrochemical series, Evidences for metal-ligand covalency.
Molecular Orbital Theory: MO energy diagrams for octahedral, tetrahedral and square planar complexes without and with pi-bonding.
Electronic spectra: Introduction, selection rules and intensities, electronic spectra of octahedral and tetrahedral complexes, Term symbols for dn ions, Orgel and Tanabe-Sugano diagrams, electronic spectra of octahedral, tetrahedral and square complexes, charge-transfer spectra.
Magnetic properities: Introduction, Magnetic susceptibility and its measurements (Gouy's and Faraday's methods), Spin and orbital contributions to the magnetic moment, the effect of temperature on magnetically dilute (diamagnetic and paramagnetic) and non-dilute compounds (ferromagnetic, antiferromagnetic) compounds.

Unit-III
Reactions and Mechanisms: Introduction Substitution reactions- Inert and labile compounds, mechanisms of substitution.Kinetic consequences of Reaction pathways-
Dissociation, interchange and association.Experimental evidence in octahedral
substitution- Dissociation, Associative mechanisms, the conjugate base mechanism, the kinetic chelate effect. Stereochemistry of reactions Substitution in trans and its complexes, isomerization of chelate rings. Substitution reactions of square-planar
complexes- Kinetics and stereochemistry of square-planar substitutions, evidence for associative reactions, explanations of the trans effect. Inner-sphere and outer-sphere electron transfer mechanisms.

Unit IV:
Metal-metal bonding: Evidences and factors favoring of M-M bonding, Wade's-Mingo's-Lauher rules, bi, tri, tetra, penta and hexa nuclear metal clusters.
Photochemical reactions: Prompt and delayed reactions, d-d and charge transfer reactions, transitions in metal-metal bonded systems. Photochemical reaction channels, Intramolecular photoreactions,Photodissociation and photoionization, Photoisomerization, Intermolecular photoreactions,The coordination compound specificity. Ligand field photochemistry, Photochemistry from LC or LLCT states, Photosensitized reactions, energy storage.

References:

1. Chemical Applications of Group Theory, 3rd edn, F.A. Cotton, John Wiley and Sons (2006).
2. Molecular Symmetry and Group Theory – Robert L Carter, John Wiley and Sons (2005).
3 Physical Inorganic Chemistry- A Coordination Chemistry Approach- S. F. A. Kettle, Spektrum, Oxford, (1996).
4 Inorganic Chemistry- 2nd edn, C. E. Housecroft and A. G. Sharpe, Pearson Education Ltd, (2005).
5 Inorganic Chemistry- 3rd edn, G. L. Miessler and D. A. Tarr, Pearson Education, (2004).
6 Inorganic Chemistry- 2nd edn, D. F. Shriver, P. W. Atkins and C. H. Langford, Oxford University Press, (1994).
7 Inorganic Chemistry- 3rd edn, James E. Huheey, Harper and Row Publishers, (1983).
8 Basic Inorganic Chemistry- 3rd edn, F. A. Cotton, G. Wilkinson and P. L. Gaus, John Wiley and Sons, (2002).
9 Photochemistry and Photophysics of Coordination Compounds I-Volume Editors:Balzani, V., Campagna, Springer Publications.Vol. 280, 2007.
10 Photochemistry and Photophysics of Coordination Compounds II - Volume Editors:Balzani, V., Campagna, Springer Publications.Vol. 281, 2007.

MSE(C)-X.3 : SYNTHETIC ORGANIC CHEMISTRY AND CHEMISTRY OF NATURAL PRODUCTS

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:
Unit-I:
Reduction: Catalytic hydrogenation (homogeneous and heterogeneous-catalysts), reduction of functional groups- Wilkinson catalyst. Bakers yeast, LiAIH4, NaBH4, metal dissolving reactions (Birch reduction). Leukert reaction (reductive amination), Meerwein-Ponndorf-Verley reduction, Wolf-Kishner reduction. Clemmensen reduction.
Oxidation: Oxidation with chromium and manganese compounds (CrO3, K2Cr2O7, PCC, PDC, Sarret reagent, Jones reagent, MnO2, KMnO4), ozone, peroxides and peracids, lead tetra acetate, periodic acid, OsO4, SeO2, NBS, chloramine-T, Sommelet oxidation, Oppenauer oxidation

Unit-II
Reactions and Reagents in Organic synthesis: Use of following reagents in organic synthesis and functional group transformations: Lithium diisopropylamide (LDA), Gilmann reagent,

dicyclohexyl carbodiimide (DCC), dichloro dicyano quinine (DDQ), trialkyl silyl halides, phase transfer catalyst, Fenton's reagent, Ziegler-Natta catalyst, diazomethane, epoxidation, Stark enamine reaction, Phosphorus ylides – Wittig reaction, 1, 3- dithiane anions-Umpolung reaction, sulphur ylides – reactions with aldehydes and ketones, Peterson reaction-synthesis of alkenes.

Unit-III

Protecting groups: Protection of hydroxyl, carboxyl, carbonyl and amino groups. Illustration of protection and de-protection in synthesis.

Aldol and related reactions: Keto-enol tautomerism, mechanism and synthetic applications of aldol condensations, Claisen reaction, Perkin raction, Knovenagel, benzoin, Darzens Glysidic ester condenasation, Cannizzaro reaction, Tschenko reaction. Michael addition.

Introduction to disconnection approach: Basic principles and terminologies used in disconnection approach. One group C-X and two group C-X disconnections.

Unit IV:

Chemistry of Natural Products

Alkaloids: Introduction, classification, isolation and general methods of structural elucidation, biological importance. Structural elucidation and synthesis of Atropine, Papaverine and Quinine.

Terpenoids: Introduction, classification and general methods of structural elucidation, biological importance. Structural elucidation and synthesis of alpha- terpineol, alpha- Pinene and Camphor.

Steroids: Introduction, Structural elucidation and synthesis of Cholesterol and Ergosterol. Biological importance of bile acids, estrone, progesterone, testosterone, androsterone and corticosterones.

References

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, McGrow Hill, New York, 1987.
2. Organic Chemistry-Morrison & Boyd
3. I. Finar, Organic Chemistry,m ELBS LOongmann, Vol 1 & II, 1984.
4. J. March, Advanced Organic Chemistry, Willey Interscience, 1994.
5. E. S. Gould, Mechanism Mechanism and structure in Organic Chemistry, Halt, Rinehart & Winston, New York, 1964.
6. F. A. Carey and Sundberg. Advanced Organci Chemistry – part A & B, 3rd edition, Plenum Press, New York. 1990.
7. Comprehensive Organic Synthesis – B. M. Trost and 1. Fleming series, Pergamon Press, New York, 1991.
8. A Guide book to mechanism in organic chemistry-Petersyke.
9. S. K. Ghosh, Advanced General organic chemistry, Book and Alleied (P) Ltd. 1998.
10. K.Albert, l.Lehninger, D.L.Nelson, M.M.Cox, Principles of Biochemistry, CBZ Publishers, New Delhi, 1993
11. Harper's Biochemistry, Ed. R.Harpere, Prentice Hall Press, New York, 1990
12. Steroids, L.Fiescher and M.Fiescher

MSE(C)-X.4 : QUANTUM , NUCLEAR AND RADIATION CHEMISTRY

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:

Unit I : Quantum Chemistry

A brief survey of: black body radiation, photoelectric effect, Compton effect, Uncertainty principle, de Broglie's concept, Bohr's theory hydrogen atom. Concept of operators (operator-operand),Algebra of operators, commutative and non-commutative operators, linear operator, Laplacian operator, Hamiltonian operator, Eigen value, eigen function, class Q function, turnover rule. Wave equation for stretched strings, Shrodinger equation to a free particle and to a particle trapped in a potential field (one dimension and three dimensions).

Degeneracy, wave equation for hydrogen atom, separation and solutions of R, Phi and theta equations. Application of Schrodinger equation to rigid rotator and harmonic oscillator. Approximate methods-Necessity of approximate methods, perturbation method-first order and second order correlation, application to He-atom(first order correlation only)-calculation of first ionization and binding energy.

Unit II: Nuclear chemistry

Radioactive decay-General characteristics, decay kinetics, parent-daughter decay- growth relationships, determination of half-lives, mention various nuclear models, discussion on shell-model, liquid-drop model, collective model.Nuclear stability-binding energy, proton-neutron ratio, magic number, packing fraction, nuclear stability with respect to beta decay. Theories of alpha, beta and gamma decays. Nuclear reactions- Bethe's notation, types of nuclear reations-specific nuclear reactions, Photonuclear reactions, fission and fusion reactions, Oppenheimer-Phillipe process, spallation reactions, conservation in nuclear reactions, reaction cross-section.

Units of radioactivity-Curie, Bequrel and related calculations. Preparation of artificial radioisotopes by bombardment, radiochemical separation techniques- carrier, solvent extraction and ion-exchange.Szirald-Chalmers reaction. Nuclear power reactors-basic features and components of power reactors. An introduction to breeder reactor.

Unit III :Radiation Chemistry

Introduction, units, interaction of electromagnetic radiation with matter, G-value, LET of radiation, dosiometry,Fricke and cericsulphate dosiometers.Radiolysis-cysteine and biphenyl. Radioisotopes as tracers, use of isotopic tracers in the elucidation of reaction mechanism, structure determination and solubility sparingly soluble substances. Carbon-14 dating, isotope dilution, neutron activation analysis, radiometric titrations. Medicinal applications of isotopic tracers.Hazrds of radiochemical work and radiation protection.

Radiation detection and measurement: Experimental techniques in the assay of radioisotopes, gas-filled detectors-ionization chamber, proportional and Geiger-Muller counters-G.M. plataue, dead time and its determination. coincidence loss, scintillation counters, solid state detectors.

Unit IV : Photochemistry

Introduction to photochemistry- quantum yield and its determination, factors affecting quantum yield. Actinometry- uranyl oxalate and ferrioxalate actinometers, acetone and diethylketone actinometers. Term, symbol and significance. Photosensitiziation: by mercury, dissociation of Hydrogen iodide. Photochemical kinetics of decomposition of acetaldehyde, formationof HCl. Photodegration: Photocatalyst-ZnO, TiO2: principle and application of ZnO/TiO2 in photodegradation of dyes (IC), pesticides(DDT) and in industrial effluents, effect of photodegradtion COD value.

References

1. Quantum Chemistry – A.K. Chandra. Second Edition, Tata McGraw Hill Publishing Co. Ltd., (1983).
2. Quantum Chemistry – Eyring, Walter and Kimball. John Wiley and Sons, Inc., New York.
3. Quantum Chemistry –I.N. Levine. Pearson Education, New Delhi, (2000).
4. Theoretical Chemistry – S. Glasstone. East West Press, New Delhi, (1973).
5. Quantum Chemistry – R.K. Prasad, New Age International Publishers, (1996).
6. Valence Theory – Tedder, Murel and Kettle.
7. Quantum Chemistry – D.A. McQuarrie.
8. Theoretical Inorganic Chemistry – Day and Selbin.
9. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
10. Nuclear Physics and Chemistry by G. Harvey.
11. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
12. Nuclear Chemistry by U.N. Dash, Sultan Chand and Sons (1991).
13. Source book on atomic energy by S. Glasstone, 3rd edition Van Nonstrand (1967).
14. Nuclear chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
15. Essentials of nuclear chemistry by H.J. Arnikar, Eastern Wiley (1990).
16. Nuclear radiation detection by Price. Nuclear radiation detectors by S.S. Kapoor and Ramamoorthy, Wiley Eastern (1986).
17. Fundamentals of radiochemistry by D.D. Sood, A.V.R. Reddy and N. Ramamoorthy
18. Photochemistry-Calvert & pitts, Wiley, New York, (1996)
19. Advances in Photochemistry-Rohatgi Mukherjee.
20. Principle and applications of Photochemistry-R. P. Wayne, Elsevier, New York.(1970)
21. Photochemistry, Paul Suppan, RSC. London, (1994)
22. Dupey and Chapmann, Molecular reactions and Photochemistry, Prenctic Hall-International, Tokyo, 1972.

MSE(C)-X.5 : LAB III - ORGANIC PRACTICAL –I

Credits : 2(0L+0T + 2P) — **Max.Marks :100**
Contact Hrs per week : 4 — **C1 + C2:50**
Exam. Duration: 4 Hrs — **C3:50**

COURSE CONTENT:

1. Preparation of o-chlorobenzoic acid from phthalic anhydride
2. Preparation of p-nitroiodobenzene from para nitroaniline.
3. Preparation of m-nitroaniline from nitrobenzene
4. Preparation of p-aminoazobenzene from aniline
5. Preparation of sym-tribromoacetanilide from aniline
6. Preparation of anthranilic acid from phthalic anhydride
7. Preparation of benzidine from nitrobenzene
8. Preparation of m-nitrobenzoic acid from methyl benzoate
9. Preparation of 2-phenyl indole using phenyl hydrazine
10. Preparation of benzilic acid from benzoin

References:

1. A Text book of practical organic Chemistry – A. I. Vogel Vol.I
2. Practical Organic Chemistry-Mann & Saunders.
3. Manual of Organic Chemistry –Dey and Seetharaman.
4. An introduction to practical organic Chemistry-Robert, Wingrove etc.
5. Semimicro qualitative organic Analysis by Cheronis, Entrikin and Hodnet.
6. J. N. Guthru & R. Kapoor, Advance experimental Chemistry, S. Chand Company, New Delhi-1991.
7. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition. 1996.
8. N. K. Visnoi, Practical Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition, 1996.

MSE(C)-X.6 : LAB IV - INORGANIC PRACTICAL – I
(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P) — **Max.Marks :100**
Contact Hrs per week : 4 — **C1 + C2:50**
Exam. Duration: 4 Hrs — **C3: 50**

COURSE CONTENT:

A. Qualitative Analysis:
Semimicro qualitative analysis of mixtures containing TWO anions and TWO cations and ONE of the following less common cations: W, Mo, Ce, Ti, Zr, V and Li.

B. Inorganic Synthesis: (Any five of the following experiments)

1. Preparation of Chloropentammine cobalt(III) chloride and Estimation of chloride in a complex by potentiometric or ion-exchange method

2. Synthesis and characterization of tris-triphenyl phosphine copper(II)nitrate. Estimate copper.
3. Preparation of cis- and trans- dichlorobis(ethylenediammine) cobalt(III)chloride. Record the UV-Vis spectra and compare it with cis-form.
4. Preparation of hexaammine cobalt(III) chloride and estimate cobalt ion.
5. Synthesis of bis-dichlrotriphenyl phosphine nickel(II).
6. Determination of magnetic susceptibility of any two compounds/complexes by Gouy method.
7. Determination of the composition of iron-phenanthroline complex by:
   (a) Job's method and
   (b) Mole ratio method
8. Determine the stability constant of iron-phenanthroline by Turner-Anderson method.
9. Preparation and kinetics of the acid hydrolysis of potassium trisoxalato cobaltate(III) trihydrate.
10. Preparation of tris(oxalato)ferrate(III) and estimate the metal ion.
11. Preparation of hexaammine nickel(II) chloride.
12. Preparation of the EDTA complex of Mn(II).
13. Estimate the chloride ion in a given complex by silver nitrate titration after ion-exchange separation.

References

1. Vogel's Text Book of Quantitative Chemical Analysis – 5th edition, J. Basset, R.C.Denney, G.H. Jeffery and J. Mendhom.
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel, 3rd edition.
3. Spectrophotometric Determination of Elements by Z. Marczenko.
4. Vogel's Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.
6. Inorganic Synthesis – O. Glemser.

MSE(C)-X.7 : TEACHING OF CHEMISTRY

Credits: 3 (2L+1T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs	**C_3 : 50**

Objectives:

The student teacher will be able to

- Understand the nature and scope of Chemistry
- Understand the different pedagogical approaches to teaching of Chemistry
- Plan learning designs based on problem situations, inquiry and projects
- Explore the use and relevance of different learning resources and materials in teaching of Chemistry
- Study the facilities and materials available in chemistry labs for teaching chemistry at higher secondary level
- Familiarize with different types of curricular projects in Chemistry, their purpose and themes
- Analyse the text books and other instructional materials with reference to the content, its organization, learning experiences and other characteristics
- Prepare tools for assessing learning of chemistry

COURSE CONTENT:

Unit I: Aims, Objectives and Approaches to Teaching/Learning Chemistry
Chemistry as a pure and experimental science; processes of scientific method; applied disciplines of chemistry; objectives of teaching chemistry at +2 level based on the aims of education as reflected in NCF-2005;Criteria of selecting learning objectives-integration of process skills and learning attainments, promoting scientific temper and creativity as the other aims of teaching/learning chemistry; Approaches to teaching/learning chemistry: Investigatory approach, Inquiry method, Problem solving, Problem Based Learning, Projects, Demonstration Cum Discussion, Discovery and Guided Discovery learning, Inductive and deductive methods, and concept attainment approaches, Cooperative and collaborative learning, Self learning methods, ICT integrated approaches for teaching/learning Chemistry. (The above listed approaches will be illustrated drawing specific examples from content at +2 level followed by group work), Identification of teacher qualities to enhance scientific temper and creativity and suitable approaches to develop these in learners.

Unit II : Planning for Teaching/Learning of Chemistry
Pedagogical Analysis: Meaning and importance, identification of content categories-facts, concepts, principles, generalizations, laws and theories, pedagogical analysis of content reflecting STS links and social concerns and issues if any, writing learning objectives, identification of learning experiences for teaching different content categories; Preparation of lessons for teaching/ learning of chemistry: Components-Learning objectives, learning concepts, connecting to prior knowledge, learning resources, sequential learning experiences: Designing learning episodes and activities, grouping of learners, designing of group tasks, teachers' questions, scaffolding with the present knowledge, black board work, use of ICT and other learning resources, review and assignments.

Suggested topics for pedagogic analysis
1. Laws of Chemical Combinations
2. Mole Concept and Molar Masses
3. Electronic Configuration of Elements and their Periodic Properties
4. Laws of Chemical Equilibrium and Factors affecting equilibrium
5. Acids, bases and salts
6. Electrical & Magnetic properties of Solids
7. Types of Solutions and Colligative properties
8. Galvanic cells, Electrolytic cells and Electrolysis
9. Rate of Chemical reaction and Factors influencing rate of reaction
10. Isomerism in Co-ordination compounds
11. **Redox reactions in terms of electron transfer**
12. Nomenclature of Organic compounds
13. Concepts in Organic Reaction Mechanism
14. Chemical reactions of Alcohols / Phenols / Carbonyl compounds

Unit III
Instructional and Curricular Resources
Chemistry Text books, lab manuals, journals on Chemistry Education, Teacher manuals, work sheets, Teaching Learning Aids, Laboratory work, multimedia and web based resources
Lab as a resource: Evolution of practical work in Chemistry and its purpose; Demonstration of content specific experiments on topics related to +2 content, Set of experiments in the lab to illustrate process skills related to learning of chemistry; Planning, designing and demonstrations of experiments, Recent trends and issues in practical work

Curricular Resources: Study of curricular projects at the State/ National/Inter National Levels in Chemistry; Critical analysis of CBSE syllabus and text books in Chemistry based on the validities enumerated in NCF-2005.

Unit IV : Assessment in Learning Chemistry

Tools and techniques of assessment in chemistry learning: Open ended questions, short answers and objective type questions.

Assessment of Practical Work**:** Criteria for observing the practical work, skills in observation and recording the observations; interpreting the results of practical work, ability to plan practical procedures and techniques of solving problems and manipulative skills.Assessment of attitude towards practical work: Set of exercises, course work, oral questioning. Assessment of project work; Self assessment; Peer assessment; Planning for Portfolio assessment in chemistry.

ELEVENTH SEMESTER

MSE(C)-XI.1 : SOLID STATE CHEMISTRY

Credits: 4 (4L+0T+0P)
Contact Hrs per week : 4
Exam. Duration: 2 Hrs

Max.Marks :100
C1 + C2 : 50
C3 : 50

COURSE CONTENT:

Unit I:

Solid State Chemistry: Fundamentals of X-ray crystallography, law of interfacial angles, laws of symmetry, Miller indices, Bravis lattice, X-ray diffraction, Bragg's equation, Bragg's X-ray spectrometer, experimental methods-rotating crystal, powder samples, indexing of powder photographs. Atomic scattering factor, structure factor, Fourier synthesis and electron density diagrams. Electron diffraction of gases, experimental technique, scattering-intensity curves, Weirl equation (no derivation), determination of bond lengths and bond angles. Imperfections in atomic packings: types of imperfections, point defects-Schottky and Frenkel defects. Line defects-dislocation types and dislocation theory. Plane defects and non-stoichiometry. Imperfections and physical properties: electrical, optical, magnetic, thermal and mechanical properties.

Unit II:

Metals, insulators and semiconductors, electronic structures of solids: Band theory, band structure of metals, insulators and semiconductors. Intrinsic and extrinsic semiconductors, electrons and holes, temperature dependence of conductivity in semiconductors. Properties of semiconductors, electrical conductivity in both n- and p-type extrinsic semiconductors. Concept of Fermi energy, Fermi energy in
intrinsic and extrinsic semiconductors.
Junction properties: Metal-metal junctions, metal-semiconductor junctions, p-n junctions, junction transistor action-n-p-n junctions.

Unit III:
Optical properties of semiconductors: absorption spectrum, photoconductivity, photovoltaic effect, luminescence. Magnetic properties of solids-classification of magnetic materials. Magnetic susceptibility and experimental determination. Variation of magnetic susceptibility with temperature for different magnetic materials.
Magnetic properties of mixed oxides with reference to spinel structure. Magnetisation of ferro magnetic materials-Hysteresis and magnetic domains.
Superconductors: Introduction, basic experimental facts: critical temperature and zero resistivity, Meissner effect, critical magnetic field and its variation with temperature. Classification of type-I and II superconductors, specific heat, isotope effect. Basic concepts of BCS theory. High Tc superconductors and their applications.

Unit IV:
Chemistry of nanomaterials: Definition, synthesis of nanomaterials-Laser ablation, chemical vapour transport (CVT) and sol-gel methods. Metal oxide nanoparticles with supercritical water and precursor method. Synthesis of metal oxides and its composite nanoparticles by

solvo-thermal and hydrothermal methods. Synthesis by micro-oven technique (electromagnetic radiation). Carbon nanotubes, wires and its composites. Magnetic, electrical and electronic and catalytic applications of nanoparticles. Uses of nanomaterials in renewable energy. Synthesis of organic nanoparticles(L-lysine, L-alanine etc). Nanorods-structural and electron transport properties. Inorganic and organic porus gels, effect of temperature and pH on properties of nanoparticles.

References:

1. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F.Armstrong, Oxford University Press (2010).
2. Solid State Chemistry and its Applications-A. R. West, John –Wiley & sons.
3. New Direction in Solid State Chemistry-CNR Rao and J. Gopalkrishnan, Cambridge University Press.
4. Principles of the Solid State-H. V. Keer, Wiley Eastern.
5. Brian L. Cushing, Vladimir L. Kolesnichenko and Charles J. O’Connor. Chemical Reviews, 2004, 104, 3893-3946.

MSE(C)-XI.2 : ORGANOMETALLICS, CATALYSIS & FRONTIERS IN INORGANIC CHEMISTRY

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:

Unit-I:

Fundmental concepts: Introduction, Classification of organmetallic compounds by bond type, Nomenclature, the Effective atomic number rule, complexes that disobey the EAN rule, common reactions used in complex formation.

Organometallics of transition metals: Preparation, bonding and structures of nickel, cobalt, iron and manganese carbonyls. Preparation and structures of metal nitrosyls in organometallics. Ferrocene and ruthenocene: Preparation, structure and bonding. Complexes containing alkene, alkyne, arene and allyl ligands: preparation, structure and bonding. The isolobal principles.

Unit-II:

Homogeneous catalysis - Industrial Applications: Alkene hydrogenation, hydroformylation, The Wacker’s process, Monsanto acetic acid process and L-DOPA synthesis, alkene oligomerizations, water-gas shift reactions.

Heterogeneous catalysis - Commercial Applications: Alkene polymerization: Ziegler-Natta catalysis, Fischer-Tropsch carbon chain growth.

Alkene metathesis, hydroboration, arylation or vinylation of olefins (Heck reaction).

Biological and Medicinal Applications: Organomercury, boron, silicon and aresenic compounds

Zeolites as catalysts for organic transformation: Uses of ZSM – 5(hydroboration, Arylation or vinylation of olefins/Heck reaction).

Unit III:

Nanomaterials, nanoscience and nanotechnology

Fundamentals-Terminology and history, novel optical properties of nanomaterials.
Characterization and fabrication: Characterization methods. Top-down and bottom-up fabrication. Solution based synthesis of nanoparticles. Vapour-phase synthesis of nanoparticles. Synthesis using frameworks, supports and substrates.
Artificially layered materials: Quantum wells and multiple quantum wells. Solid state superlattices. Artificially layered crystal structures.
Self-assembled nanostructures: Self-assembly and bottom-up fabrication. Supramolecular chemistry and morphosynthesis. Dimensional control in nanostructures.
Bioinorganic nanomaterials: DNA and nanomaterials. Natural and artificial nanomaterials-Biomimetics. Bionanocomposites.
Inorganic-organic nanocomposites: Uses and design strategies. Polymer nanocomposites.

Unit IV:
Zeolites: Introduction, types of zeolites, manufacture of synthetic zeolites and applications.
Inorganic fibers: Introduction, properties, classification, asbestos fibers, optical fibers, carbon fibers, Applications.
Ceramics: General information, classification of ceramic products, composition and raw materials, Applications of clay ceramic products.
Inorganic pigments: General information and economic importance,
White pigments – titanium dioxide pigments, zinc oxide pigments.
Colored pigments – Iron oxide, chromium oxide, mixed-metal oxide pigments and ceramic colorants.
Corrosion protection pigments, luster pigments, luminescent pigments, magnetic pigments.

References:
1. Organometallic Chemistry, 2nd edn, R.C. Mehrothra and A. Singh, New Age International Publications (2006).
2. The Organometallic Chemistry of the Transition Metals, 4th edn, Robert H. Crabtree, Wiley Interscience, (2005).
4. Organometallics- A Concise Introdution, 2nd edn, Chistoph Elschenbroich and Albert salzer VCH, (1992).
5. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F.Armstrong, Oxford University Press (2010).
6. Inorganic Chemistry, 2nd edn- C. E. Housecroft and A. G. Sharpe, Pearson Education Ltd., (2005).
6. Inorganic Chemistry- 3rd edn, G. L. Miessler and D. A. Tarr, Pearson Education, (2004).
9. Industrial Inorganic Chemistry – 2nd edn. K.H. Buchel, H.H. Moretto and P. Woditsh, Wiley- VCH (2000).

MSE(C)-XI.3 SPECTROSCOPY

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:
Unit I:

UV-VIS and IR Spectroscopy: Quantitative aspects of Absorption-Beer's law. Terminology associated with absorption measurements. Limitations of the law: Real, chemical, instrumental and personal. Theory of molecular absorption. Vibration rotation fine structure of electronic spectra. Types of absorption bands C-T & ligand field. Empirical rules for predicting the wavelength of maximum absorption:Olefins, conjugated dienes, cyclic trienes and polyenes- unsaturated aldehydes and ketones-benzene and substituted benzene rings. Basic components of instrumentation, single and double beam designs. Applications: Qualitative and quantitative analysis of binary mixtures, measurement of dissociation constants of acids and bases, determination of molecular weight, photometric titrations, determination of stoichiometry and stability of the complexes and kinetic studies.
IR Spectrosocpy: Introduction, Instrumentation, samples handling, Modes of vibrations, Hooks Law, Characteristic group frequencies and skeletal frequencies. Finger print region, Identification of functional groups- Alkenes, Aromatics, Cabonyl compounds (aldehydes and ketones, esters and lactones), halogen compounds, sulphur and phosphorus compounds, amides, lactums, amino acids and amines. Factors affecting group frequencies and band shapes - conjugation, resonance and inductance, hydrogen bonding and ring strain. Tautomerism, Cis-trans isomerism. Applications of IR spectra.

Unit II:
NMR Spectroscopy: Magnetic properties of nuclei (magnetic moment, g factor, nuclear spin), effect of external magnetic field on spinning nuclei, Larmor precession frequency, resonance conditions, population of nuclear magnetic energy levels, relaxation processes, relaxation time, line width and other factors affecting line width.
Chemical Shift: Standards employed in NMR, factors influencing chemical shift: electronegativity, shielding and deshielding, vander Walls deshielding magnetic anisotropy, H-bonding, diamagnetic and paramagnetic anisotropies, spin-spin coupling, chemical shift values and correlation for protons bonded to carbon and other nuclei, Instrumentation.
Chemical shift equivalence and magnetic equivalence, proton exchange reactions, effects of chiral centre, stereochemistry-hindered rotation, karplus curve-variation of coupling constants with dihedral angle. .Application of nmr in structural diagnosis, conformational analysis, keto-enol tautomerism and H-bonding. Structural studies using C-NMR and FT-NMR, application of NMR to other nuclei, two dimensional NMR.

Unit III:
Mass spectrometry: Principles, instrumentation, different methods of ionization. El, Cl, FD and FAB, lon separators-single focusing separator with magnetic diffraction, double focusing analyzer, time-of-flight separator and quadrupole analyzer, Mass spectra – molecular ion, base peak, metastable peak. General rules for fragmentation pattern. Nitrogen rule and McLafferty rearrangement. Mass spectral fragmentation of Organic compounds (acids, ester, hydrocarbons, halogenated hydrocarbons, alcohols, carbonyl compounds, amines and heterocyclic compounds).

Composite Problems. Problems involving the application of the above spectroscopic techniques (UV-Visible, IR, NMR and Mass) for structural elucidation of organic molecules.

Unit IV:
Microwave and Raman Spectroscopy: Classification of molecules based on rotation – linear, symmetric, spherical and asymmetric top molecules (HCl, HCN, H2O, BCl3, CH4 and CH2=CH2). Pure rotation spectra of diatomic molecules – rigid rotor model, energy levels, rotational quantum number and the selection rule. Effect of non-rigid rotation. Determination of moment of inertia and bond length of diatomic molecules using rotational spectra. Effect of isotopic substitution on rotation spectra. Relative intensities of the spectral lines. Rotation

spectra of polyatomic molecules (BCl_3 and CH_3F). Moment of inertia expression for linear and non-linear molecules. Microwave spectrometer, Principles of determination of bond length and moment of inertia from rotational spectra. Strak effect in rotation spectra and determination of dipole moments.

Basic principles of ESR spectroscopy, general rules for the interpretation of spectra, zero field splitting and Kramer's degeneracy, factors affecting the magnitude of 'g' value. Double resonance - ENDOR, ELDOR. Applications – study of free radicals, structure determinations and analytical applications.

References:

1. Spectroscopy, B. P. Straughan and S. Salker, John Wiley and Sons Inc., New Yourk, Vol.2, 1976.
2. Organic Spectroscopy, William kemp, English Language Book society, Macmillm, 1987.
3. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice/Hall of India Private Limited, New Delhi, 1974.
4. Spectrometric Identification of Organic Compounds, Fourth Edition, Robert M. Silverstein, G. Clayton Bassler and Terence C. Morrill, John Wiley & Sons, New York, 1981.
5. Organic Spectroscopy, V. R. Dani, Tata MeGraw-Hall Publishing Company Limited, New Delhi. 1995.
6. Spectroscopy, B. P. Straughan, S. Walker, Chapman and Hall John Wiley and Sons Inc., New York, Vol.I 1976.
7. Interpretation of Carbon-13 NMR Spectra, F.W. Wehrli and T. Wirthin, Heyden, London, 1976.
8. NMR spectroscopy-Powai

MSE(C)-XI.4 : ELECTROCHEMISTRY AND SURFACE CHEMISTRY

Credits: 4 (4L+0T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **C1 + C2 : 50**
Exam. Duration: 2 Hrs **C3 : 50**

COURSE CONTENT:

Unit I:

Electro Chemistry Arrhenius theory of strong and weak electrolytes and its limitations, Debye-Huckel theory of strong electrolytes, Debye Huckel-Onsager equation, Debye-Huckel limiting equation for activity coefficients, Debye-Huckel equation for appreciable concentrations. A brief survey of Helmholtz- Perrin, Gouy-Chapman and Stern electrical double layer (No Derivation). Liquid junction potential and its determination. Transport Number: Determination of transport number by Hittorf method and e.m.f method. True and apparent transport numbers. Abnormal transport numbers, effect of temperature and concentration on transport number.

Unit II:

Irreversible electrode process: Introduction, reversible and irreversible electrodes reversible and irreversible cells. Polarization, over voltage-ohmic over voltage, concentration over voltage activation over voltage, experimental determination of over voltage. Equations for concentration over potential, diffusion current – stationary current, potential curves, thickness of diffusion layer, diffusion controlled current – potential curves at a dropping mercury electrode, polarography, half wave potential, application in qualitative and quantitative analysis. Energy barrier and electrode kinetics, Butler- Volmer equation, Tafel equation. Hydrogen over voltage and Oxygen over voltage. Effect of temperature, current density and pH on over voltage.

Unit III:

Surface Chemistry: Different types of surfaces. Examination of surfaces using ESCA, Auger, SEM and STM. Properties of surface phase. Thermodynamics of surface. Surface tension of solutions. Gibbs' adsorption equation and its verification. Surfactants and miscelles. Surface films: Different types. Surface pressure and surface potential, and their measurements and interpretation.

The gas-solid inter phase: Types of adsorption. Theory of adosrption. The Langmuir theory-kinetic and statistical derivation. Multilayer adsorption- the BET theory and Harkins-Jura theory. Adsorption from solutions on solids. Langmuir and classical isotherms. Chemisorption-differences with physical adsorption. Adsorption isotherms. Adsorption with dissociation. Adsorption with interaction between adsorbate molecules. Measurement of surface area of solids: Harkins-Jura absolute method, entropy method, and the point B method. Use of Langmuir, BET and Harkins-Jura isotherms for surface area determination.

Unit IV

Electrokinetic Phenomena: Electrophoresis - principles of free electrophoresis, zone electrophoresis, gel electrophoresis and its applications in qualitative and quantitative study of proteins. Determination of isoelectric point of a protein. Electro osmosis and streaming potential and its biological significance. Biological significance of Donnan membrane phenomenon. Micelles and its involvement during digestion and absorption of dietary lipids. Diffusion of solutes across biomembranes and its application in the mechanism of respiratory exchange. "Salting In" and "Salting out" of proteins. Osmotic behaviour of cells and osmo-regulation and its application in the evolution of excretory systems of organisms. Effect of temperature and pH on the viscosity of biomolecules (albumin solution). Significance of viscosity in biological systems - mechanism of muscle contraction, detection of intrastrand disulfide bonds in proteins, polymerization of DNA and nature of blood flow through different vessels. Effect of temperature, solute concentration (amino acids) on surface tension. Biological significance of surface tension - stability of Alveoli in lungs, interfacial tension in living cells (Danielli and Davson model). Application of sedimentation velocity and sedimentation equilibrium method for molecular weight determination of proteins.

References

1. Elements of Physical Chemistry –Lewis and Glasstone.
2. Physical Chemistry by P.W. Atkins, ELBS, 4th Edition, Oxford University Press(1990).
3. Basic Physical Chemistry by W.J. Moore, Prentice Hall, New Delhi, (1986).
4. Physical Chemistry –G.M. Barrow, McGraw Hill International service (1988).
5. Introduction to electrochemistry by S. Glasstone.
6. Modern electrochemistry Vol. I and II, by J.O.M. Bockris and A.K.N. Reddy, Pentium Press, New York (1970).
7. Electrochemistry –Principles and applications by E.G. Potter.
8. Electrochemistry by Reiger, Prentice Hall (1987).
9. Treatise on Electrochemistry, G. Kortum 2nd Edition, Elsevier, London (1965).

MSE(C)-XI.5 : LAB V ORGANIC PRACTICAL – II

Credits : 2(0L+0T + 2P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2:50**
Exam. Duration: 4 Hrs	**C3:50**

COURSE CONTENT:

A. Qualitative organic analysis:

Separation of binary mixtures, identification of components of binary mixture through preliminary investigations, elements detection, solubility behavior, functional group analysis and determination of physical constants. Preparation of suitable solid derivative for each component for confirmation.

B. Quantitative Analysis:

1. Estimation of keto group by haloform or oxime method.
2. Estimation of esters by base hydrolysis
3. Estimation of nitrogen by Kjaldhal's method.
4. Estimation of Glycine by Sorensen's method.

References:
1. Manual of Organic Chemistry-Dey and Seetharaman.
2. Modern experimental Organic Chemistry by John H. Miller and E. F. Neugil, p 289.
3. An introduction to practical Organic Chemistry-Robert, Wingrove etc.
4. A Text book of practical Organic Chemistry – A I. Vogel Vol.III
5. Practical Organic Chemistry-Mann & Saunders
6. An Introduction to Practical Organic Chemistry-Robert, Wingrove etc.
7. Semimicro qualitative Organic Analysis by Cheronis, Entrikin and Hodnet .
8. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PAGE International (P) Ltd. London, 3rd edition, 1996.
9. N. K. Vishnoi, Practical Organic Chemistry, New PAGE International(P) Ltd. London, 3rd edition, 1996.

MSE(C)-XI.6 : LAB VI - ANALYTICAL PRACTICAL – II

(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2:50**
Exam. Duration: 4 Hrs	**C3:50**

COURSE CONTENT:

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium (IV) and with 2, 6-dichlorophenol indophenol.
3. Determination of aluminium and magnesium in antacids by EDTA titration.
4. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
5. Determination of saccharin in tablets by precipitation titration.
6. Determination of iodine value and saponification value of edible oils.
7. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry / spectrophotometry using N-bromosuccinimide (NBS).
8. Determination of sulpha drugs by potentiometry using NaNO2 and iodometric assay of penicillin.
9. Polarographic determination of copper and zinc in brass.
10. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
11. Spectrophotometric determination of titanium using hydrogen peroxide.
12. Spectrophotometric determination of iron using thiocyanate/1,10-phenanthroline.
13. Spectrophotometric determination of nickel in steel using DMG.

References
1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.

5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Pharmaceutical Drug Analysis by Ashutoshkar, New Age International Publishers, New Delhi, 2005.
7. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rd Ed. CBS Publishers & Distributors, New Delhi, 1997.

MSE(C)-XI.7 : INTERNSHIP PROGRAMME 2 (Senior Secondary Level)

Credits : 4 **Max. Marks: 100**
Duration: 4 Weeks **$C_1 + C_2$: 50**
C_3 : 50

Objectives:
To provide field experience to the students to develop competencies and skills required for effective classroom teaching at the senior secondary level; class management; evaluation of student learning; organization of cocurricular activities; to enable students to develop proper professional attitudes, values and interests; to establish a closer professional link between RIE Mysore and schools in the region.

COURSE CONTENT:
The course is organized into activities distributed over two phases.

Phase 1 : Internship (3 weeks)

Phase 2 : Post-Internship and Critical Reflection of Internship Experience

Activities:
- Student teachers will teach 12 lessons (including 2 practicals) at Senior Secondary level
- Student teachers will observe a minimum of 5 lessons of their peers
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records
- The student teachers will carry out action research project, analyse and write the report

(C1 : Observation, Evaluation and Activity Records; C2 : Action Research Report & Post-Internship Activities; C3 : Teaching)

TWELFTH SEMESTER

MSE(C)-XII.1 : INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Credits: 4 (4L+0T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **C1 + C2 : 50**
Exam. Duration: 2 Hrs **C3 : 50**

COURSE CONTENT:

Unit I:
Fundamentals of chromatography: General description, definition, terms and parameters used in chromatography, classification of chromatographic methods, criteria for selection of stationary and mobile phase-nature of adsorbents, factors influencing the adsorbents, nature and types of mobile phases and stationary phases.
Thin-layer chromatography (TLC): Definition, mechanism, efficiency of TL plates, methodology selection of stationary and mobile phases-preparation of plates, spotting, development, identification and detection, applications.
Gas chromatography (GC): Principle, comparison of GSC and GLC, instrumentation columns packed and tubular, study of detectors-thermal conductivity, flame ionization, electron capture and mass spectrometry, factors affecting separation, applications.

High pressure liquid chromatography (HPLC): Apparatus, pumps, column packing, characteristics of liquid chromatographic detectors-UV and fluorescence detectors, advantages and applications.
Affinity chromatography: Definitions, separation mechanism-matrices, matrix activation, role of spacer arms and applications.
Ion-exchange chromatography(IEC): Definitions, requirements for ion-exchange resin, synthesis and types of ion-exchange resins, resin properties, ion-exchange capacity, resin selectivity and factors affecting the selectivity, applications of IEC.
Exclusion chromatography: Theory and principle of size exclusion chromatography, experimental techniques for gel-filtration chromatography (GFC) and gel-permeation chromatography (GPC), materials for packing-factors governing column efficiency, methodology and applications.

Unit II
Solvent extraction: definition, types, principle and efficiency of extraction, sequence of extraction process, synergistic, masking agents, techniques-batch and continuous extraction, applications.
Capillary electrophoresis: Overview, types, the basis for electrphoretic separations, migration rates and plate heights, electroosmotic flow, instrumentation, capillary zone electrophoresis, capillary gel electrophoresis.
Supercritical fluid chromatography: Properties of supercritical fluids, instrumentation and operating variables, applications.
Coulometry: Principle, constant current and controlled potential coulometry. Applications.

Amperometry: Principle, titrations, advantages and limitations, Applications.
Voltammetry: Fundamentals of voltammetry. Cyclic voltammetry: Principles and applications.

Stripping analysis: Stripping voltammetry-basic principles, electrodes used for stripping analysis, apparatus for stripping analysis, applications.

Unit III:

Flame photometry and Atomic absorption spectrometry: Energy level diagrams-atomic absorption spectra. Flame characteristics. Flame atomizers and electrothermal atomization. Comparison of spectral interferences, chemical and physical interferences in flame photometry (FP) and atomic absorption spectrophotometry (AAS). Use of organic solvents. Quantitative techniques-calibration curve procedure and the standard addition technique. Typical commercial instruments for FP and AAS. Applications. Qualitative analysis and quantitative evaluations. Relative detectabilities of atomic absorption and flame emission spectrometry. Inductively coupled plasma optical emission spectrometry-theory, advantages and applications

Molecular luminescence spectrometry: Theoretical basis for fluorescence and phosphorescence. Singlet and triplet excited states. Variables affecting luminescence-quantum efficiency, transition types, structure and structural rigidity, temperature and solvent effects, effect of pH, dissolved oxygen and concentration effect. Excitation spectra vs emission spectra. Fluorescence instrumentation-fluorometers and spectrofluorometers. Sensitivity and selectivity. Modification necessary to measure phosphorescence. General scope of applications of luminescence.

Light-Scattering methods: Nephelometry and turbidometry- Principles, instrumentation and applications

Unit IV:

Radio analytical methods:

Radioactivity tracers-Principles and applications, isotopic dilution analysis, direct, inverse, special analytical applications, radiometric titrations, Neutron activation analysis- principle, instrumentation, applications and limitations.

Radio chromatography, radio immunoassay.

Thermal methods of analysis: Introduction, thermogravimetric analysis (TGA)-types of thermogravimetric analysis, principles. Factors affecting the results-heating rate, furnace, instrument control/data handling. Applications-purity and thermal stability, evaluation of correct drying temperature, analysis of complex mixture and determination of kinetic parameters of thermal degradation.

Differential thermal analysis (DTA): Theory-variables affecting the DTA curves. Differences between TGA and DTA. General principles. Instrumentation. Applications-analysis of the physical mixtures and thermal behaviour study. Determination of melting point, boiling point and decomposition point.

Differential scanning calorimetry (DSC): Basic principle. Differences between DTA and DSC. Instrumentation-power compensated DSC, heat flux DSC. Applications-Studies of thermal transitions and isothermal crystallization. Pharmaceutical industry for testing the purity of the samples. Thermomechanical analysis. Dynamic mechanical analysis.

References:

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.

5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th Edition, (1988).
7. Principles and Practice of Analytical Chemistry, F. W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instrumental Method of Analysis, W. M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
11. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., 2002.

MSE(C)-XII.2 : BIO-INORGANIC CHEMISTRY

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:

Unit- I:

Classification of elements: Essential, trace metals and their biological roles.

Structural and molecular biology: Introduction, The structural building blocks of proteins, the structural building block of nucleic acids. General features of DNA- metal complex interaction.

A brief overview of molecular biology- Replication and Transcription, Translation.

Bioenergetics: Introduction, Redox reactions in metabolism, the central role of ATP in metabolism. Kinetic stability of ATP, Mitochondrial flow of electrons from NADH to O_2. Oxidative phosphorylation and respiratory chain.

Sodium and potassium-Channels and Pumps: Introduction, Ionophores, Transport across membranes. Potassium and sodium channels, The sodium-potassium ATPase.

Biochemistry of calcium: Introduction-comparison of Ca2+ and Mg2+. Biological roles of calcium, binding sites of calcium and proteins, storage of calcium, calcium in muscle contraction, calcium in blood clotting process.

Unit II:

Metal ion transport and storage:

Iron storage and transport: Transferrin, ferritin and gastroferrin. Iron transport in microbes: siderophores.

Oxygen transport and oxygen uptake proteins: Properties of dioxygen(O2): Thermodynamic and kinetic aspects of dioxygen as an oxidant, activation of dioxygen through complexation with metal ions.

Haemoglobin (Hb) and Myoglobin (Mb) in oxygen transport mechanism: Introduction to porphyrin system, substituent effects on porphyrin rings, functions of Hb and Mb.

Characteristics of O2-binding interaction with Hb and Mb. Model compounds for oxygen carriers. Hemerythrin and Hemocyanin.

Chlorophyll and its role in photosynthesis

Unit III:

Electron transport proteins and redox enzymes: Iron – sulfur proteins (rubredoxins and ferredoxins) and cytochromes including cytochrome P450. Catalase and peroxidase: Structure and reactivity. Superoxide dismutase: Structure and reactivity. Molybdenum containing enzymes: Aspects of molybdenum chemistry, Xanthine oxidase, aldehyde oxidase, nitrogenase.
Non-redox metalloenzymes - Structure and reactivity : Carboxypeptidase-A, Alcohol dehydrogenase and carbonic anhydrase.
Vitamin B12 and Coenzymes: Structural feature, names of different forms, chemistry of cobalamin, biochemical functions of cobalamins, model compounds. Special characteristics of B12 Coenzyme.

Unit IV:
Therapeutic uses of Metals - Metals in Medicine: Introduction, Metals and human biochemistry, general requirements.
Disease due to metal deficiency and treatment: Iron, zinc, copper, manganese, sodium, potassium, magnesium, calcium and selenium.
Metal complexes as drugs and therapeutic agents; Introduction, antibacterial agents, antiviral agents, metal complexes in cancer therapy, Metal complexes for the treatment of rheumatoid arthritis, vanadium diabetes , Metal complexes as radio diagnostic agents.
Treatment of toxicity due to inorganics: General aspects of mechanism of metal ion toxicity, (i)-Mechanism of antidote complex with poison, rendering it inert: arsenic, lead, mercury, iron, copper.
(ii) Antidote accelerated metabolic conversion of poison to non-toxic product: cyanide and carbon monoxide.

References:

1. The Inorganic Chemistry of Biological Process- 2nd edition , M. N. Hughes, John Wiley and Sons, (1988).
2. Bioinorganic Chemistry- R. W. Hay, Ellis Horwood Ltd, (1984).
3. Biological Inorganic Chemistry –An Introduction, R. R. Crichton, Elsevier, (2008).
4. Bioinorganic Chemistry- A. K. Das, Books and Allied(P) Ltd, (2007).
5. Bioinorganic Chemistry- K. Hussain Reddy, New Age International Ltd. (2003).
6. Bioinorganic Chemistry: A Survey- Eiichiro Ochiai ,Academic Press, (2008).
7. Bioinorganic Chemistry: A Short Course-2nd edition, R. M. Roat-Malone, Wilely Interscience,(2007).
8. Medicinal Applications of Coodination Chemistry- Chris Jones and John Thornback, RSC Publishing, (2007).
9. Transition Metal Complexes as Drugs and Chemotherapeutic Agents-N.Farrell, Kluwer Academic Publishers (1989).
10. The Biological Chemistry of the Elements: The Inorganic Chemistry of Life- 2nd edition , J.J. R. Frausto da Silva and R. J. P. Williams, Oxford University Press,(2001).

MSE(C)-XII.3 : HETEROCYCLICS, MOLECULAR REARRANGEMENTS, GREEN CHEMISTRY, SYNTHETIC DRUGS AND ANTIBIOTICS

Credits: 4 (4L+0T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2 : 50**
Exam. Duration: 2 Hrs	**C3 : 50**

COURSE CONTENT:

Unit – I:

Chemistry of heterocyclic compounds: Nomenclature of heterocyclic systems, Principles of heterocyclic synthesis involving cyclisation and cycloaddition. Three and four membered heterocycles – synthesis and reactions of aziridines, oxiranes, thiiranes, azetidines, oxetanes and thietanes. Synthesis and reactions of heterocycles with one hetero atom – furan, thiophene, pyrrole, pyridine, indole, quinoline, isoquinoline, pyrones, coumarin and chromones. Synthesis and reactions of heterocycles with more than one hetero atom – pyrimidines, purines, oxazole and isoxazole.

Unit-II

Molecular rearrangements: Introduction. Carbon-to carbon migrations: Pinacol-pinacolone, Wagner-Meerwein, Benzidine, Demjanov, Benzilic acid, Favorskii, Fries, Claisen rearrangement.

Carbon-to nitrogen Migrations: Hofmann, Curtius, Lossen, and Beckmann rearrangement.

Miscellaneous rearrangements: Sommelet-Hauser, Witting, Baeyer-Villiger rearrangement.

Unit III: Green Chemistry

Introduction, Green Chemistry Principles, Presidential Green Chemistry Challenge Awards (PGCCA), designing green synthesis – choice of starting materials, choice of reagents, choice of catalysts including phase transfer catalysts, choice of solvent. atom economy, green oxidizing agents, microwave induced synthesis, ultrasound assisted synthesis, synthesis using bio-catalysts, synthesis in aqueous phase, synthesis in solid state, applications of green chemistry in daily life and Environmental pollution and health hazards.

Unit IV:

Drugs & Antibiotics:

Synthetic Drugs: Synthesis of antipyretics: antipyrine, aminopyrine, novalgin and phenacetin. Synthesis of anticoagulants: dicoumarol, tromexan, warfarin and phenindione. Synthesis of anaesthetics: α-eucaine, benzocaine, procaine and xylocaine.

Antibiotics: Structural elucidation and synthesis of Chloromycetin and Penicillin, Structure of streptomycin and terramycin (without elucidation) and their pharmaceutical importance.

References

1. Photochemistry-Calvert & Pitts, Wiley, New York, (1996)
2. Advances in Photochemistry-Rohatgi Mukherjee.
3. Principle and applications of Photochemistry-R. P. Wayne, Elsevier, New York.(1970)
4. Photochemistry, Paul Suppan, RSC. London, (1994)
5. Dupey and Chapmann, Molecular reactions and Photochemistry, Prentice Hall-International, Tokyo, 1972.
6. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow hill, New York 1987.
7. Organic Chemistry-Marrison & Boyd
8. I. Finar, Organic chemistry, ELBS Longmann, Vol. I & II, 1984.
9. J. March, Advanced Organic Chemistry, Willey Interscience, 1994
10. E. S. Gould, Mechanism and Structure in Organic chemistry, Halt, Rinehart & Winston, New York. 1964.
11. F. A. Carey and Sundberg, Advanced Organic Chemistry-Part A & B. 3rd edition, Plenum press, New York. 1990.
12. Heterocyclic chemistry – Joule & Smith.
13. Heterocyclic Chemistry – Acheson.

14. Green Chemistry; Theory and Practice, Anastas, P.T. and Warner, J.C., Oxford University Press, NY, 1998.
15. New Trends in Green Chemistry, Ahluwalia, V.K. and Kidwai, M., Anamaya Publishers, New Delhi, 200

MSE(C)-XII.4 : CHEMICAL KINETICS

Credits: 4 (4L+0T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **C1 + C2 : 50**
Exam. Duration: 2 Hrs **C3 : 50**

COURSE CONTENT:

UnitI :
Kinetics of complex reactions: Parallel, consecutive and reversible reactions. Determination of order of reaction. Arrhenius equation, energy of activation and its experimental determination. Simple collision theory-mechanism of bimolecular reaction. Lindemann's theory, Hinshelwood's theory for unimolecular reaction. Activated complex theory of reaction rate, classical thermodynamic treatment,
partition function, statistical thermodynamic treatment.

Unit II:
Kinetics of reactions in solution-Salt effects, effect of dielectric constant (single sphere and double sphere model), effect of pressure, volume and entropy change on reaction rates. Cage effect with an example. Kinetics of heterogeneous reactions -
Langmuir's theory, unimolecular and bimolecular surface reactions.

Unit-III:
Fast Reactions: Study of kinetics by flow techniques, equation for contact time, stopped flow and continuous flow methods. Relaxation method, equation for relaxation time, temperature jump and pressure jump methods, flash photolysis, pulse radiolysis and shock tube method.
Potential energy surface, theoretical calculation of energy of activation.
Chain reactions: Rice-Herzfeld mechanism for the thermal decomposition of acetaldehyde, Kinetics of explosive reactions, explosion limits (H2 and O2 reaction). Kinetics of autocatalytic and oscillatory chemical reactions, oscillatory chemical reaction of oxidation of malic acid by bromate ion catalyzed by Ce (III). Catalyzed and uncatalyzed reaction: Ru(III) catalyzed oxidation reaction of primaryamines by chloramine –T in HCl medium.

Unit IV:
Kinetic methods of analysis: Analytical uses of reaction rates relative basis of reaction rate methods, rate laws-first and second order reactions relative rates of reactions, analytical utility of first or pseudo first order reactions, determination of reaction rates, types of kinetic methods–differential methods, integral methods, multicomponent analysis-neglect of reaction of slow-reacting component,logarithmic extrapolation method, reaction rate method, applications-catalyzed reactions,measurement methods for catalyzed reactions, micro determination of inorganic species like iodide, selenium, cobalt & mercury in complex materials, determination of organic species, non-catalytic reactions. Applications of enzyme-catalysed reactions for the analysis of substrates-stoichiometric and rate methods, determination of urea, uric acid, blood glucose, galactose and blood alcohol, determination of enzymes-LDH, GOT and GPT.

A brief outline of IR, UV, NMR, Mass spectroscopy as tools for kinetic study.

References:

1. Chemical Kinetics by K.J. Laidler.
2. Chemical Kinetics –Frost and Pearson.
3. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C.Kuriacose.
4. Chemical Kinetics –L.K. Jain.
5. Chemical Kinetics –Benson.
6. Elements of Physical Chemistry –Lewis and Glasstone.
7. Physical Chemistry by P.W. Atkins, ELBS, 4th Edition, Oxford University Press (1990)
8. Kinetics in Analytical Chemistry – H. B. Mark and G. A. Rechnitz, Interscience Publishers, John Willey and Sons, New York.

MSE(C)-XII.5 : LAB VII - INORGANIC PRACTICAL – II
(Any ten of the following suggested experiments)

Credits : 2(0L+0T + 2P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2:50**
Exam. Duration: 4 Hrs	**C3:50**

COURSE CONTENT:

1. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
2. Separation and determination of chloride and bromide on an anion exchanger.
3. Thin layer chromatographic separation of amino acids.
4. Thin-layer chromatographic separation of nitro anilines on fluorescent sheets.
5. Determination of chloride concentration in water by capillary electrophoresis.
6. Analysis of artificial sweeteners and additives in beverages by HPLC.
7. Determination of caffeine in beverages by HPLC.
8. Determination of manganese in steel by extraction-free spectrophotometry and molybdenum in steel by extractive spectrophotometry.
9. Extractive spectrophotometric determination of lead or zinc.
10. Analysis of brackish water for chloride content by a) spectrophotometry (mercuric thiocyanate method), b) conductometry (silver nitrate) and c) potentiometry (silver nitrate).
11. Analysis of a ground water sample for sulphate by titrimetry (EDTA) and turbidimetry.
12. Conductometric titration of sodium acetate with HCl and NH4Cl with NaOH.
13. Determination of fluoride in drinking water/ground water by spectrophotometry (alizarin red lake method).
14. Analysis of a soil sample for
    a) calcium carbonate and organic carbon by titrimetry.
    b) calcium and magnesium by EDTA titration.
15. Analysis of a soil sample for
    a) Available phosphorus by spectrophotometry.
    b) Nitrate-nitrogen/nitrite nitrogen/ammonia nitrogen by spectrophotometry.
    c) sodium and potassium by flame photometry.
16. Analysis of blood for

a) cholesterol by spectrophotometry
b) bicarbonate by acid-base titration

References:

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall,Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Pharmaceutical Drug Analysis by Ashutoshkar, New Age International Publishers, New Delhi, 2005.
6. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
7. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
8. Practical Clinical Biochemistry, Harold Varley and Arnold. Hein mann, 4th edition.
9. Experiments on Water Pollution, D.I. Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
10. Experiments in Environmental Chemistry, P.D. Vowler and D.W. Counel, Pergamon Press, Oxford 1980.

MSE(C)- XII. 6 : LAB VIII - PHYSICAL CHEMISTRY PRACTICAL – II
(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P)	**Max.Marks :100**
Contact Hrs per week : 4	**C1 + C2:50**
Exam. Duration: 4 Hrs	**C3:50**

COURSE CONTENT:

1. Determination of thermodynamic parameters for the kinetics of decomposition of diacetone alcohol by NaOH.
2. Spectrophotometric kinetics of oxidation of indigocarmine by chloramine-T (CAT) (a) Determination of order of reaction w.r.t. [CAT] (b) Effect of pH and determination of order of reaction w.r.t. [H+].
3. Kinetic study on Ru(III) –catalysed reaction between primary amine and CAT (a) Determination of order of reaction w.r.t. [Ru(III)], (b) Determination of order of reaction w.r.t. [H+], (c) Determination of Ea and thermodynamic parameters.
4. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH3OH).
5. Study of photolysis of uranyl oxalate: (a) determination of intensity of light source (b) study of photocatalysis of oxalic acid.
6. Determination of rate for the photolysis of CAB solution.
7. Determination of half-life of 40K.
8. Study of salt effect on solubility and determination of activity coefficient.
9. Determination of pKa value of an indicator (bromophenol blue).
10. Spectrophotometric analysis of a mixture of (a) CuSO4 and K2CrO4.
11. Study of complex formation between ferric salt and salicylic acid.
12. Determination of half wave potential of metal ions in a mixture (Mn2+, Pb2+ and Cu2+).
13. Estimation of a metal ion in solution by polarographic method.
14. Amperometric titration of lead nitrate against potassium chromate/potassium dichromate.
15. Coulometric titrations - NaOH vs HCl.

References:

1. Practical Physical Chemistry – A.J. Findlay.
3. Experimental Physical Chemistry –F. Daniels et al.
4. Selected Experiments in Physical Chemistry – Latham.
5. Experiments in Physical Chemistry – James and Prichard.
6. Experiments in Physical Chemistry – Shoemaker.
7. Advanced Physico-Chemical Experiments –J. Rose.
8. Practical Physical Chemistry –S.R. Palit.
9. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
10. Experiments in Physical Chemistry – Palmer.
11. Experiments in Chemistry- D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
12. Experimental Physical Chemistry –Das. R.C. and Behera B, Tata McGraw Hill.

MSE(C)-XII.7 : RESEARCH IN CHEMISTRY EDUCATION

Credits: 3 (2L+1T+0P)	**Max.Marks :100**

Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Objectives:

The present research in Chemistry Education is concentrated around Using new methodologies, technology, learning tools and assessment techniques**.** The goal of this course is to present the contemporary perspectives in Research in Chemical Education and to find solutions to problems in class rooms from the reform initiative.

The student teacher will be able to:

- understand the current reform movements in Chemistry Education
- critically Examine the areas of research in Chemistry Education
- familiarize the Student teachers with the concept and methods in Action Research.
- encourage teachers to take up research as a measure of Professional Development

Unit I:Trends in Research in Chemical Education.

Diversity in Research; Areas of research; Transition from behaviorist to constructivist model; Developmental, experimental and correlation studies with examples; A comparison of Studies in India and other countries; Implications to classrooms; vision of Science Education Research- Policy Perspectives in India.

Unit II: Action Research and Investigatory Projects in Chemistry

Meaning, scope, some typical Action Research Studies; Steps involved and role of the teacher; as an indicator of professional growth. Planning Investigatory projects and studying its effectiveness in learning. Teacher as a reflective practitioner.

Unit III: Professional Development in Chemistry Education

Chemical Abstracts and Current Contents; Chemical Education Journals relating to school Education(School Science Review, Journal of Chemical Education, Journal of Research in Science Teaching, Chemistry Education, NCERT journals); Format of reporting in different journals; Online surfing and Internet browsing-Web resources in Chemical Education; Online journals, Virtual laboratories, Wikipedia, Patenting and copy right rule; Acknowledging the source.

Unit IV: Supporting Agencies for Researching Teachers

Role of National and state agencies in NCERT, RIEs, SCERT, ERIC, IASE in conducting In-service programmes,conferences, monitoring capacity building and evaluating the functions of them.; financing agencies for research in Chemistry Education; Seminars, conferences and paper presentations through in NSTA, Indian Chemical society, Indian Science Congress, NSTC, NCERT and other organizations; Teacher autonomy as a researcher

References:

1. N.Costa, L.Marques and R Kempa (2000), Science teachers' awareness of findings from education research. *Research in Science and Technology Education*,**18**,37-44
2. M.Stolk, A Bulte, O.De Jong, and A. Pilot (2005). Teaching concepts in contexts, designing a chemistry teacher course in a curriculum innovation. In Boersma, K. et.all... (Eds). Research and the quality of science education (in pres). Dordrech / Boston: Kluwer Academic publishers.
3. J.Gilbert, O.DeJong, R.Justi, D.Treagust, and J.Van Driel (2002). Research and development for the future of chemical education. In Gilbert. J...et.all. (Eds). Chemical Education: Towards Research-based practice (PP.391-408). Dordrech / Boston: Kluwer Academic Publishers.
4. Journal of Research in Science Teaching
5. School Science Review
6. Journal of Chemical Education
7. Chemistry Education
8. Home Pages on Web: NCERT, NCTS, ERIC, NSTA

****

UNIVERSITY OF MYSORE

REGIONAL INSTITUTE OF EDUCATION
[National Council of Educational Research and Training, New Delhi]

Regulations governing the Programme

1.0 Programme and Duration :

Integrated Programme of Teacher Education titled **'Master of Science Education' (Mathematics)** leading to the post-graduate degree**, M.Sc.Ed. (Mathematics).** The programme will be of six year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of 16 weeks of instruction excluding examination.

1.1 **Equivalence:**

The course content in the subjects, Physics, Chemistry and Mathematics in the first four years are equivalent to course content in the relevant subjects in the B.Sc. (PCM) Programme of the University of Mysore. The course content of the fifth and sixth years are equivalent to the M.Sc. Programme in Mathematics offered by the University of Mysore.

The course content related to Professional education are equivalent to the B.Ed. of University of Mysore and are as per the NCTE Regulations (2014).

In addition, in the last two years of the Programme, Professional Education components required for teaching of Mathematics at senior secondary level are also included. The composite degree, M.Sc.Ed., is thereby equivalent to B.Sc., B.Ed. and M.Sc. degrees of University of Mysore.

2.0 Eligibility for admissionto M.Sc.Ed.

2.1 Candidates seeking admission to the programme should have passed CMSE Senior Secondary examination/ Pre-University examination of Karnataka or an equivalent examination of any state or UT of the Republic of India with 45% marks in the aggregate. Relaxation up to 5% of marks is given to the SC/ST candidates.

2.2 Candidates should have passed the qualifying examination with the following combinations of subjects: Physics, Chemistry, Mathematics/Statistics.

2.3 Admission shall be made by selection on the basis of marks in the qualifying examination and performance in a specially designed national level test (Common Entrance Examination) conducted by the NCERT. It shall be governed by the admission policies of NCERT and the guidelines of the University of Mysore.

It will also be governed by the reservation policies of Govt. of India as prevalent at the time of admission.

3.0 Scheme of Instruction :

Details of courses, scheme of study, credit distribution pattern and method of evaluation, etc. are provided in Table 1.

From semesters I to VIII Courses of Study are organized under the following categories:

a) Core Courses
b) Ability Enhancement Courses
c) Discipline Specific Electives
d) Skill Enhancement Courses
e) Generic Courses
f) Professional Education Courses.

From semesters IX to XII, courses of study are classified under the following categories:

a) Core Courses
b) Professional Education Courses

3.1 Core Courses:

The Programme offers three majors, Physics, Chemistry and Mathematics. Each Major comprises of 6 core courses. The titles of courses in each major and their positions are given in Tables 14 & 15.

3.2 **Ability Enhancement Courses :**

This is mandatory for all students. Comprises of 4 courses, two each in a language of student's choice and two in English

a) Language: Any one of the following: Hindi/ Kannada/ Malayalam/ Tamil / Telugu
b) English

3.3 Discipline Specific Elective:

Total of six advanced courses, two in each Major Subject are offered in the VII and VIII semesters of the Programme.

3.4 Skill Enhancement Course:

Two courses are offered in the third and fourth semesters of the Programme. Students can choose any two courses of their choice, cutting across disciplines, from a pool of courses that are being offered in each subject area.

3.5. Generic Course:

Two courses of inter-disciplinary nature are offered in the first and eighth semesters of the programme.

3.6 Professional Education Courses:

In accordance with the NCTE regulations – 2014, the programme includes 23 courses which are positioned in the first 8 semesters. The requirements of the 16 week internship proposed by the NCTE, are met through three rigorous phases of School Attachment Programmes. The first two Phases are of 2 week duration each which will be organized in the Demonstration School and selected schools in Mysore. The longer duration, TEN weeks will be held in the third phase of School Attachment Programme, is primarily an internship in teaching Programme which will be organized in selected schools of NVS, Hyderabad Region or other schools.

An additional School attachment Programme is organized in the XI semester for a duration of 4 weeks. This will be organized in selected higher secondary schools where the student trainees will have a specialized internship in teaching experience at the higher secondary level.

4.0 Attendance

Each student has to attend a minimum of 7**5%** classes out of the classes conducted in each course. Failure to meet the minimum requirement renders disqualification from terminal examination and makes him/her ineligible for NCERT scholarship/ free ship. Such a student is deemed to have dropped the course and is not allowed to write the semester end examination (C3) of that course. He has to re-register for the course/s as and when they are offered by the institute.

5.0 Medium of Instruction:

The medium of instruction and examination is English.

6.0 Course Structure

TABLE 1: CREDIT BREAK-UP INTO B.SC., M.Sc. AND B.ED. COMPONENTS AND MODE OF EVALUATION

Semesters	Total Credits	Programme	Credits (Theory) (L)	Teaching hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Assessment C1+C2	Terminal Assessment C3)
I	24	B.Sc.	13	13	5	10	23	50	50
		B.Ed.	4	4	2	4	8	50	50
II	24	B.Sc.	13	13	5	10	23	50	50
		B.Ed.	4	4	2	4	8	50	50
III	23	B.Sc.	11	11	4	8	19	50	50
		B.Ed.	4	4	4	8	12	50	50
IV	23	B.Sc.	11	11	4	8	19	50	50
		B.Ed.	4	4	4	8	12	50	50
V	24	B.Sc.	9	9	3	6	15	50	50
		B.Ed.	7	7	5	10	17	50	50
VI	24	B.Sc.	9	9	3	6	15	50	50
		B.Ed.	6	6	6	12	18	50	50
VII	17	B.Sc.	3	3	6	12	15	50	50
	12*	B.Ed.	4	4	16**	8	8	50	50
VIII	21	B.Sc.	5	5	6	12	17	50	50
		B.Ed.	6	6	4	8	14	50	50
IX	23	M.Sc	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
X	23	M.Sc.	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
XI	20	M.Sc.	16	16	4	8	24	50	50
	4*	PE			4**	4	4	50	50
XII	23	M.Sc.	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
Total	**285**		183	183	102	176	359		

*internship ** includes internship credits

L : Lectures: 1 credit =1hr/week x 16 weeks

T :Tutorial/ 1 credit = 2 hr/week x 16 weeks

P : Practicum/practical = 2 hr/week x 16 weeks

V: Credit value of a course is L+T+P

Tables 2 to 13: Detailed Course Structure for M.Sc.Ed.(Mathematics)

Total Credits = 285; B.Sc.Component = 112; M.Sc. 80; B.Ed. Component =80+13

TABLE 2: Semester I (Credits: B.Sc.12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1A Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2A Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3A Mathematics	3	3	1	2	5	50%	50%
4	3	AEC 1A Language H/K/M/Tam/Tel	2	2	1	2	4	50%	50%
5	3	AEC 2A English	2	2	1	2	4	50%	50%
6	4	Language across the curriculum	3	3	1	2	5	50%	50%
7	2	Environmental Education	1	1	1	2	3	50%	50%
Total	**24**		**17**	**17**	**7**	**14**	**31**	**50%**	**50%**

Note:
Core Courses 1A, 2A & 3A – refer to the major subjects; A refers to the First course in each major; from Sem II to VI, papers in core courses are designated B, C, D, E & F.
AEC – Ability Enhancement Course
GE- Generic Elective

TABLE 3: Semester II (Credits: B.Sc. 12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1B Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2B Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3B Mathematics	3	3	1	2	5	50%	50%
4	3	AEC 1B Language H/K/M/Tam/Tel	2	2	1	2	4	50%	50%
5	3	AEC 2 B English	2	2	1	2	4	50%	50%
6	4	Contemporary Indian Education	3	3	1	2	5	50%	50%
7	2	Yoga Edu., self-understanding & development	1	1	1	2	3	50%	50%
Total	24		17	17	7	14	31		

TABLE 4: Semester III (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1C Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2C Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3C Mathematics	3	3	1	2	5	50%	50%
4	3	Skill Enhancement Course 1	2	2	1	2	4	50%	50%
5	4	Childhood & Growing up	3	3	1	2	5	50%	50%
6	2	Gender School & Society	1	1	1	2	3	50%	50%
7	2	School Attachment Programme 1	0	0	2	4	3 weeks	50%	50%
Total	23		15	15	8	16	31		

*** SEC 1 - Skill Enhancement Course 1 –** Each student will select any one from a list of courses offered.

TABLE 5: Semester IV (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessmet C3
1	4	Core Course1D Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2D Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3D Mathematics	3	3	1	2	5	50%	50%
4	3	*Skill Enhancement Course 2	2	2	1	2	4	50%	50%
5	4	Learning & Teaching	3	3	1	2	5	50%	50%
6	2	Drama & Art Education	1	1	1	2	3	50%	50%
7	2	School Attachment Programme 2	0	0	2	4	3 weeks	50%	50%
Total	23		15	15	8	16	31		

*** SEC 2 - Skill Enhancement Course 2 –** Each student will select any one from among the courses offered.

TABLE 6: Semester V (Credits: B.Sc. 12; B.Ed. 12; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1E Physics	3	3	1	2	5	50%	50%
2	4	Core Course2E Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3E Mathematics	3	3	1	2	5	50%	50%
4	4	Assessment For Learning	3	3	1	2	5	50%	50%
5	4	Pedagogy of Physical Sciences	2	2	2	4	6	50%	50%
6	4	Pedagogy of Maths.	2	2	2	4	6	50%	50%
Total	24		16	16	8	16	32		

TABLE 7: Semester VI (Credits: B.Sc. 12; B.Ed. 12; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	CoreCourse1F Physics	3	3	1	2	5	50%	50%
2	4	Core Course2F Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3F Mathematics	3	3	1	2	5	50%	50%
4	4	Critical Under-standing Of ICT	2	2	2	4	6	50%	50%
5	4	Pedagogy of Physical Sciences	2	2	2	4	6	50%	50%
6	4	Pedagogy of Maths	2	2	2	4	6	50%	50%
Total	**24**		**15**	**15**	**9**	**18**	**33**		

TABLE 8: Semester VII*(Credits: DSE 9; B.Ed. 20; Total 29**)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	3	DSE 1 A Physics	1	1	1+1	2+2	5	50%	50%
2	3	DSE 2 A Chemistry	1	1	1+1	2+2	5	50%	50%
3	3	DSE 3 A Mathematics	1	1	2	4	5	50%	50%
4	4	Creating an Inclusive School	2	2	2	4	6	50%	50%
5	2	Health & Physical Education	1	1	1	2	3	50%	50%
6	2	Reading & Reflections On Text	1	1	1	2	3	50%	50%
7*	6	Internship in School Subject 1 : Physical Sciences	0	0	6		10 weeks	50%	50%
	6	Internship in School Subject 2 : Mathematics	0	0	6			50%	50%
Total	**29**		**7**	**7**	**22**	**20**	**27**		

*Semester duration 24 weeks; Instructional duration -14 weeks; Engagement in field -10 weeks:

**includes Internship 12 credits; DSE – Discipline Specific Elective

TABLE 9: Semester VIII (Credits: DSE 9; GE 2; B.Ed. 10; Total 21)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	3	DSE 1 B Physics	1	1	1+1	2+2	5	50%	50%
2	3	DSE 2 B Chemistry	1	1	1+1	2+2	5	50%	50%
3	3	DSE 3 B Mathematics	1	1	2	4	5	50%	50%
4	2	GE 2 Indian Const. & Human Rights	2	2	0	0	2	50%	50%
5	4	Knowledge & Curriculum	2	2	2	4	6	50%	50%
6	4	Guidance & Counseling	3	3	1	2	5	50%	50%
7	2	Value & Peace Education	1	1	1	2	3	50%	50%
Total	**21**		**11**	**11**	**10**	**20**	**31**		

TABLE 10: Semester IX (Credits: M.Sc. 20: Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	5	Core Maths 1	4	4	1	2	6	50%	50%
2	5	Core Maths 2	4	4	1	2	6	50%	50%
3	5	Core Maths 3	4	4	1	2	6	50%	50%
4	5	Core Maths 4	4	4	1	2	6	50%	50%
5	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 11 : Semester X (Credits: M.Sc. 20 Prof. Edu. 3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	5	Core Maths 5	4	4	1	2	6	50%	50%
2	5	Core Maths 6	4	4	1	2	6	50%	50%
3	5	Core Maths 7	4	4	1	2	6	50%	50%
4	5	Core Maths 8	4	4	1	2	6	50%	50%
5	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 12: Semester XI (Credits: M.Sc. 20 Prof. Edu. 4; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	5	Core Maths 9	4	4	1	2	6	50%	50%
2	5	Core Maths 10	4	4	1	2	6	50%	50%
3	5	Core Maths 11	4	4	1	2	6	50%	50%
4	5	Core Maths 12	4	4	1	2	6	50%	50%
5	4	Professional Education – Internship	0	0	4	-	4 weeks	50%	50%
Total	**24**		**16**	**16**	**8**	**8**	**24**		

TABLE 13: Semester XII (Credits: M.Sc. 20 ; Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	5	Core Maths 13	4	4	1	2	6	50%	50%
2	5	Core Maths 14	4	4	1	2	6	50%	50%
3	5	Core Maths 15	4	4	1	2	6	50%	50%
4	5	Core Maths 16	4	4	1	2	6	50%	50%
5	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 14: PANORAMA OF COURSES IN THE EIGHT-SEMESTERS

Sl.No.	COURSE	CREDITS (L+T+P)								Credits	Total Credits In Prog.	Total Contact Hours per week (×16)
		I	II	III	IV	V	VI	VII	VIII			
	CORE COURSES:											
1	Physics	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24	30
2	Chemistry	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24	30
3	Maths	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	--	--	18+0+6	24	30
	ABILITY ENHANCEMENT COURSES											
1	Language H/K/M/Tam/Tel	2+1+0	2+1+0	--	--	--	--	--	--	4+2+0	6	8
2	English	2+1+0	2+1+0							4+2+0	6	**8**
	SKILL ENHANCEMENT COURSES											
1	Courses 1 & 2	--	--	2+0+1	2+0+1	--	--	--	--	4+0+2	6	8
	DISCIPLINE SPECIFIC ELECTIVE											
1	Physics							1+1+1	1+1+1	2+2+2	6	10
2	Chemistry							1+1+1	1+1+1	2+2+2	6	10
3	Maths							1+1+1	1+1+1	**2+2+2**	**6**	**10**
	GENERIC ELECTIVE											
1	Environmental Education	1+1+0								1+1+0	2	**3**
2.	Indian Constitution & Human Rights	1+1+0								1+1+0	2	3
	PROFESSIONAL EDUCATION COURSES											
1	Language Across Curriculum	3+1+0								3+1+0	4	5
2	Contemporary Indian Education		3+1+0							3+1+0	4	5
3	Yoga Edu., self-understanding & development		1+0+1							1+0+1	2	3

4	Childhood &Growing up			3+1+0						3+1+0	4	5
5	Gender School & Society.			1+1+0						1+1+0	2	3
6*	School Attachment Programme 1			0+0+2						0+0+2	4	3 weeks
7	Learning & Teaching				3+1+0					3+1+0	4	5
8	Drama & Art Education				1+1+0					1+1+0	2	3
9*	School Attachment Programme 2				0+0+2					0+0+2	4	3 weeks
10	Assessment for Learning					3+1+0				3+1+0	4	5
11	Pedagogy of Physical Science					2+2+0				2+2+0	4	6
12	Pedagogy of Maths					2+2+0				2+2+0	4	6
13	Critical Under-standing of ICT						2+2+0			2+2+0	4	6
14	Pedagogy of Physical Science						2+2+0			2+2+0	4	6
15	Pedagogy ofMaths.						2+2+0			2+2+0	4	6
16	Creating an inclusive school							2+2+0		2+2+0	4	6
17	Health & Physical Education							1+0+1		1+0+1	2	3
18	Reading & reflection on text							1+1+0		1+1+0	2	3
19*	Internship in School Subject 1: Physical Science							0+0+6		0+0+6	6	10 Weeks
20*	Internship in School Subject 2: Mathematics							0+0+6		0+0+6	6	
21	Knowledge & Curriculum								2+2+0	2+2+0	4	6
22	Guidance & Counselling								3+1+0	3+1+0	4	5
23	Value & Peace Education								1+1+0	1+1+0	2	3

***=** courses which do not have C3 Theory examination

TABLE 15: Semesters IX to XII

SL. NO.	**COURSE**	NO. OF CREDITS PER WEEK				**TOTAL NO. OF CREDITS**	**TOTAL NO. OF CONTACT HOURS**
		IX L+T+P	X L+T+P	XI L+T+P	XII L+T+P		
	Core papers						
1	Abstract Algebra	4 + 1 +0				5	6
2	Linear Algebra	4 + 1 +0				5	6
3	Analysis I	4 + 1 +0				5	6
4	Discrete Mathematics	4 + 1 +0				5	6
5	Analysis II		4 + 1 +0			5	6
6	Complex Analysis I		4 + 1 +0			5	6
7	Theory of Numbers		4 + 1 +0			5	6
8	Topology I		4 + 1 +0			5	6
9	Elements of Functional Analysis			4 + 1 +0		5	6
10	Theory of Ordinary and Partial differential equations			4 + 1 +0		5	6

11	Complex Analysis II			4 + 1 +0		5	6
12	Topology II			4 + 1 +0		5	6
13	Commutative Algebra				4 + 1 +0	5	6
14	Measure Theory				4 + 1 +0	5	6
15	Algorithms And Computation				4 + 1 +0	5	6
16	Differential Geometry				4 + 1 +0	5	6
	Sub-total					**80**	**96**
	PROFESSIONAL EDUCATION						
17	Foundations of higher secondary education	2 + 1+0				3	4
18	Teaching Of Mathematics		2 + 1+0			3	4
19	Internship Programme 2 (senior secondary level)			0+0+4		4	4 Weeks
20	Research in Mathematics Education				2 + 1+0	3	4
	Sub-Total					**13**	**16**
	GRAND TOTAL					**93**	**112**

L : Lectures: 1 credit =1hr/week x 16 weeks
T : Tutorial: 1 credit = 2 hr/week x 16 weeks
P : Practicum/practical = 2 hr/week x 16 weeks
V: Credit value of a course is L+T+P

TABLE 16 : SUBJECTS AND TITLES OF COURSES IN THE PROGRAMME

SEMESTER	COURSE	CODE	SUBJECT	TITLE
FIRST	**Core course 1A**	MSE I.1	Physics	Mechanics
	Core Course 2A	MSE I.2	Chemistry	Atomic Structure and Bonding
	Core Course 3A	MSE I.3	Mathematics	Calculus – I and Matrices
	AEC 1A	MSE I.4A MSE I.4B MSE I.4C MSE I.4D MSE I.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2A	MSE I.5	English	
	GE 1	MSE I.6		Environmental Education
	Professional Education	MSE I.7		Language Across Curriculum
SECOND	**Core course 1B**	MSE II.1	Physics	Elasticity, Waves, Heat and Thermodynamics
	Core Course 2B	MSE II.2	Chemistry	States of Matter and Nuclear Chemistry
	Core Course 3B	MSE II.3	Mathematics	Calculus – II , Analytical Geometry and Number Theory
	AEC 1B	MSE II.4A MSE II.4B MSE II.4C MSE II.4D MSE II.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu

	AEC 2B	MSE II.5	English	
	Professional Education	MSE II.6		Contemporary Indian Education
		MSE II.7		Yoga Edu., self-understanding & development
THIRD	**Core course 1C**	MSE III.1	Physics	Electricity and Electromagnetism
	Core Course 2C	MSE III.2	Chemistry	Organic Chemistry – I
	Core Course 3C	MSE III.3	Mathematics	Real Analysis
	SEC 1	MSE III.4A MSE III.4B MSE III.4C	Physics Chemistry Mathematics	Basic Instrumentation Skills Industrial Chemicals and Environment Combinatorics, Statistics & Basic Probability
	Professional Education	MSE III.5		Childhood &Growing up
		MSE III.6		Gender School & Society
		MSE III.7		School Attachment Programme 1
FOURTH	**Core course 1D**	MSE IV.1A	Physics	Optics
	Core Course 2D	MSE IV.2	Chemistry	Thermodynamics, Equilibrium and Solutions
	Core Course 3D	MSE IV.3	Mathematics	Differential Equations
	SEC 2	MSE IV.4 MSE IV.4C MSE IV.4D MSE IV.4E	Physics Chemistry Mathematics	Computational Physics Industrial Inorganic Materials Data Handling
	Professional Education	MSE IV.5		Learning&Teaching
		MSE IV.6		Drama & Art Education
		MSE IV.7		School Attachment Programme 2
FIFTH	**Core course 1E**	MSE V.1	Physics	Atomic and Molecular Physics
	Core Course 2E	MSE V.2	Chemistry	Transition Elements, Coordination Compounds and Chemical Kinetics
	Core Course 3E	MSE V.3	Mathematics	Multivariate Calculus and Vector Calculus
	Professional Education	MSE V.4		Assessment For Learning
		MSE V.5		Pedagogy Of Physical Sciences
		MSE V.6		Pedagogy of Mathematics
SIXTH	**Core course 1F**	MSE VI.1	Physics	Classical and Quantum Mechanics and Special Theory of Relativity
	Core Course 2F	MSE VI.2	Chemistry	Organic Chemistry II
	Core Course 3F	MSE VI.3	Mathematics	Groups and Rings
	Professional Education	MSE VI.4		Critical Understanding of ICT
		MSE VI.5		Pedagogy of Physical Science
		MSE VI.6		Pedagogy of Mathematics

SEVENTH	**Discipline Specific Elective 1**	MSE VII.1	Physics	Nuclear and Particle Physics
		MSE VII.2	Chemistry	Electrochemistry and Photochemistry
		MSE VII.3	Mathematics	Linear Algebra
	Professional Education	MSE VII.4		Creating an inclusive school
		MSE VII.5		Health & Physical Education
		MSE VII.6		Reading & reflection on text
		MSE VII.7A		Internship in School Subject 1 : Physical Science
		MSE VII.7B		Internship in School Subject 2: Mathematics
EIGHTH	**Discipline Specific Elective 2**	MSE VIII.1	Physics	Solid State Physics
		MSE VIII.2	Chemistry	Spectroscopy, Natural Products and Heterocyclics
		MSE VIII.3	Mathematics	Complex Analysis and Numerical Analysis
	Generic Elective 2	MSE VIII.4		Indian Constitution and Human Rights
	Professional Education	MSE VIII.5		Knowledge &Curriculum
		MSE VIII.6		Guidance & Counselling
		MSE VIII.7		Value & Peace Education

Semesters IX to XII:

NINTH	**Core Mathematics**	MSE(M)-IX.1	Abstract Algebra
		MSE(M)-IX.2	Linear Algebra
		MSE(M)-IX.3	Analysis I
		MSE(M)-IX.4	Discrete Mathematics
	Professional Education	MSE(M)-IX.5	Foundations of Higher Secondary Education
TENTH	**Core Mathematics**	MSE(M)-X.1	Analysis II
		MSE(M)-X.2	Complex Analysis I
		MSE(M)-X.3	Theory of Numbers
		MSE(M)-X.4	Topology I
	Professional Education	MSE(M)-X.5	Teaching of Mathematics
ELEVENTH	**Core Mathematics**	MSE(M)-XI.1	Elements of Functional Analysis
		MSE(M)-XI.2	Theory of Ordinary and Partial differential equations
		MSE(M)-XI.3	Complex Analysis II
		MSE(M)-XI.4	Topology II
	Professional Education	MSE(M)-XI.5	Internship Programme 2 (Senior Secondary Level)
TWELFTH	**Core Mathematics**	MSE(M)-XII.1	Commutative Algebra
		MSE(M)-XII.2	Measure Theory
		MSE(M)-XII.3	Algorithms And Computation
		MSE(M)-XII.4	Differential Geometry
	Professional Education	MSE(M)-XII.5	Research in Mathematics Education

7.0 Change to another programme

Candidates admitted to M.Sc.Ed.(Mathematics) programme have the option of changing to M.Sc.Ed. Physics or Chemistry programme in the beginning of IX semester, after successful completion of first eight semesters without dropping any course, and subject to conditions laid down by the Academic Commmittee constituted for the purpose.

8.0 Scheme of Examination

8.1 There shall be a terminal (C3) Examination conducted by the University of Mysore at the end of each semester in Theory and/or Practical as the case may be.

8.2 Detailed Scheme of Examination along with course titles and breakup of marks is given below.

Scheme of Evaluation:

- ❖ All the courses will be evaluated for a total of 100 marks in the C1, C2 and C3 pattern.
- ❖ C1= 25; C2 = 25 and C3 = 50 will be followed uniformly for all the courses.
- ❖ In Courses with both theory and practicals, Theory C3 = 50 & Practical C3 =50
- ❖ Courses without a C3 theory are separately indicated in the following table

X is the marks scored out of 50 in C_3 in Theory

Y is the marks scored out of 50 in C_3 in Practical

Z is the marks scored out of 50 in C_3 in Tutorial

8.3 Duration of semester end examination for all theory courses will be 2 hours and for practical examination, it is 3 hours.

Each theory paper comprises of 9 questions of 10 marks each. Each Unit will have two questions with internal choice. Question 9 will consist of objective type questions drawn from all the units.

9.0 Question paper setting, valuation, declaration of results, challenge valuation and all other examination related issues will be as per the rules and procedures followed by the University of Mysore.

9.1 Question paper setting for C_3.

(i) There shall be a separate Board of Examiners for each subject approved by the University, for preparing, scrutinizing and approving the question papers and scheme of valuation for use in the examination/s.

(ii) The question papers shall be drawn from the question bank, through a computer.

(III) For Semesters IX to XII, a separate PG board approved by the University will be constituted. All question papers will be set by the internal examiner but valuation shall be done only by external examiners.

9.2 Coding of Answer Scripts:

Before valuation, the answer scripts shall be coded using false numbers. For each paper code separate false number shall be given.

9.3 Valuation and Classification of Successful Candidates

All papers including practicals will be valued by an internal examiner and there will be single valuation.

The performance of a student in a course will be assessed for a maximum of 100 marks as explained below.

A semester is divided into three discrete components namely C_1, C_2 and C_3.

The evaluation of the first component C_1 will be done during the first half of the semester while the first the I and II units of the syllabus is covered. This will have a weightage of 25%. This will be consolidated during the 8^{th} week of the semester.

The evaluation of the second component C_2 will be done during the second half of the semester when units III and IV of the syllabus is covered. This will have a weightage of 25%. This will be consolidated during the 16^{th} week of the semester. In general C_1, and C_2 should be evaluated through Test/seminar/dissertation/presentation/assignment.

Between the 18^{th} and 20^{th} week of the semester, the semester end examination will be conducted by the University and this forms the third component of evaluation C_3 with weightage of 50%.

If a candidate has not scored at-least 30% in C_1 and C_2 put together, he/she is **not allowed** to appear for C_3.

It should be noted that evaluated papers/assignments of C_1 and C_2 of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.

For the courses that has both Theory and Practical components, as part of C_3, both theory and practical examinations shall be conducted for 50 marks each.

The final marks of a course, M of C_3,will be computed as per the following table :

	Probable Credit Distribution patterns	**Formula for calculating M**
1.	L : T : P	M = ((L+T)*X+ (P*Y)) / (L+T+P))
2.	L : T : P = 0	X
3.	L : T = 0 : P	(L*X + P*Y) / (L+P)
4.	L = 0 : T : P	Y
5.	L : T = 0 : P = 0	X
6.	L = 0 : T = 0 : P	Y
7.	L = 0 : T : P = 0	Z

Where,
X is the marks scored out of 50 in C_3 in Theory
Y is the marks scored out of 50 in C_3 in Practical
Z is the marks scored out of 50 in C_3 in Tutorial

The total marks in a course is $P = C_1 + C_2 + M$ (after rounding to nearest integer. The grade (G) and grade point (G.P) will be calculated as follows where V is the credit value of the course.

P	G	GP = V × G
90 – 100	10	V × 10
80 – 89	9	V × 9
70 – 79	8	V × 8
60 – 69	7	V× 7
50 – 59	6	V × 6
40 – 49	5	V × 5
30 – 39	4	V ×4
0 -29	0	V × 0

If a candidate scores in **$C_1 + C_2 \geq 30\%$, $M \geq 30\%$M and $G \geq 5$** in a course, then he is considered to be successful in that course.

After successful completion of the required number of credits, then the overall cumulative grade point average (CGPA) of a candidate is calculated using the formula CGPA = ΣGP / Total number of credits and the class is declared as follows :

	FGP	
CGPA	Numerical Index	Qualitative Index
$4 \leq$ CGPA < 5	5	Second Class
$5 \leq$ CGPA < 6	6	
$6 \leq$ CGPA < 7	7	First Class
$7 \leq$ CGPA < 8	8	
$8 \leq$ CGPA < 9	9	Distinction
$9 \leq$ CGPA≤ 10	10	

Overall percentage = 10 * CGPA or is said to be 50% in case CGPA < 5.

However, if **$C_1 + C_2 \geq 30\%$, $M \geq 30\%$ and with grade $G = 4$,** then a candidate has three options namely conditional success or make up of a course or dropping a course.

A. **Conditional Success**: A candidate is said to be successful conditionally in a course if his score in $C_1 + C_2 \geq 30\%$, $M \geq 30\%$ and grade $G = 4$. But this benefit will be available upto a maximum 48 credits for the entire programme of M.Sc.Ed. of 6 years. The candidate has to exercise this option within 10 days from the date of notification of results.

B. **Make Up of a Course**: Under the following circumstances, a candidate can have option to choose MAKE-UP OPTION for C_3:

1. scores $\geq 30\%$ in $C_1 + C_2$ and $M < 30\%$
2. scores $\geq 30\%$ in $C_1 + C_2$; $M \geq 30\%$ but with grade $G = 4$

The candidate has to exercise this option within 10 days from the date of notification of results. Once he has chosen the option he has to write the examination which will be conducted within 25 days from the date of notification of results or as directed by the University. There can be two or more examinations on the same day and they may be held on Saturdays and Sundays also.

If the candidate is unsuccessful in make up, also then he/she is deemed to have withdrawn / dropped the course.

C. **Dropping a Course**

Under the following circumstances a candidate is said to have DROPPED a course,
If the candidate :

1. fails to put in 75% attendance in a course,
2. decides to discontinue/ withdraw from the course,
3. scores less than 30% in $C_1 + C_2$ together,

4. scores in
   i) $C_1 + C_2$ is $\geq$ 30% and M < 30% or
   ii) $C_1 + C_2$ is $\geq$ 30%, M $\geq$ 30% and Grade G = 4 and exercises option to drop the course within 10 days from the date of notification of final results,
5. is unsuccessful in the MAKE-UP examination.

A candidate who has dropped a course has to **re-register** for the course when the course is offered again by the Institute.

9.4 Each student can go with a normal pace of 24 credits per semester. However, he/she has provision to go with a slow pace of 20 credits per semester or an accelerated pace of 28 credits per semester. In any case it should not exceed 28 credits in a semester including re-registered courses.

9.5 The tuition fee and the examination fee of a semester will be in accordance with the number of credits registered by each student in that semester.

9.6 The student may avail a maximum of two blank semesters in one stretch. However, he has to pay a nominal fee for maintaining a semester blank to the institution.

9.7 The Institute shall follow the CBCS guidelines of the University and its amendments thereof provided they are beneficial to the system.

10.0 Provision for Appeal

A candidate, if dissatisfied with the grades that he/she has got with a feeling that he/she is unnecessarily penalized can approach the grievance cell with the written submission together with all facts and all the assignments, test papers etc. which were evaluated. He/She can do so before the semester-end examination (based on 2 continuous assessment components already completed) or after the semester-end examination. The grievance cell is empowered to review the grades if the case is genuine and is also empowered to penalize the candidate if his/her submission is found to be baseless and unduly motivated. This Cell may recommend to take disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the Grievance Cell is final.

The Registrar (Evaluation) will be the Chairman and Convenor of the Grievance Cell. The composition of the Grievance Cell is as follows:

1. The Principal
2. The Dean of Instruction
3. Heads of DESM, DESSH and I/c Sections. An external expert from the University of Mysore in the concerned subject.
4. The Registrar (Evaluation) ex-officio Chairman/Convenor.
5. Additional lady faculty member (in case not covered by 1,2,3,4,6 and 7).
6. Additional faculty member from a minority community (in case not covered by 1,2,3,4,5 and 7) and

The appropriate fee as fixed by the University shall be collected from the candidate who goes for an appeal to the Grievance Cell.

11.0 Marks Cards:

11.1 The marks card shall be laminated after affixing the hologram only when a candidate passes all the courses/papers of a particular semester.

12.0 Barring of Simultaneous Study

12.1 No student admitted to a degree course in a college under the jurisdiction of this university, shall be permitted to study simultaneously in any other course leading to a degree (regular, evening, morning) offered by this/any other university.

12.2 If a candidate gets admitted to more than one course, the university shall without giving prior notice cancel his/her admission to all the courses to which he/she has joined.

13.0 Miscellaneous:

13.1 These revised regulations will apply to the candidates admitted for the academic year 2016-17 and onwards for the course mentioned in Regulation No.1.0 above.

13.2 Other regulations not specifically mentioned above are as per the Regulations of the University as applicable from time to time.

13.3 Any other issue not envisaged above, shall be resolved by the Vice-Chancellor in consultation with the appropriate Bodies of the University, which shall be final and binding.

SYLLABUS

FIRST SEMESTER

Core course 1A: Physics

MSE I.1 :MECHANICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- The students will be able to understand Newtonian mechanics and apply its principles to explain natural physical phenomena.
- The teacher will be able to enable the students to identify and modify alternative conceptions in the domains of Newtonian Mechanics.

COURSE CONTENT:

Unit I

Vectors: Vector and scalar products. Scalar triple product and Vector triple product. Differentiation of a vector with respect to scalars (such as time). Gradient, Divergence, Curl- definitions, physical meaning, and operations, Laplacian, Line, Surface, and Volume integrals. Gauss', Stokes, and Greens theorem.
Ordinary Differential Equations: 1^{st} order homogeneous differential equations. 2^{nd} order homogeneous differential equations with constant coefficients.

Unit II

Laws of Motion: Newton's Laws of motion. Frames of reference, inertial and non inertial, pseudo forces, Galilean transformations; Galilean invariance, Dynamics of a system of particles. Centre of Mass.
Momentum and Energy: Principle of conservation of momentum for a system of particle, Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Conservation of energy. Momentum of variable-mass system: motion of rocket.

Unit III

Rotational Motion: Angular velocity and angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum.
Gravitation: Newton's Law of Gravitation. Central force and motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). two-body central force problem and reduction to the equivalent one body problem, inverse square law potential and different forms of orbit, Kepler's laws of planetary motion. Satellitein circular orbit and applications. Geosynchronous orbits. Weightlessness.

Unit IV

Oscillations: Simple Harmonic Motion (Basic idea), Differential equation of SHM and its solutions (simple pendulum, compound pendulum, loaded spring), Kinetic and Potential Energy, Total Energy and their time averages. Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats), Lissajous figures with equal an unequal frequency and their uses. Damped vibrations. Forced vibrations.

Reference Books:

1. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons Inc.
2. Harris Benson,University Physics, Revised Edition, John Wiley and Sons, Inc.
3. FW Sears, MW Zemansky and HD Young,University Physics, 1986. Addison-Wesley.
4. K. R. Symon, Mechanics, Addison Wesley, 1971.
5. Basudeb Bhattacharya,Engineering Mechanics, 2nd edn., 2015, Oxford University Press
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
7. Y. R. G. Takwale and P. S. Puranik,Introduction to classical mechanics, Tata McGraw Hill.
8. Charles Kittel et. al., Mechanics Berkeley Physics course, 2007, Tata McGraw-Hill.
9. H C Verma,Concepts of Physics, Bharati Bhawan; Revised Reprint 2015 edition

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following)

1. Study of the motion of an air bubble.
2. Study of the motion of a freely falling body.
3. Study of the acceleration of a body subjected to different unbalanced forces.
4. Study of accelerations of different masses under a constant unbalanced force.
5. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
6. Study of conservation of momentum and energy of a collision in a plane.
7. Conservation of momentum in a mechanical explosion.
8. To study the relation between length and time period of a simple pendulum.
9. To study the relation between force and extension produced in a stretched spring.

10. Study of the variation of the time period of a bar pendulum with different length and determination of 'g' at the given place.
11. Study of the dependence of the period of oscillation of a spring-mass system on mass
12. The Spiral spring: Determination of the acceleration due to gravity by the graphical method.
13. Determination of moment of Inertia, mass and density of the flywheel.
14. Moment of inertia of a disc supported on strings.
15. The moment of inertia of a wheel and axle.
16. The Bifilar Suspension

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7thEdition, Cengage Learning, 2009.

Core Course 2A- Chemistry

MSEI.2 :ATOMIC STRUCTURE AND BONDING

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

- To understand and appreciate the development of various atomic theories
- To develop an understanding of principles of Atomic structure
- To justify the need for quantum mechanical structure of atoms
- To develop an understanding of the periodic trends, preparation and uses of s- and p-block
- elements and their compounds in terms of structure and bonding
- To understand the nature of bonding and to predict the shapes of molecules
- To construct MO energy level diagrams and predict the properties of molecules

COURSE CONTENT:

Unit I: Atomic Structure

History of an atom. List the Characteristics of Black-body radiation- Planck's radiation law, photoelectric effect, Compton effect and their explanation using quantum theory. Bohr's model of hydrogen atom and its limitations. Summarise the evidence for the wave nature of matter. State de Broglie hypothesis and Heisenberg uncertainty principle.

Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of ψ and ψ^2, postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals , Multi-electron atoms, Aufbau and Pauli exclusion principles and Hund's multiplicity rule- Electronic configurations of the elements(s,p,d blocks), effective nuclear charge.Explanation for the stability of completely filled and half filled shells with examples. Screening effect: Slaters' rule, Energy level diagram for multi –electron atoms.

Unit II: Periodic Properties and s -and p-Block Elements

Atomic radii, Covalent radii, ionic radii and Vander waal's radii- definition with explanation with examples in a group and period Explanation of oMSErved trwends.Comparision of the ionic size of atoms with the corresponding anion and cation. Variatioin of ionic radii in isoelectronic ions. Additive nature of covalent radii.
Ionization energy: Definition,the factors influencing ionization energy, variation in a group and period. Effect of the size and electronic configuration on successive ionization energies.

Electron affinity : Definition, variation in a group and in a period (oMSErved trends in the values to be accounted for).
Electronegativity: Definition, variation in a group and in a period (oMSErved trends in the values to be accounted for), calculation of electronegativity by Pauling and Mulliken methods.
s- and p-block elements: Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls –salient features of hydrides, Action of Liquid Ammonia , Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium.
To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Unit III: Chemical Bonding - I
Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule, Metallic bond-free electron, valence bond and band theories. Weak interactions – Hydrogen bonding, van der Waals forces. Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICl_2, and H_2O.

Unit IV: Molecular Orbital theory, boranes and Xenon compounds

Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO – H_2^+ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ^*, π, π^* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. Models.

Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and NO) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, silicates (structural principle), - Chemistry of xenon: structure and bonding in xenon compounds.

References :

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee , fifth Edition,Wiley Publishers
3. An Introduction to Inorganic chemistry Mackay and Mackay
4. Advanced Inorganic Chemistry Satya Prakash, G.D.Tuli,S.K.Basu,R.D.Madan
5. S.Chand & Company Pvt. Ltd.Principles of Physical Chemistry Puri, Sharma,Pathania 47th Edition,Vishal Publishing Co.
6. Text book of Inorganic Chemistry P.L. Soni Sultan Chand & sons.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To develop the concept of good lab practices including safety, glasswares handling,
- chemicals handling, chemical/glassware waste management, error analysis, note
- book maintenance
- To strenghten the concepts of mole and stoichiometry
- To develop analytical skills of volumetric technique

COURSE CONTENT :

1. Calibration and handling of balances, pipette, burette, and standard flask. Basic principles underlying the preparation of solutions, knowledge of primary and standard substances, Indicators used intitrations, their working principles range and their uses. Concept of Molarity, Normality, Molality, Equivalent weight and related calculations.
2. Stoichiometry of neutralization reactions of Sulphuric, Hydrochloric and Nitric acid using sodium hydroxide solution.

3. Preparation of standard Sodium Carbonate solution, Standardisation of Hydrochloric acid andestimation of Sodium hydroxide present in the given solution.
4. Estimation of carbonate and hydroxide present in a mixture.
5. Estimation of Carbonate and Bicarbonate in a given mixture by double indicator method.
6. Estimation of ammonium chloride in a given solution by back titration
7. Estimation of oxalic acid present in the given solution using sodium hydroxide solution and purecrystals of potassium hydrogen phthalate.
8. Estimation of Ferrous ammonium sulphate present in the given solution using potassium
   permanganate solution and pure crystals of oxalic acid.
9. Estimation of iron(II) using Potassium dichromate with internal and external indicators.
10. Estimation of ferrous and ferric ions in a given mixture using potassium dichromate solution.
11. Standardisation of Sodium thiosulphate using potassium dichromate and estimation of copper by Iodometry.
12. Estimation of Copper in the given Copper salt by Iodimetry.
13. Estimation of total hardness of water using EDTA solution and pure crystals of Zinc sulphate.

References :

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Systematic Experiments in Chemistry Arun Sethi New Age International (p) Ltd. Cochin.

Core Course 3A Mathematics

MSEI.3 :CALCULUS - I AND MATRICES

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

At the end of the course students will be able to understand and to apply the concepts, principles and techniques of calculus and matrix theory in problem solving.

COURSE CONTENT:

Unit I: Differential calculus:

Limits revisited, Continuous functions, Discontinuous functions and types. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem.Monotone functions,

Maxima and Minima, Concavity, Convexity and Points of inflection. Angle of intersection between two curves.
Differentiability theorems, Rolle’s theorem, Mean Value theorems,Taylor’s theorem, Maclaurin’s theorem, Taylor’s and Maclaurin’s infinite series, Indeterminate forms.

Unit II: Integral Calculus:

The integral of a function, Techniques of integration, Integration of Rational Functions, Rationalizable Integrals.

Definite Integral, Properties, Definite integral as the limit of a sum,The fundamental theorem of Calculus, Reduction formulae, Area, Volume and Length.

Unit III: Matrices – I

Matrices of order mXn, Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants, Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

Unit IV : Matrices - II

System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems and their uniqueness.

Characteristic equation of a square matrix, Eigen values and Eigen vectors, Finding them for a real symmetric matrix, Diagonalization of a real symmetric matrix, Cayley – Hamilton theorem and its applications.

References :

1. Calculus by Anton, Addison-Wiley.
2. First Course in Calculus, Serge Lang, Addison-Wiley
3. Calculus by Lipman Bers, Vols. 1 and 2, IBH.
4. Advanced Calculus, Frank Ayres, Schaum Publishing Co.
5. Higher Algebra by Bamard and Child, MacMillan India Ltd.
6. Integral Calculus by Shanthinarayan, S.Chand and Co.Ltd.
7. Differential Calculus by Gorakhprasad, Pothishala Ltd.
8. Calculus and Analytical Geometry by Thomas – Finney, Narosa Publishing House.
9. Algebra by Natarajan, Manicavachagon Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
10. Matrices by Frank Ayres, Schaum Publishing Co.
11. Textbook of Matrix Algebra by Suddhendu Biswas.

Ability Enhancement Course 1 A : Language

MSE I.4A :HINDI

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs.	**C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I: Functional language
Prayojanmoolak Hindi: Saidhantik Pakchh
Prayojanmook Hindi: Zaroorat, Swaroop, Visheshtayen, Prayukti ke Madhyam, Mukhya tatwa-Paribhashik Shabdavali aur Anuvad, Simayen aur Smabhavnayen,

Unit II: Communication skills
Samooh Charcha (Group discussion): Introduction – Definition – Characteristics – Types of Discussion –Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.
Sachhatkar (Interview): Characteristics – Definition – Types of Interviews – Preparation for Interview –Models – Exercises.

Unit III: Collection of Poetries:
Maithilisaran Gupt- Nar Ho Na Nirash Karo Man ko
Jayshankar Prasad- Himadri Tung Sring Se Prabudh Sudhha Bharti
Suryakant Tripathi Nirala- Joohi ki Kali
Sumitranandan Pant- Drut Jharo Jagat Ke Jirn Patra
Mahadevi Verma-Mai Neer Bhari Dhukh Ki Badli,
Sacchidanand Heeranad Vatasyayan Aggey-Kalgi Bajre Ki
Gajanan Madhav Muktibodh- Bhool Galti,
Kedarnath Agrawal- Chandra Gahna Se Lautati Ber
Nagarjun- Aakal Aur Uske Bad
Kedarnath Singh- Aakal Me Saras

Unit IV: Collection of Short Stories:
Chandradhar Sharma Guleri- Usne Kaha Tha
Jayshankar Prasad- Puraskar
Premchand- Panch Parmeshwar
Aggey-Gaingreen (Rooj)
Phanishwar Nath Renu- Teesari Kasam

Bhism Sahani- Cheef ki Dawat
Krisna Sobti-Dadi Amma
Sudha Aroda-Annapurna Mandal Ki Aakhiri Chitthi
Maitreyee Pushpa- Goma Hasti Hai
Omprakash Valmiki- Shavyatra

References:

1. Bhasha, Yugbodh aur Kavita: Dr Ramvilas Sharma, Vani Prakashan, Delhi
2. Kavita ka Vartmaan: Dr P Ravi, Vani Prakashan, Delhi
3. Hindi Kvaya ka Itihas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
4. Kavita ki Zameen aur Zameen ki Kavita: Namvar Singh, Rajkamal Prakashan, Delhi
5. Naee Kavita aur Astitvawad: Ramvilas Sharma, Rajkamal Prakashan,Delhi
6. Chhayavad: Namvar Singh, Rajkamal Prakashan, Delhi
7. Hindi Kavita ka Atit aur Vartmaan: Maneger Panday, Vani Prakashan, Delhi
8. Hindi Kahani- Antarang Pahchan: Dr Ramdars Mishra, Vani Prakashan, Delhi
9. Hindi Kahani-Sanrachana aur Samvedana: Dr Rachna Saah, Vani Prakashan, Delhi
10. Galp Ka Yatharth-Kathaloochan ke Aayam: Suvas Kumar, Vani Prakashan, Delhi
11. Hindi Ka Gadyaparva: Namvar Singh, Rajkamal Prakashan,Delhi
12. Sahitya ki Pahchan: Namvar Singh, Rajkamal Prakashan,Delhi
13. Katha Vivechan aur Gadyashilp: Ramvilas Sharma, Vani Prakashan, Delhi
14. Kahani Anubhav aur Abhivyakti: Rajendra Yadav, Vani Prakashan, Delhi
15. Kahani- Swaroop aur Samvedana: Rajendra Yadav, Vani Prakashan, Delhi
16. Kahani-Sankramansheel Kala: Khagendra Thakur, Vani Prakashan, Delhi
17. Aadhoonik Hindi Kahani: Laxminarayan Laal, Vani Prakashan, Delhi
18. Hindi Kahani-Vakt Ki Shinakht aur Srijan ka Raag: Rohini Agarwaal, Vani Prakashan, Delhi
19. Kahani Samkaleen Chunautiyan: Dr Sambhoo Gupt, Vani Prakashan, Delhi
20. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
21. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
22. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
23. Sarkari Karyalayon mein Hindi ka Prayog- GopiNath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
24. Hindi Prayog: Ramchandra Verma, Rajkamal Prakashan Samooh, Delhi
25. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
26. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
27. Effective Communication Skills, by Omkar N Kour
28. http://www.hindisamay.com

MSE I.4B :KANNADA

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive Grammar
Sandhi (Agama, Adesa, Dwitva, etc) A suitable grammar book on Sandhi will be followed in the classroom.

Unit II: Functional Language
Group Discussion: Introduction – Definition – characteristics – types of discussions – round-table sy lecture forum etc. – relevance of Group Discussion – exercises.

Conversation: Definition – styles of conversation – formats of conversation – telephonic conversation, etc. – Exercises

Unit III: Modern Poetry
i) Kalki – Kuvempu
ii) Thilisaru-Videhi
iii) Balegaarana Haadu –K S Narashimha Swamy
iv) Nanna nayi- Pu Thi Na
v) Nanna avathara – M Gopalakrishna Adiga
vi) Puttavidhave –DA. RA.Bendre
Selected from Aunika Kannada Kavya Part I, University of Mysore.

Unit IV: Prose: Collection of short stories
Collection of Short Stories
i) Danbaru Banbudu- Devanuuru Mahadeva
ii) Kallina Kolalu – Chaturanga
iii) Rotti- P Lankesh
iv) Cappaligalu – Sara Abubakkar
Selected from Sanna Kathegalu, Mysore University, Mysore

References:

1. Kannada Kaipidi, Prasaranga Publication, University of Mysore.
2. Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company(Publishers).

MSEI.4C :MALAYALAM

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I :**Descriptive Grammar - Sandhi**

Unit II: Functional Language
Group Discussion- Introduction – Definition – characteristics – types of discussions – round-table symposium – panel – lecture forum etc. – relevance of Group Discussion – exercises

1. Conversation - Definition – styles of conversation – formats of conversation– telephonic conversation, etc. – Exercises

Unit III: Modern Poetry
Lessons from " Kavya Mala, University of Kerala publications,Kerala

1. Mazhuvinte Katha
2. Sabhalamee yaatra
3. Shanta
4. Kochiyile Vrikshangal
5. Bharatheeyam

Unit IV: Literature
Collection of Short Stories:
From Katha malika, University of Kerala publications

1. Kadal theerathu
2. Shavadaham
3. Ammayum makanum
4. Perumazhayude pittennu
5. Chaya

References:

1. Kerala Panineeyam by A R Rajaraja Varma, NBS, Kottayam
2. Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

MSEI.4D : TAMIL

Credits :3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive grammar – Sandhi

Unit II: Functional Language
Group Discussion: Introduction-Definition-Characteristics-types of discussions-round table-symposium-panel-lecture forum etc.-relevance of group Discussions –Exercises
Conversation: Defination-styles of conversation-formats of conversation-telephonic conversation, etc-Exercises
.
Unit III: Poetry: Modern Poetry
Ikkalak Kavithaikal, Kannan En Sevegan, Thiru Arutpa, An Anthology of Tamil Poetry

Unit IV: Prose: Collection of Short Stories
Naatru – (Collection of Short Stories)

References:

1. Tamil Ningalum Thavarillamal Ezuthalam- Dr. Porko
2. Efective Group Discussion – Theory and Practice,Gloria J. Galanes, McGraw Hill Company (Publishers)
3. Naatru, Vaanathi Pathippagam, 13 Deenadayalu Street, T. Nagar, Chennai 600 017

MSE I.4E: TELUGU

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.

- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I : Functional language (Styles and Registers):

1. Letter writing: Characteristics – Definition – Types of Letters – E-mails – Language of Letters –Exercises
2. NEWS Reporting: Characteristics – Definition – Language of NEWS Reporting - Models – Role of Median NEWS Reporting – Exercises.

Unit II: Communication skills (Effective speaking and effective writing) in language:

1. Group discussion: Introduction – Definition – Characteristics – Types of Discussion – Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.
2. Interview: Characteristics – Definition – Types of Interviews – Preparation for Interview – Models – Exercises.

Unit III: Modern Poetry and Folk literature

1. Desha Charitralu – Sree Sree (From Maha Prasthanam, Visalandhra Publications, Hyderabad).
2. Folk Songs from 'Rayalaseema Raagalu' & 'Triveni' Published by Telugu Academy, Hyderabad

Unit IV: Genre of literature (Piece of a Drama/Portion of Autobiography)

Selected scenes from drama '**Kanyashulkam'** by Gurazada Apparao (available at Visalandhra Publication, Hyderabad.

References:

1. A Hand book of writing activities, Prasaranga, University of Bangalore.
2. The perfect Interview by Max Eaggert, Random House, UK.,
3. Interview Secrets by Heather Salter, Publications: Collins, London,
4. Effective Group Discussion – Theory and Practice be Gloria J.Galanes, McGraw Hill Company.
5. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
6. Effective Communication Skills, by Omkar N Kour

Ability Enhancement Course 1B : English

MSEI.5 : PROFICIENCY IN ENGLISH

Credits 3 (2L+1T+0P) — **Max. Marks: 100**
Contact Hours per week: 4 — **C1+C2:50**
Exam duration: 2 Hrs. — **C 3: 50**

Objectives:
Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: Descriptive Grammar

1. Tenses:

a) Simple Present: Habitual action, General truths, Future time, Verbs of state, Verbs of perception, Verbs of sensation, Narration, Use of simple present for demonstration and commentaries, Present perfect, present perfect continuous, Present continuous also indicative of future action.

b) Simple past: Past time reference, Present time reference, Future time reference, Past continuous, Past perfect, past, perfect continuous

Unit II: Skills in Communication

1. Negotiating a point of view – learning to talk persuasively so as to get across one's perspective.
2. Debating on an issue – agreeing / disagreeing.

Unit III: Study and Reference Skills

Note making; Note- taking; Summary writing.
Comprehension Skills
Extracts from literary, scientific and educational journals.

Unit IV: Skills of Communication

Advanced Writing Skills, writing advertisement copy; Writing a project proposal and Writing Resume, sending an application.
Listening effectively; Talking about one self (likes, dislikes, interests, beliefs, personality traits, ambitions); Expressing an opinion about personal belief on a current issue. (Ability to speak fluently for 3-4 minutes. Focus would be on organized, logical, sequential presentation of thought through spontaneous speech).

Suggested Activities:

- Politeness competitions- students with partners take turns in using a given number of utterances for negotiation / requests/complaints/small talk.
- Students introduce themselves though using symbols/ metaphors.
- Students collect newspaper/magazine cuttings on topical and/ or cultural issues of interest-write and share their opinion with peers.

References:

1. Block, C.C. (1997). Teaching the Language Arts, 2 nd Ed. Allyn and Bacon
2. Mckay. et al. (1995). The Communication Skills Book, 2 nd Ed. New Harbinger Publications.
3. Hornby,A.S.(2001).Oxford Advanced Learner's Dictionary,OUP
4. Thomsan,A.J. & Martinet.(2002).A Practical English Grammar.OUP

GENERIC ELECTIVE 1

MSEI.6 : ENVIRONMENTAL EDUCATION

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student-teacher will be able to:

- Develop awareness and concern for environmental issues and sustainable development.
- Acquaint with the concept, objectives and importance of Environmental Education (EE).
- Introduce multi-disciplinary approach to environmental problems.
- Acquaint how to design, develop and implement strategies for Environmental Education (EE).
- Acquaint with the different methods and techniques of teaching Environmental Education (EE).
- Undertake practical activities for school cleanliness, neighbourhood cleanliness drive, and healthy personal hygiene in relation to Swachh Bharat and healthy living. (These activities would have been oMSErved and practiced during the 16-week Internship in schools)
- Inculcate environment friendly values through EE.

COURSE CONTENT :

Unit I :Meaning and Concepts

Meaning as evident from Indian literature and contemporary texts, Definition, Objectives, Importance of EE with special reference to Indian view of life and sustainable development Sustainable Development Goals.

Unit II: Basic Environmental Concepts

Ecosystem, Biotic and Abiotic factors, Inter-relationship, Factors affecting environment, population, air, water, soil, noise; Acid rain, Greenhouse effect, Extinction of species, Soil erosion, Energy crisis, Environment and sustainable development; Role of specially designed strategies for cleanliness, Role of mass media and technology in developing awareness about nvironmental problems and its prevention, Role of NGO and governmental organizations in developing EE.

Unit III: Curriculum, Methods and Techniques of EE

Designing, developing strategies for EE, Evaluation of EE resources materials; Field trips, Role play, Poster presentation, Quiz, Debate, Projects, Swachh Bharat Abhiyan sustainability

Unit IV: Value Development through EE as in Indian View of Life

Practical work in relation to school cleanliness and neighbourhood watch, Text book evaluation for contents on environment and cleanliness, Field trip on environmental degradation, and school and neighbourhood cleanliness, Visit to nature park, industry polluted areas.

Practicum

- Study sustainable development initiative in the country.
- Visits to polluted sites and preparation of report.
- Interviewing people and reporting the inconveniences due to any of the environmental problems.
- To study innovations done by to improve the environment of that area.
- To study the implementation of Environmental Education Programmes in schools/stated country.
- To prepare models and exhibits for general awareness of public regarding environmental hazards.
- To prepare a programme for environmental awareness and school cleanliness, and to conduct the same with school children.
- To visit industries and study alternative strategies of Environmental pollution management.
- To prepare a resource material on any of the environmental problems along with a suitable evaluation strategy. To prepare quizzes and games on environmental issues.
- Organise Swacch Bharat Abhiyan as sustainable activity.
- To study the contribution of NGOs in improving the environment of the city. Classroom. Prepare posters/chart on Sustainable Development Goals.

* In addition, school and community based activities may be organised.

Evaluation Strategies

1. Assignments/sessional work.
2. Unit tests.
3. Portfolio assessment of exhibits, model of charts prepared by student teachers.
4. Seminar presentations followed by group discussion.

References:

1. Trivedi, M.M. and Pathak, Y.P. (1994). *Manav ane Paryavaran: Bhaugolic Paripekshma, Universitygranth Nirman.* Board Publication, Ahmedabad, Gujarat.
2. Garg, B. and Tiwana (1995). *Environmental Pollution and Protection*. New Delhi: Deep & Deep Publication.
3. Sharma, R.C. (1981). *Environmental Education.* New Delhi: Metropolitan Publication.
4. UNESCO, Environmental Education in the light of the Tbilisi Conference, UNESCO.
5. NCERT (2009), *Project Book in Environmental Education from Class I-X.* New Delhi: NCERT.
6. NCERT (2004), *Environmental Education in Schools.* New Delhi: NCERT.
7. **Web Resources**Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT
8. http://www.ncert.nic.in/departments/nie/dee/publication/pdf/Towards%20A%20green%20School.pdf
9. Swachh Bharat Swachh Vidyalaya: A National Mission, Clean India: Clean Schools A Handbook, MHRD, http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/Eng_Swachch-Bharat-Swachch-Vidhalaya.pdf

PROFESSIONAL EDUCATION COURSES

MSEI.7 :Language Across Curriculum

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The student teacher will be able to:

- Understand nature, function and role of different kinds of languages in curriculum transaction
- Acquaint with obstacles in language usage while using the language and ways to overcome them.
- Understand importance and use of first and second language, multilingualism and impact of culture.
- Acquire knowledge about the communication process and verbal and nonverbal communication skills.
- Familiarize the students with of barriers to (Listening, Speaking, Reading, Writing) LSRW skills and activities for developing these skills.

COURSE CONTENT :

Unit I Nature and Functions of Language

Language – Meaning and Concept, Functions of Language, Role of Language in Curriculum Transaction, Theories of Language Learning, Barriers in Using a Language & Strategies to Overcome them, Verbal and Non-verbal communication

Unit IILanguage across Curriculum in the Indian Context

Language as a determinant of Access, Language proficiency and students' attitude towards Learning and Schooling/ dropouts, Language/oral proficiency and critical thinking

Unit IIIStrategies for Multilingual Classrooms

Role Plays and Discussions as tools for learning, 'Questioning' to stimulate thought and to encourage and motivate to respond, Preparing Subject/content based exercises in reading, comprehension and usage, Sensitizing, Reflecting and Facilitating, Understanding the learner and his/her language background, Creating sensitivity to the language diversity, Using oral & written language in the classroom for optimal learning

Unit IVDeveloping Receptive Skills and Productive Skills

Barriers to Listening Skills, Activities for Developing Listening Skills, Barriers to Reading Skills, Activities for Developing Reading Skills, Barriers to Writing Skills, Activities for Developing Writing Skills, Need and Importance of Classroom Discourse. Barriers to Speaking Skills, Activities for Developing Speaking Skills

Practicum

1. School Visit to Find out Communication Problem/Apprehension in Students
2. Designing Games and Exercises for Developing Listening, Speaking, Reading and Writing Skills
3. Assignments on Developing Writing Skills- Summary, Letter, Paragraph, Essays, Speech
4. Assignments on Developing Speaking Skills – Oral Presentations, Debate, Elocution, Discussion, Brain-storming
5. Assignments on Developing Listening Skills – Listening to speech, directions

***** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.

References:

1. Akmajian, A. et al. (2010). *Linguistics: Introduction to Language and Communication.* (6th ed.). Cambridge: MIT Press.
2. Fasold, R. & Connor-Linton, J. (2013). *An Introduction to Language and Linguistics*. (6th ed.). Cambridge: Cambridge University Press.
3. Floyd, K. (2009). *Interpersonal Communication*. New York: McGraw Hill Companies Inc.
4. Fromkin, V., Rodman, R. & Hyms, N. (2011). *Introduction to Language.* (9th ed.). Canada: Cengage Learning.
5. Pearson, J.C. et al (2011). *Human Communication.* (4th ed.). New York: McGraw Hill Companies Inc.

Web Resources

6. First and Second Language Acquisition – A Brief Comparison. Retrieved from https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf
7. Similarities and Differences between First and Second Language Acquisition

Retrieved
from http://multilingualism.pbworks.com/w/page/21913433/Similarities%20and%20Differences%20between%20First%20and%20Second%20Language%20Acquisition

8. Activities for Developing Speaking Skill
Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm
9. http://www.educ.ualberta.ca/staff/olenka.Bilash/best%20of%20bilash/speaking.html
10. Activities for Developing Listening Skill Retrieved from http://www.educ.ualberta.ca/staff/olenka.bilash/best%20of%20bilash/listening.html
11. https://blog.udemy.com/listening-skills-exercises/
12. Learning curves: Language Education (2009), by Azim Premji Foundation http://azimpremjifoundation.org/pdf/LCIssue13.pdf
13. Courses on Communication Skills, http://nptel.ac.in/courses/109104030/

SECOND SEMESTER

Core Course I B Physics

MSEII.1 : ELASTICITY, WAVES, HEAT, AND THERMODYNAMICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- The students will be able to understand principles of elasticity, waves, heat, thermodynamics and classical statistical mechanics and apply its principles to explain natural physical phenomena.
- The teacher will enable the students to identify and modify alternative conceptions in the domains of elasticity, waves, heat, thermodynamics and classical statistical mechanics.

COURSE CONTENT:

Unit I: Elasticity

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli- Dependence of Young's modulus on temperature and its applications, Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Elastic potential Energy, Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, η and σ by Searle's method.

Unit II: Waves

Review of Mechanical waves, types of waves, travelling waves, the superposition principle, wave speed, power and intensity in wave motion. Transverse waves on a string- travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, interference of waves, standing waves, resonance, Doppler effect. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave.

Unit III: Thermodynamics-I

Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P& C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient. Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem.

Unit IV: Thermodynamics-II

Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams.Third law of thermodynamics, Unattainability of absolute zero. Thermodynamic potentials. Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations& applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (C_P – C_V), C_P/C_V, TdS equations.

References:

1. David Halliday, Robert Resnick and Jay Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons, Inc.
2. Harris Benson, University Physics, Revised Edition, John Wiley and Sons Inc.
3. Zeemanskyand R. Dittman, Heat and Thermodynamics, McGraw Hill, 7th edition, 1996.
4. H J Pain, Physics of Vibration and Waves, Wiley; Sixth edition, 2006.
5. Brijlal and Subramaniam, Heat and Thermodynamics, S Chand, 2008.
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S.Chand (G/L) & Company Ltd., 2010.
8. A. B. Gupta and H. Ray, Heat and Thermodynamics, New central publications.
9. D. S. Mathur, Heat and Thermodynamics, SultanChand.
10. M. N. Saha and B. N. Srivastava, Treatise on Heat, The Indian Press.
11. A. Kumar and S.P. Taneja,Thermal Physics, R. chand Publications, 2014.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following).

1. Study of the oscillations of a column of water as a function of its length and study of damped oscillation.
2. To determine the velocity of sound at 0^o C and the end correction by setting up a resonance column (first resonance length).
3. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire.
4. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method.
5. Study of Newton's law of cooling.
6. Determination of solar constant.
7. J by Joules Calorimeter.
8. Study of the rate of flow of water through a capillary tube under different pressure heads.
9. Study of the relation between pressure and volume of a gas at constant temperature

10. Study of variation of pressure and temperature of a gas at constant volume.
11. To study the variation of thermo emf across two junctions of a thermocouple with temperature
12. Surface Tension-capillary rise method-radius by vernier microscope
13. Study of the motion of a steel sphere in a viscous liquid and determination of the coefficient of viscosity of the liquid.
14. Melde’s experiment – determination of frequency.
15. Lees and Charlton disc – Thermal conductivity of a bad conductor.
16. Specific heat of a solid by the method of mixtures.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7thEdition, Cengage Learning, 2009.
7. D.P. Khandelwal,A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication, 1985.

Core Course 2 B :Chemistry

MSEII.2 :STATES OF MATTER AND NUCLEAR CHEMISTRY

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

- Illustrate how a scientific model can be constructed based on the experimental oMSErvations of the behaviour of gases and to explain the properties in terms of microscopic organization.
- To develop an understanding of properties of Gases, Liquids, colloids and Solutions.
- To understand the shapes of molecules in terms of symmetries and to relate the properties of matter in solid state to the structure.
- To develop an understanding of the concept of acids and bases, characteristics of non-aqueous solvents.
- To familiarize radioactivity as a nuclear phenomenon in understanding the nuclear reactions

COURSE CONTENT

Unit I : Gaseous and Solid State

Review of kinetic theory of gases and van der walls equation. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liqefaction of gases based on Joule-Thomson effect.

Explanation of the macroscopic properties of solids in terms of structure, bonding and defects. Definition of space lattice, unit cell.

Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystals.
X-ray diffraction by crystals. Derivation of Bragg equation. Predicting crystal structure . Defects in solids , Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of state. Critical Phenomena : P-V isotherms of real gases, continuity of states, the isotherms of van der Waals equation, Derive a relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.
Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).

Unit II : Liquids and Colloids

Accounting the Isotropic and intermediate behaviour of liquids as a link between solids and gases. Also tracing the role of liquids as solvents and reaction regulators Intermolecular forces, structure of liquids (a qualitative description).
Structural differences between solids, liquids and gases.
Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.
Definition of colloids, classification of colloids.
Solids in liquids (sols) : Properties – kinetic, optical and electrical; stability of colloids, protective action, Hardy – Schulze law, gold number.
Liquids in liquids (emulsions) : Types of emulsions, preparation. Emulsifier.
Liquids in Solids (gels) : Classification, preparation and properties, inhibition, general applications of colloids.

Unit III : Acids and bases

A discussion on changing concepts of acids and bases involving concentrations and effects of solvent medium. Arrhenius, Bronstead-Lowry and Lewis concepts of acids and bases.
Hard and Soft Acids and Bases (HSAB) -Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.
Non-aqueous Solvents- Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Unit IV : Nuclear Chemistry

Fundamental particles of nucleus, Concept of Nuclides, isotopes, isobars and isotones (with specific examples), nuclear forces,qualitative idea of stability of the nucleus (n/p ratio), binding energy, packing fraction,Natural and artificial radioactivity, Radioactive Disintegration series, half life, average life,nuclear reactions, artificial transmutation, nuclear fusion and fission. Nuclear fusion as a future source of energy ,Nuclear reactors, Application of Radioactivity and Radio isotopes as tracers in chemistry, , biology,medicine, agriculture and industry.Isotope dilution analysis,Neutron activation analysis.

References :

1. Essentials of Physical Chemistry Arun Bahl B.S.Bahl, G.D.Tuli, S.Chand & Company Ltd.
2. Principles of Physical Chemistry : Marron and Prutton
3. Elements of Physical Chemistry : Samuel Glasstone and Lewis
4. Physical Chemistry : P W Atkins
5. Nuclear Chemistry V.N.Darls Sultan Chand & sons.
6. Essentials of Nuclear Chemistry Arnikar, Hari jeevan, 4th edition, New age international.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To evolve a scheme of qualitatively analyzing an inorganic mixtureclassification of anions and cations.
- Quantitative inorganic analysis of mixtures containing four radicals.
- To develop skills of synthesizing coordination compound

COURSE CONTENT:

1. To arrive at a scheme of analysis of anions and cations based on solubility products and common ion effect: Systematic qualitative analysis by micro-scale methods of a mixture containing two acidic and two basis radicals from the following list(not more than one interfering radical):
   Cations: lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, sodium potassium, ammonium.
   Anions: carbonate, bicarbonate, acetate, fluoride, chloride, bromide, iodide, nitrate, sulphate,
   borate, oxalate, phosphate.
2. Preparation of the complexes:
   Tris(thiourea)copper(I)sulphate monohydrate, Mercury tetra thiocyanato cobaltate(II), simple cobalt and chromium complexes and their analysis.

References:

1. A Text Book of Quantitative Inorganic Analysis, A .I . Vogel
2. Advanced Practical Inorganic Chemistry, Gurudeep

Core Course 3 B Mathematics

MSEII.3 : CALCULUS – II - ANALYTICAL GEOMETRY AND NUMBER THEORY

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
At the end of the course students will be able to understand the concepts of number system and analytical geometry and principles and techniques of calculus of several variables in problem solving.

COURSE CONTENT:

Unit I: Partial Derivatives – I
Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Linear approximation theorem. Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Directional Derivative, Partial Derivatives of higher order, Taylor's Theorem, Derivative of Implicit functions, Jacobians.

Unit II: Analytical Geometry – I
Cartesian coordinates in three dimensional spaces, Relation between Cartesian coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations of straight lines (Cartesian and Vector form).

Unit III: Analytical Geometry – II
Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Shortest distance between two skew lines.
Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Classification theorem on second degree equation.

Unit IV: Theory of Numbers
Division Algorithm – Prime and Composite Numbers – proving the existence and uniqueness of GCD and the Euclidean Algorithm – fundamental theorem of Arithmetic - the least common multiple – congruences – linear congruences – Wilson's theorem – Simultaneous congruences – Theorem of Euler – Fermat and Lagrange.

References :

1. Calculus by Anton,Wiley.
2. Calculus with Analytic Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.

4. First Course in Calculus by Serge Lang, Addison-Wiley.
5. Calculus, Vols. 1 and 2 by Lipman Bers, IBH.
6. Introduction to Calculus and Analytical Geometry by Courant and John, Narosa Publishing House.
7. Advanced Calculus by Frank Ayres, Schaum Publishing Co.
8. Higher Algebra by Bamard and Child, Macmillan India Ltd.
9. Integral Calculus by Shanthinarayan, S.Chand and Co. Ltd.
10. Differential Calculus by Gorakhprasad, Pothishala Ltd.
11. A Course in calculus and Real Analysis-Iby Ghorpade S R and Limaye B V (2006), Springer Verlag
12. Elementary Number Theory by David M. Burton.
13. Elementary Number Theory with applications (2nd edition) by Thomas Koshy, Academic Press.

ABILITY ENHANCEMENT COURSE AEC 1B : LANGUAGE

MSEII.4A:HINDI

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I : Functional Language
Prayojanmoolak Hindi: Prayog ke Chhetra
Prayojanmoolak Hindi: Rajbhasha Hindi-Samvaidhanik Pravdhan, Raajbhasha Adhiniyam Aadi**,** Sarkari Karyalayon mein Prayukt Hindi-Karyalayee Aalekhan, Tippan, Patrachar, Sanchhepan

Unit II : **Communication skills**
Varta (Conversation): Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.
Bahas (Debate): Characteristics – Definition – Need of Debate – Technique to conduct Debates,etc. Exercise.

Unit III :Drama and Novel :
Hanoosh by Bhishm Sahani Published by Rajkamal Prakashan, Delhi
Karmbhoomi by Premchand, Swaraj Prakashan, Delhi

Unit IV : Modern Literature
Collection of Essays:

a) Baalkrisna Bhatt- Manusya Ke Jivan Ki Sarthakta
b) Mahaveer Prasad Diwedi- Sahitya Ki Mahatta
c) Sardar Purn Singh- Aacharan Ki Sabhyata
d) Hajari Prasad Diwedi- Kutaj
e) Harishankar Parsai- Thithurta Hua Gantantra
f) Nirmal Verma- Dharm Aur Dharmnirpechhata

References:

1. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
2. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
3. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
4. Hindi Nibandh Sahitya ka Sanskritik Addhyan: Dr Baburam,Vani Prakashan, Delhi
5. Hindi Gadhya-Vinayas aur Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
6. Aadhunik Hindi Ka Gadhya Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
7. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Maneger Panday, Vani Prakashan, Delhi
9. Bhakti Ke Aayam: Dr P Jayraaman, Vani Prakashan, Delhi
10. Bhartiya Bhakti Sahitya: Dr Rajmal Bora, Vani Prakashan, Delhi
11. Bhaktikavya ka Samajdarshan: Dr Premshankar, Vani Prakashan, Delhi
12. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
13. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
14. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
15. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
16. Sarkari Karyalayon mein Hindi ka Prayog- GopiNath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
17. Alankar Mimansh: Murlimanohar Prsad Singh, Swaraj Prakashan, Delhi
18. Saral Hindi Vyakaran: Swaraj Prakashan, Delhi
19. Upanyas aur Lokjeevan: Railph Fox, Vani Prakashan, Delhi
20. Upanyas ka Uadai: Aayan Waat, Hariyana Grantha Academy,Haryana

MSEII.4B: KANNADA

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives*:*

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive Grammar
Samasa and Alankara

Unit II: Functional Language
a) News reporting: Characteristics – definition – language of news reporting–model of news report-patterns – role of media in news reporting – exercises.
b) Interview: Characteristics – definitions – preparation for interview – various types of interviews (business – employment – literary etc) – exercises.

Unit III: Medieval Poetry
i) Enna Devange Jagavella Hennu Noada - Akkamahadevi
ii) Kaayuttirdanirulu Hagalennade-Raghavanka
iii) Parahimseyam Madi Manavam Baldapane – Lakshmeesha
(Kaavya Sanchaya – 3- Mysore University, Mysore).

Unit IV: Collection of Essays
i) Prajle Mattu Parisara-U R Ananthamurthy
ii) Samakalina Prajne– G S Shivarudrappa
iii) Samaanaavakaasha – S L Bhairappa
iv) Namma Prachinara Jivana Moulyagalu- T V Venkatachalashastri
(Selected from Gadya Vihara Part III) Mysore University, Mysore

References:

1. Kannada Kaipidi, Prasaranga Publication, University of Mysore
2. Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, MarquetteBooks LLC, Washington.
3. The Perfect Interview by Max Eggert, Random House, UK.

MSE II.4C: MALAYALAM

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Unit I. Descriptive Grammar
Samasa and Alamkara

Unit II :Functional Language

1. News reporting- Characteristics –definition – language of news reporting– model of news report- patterns – role of media in news reporting – exercises
2. Interview- Characteristics – definitions – preparation for interview – various types of Interviews(business – employment – literary etc) – exercises.

Unit III:Poetry - Medieval
VEENA POOVU by Kumaaran ashan, Published by Devi Book Stall, Kodungalloor

Unit IV: Collection of Essays
Lessons from “Bharatha Paryatanam by Kutti Krishna Maraar, Published by Maraar Sahitya Prakasha, Kozhikode
1. Yudhathinte parinaamam
2. Amba
3. Karnante arangettram
4. Markandeyante chiri

References:

1. Bhashaa bhushanam and Kerala Paanineeyam, NBS, Kottayam
2. Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.
3. The Perfect Interview by Max Eggert, Random House, UK.

MSE II.4D:TAMIL

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: **Aspects of Style**
Styles of writing
Idioms, Phrases and Proverbs

Unit II: Functional Language:
News Reporting: Characteristics-Definition-language of news reporting-model of news reporting-patterns-role of media in news reporting –exercises.
Interview: Characteristics-definition-preparation for interview-various types of interviews (business-employment-literary etc.)-exercises

Unit III: Medieval Poetry
Periya Puranam Selection of poems
Naladiyar – Selection of poems
An Anthology of Tamil Poetry

Unit IV:Collection of Essays
Ariviyal Tamilzhakkam-S. V. Shanmugam (3 Essays), New Century Book House (P) Ltd, 41 – B SIDCO Industrial Estate Chennai 600 017, Tamil Nenjam-Dr. M. Varadharajan (3 Essays)

References:

1. Tamil Ningalum Thavarillamal Ezhuthalam, Dr. Porka
2. Fundamentals of journalism, Report Writing and editing by R. Thomas Berner, Maruette BooksLLC, Washington.
3. The perfect Interview by Max Eggert, Random House, UK.

MSEII.4E: TELUGU

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I: Functional language (Styles and Registers)
1. Essay Writing: Characteristics – Definition – Format of Essays – Types of Essays (Literary, Scientific, etc.) – Models – Exercises.
2. Translation: Characteristics – Definition – Need of Translation – Translation Models – Exercises (From English to Regional Languages).
.

Unit II : Communication skills (Effective speaking and effective writing) in language
1. Conversation: Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.
2. Debate: Characteristics – Definition – Need of Debate – Technique to conduct Debates, and other Exercise.

Unit III: Ancient Poetry and medieval poetry

1. Damayanthee Swayamvaram by Nannaya (First 18 Poems)
2. Sathyabhama Santhwanam by Nandi Timmana (Poems 82 to 104)
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

Unit IVGenre of literature (Prose: Literary Work)

1. Andrula Sanghika Acharamulu by Khandavalli Lakshmi Ranjanam.
2. Telugu Samethalu by Nayani Krishna Kumari
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

References:

1. A Hand book of writing activities, Prasaranga, University of Bangalore.
2. About Translation by Peter Newmark, Multi lingual Motters, Clavedon, UK,
3. The art of Translation (A Symposium), Ministry of Scientific Research and Cultural Affairs, Govt.of India.
4. Effective Group Discussion – Theory and Practice be Gloria J.Galanes, McGraw Hill
5. Anuvada Samsyalu by Rachamallu Ramachandra Reddy, Published by Visalandhra Books,Hyderabad
6. Aspects of Translation, Prof K V V L Narasimha Rao, CIIL Publication, Mysore

Ability Enhancement Course AEC 2B : English

MSEII.5 : PROFICIENCY IN ENGLISH-1I

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives :

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: **Descriptive Grammar**
Function of Auxiliaries; Modals; Question form
Clauses: Noun Clause; Reported Speech and Change of Voice.

Unit II: Development of Language Competence
To be based on the use of multiple texts which address issues of multiculturalism, gender, racism and texts which relate with current issues and contemporary trends. Short stories, comic strips, cartoons and animations (both print and non-print media) to be used. Speeches of famous persons, diaries, travelogues can also be used.

Unit III: Writing for Functional Purposes
Letter-writing (Professional / Personal)

Unit III: Creative Skills in Writing
Writing dialogues, poems and essays

Unit IV: Basic Phonetics
Sounds of English language, intonation and transcription using IPA.

References:

1. Chan. et al. (1997) Professional Writing Skills, San Anselma, CA
2. Fiderer, A. (1994) Teaching Writing: A Workshop Approach. Scholastic.
3. Block, C.C. (1997). Teaching the Language Arts, 2 nd Ed. Allyn and Bacon
4. Mckay. et al. (1995). The Communication Skills Book, 2 nd Ed. New Harbinger Publications.
5. Merrriam, E. (1964). It Doesn't Always Have to Rhyme. Atheneum.
6. Hyland, Ken (2004) Second Language Writing. University of Michigan Press.
7. Graves,D (1992). Explore Poetry: The reading /writing teacher's companion.Heinemann
8. Stone Douglas (1999). Difficult conversations: How to discuss what Matters Most, New York.:Penguin Books.
9. Gabor Don (2001). How to start a Conversation and Make Friends, New York: Fireside.

PROFESSIONAL EDUCATION COURSES

MSE II.6: CONTEMPORARY INDIAN EDUCATION

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The course enables the student teachers to:

- Understand different perspectives of Education.
- Analyse the concept of Education and its related terms
- Analyse the Aims of Education and their determinants
- Reflect on the educational ideas and systems of various thinkers and develop the ability to theorize educational practices;
- Collect evidences for the influence of socio-cultural aspects on Education
- Analyse the role of Education on society by gathering various evidences and illustrations
- Understand and appreciate the need of autonomy to teacher and learners
- See the relationship between autonomy, accountability, and commitment
- Arrive at a list of qualities of a committed teacher through discussions.

COURSE CONTENT:

UnitI: Education: Concept, Nature, and Purpose

Education as concept and its distinct nature; Classical, Liberalists and Progressivists view on Education; Analytical concept of education - education as a normative concept; Education as a family of Processes; Education as worthwhile activity; Cognitive and normative dimensions of education; Education and Educated person;

Education as System; Modes of education- formal, informal, non-formal;

Education and its related concepts- Training, Instruction and teaching

Education: Purpose(s) and Determinants - Determinants of Purpose-individual, Community, Religion, State and Market; Brief historical inquiry into purposes and determinants of education (from ancient India to contemporary India); social context of purposes of education

Education as a Discipline and Interdisciplinary in nature

Aims of Education from ancient to contemporary Indian society

Education as value development

Determinants of Aims of Education in emerging India

Unit II: Education and Socio-cultural context

Education as an instrument of social change; Influence of education on society and family; Socio-cultural influences on the aims of education; Emerging trends in societies and their influence on education

Education and Development

Globalization and Internationalization of education

Unit III: Educational thoughts and practices

Critical reflection on the educational thoughts of Indian and Western thinkers and on their relevance to the present education system

Indian: Mahatma Gandhi, Rabindranath Tagore, Aurobindo, Swami Vivekananada, Jiddu Krishnamurthy, Gijju Bhai Badheka; B R Ambedkar; Vinova Bhave

Western: Plato, Rousseau, John Dewey, Froebel, Montessori, Ivan Iliach, Paulo Frieri

Unit IV: Autonomy of Teacher and Learner

Autonomy: Meaning and extent

Teacher autonomy: Meaning, extent and nature; Teacher as autonomous professional; Areas of teacher autonomy: Their limit-situations - Curriculum making; Learning resources and material selection and use; Pedagogical practices; Assessment modalities;Limit-situations: Structures- Structured curriculum, and examination system; Time-tables;

Learner Autonomy: Meaning, extent and nature; Learning as an autonomous act; Meaning making and learners' autonomy-opportunities and constraints

Autonomy and Accountability: Teacher Accountability; Teacher commitment

Sessional Activities:

- Presentations on Educational thoughts of Various thinkers
- Preparation of an Album or posters on different thoughts of great thinkers
- Analysis of aims of education from ancient Vedic times to modern times
- Collection of examples/evidences to show the influence of Education on social change and the socio-cultural influences on Educational aims
- Comparative study of National curriculum frameworks of NCERT on aims of education
- Readings on Position paper on " Aims of Education"-NCF 2005
- Comparative study of Aims of Education of few countries
- Collection of case studies that exemplifies teacher accountability and commitment

References:

1. Alfred North Whitehead (1967), 'The Aims of Education and Other Essays', The McMilan Company, New York. .
2. Debra Hayes, Martin Hills, Pam Christie & Bob Lingard (2007) Teachers & Schooling: Making a Difference, Allen and Unwin, Australia.
3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
4. Diane Tellman (2000), Living Values: An Educational Program, Sterling Publishing Private Limited, USA.
5. Freiri, Paulo (1968). Pedagogy of the Oppressed, Sea burry Press, New York, USA
6. Hirst,Paul(1970). The Logic of Education, Taylor & Francis, London
7. JJ Rousseau, (1956) Emile
8. John S Brubacher, (1969) Modern Philosophies of Education. Tata McGraw Hill Pub., Co.,Pvt., Ltd, New Delhi.
9. Krishna Murthy, J. (1947) On Education, Orient Longman, New Delhi.
10. Mani, R.S. (1964). Educational Ideas and Ideals of Gandhi and Tagore, New Book Society, New Delhi.
11. Manoj Das (1999). Sri Aurobindo on Education, National Council for Teacher Education, New Delhi.
12. Margaret (1999). The Open Classroom: A Journey through Education, Orient Longman, New Delhi.

13. Mathur S.S. (1988). A Sociological Approach to Indian Education, Vinod Prakashan, Agra.
14. NCERT (2013). Basics in Education, National Council of Educational Research and Training, New Delhi.
15. NCERT, (2005). National Curriculum Framework-2005. National Council of Educational Research and Training, New Delhi.
16. O'Connor,J (1958) Philosophy of Education, pub by Duke university Press on behalf of philosophical review.
17. Peters, R.S. (1967), The Concept of Education, Routledge, United Kingdom.
18. Peters, RS (1968). Ethics and education.(5th edn), George Allen & Unwin Ltd, London
19. Prema Clarke (2001). Teaching & Learning: The Culture of pedagogy, Sage Publication, New Delhi.
20. Scheffler, Israel (1966).Philosophy and Education: Modern Readings, Allyn and Bacon, Boston, US
21. Stella Van Petten Henderson (1960) Introduction to Philosophy, The University of Chicago press, Chicago.
22. Steven H. Cahn (1970). The Philosophical Foundation of Education, Harper & Row Publishers, New York.

MSEII.7:YOGA EDUCATION, SELF UNDERSTANDING AND DEVELOPMENT

Credits: 2 (1L+ 0T +1P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives :

The student teacher will be able to:

- Understand the meaning and importance of self-concept and self-esteem.
- Be aware of different factors related to self-concepts and self-esteem. Record a brief history of development of yoga through the ages. Discuss how yoga and yoga practices are important for healthy living.
- Explain some important principles of yoga.
- Explain the different limbs of *Astañga* yoga.
- State the different types of yoga.
- Derive how Hatha yoga and *Astañga* yoga are complementary to each other.
- Enable the student to have good health.
- Practice mental hygiene.
- Possess emotional stability.
- Integrate moral values.
- Attain higher level of consciousness.
- Demonstrate some important *asanas* and *pranayama*.

COURSE CONTENT :

Unit I : Introduction to Yoga and Yogic Practices

Yoga: meaning and initiation, What is Yoga? Misconnects of Yoga, History of development of yoga, The streams of Yoga: Astanga yoga Raja yoga, Yogic practices for healthy living

Unit II Introduction to Yogic Texts

Historicity of yoga as a discipline, Classification of yoga and yogic texts, Hatha yogic practices, Meditational processes

Unit III: Yoga and Health

Need of yoga for positive health, Role of mind in positive health as per ancient yogic literature, Concept of health, healing and disease: yogic perspectives, Potential cause of ill health, Yogic principles of healthy living

Unit IVlPersonality Development and Stress Management through Yoga

Yogic Practices for Personality Development : Surya Namaskar, Asanas : Tadasana, Simhasana, Kukkutasana, Akarna Dhanurasana, Matsyasana, Prnayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Banda, Uddiyana Bandha, Dhyana (Meditation) , Meditation, What is Stress, Yoga as a Way of Life for Stress Management: Ahara, Vihara, Achara, Vichara, Vyavahara, Yogic Practices for Stress Management ; Asanas, Hastottanasana, Padahastasana, Trikonasana, Shashankasana, Ushtrasana, Ardhamatsyendrasana , Bhujangasana, Makarasana, Sarvangasana, Matsyasana, Shavasana; Pranayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Sheetali Pranayama; Meditation, Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs **C_3 : 50 marks**

Practicum

- General guidelines for performance of the practice of yoga for the beginners

1. Guidelines for the practice of *āsanas*
2. Guidelines for the practice of *prāṇāyāma*
3. Guidelines for the practice of *meditation*

- Select yoga practices for persons of average health for practical yoga sessions

5. Supine position
6. Prone position
7. Sitting position
8. Standing position
9. Mudras
10. Prāṇāyāmas

*** In addition, school and community based activities may be organised.**

Evaluation Strategies

The evaluation will be done through practicals/ assessment of ability to develop and design softwares for selected contents.

References:

1. Adair, J. and Allen, M. (1999). *Time Management and Personal Development.* London: Hawksmere.
2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
3. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi. (Also available in Hindi)
4. Rohrer, J. (2002). *ABC of Awareness.* Oberurnen: UTD Media.
5. Simanowitz, V. and Pearce, P. (2003). *Personality Development.* Beckshire: Open University Press.
6. Stevens, N. (2008). *Learning to Coach.* United Kingdom: How to books.

THIRD SEMESTER

Core Course 1 C : Physics

MSEIII.1 :ELECTRICITY AND ELECTROMAGNETISM

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable students to acquire a broad conceptual framework of electrostatics electromagnetic phenomena.

COURSE CONTENT:

Unit I: Electrostatics

Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss’s theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere and continuous charge distributions (charged rod, ring, disk). Calculation of electric field from potential.

Unit II: Electric Fields in Matter and DC circuits

Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Combination of capacitors, energy stored in a capacitor, Energy per unit volume in electrostatic field. Atomic view of dielectrics, Polarization, Displacement vector. Gauss's theorem in dielectrics. Dielectric constant, Parallel plate capacitor completely filled with dielectric. Polarizability and susceptibility, Clausius-Mossotti equation.
DC Circuits: Kirchhoff’s laws, Voltage and Current dividers, Mesh analysis and Loop analysis, RC circuits, Maximum power transfer theorem.

Unit III: Magnetism

Magnetostatics: Biot-Savart’s law and its applications- straight conductor, circular coil, solenoid carrying current. Magnetic force between two parallel current carrying conductors. The Divergence and Curl of **B**, Magnetic vector potential. Ampere's circuital law. Magnetic field due to a very long solenoid and a toroidal coil.
Magnetism in matter: Magnetic intensity, magnetic induction,, Magnetic susceptibility, permeability. Classification of magnetic substances- a brief introduction of dia-, para- and ferro-magnetic materials.

Unit IV: Electromagnetic Induction and AC Circuits

Electromagnetic Induction: Review of Faraday's law of induction, Lenz's law, Motional EMF. Inductance:Self inductance, energy in a magnetic field, magnetic energy density.

AC circuits: The *j* operator.sinusoidal voltage, current voltage relation in resistance, capacitance and inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance. Mutual inductance and transformers.

Reference Books:

1. David J. Griffiths, Introduction To Electrodynamics, 4th Edition, Pearson
2. D C Tayal, Electricity and Magnetism, 1988, Himalaya Publishing House.
3. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley, Inc.
4. A N Matveev, Electricity and Magnetism, Mir Publishers, Moscow.
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.
6. A F Kipp, Fundamentals of Electricity and Magnetism, McGraw Hill.
7. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill Education, 1986.
8. J.H. Fewkes & J. Yarwood, Electricity and Magnetism, Vol. I, Oxford Univ. Press, 1991.
9. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To study the variation of Magnetic field along the axis of a circular coil.
2. To determine M & H using deflection magnetometer & vibration magnetometer.
3. To determine horizontal component of Earth's magnetic field using a Tangent galvanometer.
4. To calibrate an ammeter using a potentiometer and Daniel cell.
5. Mapping of magnetic field due to a current carrying straight conductor.
6. Determination of resistance & resistivity using Meter Bridge.
7. Charging & Discharging of a Capacitor.
8. Deflection magnetometer-Tan A, Tan B positions.
9. Deflection magnetometer -Tan C Position-moment of moments.

10. Mapping of magnetic field lines for a current carrying solenoid.
11. Searle's vibration magnetometer-moment & ratio of moments.
12. Box type vibration magnetometer- M &B_h.
13. Caparison of emf and determination of internal resistance of a cell using a potentiometer.
14. Determination of resistance & resistivity using PO Box.
15. Comparison of capacitance by Desauty's bridge using BG.
16. Determination of frequency of AC mains using Sonometer & electromagnet.
17. Variation of phase angle with capacitance for a RC circuit.
18. Conversion of Galvanometer to Voltmeter.
19. Unknown resistance by Carey Foster bridge.
20. Induced emf.
21. Maximum power transfer theorem.
22. To verify the Thevenin's and Norton's theorem

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 CChemistry

MSEIII.2 :ORGANIC CHEMISTRY – I

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To review the concept of isomerism and its types
- To develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.

COURSE CONTENT:

Unit I: Stereochemistry of Organic Compounds
Review of Concept of Isomerism and Types of isomerism with examples.

Optical Isomerism: Structural changes responsible for properties: elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization and asymmetric synthesis.
Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism: Determination of configuration of geometric isomers. Cis – trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism: Difference between configuration and conformation. Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives. Review of Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

Unit II: Aliphatic Hydrocarbons
Alkanes: Review of IUPAC nomenclature of branched and unbranched alkanes. Isomerism in alkanes and industrial source. Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes: Nomenclature, methods of formation (from acetoacetic ester / malonic ester and Dieckmann reaction), chemical reactions (halogenation), Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Alkenes: Accounting for Reactions due to unsaturation in compounds. Nomenclature of alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism. Regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanism of hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration followed by oxidation, oxymercuration – reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$. Polymerization of Alkenes. Substitution at the allylic and vinylic positions of alkenes.

Cycloalkenes: Methods of formation and chemical reactions of cycloalkenes.

Alkadienes: Nomenclature and classification of dienes: Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions. Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding in alkynes. Methods of formation (alkylation of acetylene and by elimination reactions). Acidity of alkynes. Chemical reactions of alkynes: Mechanism of electrophilic and nucleophilic addition reactions, hydroboration, oxidation, metal-ammonia reductions, oxidation and polymerization.

Unit III: Aromatic Hydrocarbons

Factors responsible for the characteristic reactions of Aromatic compounds. Nomenclature of benzene derivatives. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity: The Huckel rule, aromatic ions.
Aromatic electrophilic substitution: General pattern of the mechanism, role of σ- and π-complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/ para ratio. Side chain reactions of benzene derivatives. Birch reduction.
Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.

Unit IV:Alkyl and Aryl Halides

Alkyl halides: A study of Alkyl halides highlighting its synthetic applications. Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanism of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams. Polyhalogen compounds: chloroform, carbon tetrachloride.
Aryl halides: Methods of formation of aryl halides, nuclear and side chain reactions. The addition- elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.
Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

References :

1. Organic Chemistry : Seyhand N Ege
2. Organic Chemistry : Morrison and Boyd
3. Organic Chemistry : I L Finar
4. Organic Chemistry : Hendricson, Cram and Hammond
5. Organic Chemistry : Stanley H. Pine

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objective:
To develop basic skills in organic synthesis and purification of organic compounds

COURSE CONTENT:

1. Calibration of Thermometer using naphthalene / acetanilide / urea

2. Determination of melting point of Benzoic acid / cinnamic acid / m – dinitro benzene / p-dichlorobenzene
3. Determination of boiling point of aniline / nitrobenzene / chlorobenzene
4. Distillation of water – alcohol mixture using water condenser; Distillation of chlorobenzene –nitrobenzene mixture using air-condenser
5. Cystallization: Benzoic acid from hot water, naphthalene from ethanol
6. Sublimation of camphor / phthalic acid / succinic acid

Organic synthesis:

1. Preparation of Iodoform from ethanol / acetone using sodium hypochlorite and KI
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration
3. Preparation of *p*-bromoacetanilide from acetanilide by bromination
4. Preparation of 2,4,6-tribromo phenol from phenol / 2,4,6-tribromoaniline from aniline
5. Preparation of Acetanilide from aniline by acetylation
6. preparation of benzoic acid from benzamide by base hydrolysis
7. preparation of aspirin from salicylic acid by acetylation
8. preparation of p-bromoaniline from acetanilide
9. preparation of 0-iodobenzoic acid from anthranilic acid
10. preparation of p-nitroacetanilide from acetanilide by nitration

References :

A Text Book of Qualitative organic Analysis, A .I . Vogel

Core Course 3 C :Mathematics

MSEIII.3 : REAL ANALYSIS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

At the end of the course students will be able to understand the concepts of real number system, real sequences, infinite series and the convergence tests. Also understand the concept of Riemann integration and its properties.

COURSE CONTENT:

Unit I:

The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important suMSEts, Intervals, Countable and Uncountable sets. Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness,Connectedness.

Unit II:

Introduction to sequences, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, SuMSEquences.

Unit III:
Introduction to Infinite Series, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Maclaurin's integral test.

Unit IV:
Riemann Integration: Upper and lower sums, Criterion for inerrability, Inerrability of continuous functions and monotone functions, Fundamental theorem of Calculus, Change of variables, Integration by parts, First and Second Mean Value Theorems of Integral Calculus.

References:

1. Real Analysis by J.M.Howie, Springer 2007.
2. Real Analysis by Malik, Wiley Eastern.
3. Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.
4. Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
5. Real Analysis by Royden, Prentice Hall of India Pvt. Ltd.
6. Mathematical Analysis by T M Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition.
7. Introduction to Real Analysisby Bartle R G & Sherbert, Wiley India
8. Kumar Ajit & Kumaresan S, *Real Analysis*, CRC Press
9. Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.
10. Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006.
11. Elementary Analysis – The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International Ltd.
14. Textbook of Mathematical Analysis by Leadership Project, Bombay University, Tata McGraw Hill Publishing Media Pvt. Ltd.

Skill Enhancement Course- 1 Physics

MSEIII.4A :BASIC INSTRUMENTATION SKILLS

Credits: 3 (2L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

Unit I: Basic of Measurement

Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

Unit II: Cathode Ray Oscilloscope and its uses

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Unit III:

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Unit IV:

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

References :

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. , U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

(A minimum of EIGHT experiments to be selected from the following)

1. Circuit tracing of a given laboratory electronic equipment.
2. Use of Digital multimeter/VTVM for measuring voltages.
3. Winding a coil / transformer.
4. Study the layout of receiver circuit.
5. Trouble shooting a circuit.
6. To oMSErve the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
7. To oMSErve the limitations of a multimeter for measuring high frequency voltage and currents.
8. To measure Q of a coil and its dependence on frequency, using a Q- meter.
9. Measurement of voltage, frequency, time period and phase angle using CRO.
10. Measurement of time period, frequency, average period using universal counter/ frequency counter.
11. Measurement of rise, fall and delay times using a CRO.
12. Measurement of distortion of a RF signal generator using distortion factor meter.
13. Measurement of R, L and C using a LCR bridge/ universal bridge.

References:

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.

3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

Skill Enhancement Course1 : Chemistry

MSEIII.4B :INDUSTRIAL CHEMICALS AND ENVIRONMENT

Credits: 3 (2L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To understand the basic techniques of chemical industry
- To gain idea about the energy sources
- To understand the properties and application of lubricants
- To study the effects of green house phenomena
- To study the water quality parameter and waste water management
- To acquire the basic knowledge about commom pesticides

COURSE CONTENT:

Unit I:

Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology.

Unit II:

Fuel Chemistry: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and non fuel) in various industries, its composition, carbonization of coal.Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro Gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Unit III:
Air Pollution: Pollutants and their sources, pollution by SO2, CO2, CO, NOx, H2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Green House effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluent from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

Unit IV:
Pesticides General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil) , Anilides (Alachlor and Butachlor).

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:
- To monitor the water quality parameters
- To prepare simple indusrial products
- To analyse food adultrants

COURSE CONTENT:
1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method.
   ($AgNO_3$ and potassium chromate)
6. Estimation of total alkalinity of water samples (CO_3, HCO_3) using double titration method.

7. Preparation of borax/ boric acid.
8. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
9. Preparation of simple organophosphates, phosphonates and thiophosphates
10. Preparation of Magnesium bisilicate (Antacid).
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

References:

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
3. B.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut.
4. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
5. R. Cremlyn: Pesticides, John Wiley. 7. William O. Foye, Thomas L., Lemke , David A. William:
6. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
7. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
8. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
9. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi. 10. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.

Skill Enhancement Course 1 : Mathematics

MSEIII.4C :COMBINATORICS, STATISTICS AND BASIC PROBABILITY

Credits :3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives:
To enable the students to understand the basic concepts of combinatorics, statistics and probability, to obtain the skills and apply them in problem-solving and teaching.

COURSE CONTENT:
Unit I:
Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complements, Boolean Algebra, Boolean expressions, Application to switching circuits.

Unit II:
Permutations and Combinations, Pigeon-hole principle, Principle of inclusion and exclusion. Solving real life problems based on them.

Unit-III:

Introduction to statistics, Mean, Mode and Median of grouped and ungrouped data, Graphical representations; Pie Charts, Line Graphs, Bar Graphs, Histographs, frequency polygon. Measures of dispersion; Range, Mean deviation, Variance and Standard deviation, Analysis of frequency distribution.

Unit-IV: Random experiment, Concept of probability, Sample space, Events- different kindsProbability definitions – Mathematical or Classical or Statistical, Conditional probability, Independent events, Baye's theorem.
Random variable, Discrete and continuous random variables, Probability function, Probability density function, Distribution function. Mean Variance and standard deviation of a random variable.

References:

1. Elements of Discrete Mathematics by C. L. Liu , McGraw-Hill, 1986.
2. Discrete Mathematics and its Applications by Kenneth H. Rosen, McGraw-Hill, 2002.
3. Introduction to the Theory of Statisticsby Alexander M. Mood and Others (1988), New York, McGraw Hill.
4. Introduction to Probabilityby Charles M. Grinstead and Laurie Snell J. (1991), Rhode Island, American Mathematical Society.
5. Fundamentals of Mathematical Statistics by Gupta S.C and Kapur (2011), New Delhi, Sultan Chand and Co.
6. Basic Probability Problemsby Richard Serfozo (2003), London, Springer.
7. Introduction to Mathematical Statisticsby Robert V. Hogg and Allen T. Craig (1978), McMillan Publishing Co.

PROFESSIONAL EDUCATION COURSES

MSE III.5: CHILDHOOD AND GROWING UP

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understand the salient features and problems of growth and development during childhood to adolescence.
- Understand the dynamics of personality development in order to facilitate student trainees' and their students' personal growth.
- Develop the ability to apply the knowledge provided by Educational Psychology to classroom problems of various kinds.
- Understand the intra and inter individual differences in the learners and their Implications for organizing educational programmes.
- Acquire the skills of understanding the needs of all the learners in the classroom and meeting their needs.

- Appreciate the contribution of psychology in realizing the objectives of education.

COURSE CONTENT

Unit I : Nature of Human Development and Educational Implications

Concept and Branches of Psychology; Importance of Study of Psychology by Classroom Teachers, Meaning of Growth and Development. Differences between growth and development, importance of growth and development for the teachers. Principles of Development, Factors Influencing Growth and Development ; Role of Heredity and Environment in Determining individual Differences in Development. Developmental Stages and Tasks, Development during Early Childhood, Late Childhood and Adolescence-Characteristics, Factors Influencing and Educational Implications:(a) Physical (b) Psychomotor (c) Intellectual (d) Language (e)Emotional (f) Social and (g) Moral and ValueDevelopment

Unit II : Management of Issues and Concerns of Adolescent Students

Factors Affecting Adolescent development; Issues and Concerns during Adolescence - Physical and Health concerns,Emotional Issues, Social Issues, Socio-cultural diversity, Adverse Life experiences, Identity Vs Role Confusion; Adolescent Cognition and its effect on Adjustment, Need and Importance of Adolescence Education, Significance of Life Skill Education for Adolescence, Role of Schools for the Balanced Personality

Unit III: Individual Differences in Learners

Individual Differences in - Psycho-Motor skills, Intelligence, Aptitude, Personality, Learning styles and Cognitive Preferences, Self concept and Self esteem, Social-Emotional Development, Aptitude, Interest,Attitude and Values and Study Habits.

Unit IV :Assessment of Individual and Intra Individual Differences in Learners

Tools and Techniques: Psychological Tests, OMSErvation Schedules, Inventories, Checklists, Anecdotal Records, Cumulative Records, Sociometry, Interview Techniques, Achievement and Diagnostic Tests.

Meeting the Individual Differences in the Classroom- General Approaches; Remedial Instruction, Guidance and Counseling, Whole School Approach.

Practicum

Administering Group Tests
Conducting Case Studies
Diagnosing the deviations
Studying School Record and preparing Reports.
Getting Famililiarised with Individual Psychological Tests.

References:

1. Bigge, M.L. (1982). *Learning Theories for Teachers*, (4th edition). New York, Harper and Row Publishers, pp. 89-90.

2. Bolles, R.C. (1975). *Learning Theory*. New York, Holt, Rinehart and Winston, pp. 18-19.
3. Chauhan, S.S. (1978). *Advanced Educational Psychology*, Vikas Publishing House Pvt. Ltd., New Delhi.
4. Dandapani, S. (2001). *A textbook of Advanced Educational Psychology*. New Delhi: Anmol Publications.
5. Dunn, R. (1983). *Can students identify their own Learning Styles?* Educational Leadership, 40, pp. 60-62.
6. Dash, M. (1988). *Educational Psychology*. Delhi: Deep and Deep Publication.
7. Duric, L. (1975). *Performance of Pupils in the Process of Instruction*. Bratislava, SPN, pp. 54-90.
8. Duric, L. (1990). *Educational Sciences: Essentials of Educational Psychology*. International Bureau of Education, UNESCO, New Delhi, Sterling Publishers, p. 81.
9. Fontana, D. (1995). *Psychology for Teachers* (3rd edition). The British Psychological Society, London: McMillan in association with BPS Books.
10. Kumar, S. (2014). Child Development and Pedagogy, Pearson.
11. Kundu C.L. and Tutoo, D.N. (1993). *Educational Psychology*, Sterling Publishers Pvt. Ltd.
12. Lindgren, H.C. (1967). *Educational Psychology in Classroom* (3rd edition). New York: John Wiley and sons.
13. Mohan J. and Vasudeva P.N. (1993). *Learning Theories and Teaching, In Mohan Jitendra (ed.) Educational Psychology*, New Delhi, Wiley Eastern Limited, P. 146.
14. Murthy, CGV and Rao, AVG. (2005). *Life skills Education: Training Package*, Mysore: Regional Institute of Education.
15. NCERT (2013) *Training and Resource materials in Adolescence Education*, New Delhi
16. Oza, D.J. and Ronak, R.P. (2011). *Management of behavioral problems of children with mental retardation*. Germany: VDM publication.
17. Papalia D.E., and Sally, W.O. (1978). *Human Development*. McGraw Hill Publishing Company.
18. Phens, J.M., and Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational Psychology*. New York: Holt Rinehart and Winston Inc.
19. Tessmer, M., and Jonassen, D. (1988). *Learning Strategies: A New Instructional Technology*. In Harris Duncun (1988) Education for the New Technologies, World Year Book of Education. London: Kogan page Inc.
20. Skinner, E.C. (1984). *Educational Psychology*-4th Edition. New Delhi: Prentice Hall of India Pvt. Ltd.
21. Spinthall, N., and Spinthall, R.C. (1990). *Educational Psychology* 5th Edition. McGraw Hill Publishing Company.

Web Resources

- Animated Videos from Study.com, http://study.com/academy/course/educational-psychology-course.html
- Seifert, K. and Sutton, R. 2011). Educational Psychology Third Edition http://www.oercommons.org/courses/educational-psychology/view
- Introduction to Psychology, Open Textbook, http://open.lib.umn.edu/intropsyc/
- Generic Issues, NCERT, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/PDF/generic.pdf
- www.aeparc.org

MSEIII.6 : Gender, School and Society

Credits: 2 (1L+ 1T +0P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
This course enables the student teachers to

- Understand and contextualize ideals of the Constitution of India;
- Appreciate humanistic agenda of the Constitution of India;
- Value and recognize the role of education in realizing the ideals of the Constitution;
- Analyse various educational contexts to see whether the child's rights are ensured
- Understand and develop positive attitudes towards various forms of exclusions;
- Appreciate the measures taken at the national level to universalize elementary and secondary education;
- Analyse the contextual examples to understand the gender issues and concerns;
- Develop positive attitude and values towards promoting gender equality;
- Evolves strategies and mechanisms as a teacher to ensure equality in school and learning contexts

COURSE CONTENT:
Unit I: Education as Fundamental Right
Constitution of India : Fundamental rights; Education as Fundamental right; Human Rights: Meaning, Nature, and classification;Rights of Children: International covenants and Indian Constitution; Education as Fundamental Right of Children: 2009, Rights of girl child

Unit II: Policy framework for public Education in India and its implementation
Education in Post-Independent India: Significant recommendations of commissions and committees, National Policy on Education-1986,Revised 1992, Delors Report: learning the treasure within, Universalization of elementary education: Need and significance; Government schemes and efforts with special focus on Sarva Shiksha Abhiyan, Issues in implementing RTE-2009: A critical understanding.Issues that affect and negate the children's right to education(Child labour: Street children, abandoned and orphans; Differently abled children; Attitude towards the girl child and her participation in schooling; Punishment, abuse and violence in schools). alternative schooling, Secondary education: Universalization of secondary education; universal access, universal enrollment, universal retention, universal success; Issues and Quality concerns- Recommendations of CABE; interventions of RMSA, Initiatives and measures taken at national level to improve teacher education at secondary level: Role of NCTE and NCERT

Unit III: Contemporary Indian Schooling: Concern and Issues
Equality of Educational Opportunity: Meaning and nature; Forms of inequality: Caste, Gender, Transgender, regional, religious and other marginalized groups;

Inequality in Schooling: Public- private schools, Rural-urban schools,Mass-elite schools, single teachers' schools and many other forms of in equal school systems. Positive discrimination: concept and issues and policy intervention;

Understanding Exclusion in schooling: Exclusion: Meaning, and nature; Forms of Exclusion:

Physical/physiological Exclusion; Different kinds/types of differently abled children: Measures to address the issues of leaning of differently abled children and professional preparedness of institutions;

Socio-cultural and economic exclusion

Understanding different forms of socio-cultural and economic exclusion in schooling—Caste, Class, Gender, Minority, and other Marginalized sections of the society;

Critical understanding of 'ascribed identities' on educational opportunities;

Unit IV: Gender: Issues and concerns

Basic Gender concepts: Difference between Gender and Sex; Social construction of Gender; Gender roles as viewed in Indian context; Concept of Transgender

Gender roles in society through various institutions such as family, caste, religion, culture, media and popular culture (films, advertisements, songs etc), law and State; stereotype in gender roles

Issues related to women/girl child: female infanticide and feticide, sex ratio, honour killing, dowry, child marriage, property rights, divorce, widowhood.

Gender bias in school enrolments, household responsibilities, societal attitude towards girl's education

Issues related to gender in school: sexual abuse, sexual harassment, perception of safety at school, home and beyond

Representation of gendered roles, relationships and ideas in textbooks and curricula.

Role of schools, peers, teachers, curriculum and textbooks in challenging gender inequalities or reinforcing gender parity

The Indian constitution and provisions accorded to women; women's rights; legal aspects related to women, indecent representation of women (Prohibition act), cybercrime:

Educational and Employment provisions for Transgender: Legal aspects; social recognition

Sessional activities

- A critical study, with the help of survey and oMSErvational study, of alternative schools-child labour schools, night schools, mobile schools and boat schools.
- Critical analysis of different committees and commissions on Education
- Readings on National Policy on Education, RTE Act 2009, Delors Report
- Survey of schools to see the implementation of various incentives of government to equalize educational opportunities
- Textbook analysis for identifying integration of gender issues.
- Prepare presentation on laws related to women harassment, early marriage, property inheritance, trafficking etc.
- Prepare presentations on constitutional provisions and other government measures to promote girl child's education
- Presentation of Case study reports on girl child's problems in schools and at home.

Suggested Readings

- Anand, C.L. et.al. (1983). Teacher and Education in Emerging in Indian Society, NCERT, New Delhi.
- Govt. of India (1986). National Policy on Education, Min. of HRD, New Delhi.

- Govt. of India (1992). Programme of Action (NPE). Min of HRD.
- Mistry, S.P. (1986). Non-formal Education-An Approach to Education for All, Publication, New Delhi.
- Mohanty, J., (1986). School Education in Emerging Society, sterling Publishers.
- Mukherjee, S.N. (1963). Secondary School Administration, Acharya Book Depot, Baroda.
- Mukherji, S.M., (1966). History of Education in India, Acharya Book Depot, Baroda.
- Naik, J.P. & Syed, N., (1974). A Student's History of Education in India, MacMillan, New Delhi.
- NCERT (1986). School Education in India – Present Status and Future Needs, New Delhi.
- Salamatullah, (1979). Education in Social context, NCERT, New Delhi.
- Sykes, Marjorie (1988): The Story of Nai Talim, Naitalim Samiti: Wardha.
- UNESCO; (1997). Learning the Treasure Within.
- Dr. Veda Mitra. Education in Ancient India, Arya book Depot, New Delhi – 1967
- Reports of SSA and RMSA
- NCTE (2009) National curriculum framework for teacher education
- Agarwal, N (2002). Women and Law in India. New Delhi: New century Pub
- Sen,S.(2013). Women's rights and empowerment. New Delhi: Astha Pub.
- Siddiqi, F.E.& Ranganathan,S.(2001). Handbook on women and human rights, New Delhi: Kanishka Pub

Web Resources: Video on improving Gender Equality- EFA Crowdsourcing Challenge, 2012, UNESCO, Pub by The Pearson Foundation, 3 minutes.

MSEIII.7 : School Attachment Programme 1

Credits : 2	**Marks: 100**
Duration: 3 Weeks	**C1+C2 : 50**
	C3 : 50

Objectives

- To familiarize the student teachers to school environment, its structure, functions and processes.
- To familiarize the student teachers with different types of schools existing in the community.

COURSE CONTENT:

1. The student teachers will visit the neighbourhood schools for one week to get acquainted with the school environment and its functions and processes and submit the report.
2. The student teachers will familiarize themselves with school structure and administration.
3. The student teachers will visit different types of schools such as Government, Government aided and private schools to study their governing norms, regulations and participation in the community.
4. The student teachers will visit the schools run by community/NGO or other organizations like minority run schools, schools in SC/St dominated areas, schools in slum areas, special and inclusive schools and submit the report.

Evaluation:

C1 – Report 1

C2 – Report 2
C3 – Presentation of report through PPT.

FOURTH SEMESTER

Core Course 1D :Physics

MSEIV.1 :OPTICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable students to

- understand that light is a wave phenomenon.
- apply the understanding of wave phenomenon to light.

COURSE CONTENT:

Unit I: Nature of Light and Scattering

Brief discussion on theories of light. Dual nature of electromagnetic radiation, electromagnetic spectrum, energy and monmentum of em wave. Electromagnetic nature of light. Definition and Properties of wave front. Huygen's Principle.
A brief discussion on Tyndall, Rayleigh and Raman scattering of light. A qualitative account of fluorescence and phosphorescence, the Raman Effect experiment and its explanation, intensity and polarisation of Raman lines, some applications of Raman Effect.

Unit II: Interference

Definition of Coherence, Methods of production of Coherent sources by division of wavefront and division of amplitude. Theory of interference (condition for constructive and destructive interference). Young's double slit experiment, Lloyd's Mirror and Fresnel's Biprism. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.
Michelson and Fabry-Perot interferometers: determination of wavelength of light. Wavelength difference, Refractive index and Visibility of fringes

Unit III: Diffraction

Fraunhoffer Diffraction, Diffraction at a single slit, double slit, multiple slits, Diffraction grating, Resolving power – Rayleigh's criterion, Resolving power of a grating and telescope.
Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge, a slit and a wire using half-period zone analysis.

Unit IV: Polarisation

Polarization by reflection, Brewster's law, Malus law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polariods, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity, Fresnel's theory, Rotatory polarization, use of biquartz.

Reference Books:

1. F A Jenkins and H E White, Fundamentals of Optics, McGraw-Hill, 1976.
2. B.K. Mathur, Principles of Optics, Gopal Printing, 1995.
3. H.R. Gulati and D.R. Khanna, Fundamentals of Optics, R. Chand, 1991.
4. Eugene Hecht,Optics, Pearson Education India, 2012.
5. N. Subramaniam, Brijlal, and M. N. Avadhanulu Textbook of Optics, S. Chand Limited, 2004.
6. A K Ghatak, Optics, Tata McGraw-Hill Education, 2009.
7. Ariel Lipson,Stephen G. Lipson,Henry Lipson, Optical Physics, Cambridge University Press, 2010.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To determine the refractive index (n) of a liquid by Liquid Lens.
2. Determination of 'R' of a Lens using the Newton's ring arrangement.
3. Determination of thickness of a paper foil using Air wedge setup.
4. Refractive index (n) of the material of Prism by Spectrometer- measuring angle of minimum deviation.
5. To determine the refractive index (n) of glass & water by apparent depth method.
6. Specific rotation of sugar solution using Polarimeter.
7. Spectrometer- i_1- i_2 curve.
8. Refractive index of glass prism (i-d curve).
9. Spectrometer-solid prism- Dispersive power.
10. Wavelength of sodium D1 & D2 lines using Diffraction grating.
11. Newton's rings-wavelength of sodium light.
12. Cauchy's constants A & B using spectrometer.
13. p– n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11^{th} Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7^{th} Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4^{th} Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 D :Chemistry

MSEIV.2 :THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermochemical equations.
- Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts.
- Apply the concept of equilibrium to construct and interpret the phase diagrams.
- To understand the colligative properties of solutions and the behaviour of immiscible liquids.

COURSE CONTENT:

Unit I: Thermodynamics – I

Concept of Energy, Historical perspectives, Generalisation of laws of Thermodynamics based on human experience with Nature and natural Processes. Language of thermodynamics : system, surroundings, etc. Types of system, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics **:** Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule, Joule–

Thomson coefficient and inversion temperature. Calculation of w.q. dU and dT for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.
Thermochemistry : Standard state, standard enthalpy of formation. Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoff's equation.

Unit II : Thermodynamics – II
Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics , different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.
Concept of Entropy : Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical changes, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.
Third law of thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.

Unit III : Chemical Equilibrium and Phase Equilibria
Recognising a system at Chemical Equilibrium. Attributes of Chemical Equilibrium, Thermodynamic derivation of law of mass action, Equilibrium constant and free energy. Factors that affect the chemical equilibrium and Le Chatelier's principle. Calculations involving equilibrium constant Ionic equilibria in aqueous solutions, sparingly soluble salts, solubility product common ion effect, selective precipitation, applications in qualitative analysis.
Ionisation of water, pH scale, weak acids and bases, hydrolysis, buffer solutions, acid base indicators, acid base titrations and multi stage equilibria. Reaction isotherm and reaction isochore.
To establish a systematic way of discussing the changes systems undergo when they are heated and cooled and when their composition is changed. Clapeyron equation and Clausius – Clapeyron equation, applications.
Statement and meaning of the terms–phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system–water, CO_2 and Sulphur systems. Phase equilibria of two component system–solid-liquid equilibria–simple eutectic–Bi–Cd. Pb-Ag Systems, desilverisation of lead. Simple eutectics, systems forming compounds with congruent melting points.

Unit IV: Solutions
To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction.
Dilute Solution : Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.
Solid solutions – compound formation with congruent melting point (Mg – Zn) and incongruent melting point ($NaCl$– H_2O), ($FeCl_3$–H_2O) and ($CuSO_4$–H_2O) system. Freezing mixtures, acetone dry ice.

Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes–HC– H_2O and ethanol–water systems.
Partially miscible liquids– Phenol-water, trimethylamine– water, nicotine– water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.
Immiscible liquids, steam distillation. Nernst distribution law – thermodynamic derivation, applications.

References :

1. Principles of physical chemistry : Puri,Sharma and Pathania, 47^{th} edition
2. Physical Chemistry : Atkins
3. Phase rule: Gurdeep Raj, Goel Publishing house.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the energetics of chemical reactions
- To find out the equilibirium constants of selected systems
- To study the behaviour of immiscible liquid systems
- To appreciate the physical properties of liquids and liquid mixtures

COURSE CONTENT:

1. Determination of heat of neutralization of acids and bases .Verification of Hess's law of constant heat summation.
2. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
3. pH titration of acid versus base (oMSErvation of change in pH
4. Determination of equilibrium constant of hydrolysis of an ester(ethyl acetate/methyl acetate)
5. Determination of dissociation constant of a weak acid.
6. Determination of solubility product constant (K_{sp}) of a sparingly soluble salt
7. Determination of dissociation constant of phenolphthalein/methyl orange by colorimetric method.
8. Determination of molecular weight of a given liquid by steam distillation.
9. Determination of percentage composition of the given NaCl solution by miscibility temperature method (phenol-water system).
10. Determination of distribution coefficient of benzoic acid between water and toulene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
12. Determination of molecular weight of a given substance by Rast's method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.
14. Determination of refractive index of pure liquids and liquid mixtures.

.

References :

Systematic Experiments in Chemistry by Arun Sethi.

Core Course 3D :Mathematics

MSEIV.3 :DIFFERENTIAL EQUATIONS

Credits: 4 (3L+ 1T +0P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:
By the end of the semester the students will be able to understand the concept of ordinary and partial differential equations, and their uses in solving real life problems.

COURSE CONTENT:

Unit I:
Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form – Reducible to homogeneous form, Linear equations, Bernoulli's equation, Exact equations, Equations reducible to exact equations.

Unit II:
Equations of the first order and higher degree, Clairaut's equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendre's differential equations, Simultaneous differential equations.

Unit III:
Equations which do not contain x, Equation whose one solution is known, Equations which can be solved by changing the independent variable and dependent variable, Variation of parameters, Total differential equation :$Pdx + Qdy + Rdz = 0$, Simultaneous equations of the form $dx/P = dy / Q = dz / R$.

Unit IV:
Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrange's linear equations $Pp + Qq = R$, Standard types of first order non-linear partial differential equations, Charpit's method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

References :

1. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
4. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.

7. Differential Equations by Ayres, Schaum Publishing Company.
8. Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co.
9. Differential Equations by Vasishta and Sharma, Krishna Prakashan Mandir.
10. A Textbook of Differential Equations by Mittal, Har Anand Publications

Skill Enhancement Course - SEC 2 Physics

MSEIV.4A :COMPUTATIONAL PHYSICS

Credits: 3 (2L + 0T +1P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics.

- To use of computational methods to solve physical problems.
- To use computer language as a tool in solving physics problems (applications).

COURSE CONTENT:

Unit I: Introduction

Importance of computers in Physics, paradigm for solving physics problems for solution. Algorithms and Flowcharts, Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples (Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal).

Unit II: Scientific Programming

Concept of high level language, steps involved in the development of a Program, Compilers and Interpreters. Development of C, Basic elements of C. Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Data types, Type declaration of variables, Symbolic constants, Arithmetic operators, Increment and decrement operators, Conditional operator, Bitwise operators, Hierarchy, Arithmetic expressions, Logical operators and expressions, Assignment operators, Arithmetical and assignment statements, Mathematical functions, Input/output statements (unformatted/ formatted), Relational operators, Decision making and branching, Go to, if, if…else, switch statements, Looping, While, do and for, Arrays (Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Handling characters and strings, Functions and voids, structures, Pointers (elementary ideas only), File operations(defining and opening, reading, writing, updating and closing of files, Enough examples from physics problems.

Unit III:Scientific word processing

Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. Equation representation: Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors.

Unit IV:Visualization

Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot.

References:

1) S.S. Sastry, Introduction to Numerical Analysis, 5thEdn., 2012, PHI Learning Pvt. Ltd.
2) V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3) Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4) J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5) J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6) F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7) Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8) Leslie Lamport, LaTeX– A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9) Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10) R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11) U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12) K.E. Atkinson, Elementary Numerical Analysis, , 3rd edition, 2 007, Wiley India.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:
The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics and to provide hands on training on the Problem solving on Computers.

COURSE CONTENT:
(A minimum of TEN experiments to be selected from the following)
1. To print out all natural even/ odd numbers between given limits.
2. To find maximum, minimum and range of a given set of numbers.
3. Calculating Euler number using exp(x) series evaluated at x=1
4. To compile a frequency distribution and evaluate mean, standard deviation etc.
5. To evaluate sum of finite series and the area under a curve.
6. To find the product of two matrices
7. To find a set of prime numbers and Fibonacci series.
8. To write program to open a file and generate data for plotting using Gnuplot.
9. Plotting trajectory of a projectile projected horizontally.
10. Plotting trajectory of a projectile projected making an angle with the horizontally.
11. Creating an input Gnuplot file for plotting a data and saving the output for seeing on the screen. Saving it as an eps file and as a pdf file.
12. To find the roots of a quadratic equation.
13. Motion of a projectile using simulation and plot the output for visualization.
14. Numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
15. Motion of particle in a central force field and plot the output for visualization.

References:

1. S.S. Sastry, Introduction to Numerical Analysis, 5th Edn, 2012, PHI Learning Pvt. Ltd.
2. V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3. Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4. J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5. J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6. F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7. Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8. Leslie Lamport, LaTeX– A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9. Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10. R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11. U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12. K.E. Atkinson, Elementary Numerical Analysis, 3rd edition, 2 007, Wiley India.

Skill Enhancement Course – SEC 2 Chemistry

MSEIV.4B :INORGANIC MATERIALS

Credits :3 (1L + 0T +1P)	**Marks: 100**
Contact hrs per week: 3	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 50**

Objectives :

- To understand the production, handling and storage of indusrial gases
- To gain knowledge about the manufacture, application and hazardous in handling the inorganic chemicals
- To know the composition, properties and application of silicate minerals in indusry
- To acquire the knowledge of simple fertilizers, surface coatings, alloys, and chemical explosives

COURSE CONTENT

UNITI : Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate. Industrial Metallurgy - Preparation of metals (ferrous and nonferrous) and ultra pure metals for semiconductor technology.

UNITII : Silicate Industries

Glass: Glassy state and its properties, classification (silicate and non silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, super conducting and semi conducting oxides, fullerenes carbon nanotubes and carbon fiber.

Cements : Classification of cement, ingredients and their role, Manufacture of cement and the settingprocess, quick setting cements.

UNIT III

Fertilizers: Fertilizers: Different types of fertilizers. Manufacture of the following fertilizers: Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphates; Polyphosphate, Super phosphate, Compound and mixed fertilizers Potassium Chloride, Potassium sulphate.
Surface Coatings: Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electroless), metal spraying and anodizing

UNIT IV
Alloys: Classification of alloys, Ferrous and Non-Ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, Page 39 of 80 demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.
Chemical Explosive: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction of rocket propellant.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To analyse the chemical composition, properties of simple fertilizer and alloys
- To familiarise with the preparation of inorganic salts, dyes and pigments

COURSE CONTENT:

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Estimation of Cu-Zn in brass
5. Determination of composition of dolomite (by complexometric titration).
6. Analysis of Cu-Ni or (Cu, Zn) in alloy or synthetic samples.
7. Analysis of Cement.
8. Preparation of pigment (zinc oxide).
9. Estimation of Available Oxygen in Hydrogen Peroxide.
10. Determination of phosphoric acid in commercial sample of phosphoric acid.
11. Preparation of chrome alum.

12. Preparation of potash alum from alluminium scarp
13. Preparation of mthyl orange.

References:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, NewDelhi.
3. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
5. A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
6. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New

Skill Enhancement Course –SEC 2 : Mathematics

MSEIV.4C :DATA HANDLING

Credits : 2 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives:
On completion of this course, the students will be able to:

- understand the types of educational data, procedures of data validation and its analysis.
- appreciate the analysis of educational data by using statistical tests.
- Develop skill of using the application software for data analysis and computation of various statistical measures.
- Compute the different statistical measures by using computerized application software.
- Drawing meaningful conclusions based on the interpretation of analysed data.

Unit I: Data Collection- Nature and types of data
Data collection- primary sources and secondary sources; Scales of measurement (NOIR)
Coding: Variable names; Coding responses; Coding open-ended questions
Tabulation, Constructing frequency distribution table, Graphical representation of data **–** Pie diagram, Histogram, frequency curve.

UnitII : Descriptive Analysis of Data-1
Measures of dispersion – Range; Quartile deviation; Standard deviation; Coefficient of dispersion; Skewness and Kurtosis.

Unit III: Descriptive Analysis of Data-2
Normal Probability Curve – Meaning, Purpose and Applications, Derived Scores (Z & T Scores).

Measures of Reltionships: Meaning of Correlation and Methods of computing correlation - Product Moment Correlation; Rank Difference Method of Correlation

Unit IV: Inferential Statistics

Sampling Procedures –Random sampling, Systematic Random sampling, (with and without repetitions), Stratified random sampling, Cluster sampling, Snow ball sampling.

Hypothesis – Meaning and types; testing of hypothesis – one sample t-test, independent samples t-test, paired samples t-test, Chi-square test.

Practicum:

1. Collect data live – class test scores/ survey data and generate frequency distribution table and represent it graphically.
2. Collect test scores of any school subject of any class and compute Mean, Quartile Deviation and Standard Deviation.
3. Compute coefficient of correlation among language subject papers and core subject papers like – English and History, Mathematics and Science, etc.
4. Study the sampling procedures adopted by taking various school contexts like selecting a team for school reports, team for debate competition, etc.

PROFESSIONAL EDUCATION COURSES

MSE IV.5: LEARNING AND TEACHING

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The student teacher will be able to:

- Gain the knowledge about the scientific knowledge about the process of learning.
- Understands the Conditions Essential for Facilitating Learning and Retention.
- Apply the Principles and Strategies of Major Approaches to Learning in Classroom Environment.
- Understands the Process of Effective Teaching and Qualities of Effective Teachers.
- Understands various Approaches to Teaching and will be able to apply them in the relevant situations.
- Understands the Principles and Strategies for Creating Conducive Classroom Environment.
- Appreciates the role of a teacher as leader, organizer, a facilitator & a humane reflective practitioner.
- Realize the difficulties in learning and teaching.

COURSE CONTENT

Unit I :Concept and Nature of Learning

Factors Associated with Learning
Maxims of Learning and their Educational Implications
Approaches to Learning(Concept, Associated Concepts Basic Principles and Educational Implications)-Habitual Learning, Associative Learning (Classical and Instrumental Conditioning), Spatial Learning/Cognitive Maps, oMSErvational Learning, Learning by Insight, Information Processing Approach, Humanistic Approach, Constructivist Learning Approach
Types of Learning-Concept Learning, Skill Learning, Verbal Learning, Learning of Principles and Problem Solving (Meaning, Nature, Stages, Principles and Approaches/Strategies)

Unit II

Attention-Meaning, Factors Influencing Attention, Strategies for Enhancing Attention; Perception-Meaning, Laws of Perceptual Organization (Gestalt Psychologists' View) and Educational Implications.
Process of Memory- Sensory Registration, Retention(Storing), Recognition, Recall;

Factors Influencing Retention; Strategies for Enhancing Memory.
Transfer of Learning- Concept, Types, Theories; Strategies for Enhancing Positive Transfer of Learning
Achievement Motivation- Concept, Intrinsic and Extrinsic Motivation; Strategies for enhancing Achievement Motivation in Students.

Unit III: Understanding the process of Teaching-Learning

Teaching as a Profession
Teaching as an Art and Science.
Understanding the Process of Teaching as a Profession
Identifying the need and importance of classroom teaching-learning
Reflective teaching
skillful teaching
Applying the knowledge of Maxims of Teaching
Role of teacher in identifying classroom related problems

Unit IV: Teacher and Teaching as a profession

Various Approaches to Teaching: Behaviourist, Cognitivist, Constructivist, Connectionist, Participatory, Cooperative, Collaborative, Personalized, and Holistic

Teacher as a Facilitator and Guide/Philosopher/Friend

Teachers commitment towards fulfilling Felt Need of Learners

Professional Characteristics of Teacher in Classroom Management.
Skills & Competencies of a TeacherCommunication:Meaning,mode::input/process/output
Basic Model of Communication: Sender, Message, Medium, Receiver & Reach;Factors facilitating communication
Effective Classroom Management-Principles and Strategies
Leadership Qualities in Teachers

Practicum

Conducts Projects on –

Identifying the Learning Difficulties of Students in Different School Subjects and the Possible Reason for them;

Providing Remedial Instruction to the Students with Learning Difficulties;

Study the Qualities of Effective Teachers through oMSErvation, interview, case study etc.,

Visiting Model Schools and Prepare Reports

References:

- Benjamin S., Bloom et al. (1964). *Taxonomy of educational objectives*. Longman Group.
- Bruce Joyce (1985) *Models of teaching* (2nd ed.) Prentice Hall**.**
- Encyclopaedia of Modern Methods of Teaching and Learning (Vol. 1-5).
- Gage N.L. Scientific Basis of art of Teaching
- Gavriel Salomon (1981) *Communication and education* Sage.
- Lieberman, M. (1956) *Education as a profession*. Prentice Hall, Inc.
- Karthikeyan, C. (2004). *A Text book on instructional technology*, RBSA.
- Kumar, S. (2014). Child Development and Pedagogy, Pearson.
- Ohles, J.F. (1970). *Introduction to Teaching*. New York: Random House, INC.
- Siddiqui, Mujibul Hasan (2005). *Techniques of classroom teaching* A.P.H
- Skinner, E.C.(1984). *Educational Psychology. 4th Edition***.** New Delhi: Prentice Hall of India Pvt. Ltd.
- Snowman & Baihler (2006). *Psychology Applied to teaching*. Boston: Houghton Mifflin Company.
- Stephens, L.M. & Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational psychology*. New York: Holt, Rinehart and Winston, Inc.
- Tanner, L.N. & Lindgren, H.C. (1971). *Classroom Teaching and Learning*. New York: Holt, Rinehart and Winston, Inc.

Web Resources

- Courses on Communication Skills, http://nptel.ac.in/courses/109104030/
- Jane Ciumwari Gatumu, Reflective Teaching, http://oer.avu.org/bitstream/handle/123456789/155/REFLECTIVE-TEACHING.pdf?sequence=1
- School leadership (2011), http://azimpremjifoundation.org/pdf/learning-curve-16.pdf

MSEIV.6 :DRAMA AND ART EDUCATION

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the use of 'Drama' as a Pedagogy.
- Use 'Role play' technique in the teaching learning process.
- Understand the importance of dramatic way of presentation.
- Integrate singing method in teaching learning process.
- Understand various 'Dance forms' and their integration in educational practices.
- Use art of drawing and painting in teaching learning process.
- Develop creativity through different creative art forms.
- Understand the efficacy of different art forms in education.

COURSE CONTENT

Unit I :Drama and its Fundamentals

Creative writing – Drama writing, Drama as a tool of learning, Different Forms of Drama Role play and Simulation, Use of Drama for Educational and social change (Street play, Dramatization of a lesson), Use of Drama Techniques in the Classroom: voice and speech, mime and movements, improvisation, skills of oMSErvation, imitation and presentation

Unit II: Music (Vocal & Instrumental)

Sur, *Taal and Laya (Sargam),* Vocal - Folk songs, Poems, Prayers, Singing along with "*Karaoke*", Composition of Songs, Poems, Prayers, Integration of *Vocal & Instrumental* in Educational practices

Unit III: The Art of Dance

Various Dance Forms - Bharat Natyam, Kathakali, Kuchipudi, Yakshagana- Folk dance and various other dances
Integration of Dance in educational practices
(Action songs, *Nritya Natika*)

Unit IV: Drawing and Painting

Colours, Strokes and Sketching- understanding of various means and perspectives, Different forms of painting- Worli art, Madhubani art, Glass painting, Fabric painting and various forms of painting, Use of Drawing and Painting in Education -Chart making, Poster making, match-stick drawing and other forms, Model making – Clay modeling, Origami, Puppet making, Decorative – Rangoli, Ekebana, Wall painting (Mural), Kalameshuthu or any other local art

Transactional Strategies

Lecture cum Discussion for each Unit (Unit 1 to 4) followed by simulated/ authentic practices, Workshop schedule, Slide / Film show, Project work, Demonstration, Simulation, Group work and field trips involving meetings with folk singers and other skilled practitioners will especially form part of the transaction scheme. In addition to the above any one or more of the following:

Practicum

Suggestive List:

1. Developing a script of any lesson in any subject of your choice to perform a Play / Drama.
2. Developing a script for the street play focusing on "Girl's education and Women empowerment".
3. Preparing a pictorial monograph on "Various folk dance of South India.
4. Preparing a pictorial monograph on "Various Classical Dance forms in India".
5. Preparing a calendar chart on "Various Musical Instruments in India".
6. Develop an Audio CD based on newly composed Poems of any Indian language.
7. Preparing some useful, productive and decorative models out of the waste materials.
8. Visit the Faculty of Performing Arts in your city and prepare a detailed report on its multifarious functioning.
9. Development a Review of a theatre programme if possible
10. Organize a competition on some Decorative / Performing Art forms in the school during your School Internship programme and prepare a report on it.
11. Organizing a workshop on some selected Creative Art forms in the school during your School Internship programme and prepare a report on it.

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc.Action research based on teaching learning and school and community could be conducted.**

Evaluation Strategies

Sessional, practicum, unit test project work related presentations.

Suggested Readings

1. Natyashastra by Bharathamuni
2. Deva, B.C. (1981). An Introduction to Indian Music. Publication Division, Ministry of Information and Broadcasting, Government of India.
3. NCERT (2006). Position Paper by National Focus Group on Arts, Music, Dance and Theatre
4. Theory of Drama by A. Nicoll

Web Resources

Position Paper National Focus Group on Arts, Music & Dance, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/art_education.pdf
Arts in school education, (2012), http://azimpremjifoundation.org/pdf/LCXVIII.pdf
Online courses on Arts, http://www.dsource.in/course/index.php
Learning Indicators and Learning Outcomes at the Elementary Stage, (2014), NCERT
http://www.ncert.nic.in/departments/nie/dee/publication/pdf/LI_Final_Copy_Revised_29.12.

14.pdf

MSEIV.7 : School Attachment Programme 2

Credits : 2 **Marks: 100**
Duration : 3weeks **C1 + C2:50**
C3: 50

Objectives:

- To familiarize student teachers with classroom processes and skills employed in teaching-learning process
- To provide field experience of assessment practices including record maintenance and report cards followed in schools at elementary and secondary levels.
- To participate and conduct Community awareness programmes

COURSE CONTENT:

1. The student teachers will observe minimum 3 classes of regular teachers for understanding the skills and strategies used in teaching by them..
2. The student teachers will visit schools and interact with teachers to know about the assessment practices like CCE, grading patterns and reporting the performance of students and submit the report
3. Students will analyse the assessment records and the report cards to study the models of assessment and procedures followed in reporting students' performance. The students will attend the PTA meetings where feedback about students' performance is given by the teachers and submit the report.

Community Based Activities:

Objectives

- To develop an awareness and understanding of educational status of the community.
- To create an awareness of the implementation of various progrmmes of the government related to school education through field experiences and community participation.

Activities

- The student teachers will visit the local community to study the drop out/ out of school children and the modes of alternative education received by them.
- Organize awareness programmes in the selected community on literacy, human rights, gender sensitization, environmental conservation etc through street play, role play and dramatization.
- To interact with community members like zilla parishat members, SDM and PTA members to study about their participation in school development programmes

Evaluation:

C1 – Report 1
C2 – Report 2
C3 – PPT presentation of community based activities

FIFTH SEMESTER

Core Course 1 E :Physics

MSEV.1 :ATOMIC AND MOLECULAR PHYSICS

Credits: 4 (3L+ 0T +1P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Physics-I

The Electron: Determination of e/m of an electron by Thomson method, Determination of charge of an electron by Millikan's oil drop method.
Atomic Spectra: Inadequacy of Bohr atomic model, correction due to finite mass of the nucleus, Rydberg constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, relativistic mass correction, vector model of an atom, Electron spin, space quantisation, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

Unit II: Atomic Physics-II

Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valence electron and a brief mention of L-S and J-J coupling for multi electron atoms. Fine structure lines of Sodium Zeeman effect.Explanation of Zeeman effect on the basis of vector model of atom, Expression for Zeeman shift and experimental details. Mention on anomalous Zeeman effect, A qualitative mention of Paschen – Back and Stark effects.

UnitIII : Molecular Spectra

Molecular formation, the H_2^+ molecular ion, H_2 – molecule. Salient features of molecular spectra. Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules.Theory of pure rotation and rotation- vibration spectra, Raman and Infrared (IR) spectra, simple applications. UV-Visible, Fourier Transform IR, Nuclear Magnetic resonance (NMR) and Laser Raman spectra of organic molecules and their interpretations.

Unit IV: X-Rays

Electromagnetic spectrum, production of X-rays, X-ray spectra, Continuous X-ray spectra Characteristic X-ray. Duanne and Hunt limit. Moseley's law and its significance, X-ray energy levels.Bragg's law and Bragg spectrometer. A brief mention of different types of crystals. Structures of NaCl and KCl crystals. Compton Effect, Expression for Compton Shift.X-ray diagnostics and imaging

Reference Books:

1. H. S. Mani and G. K. Mehta, Introduction to Modern Physics, Affiliated East-West Press,India, 1990.
2. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
3. J.R. Taylor, C.D. Zafiratos,Modern Physics, M.A. Dubson, PHI Learning, 2009.
4. R.A. Serway, C.J. Moses, and C.A.Moyer, Modern Physics, Cengage Learning, 2005.
5. G. Kaur and G.R. Pickrell, Modern Physics, McGraw Hill, 2014.
6. Rich Meyer, Kennard, Coop, Introduction to Modern Physics, Tata McGraw Hill, 2002.
7. R. Murugeshan and K. Sivaprasath Modern Physics, S. Chand Publisher, 1994.
8. J. R. Reitz, F. J. Milford, and R. W. Christy, Foundations of Electromagnetic Theory, Addison-Wesley; 4 edition, 2008.
9. Banwell and E. Mccash, Fundamentals for Molecular Spectroscopy, McGraw Hill Education; 4 edition, 1994.
10. H. E. White, Atomic Spectra –, MacGraw-Hill, 1954.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Franck-Hertz experiment.
2. Study of sodium lines using discharge tubes.
3. Study of hydrogen lines using discharge tubes.
4. Study of helium lines using discharge tubes.
5. Dissociation energy of Iodine.
6. Hartmann's formula for wavelength.
7. Benzene IR spectrum.
8. Rydberg Constant – Solar Spectrum
9. Excitation of Brass spectrum using Arc method
10. Rutherford model – Simulation technique.
11. Zener diode characteristics.

12. Transistor characteristics and transfer characteristics in Common Base configuration-current gain.
13. Transistor characteristics and transfer characteristics in Common Emitter configuration-current gain.
14. CE Transistor Amplifier-Frequency response.
15. Basic operational amplifier.
16. Energy gap of a semiconductor.
17. Bi-prism experiment.
18. Resolving power of grating.
19. Current balance experiment- the effects of a magnetic field on a current carrying conductor.
20. Resolving power of a telescope.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11^{th} Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7^{th} Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4^{th} Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2EChemistry

MSEV.2 :TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To develop an understanding of Principles of Chemical Kinetics and Surface Chemistry.
- To explain the properties of d and f block elements and their compounds in terms of their electronicconfiguration and bonding.
- To understand the properties of coordination compounds in terms of bonding theories.

COURSE CONTENT:

Unit I: d-block and f-block elements

To relate the electronic configuration to the properties and structure of transition metals and their compounds. Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.
Chemistry of Elements of Second and Third Transition Series
General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. Powder metallurgy – extraction of tungsten. Position of lanthanides and actinides in the periodic table, lanthanide contraction and its consequences, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides. General properties of actinides:
Extraction of Thorium, Uranium and Plutonium from burnt nuclear fuels.

Unit II :Coordination Compounds
To apply theories that explain certain properties and structure of transition metal complexes. Werner's coordination theory and its experimental verification, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of VBT. Elementary treatment of crystal field theory, splitting of d-orbitals in square planar, tetrahedral and octahedral complexes, factors affecting crystal field parameters, Explanation of magnetic behavior and color of complexes using CFT, effective atomic number concept.Metal carbonyl, 18 electron rule, Preparation, structure and reactions of $Ni(CO)_4$, $Fe(CO)_5$ and $V(CO)_6$, nature of bonding in metal carbonyls.

Unit III: Chemical Kinetics
Understanding the factors that influence a chemical reaction and rationalising them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method. Radioactive decay as a first order phenomenon.
Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy, Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Unit IV : Surface Phenomena
Adsorption: Introduction-Absorption and adsorption(definition, examples and differences) types 0f adsorptions-physical and chemical(definition, examples and differences between them), factors influencing the adsorptionof gases on solids. Adsorption isotherms: definition, Mathematical expression for Freundlich and Langmuir's adsorption isotherms. applications of adsorptions.

Catalysis: Definition, general characteristics, action of catalytic promoters and inhibitors. Homogeneous catalysis (definition and examples),Heterogeneous catalysis(definition and examples) mechanism of hetwerogeneous catalysis(based on adsorption theory) enzyme catalysis (definition and examples) Mechanism of enzyme catalysed reaction(lock and key mechanism)

References :
1. Inorganic Chemistry : James Huhey
2. Essentials of physical chemistry Arun Bahl,B.S. Bahl,G.D. Tuli
3. Concise Inorganic Chemistry J.D.Lee 5th edition,Wiley publishers.

4. Advanced Inorganic Chemistry Satya Prakash G.D. Tuli S.K. Basu, R.D. Madan S.Chand and company pvt. Ltd.
5. Principles of Physical Chemistry Puri,Sharma and Pathania.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To understand the kinetics of chemical reactions
- To familiarise with the analysis of ores
- To prepare and analyse inorganic complexes
- To study the adsorption phenomena

COURSE CONTENT:

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar
8. Colorimetric study of kinetics of oxidation of Indigo carmine by Chloromine-T.
9. To study the adsorption of acetic acid on activated charcoal
10. To determine the relative strength of Hydrochloric acid and sulphuric acid by studying thekinetics of hydrolysis of ethyl acetate.
11. To study kinetically the reaction rate of decomposition of iodine by hydrogen peroxide.
12. Determination of Copper by colorimetric method using ammonia as the complexing agent.
13. Determination of Ferric ion by colorimetric method using potassium thiocyanate as the complexing agent.
14. Estimation of Manganese in pyrolusite by volumetric method
15. Preparation of a complex: potassium trioxalato aluminate(III) trihydrate or potassium trioxalato cobaltate(III)
16. To determine the rate constant for the inversion of sucrose using polarimeter.

References :

1. Advanced practical inorganic chemistry by Gurdeep Raj, Goel Publication House, Meerut-India.
2. Systematic Experiements in chemistry by Arun Sethi, New age International Pvt.Ltd, New Delhi.

Core Course 3E :Mathematics

MSEV.3 :MULTIVARIATE CALCULUS & VECTOR CALCULUS

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
To enable the students to understand the concepts of multi-variate calculus and vector clculus, and also to compute the areas of plain regions, surfaces and volume of solids.

COURSE CONTENT:

Unit I:
Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral.

Unit II:
Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula.

Unit III:
Quadratic Curves, surfaces, sphere, cylinder, cone, Ellipsoid, Hyperbloid, Parabloid, Ruled surfaces.

Unit IV:
Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane.

References

1. Calculus by Lipman Bers, Vols 1 and 2.
2. First Course in Calculus by Serge Lang
3. Calculus – Single and Multivariable by Hughes Hallet
4. Calculus and analytic geometry by Thomas and Finny.
5. Advanced Calculus by David Widder

PROFESSIONAL EDUCATION COURSES

MSEV.4 :ASSESSMENT FOR LEARNING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
This course is designed to help student teachers to:

- Understand the nature of assessment and evaluation and their role in teaching- learning process.
- Understand the importance of assessment in continuous and comprehensive manner
- Plan assessment tasks, techniques, strategies and tools to assess learner's competence and performance in curricular and co-curricular areas,
- Devise marking, scoring and grading procedures,
- Analyse, manage and interpret assessment data.
- Devise ways of reporting on student performance
- Develop the skills of reflecting-on and self-critiquing to improve performance.

COURSE CONTENT:

Unit I: Introduction to Assessment & Evaluation

(a) Concept of test, measurement, Assessment, examination, appraisal and evaluation in education and their inter relationships.
(b) Purpose and objectives of assessment/ Evaluation- for placement, providing feedbacks, grading promotion, certification, diagnostic of learning difficulties.
(c) Importance of assessment & evaluation for Quality Education – as a tool in Pedagogic decision making (writing instructional objectives, selection of content, teaching learning resources, methodology, strategies & assessment procedures followed).
(d) Forms of assessment : -
    (i) (Formative, Summative, diagnostic; prognostic, placement; Norm referenced; Criterion referenced based on purpose)
    (ii) (Teacher made tests Standardizedtests: based on nature & scope)
    (iii) (Oral, written, performance: based on mode of response)
    (iv) (Internal, External, self, peer, & teacher, group Vs individual- based on context)
    (v) Based on nature of information gathered (Quantitative, Qualitative)
    (vi) CCE, school based assessment ; Standard Based- based on Approach
(e) Recent trends in assessment and evaluations:
    - Assessment for learning, assessment of learning and assessment as learning; Relationship with formative and summative, Authentic assessment.
    - Achievement surveys- State, National and International; Online assessment; On demand assessment/ evaluation.
    - Focus on Assessment and Evaluation in Various Educational commissions and NCFs

Unit II: Developing Assessment Tools,Techniquesand Strategies -1

(a) Concept of Cognitive, Affective, Psychomotor domain of learning
(b) Relationship between educational objectives learning experiences and evaluation.
(c) Revised taxonomy of objectives (2001) and its implications for assessment and stating the objectives-
- Knowledge dimensions:- factual, conceptual, procedural and meta-cognition.
- Cognitive, Affective, Psychomotor domains – Classification of objectives

(d) Stating objectives as learning out comes: General, Specific.
(f) Construction of achievement tests- steps, procedure and uses (Teacher made test/Unit Tests)
- Constructing table of specifications & writing different forms of questions –(VSA, SA, ET & objective type, situation based) with their merits and demerits; assembling the test, preparing instructions, scoring key and marking scheme; and question wise analysis

(g) Construction of diagnostic test – Steps, uses & limitation; Remedial measures- need types and strategies
(h) Quality assurance in tools – Reliability: Meaning &Different methods of estimating reliability (Test-retest; equivalent forms, split- half); Validity: Meaning &Different methods of estimating reliability (Face, content, construct), Objectivity and Practicability/ Usability
(i) Inter dependence of validity, reliability and objectivity

Unit III: Developing Assessment Tools,Techniquesand Strategies -II

(a) Concept of CCE, need for CCE its importance; relationship with formative assessment and problems reported by teachers and students
(b) Meaning & construction of process-oriented tools- Interview; Inventory; oMSErvation schedule; check-list; rating scale; anecdotal record;
(c) Assessment of group processes-Nature of group dynamics; Socio-metric techniques; steps for formation of groups, criteria for assessing tasks; Criteria's for assessment of social skills in collaborative or cooperative learning situations.
(d) Promoting Self assessment and Peer assessment – concepts and criteria's
(e) Portfolio assessment – meaning, scope & uses; developing & assessing portfolio; development of Rubrics

Unit IV: Analysis, Interpretation, Reporting and Communicating of student's performance

a) Interpreting student's performance
  (i) Descriptive statistics (measures of central tendency & measures of variability, percentages, rank correlation)
  (ii) Graphical representation (Histogram, Frequency Curves)

(b) Grading – Meaning, types, and its uses
(c) Norms – Meaning, types, and its uses
(d) Reporting student's performance – Progress reports, cumulative records, profiles and their uses, Portfolios, Using descriptive Indicators in report cards
(e) Role of feedback to stake holders (Students, Parents, Teachers) and to improve teaching – learning process; Identifying the strengths & weakness of learners.

Sessional Works

1. Discussion on existing assessment practices in schools and submitting the report.
2. Constructing a table of specification on a specific topic (subject specific)
3. Constructing a unit test using table of specifications and administering it to target group and interpreting the result.
4. Construction of any one of the process oriented tools and administering it to group of students & interpreting it.
5. Analysis of question papers:teacher madeandvarious Boards
6. Analysis of report cards-State and Central (CMSE)
7. Analysis of various education commission reports and NCFs for knowing various recommendations on Assessment and Evaluation

References:

1. Ebel, R.L. and Fresbie, D.A. (2009).Essentials of Educational Measurement. New Delhi: PHI Learning PVT. LTD.
2. Garrett, H.E. (2008). Statistics in Psychology and Education. Delhi: Surjeet Publication.
3. Gupta, S.K. (1994). Applied Statistics for Education. Mittal Publications.
4. Mehta, S.J. & Shah, I.K. (1982).Educational Evaluation. Ahmedabad: Anand Prakashan (Gujarati).
5. NCERT (2015) Learning Indicator, New Delhi
6. NCERT (2015) CCE Packages, New Delhi
7. Rani, P. (2004).Educational Measurement and Evaluation. New Delhi: Discovery Publishers.
8. Rawat, D.S. (1970). Measurement, Evaluation and Statistics in Education. New Delhi: New Raj Book Depot.
9. Reynolds, C.R., Livingston, R.B., and Willson, V. (2011).Measurement and Assessment in Education. New Delhi: PHI Learning PVT. LTD.
10. Ten Brink, T.D. (1974). Evaluation – A Practical Guide for Teachers. New York: McGraw Hill Book Co.
11. Thorndike, R.M. (2010). Measurement and Evaluation in Psychology and Education. New Delhi: PHI Learning Pvt. Ltd.
12. Yadav, M.S. and Govinda, R. (1977). Educational Evaluation, Ahmedabad: SahityaMudranalaya.
13. Linn, Robert and Norman E Gronland (2000); Measurement and Assessment in teaching, 8th edition, by Prentice Hall, Inc, Pearson Education, Printed in USA
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi
15. Tierney, R. J., Carter, M. A., & Desai, L. E. (1991). Portfolio Assessment in the Reading – Writing Classroom. Norwood, MA: Christopher-Gordon Publishers
16. Glatthorn, A. A. (1998). Performance Assessment and Standards-based Curricula: the Achievement Cycle. Larchmont, NY: Eye no Education
17. Gredler, M. E. (1999). Classroom Assessment and Learning. USA: Longman.
18. Likert, R. (1932). A technique for the Measurement of Attitudes. Archives Psychology, 40.
19. Mehrens, W. A. & Lehmann, I. J. (1991). Measurement and Evaluation in Education and Psychology (8th ed.): Chapter 10: Describing Educational Data.
20. Oosterhof, A. (1994). Classroom Applications of Educational Measurement (Second Edition). New York: Macmillan College Publishing Company Inc.

21. Payne, D.A (2003).Applied Educational Assessment. Australia: Wadsworth: Thomson Learning.
22. Popham, W.J. (1981). Modern Educational Measurement. New Jersey, Engle Wood Cliffs: Prentice-Hall Inc.
23. Popham, W. J. (2002). Classroom Assessment: What teachers need to know (Third Edition). Boston: Allyn& Bacon.

Web Resources

1. Assessment in school education, (2013) http://azimpremjifoundation.org/sites/default/files/userfiles/files/Issue%20XX%20Section%20C.pdf
2. Compendium of Tools, (2013), CMSE
3. http://cMSE.nic.in/ePub/webcMSE/webcMSE/Revised%20Compendium%20of%20Tools/ Revised%20Compendium%20of%20Tools/docs/Revised%20Compendium%20of%20Tools.pdf
4. http://www.cMSE.nic.ib/cce/index.html
5. www.ncert.nic.in
6. http://nroer.in/home/

MSEV.5 :Pedagogy of Physical Science 1

Credits: 4 (2L+ 2T +0P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

Student teachers will be able to

- Explain the nature of science.
- Specify the goals and objectives of science teaching.
- Review the contributions of major scientists.
- Explore several methods of teaching science.
- Apply various theories science learning and analyze the implications for teaching science.
- Review the science curriculum, syllabus, and text books.
- Explore constructivist practices in teaching of science.
- Create unit plans, lesson plans in an artistic and scientific way.
- Explore the inter-relation between science and other subjects.

COURSE CONTENT:

Unit I: Nature of Science

Nature of science -Scientific method, how science works, science as a process and product. Science as a way of thinking: inquiry, oMSErvation, problem-solving, rational thinking, reasoning, science as an empirical body of knowledge.Structure of knowledge: facts, concepts, principles, generalizations, theories.Historical development of physical science with illustrations from topics such as structure of atoms, laws of chemical combinations, stoichiometry, equivalent mass, models of the universe, nature of light, electricity and magnetism etc.Contributions of Indian and international figures in science to the knowledge domain of physical science. Basic branches of physical science and applications of physical science to human life.Evolution of Physical Science as a knowledge field; science and technology; science and society; inter-relation between science and other subjects, sole of science teacher.

Unit II:

a. Aims and learning objectives of Physical Science

Aims of teaching physical science in the school curriculum.

Development of process skills of science, scientific attitude and temper by learning Physics and Chemistry as experimental sciences.

Nurturing curiosity, creativity and aesthetic sense.

Science and society– relating physical science with the natural and social environment and technology, relating science to daily life, social interaction and science.

Values through science teaching-open mindness, objectivity, truthfulness, critical thinking, logical thinking, development of problem solving skill, social learning.

Ethics of using the knowledge of science and technology.

b. Physical Science Curriculum

Recommendations of major commissions in India and policies on science teaching.

The school science curriculum with regard to NCF 2005: major themes in secondary school science.

Brief study of famous curricular reform projects such as Nuffield, STEM, PSSC, Chemical Bond Approach, CHEMSTUDY etc.

Comparison of international secondary schools science syllabus- Singapore, Oxford, CIE (Cambridge).

Unit III: Pedagogical shift, Approaches and Strategies of learning Physical Science

Role of prior knowledge in constructing new knowledge (Ausubel), Piaget's theories of learning (schema- disequilibrium).

Development of concepts in Science- real-life as the basis of conceptions; personal vs. verified knowledge of science. Conceptions, alternate concepts, and misconceptions in science.

Teaching concepts and generalizations, inductive approaches, using advance organizers, problem solving approach, investigatory approach, project method, cooperative learning method.

Vygotsky's theories of role of language and context in learning, Van Glasersfeld's theory. Development of constructivist practices in science teaching, 5E learning model, 7E model, conceptual change model of teaching, challenges in using constructivism in the classroom.

Collaborative learning approach, problem solving approach, concept mapping, experiential learning, cognitive conflict, inquiry approach, analogy strategy.

Facilitating learning: teacher's role as a facilitator, grouping students, multiple learning experiences, discussing ideas, scaffolding, consolidating students' ideas, questioning-

techniques and strategies, higher order and metacognitive questioning.
Maintaining positive learning environment. Catering to children with varied needs and abilities, context in learning, gender and science.
Scope and importance inclusiveness in science class room.
Role of learner: each learner as unique individual, involving learner in learning process, role of learner in negotiating and mediating learning, encouraging learner to raise and ask questions.

Unit IV: Planning for Physical science Teaching-learning

Importance of planning, unit plan and lesson plan.
Anderson and Krathwohl's revised Bloom's taxonomy: knowledge domains and cognitive processes, action words. types of knowledge- factual, conceptual, procedural and metacognitive knowledge.
Identification and organization of concepts.
Elements of physical science lesson plan: learning Objectives, introduction, development, assessment, extended learning, assignment.
Designing learning experiences, pre-existing knowledge, selecting approach/strategy, arrangement of teaching learning materials, group learning, formation of groups, organizing activities.
Planning the lesson by using ICT applications and laboratory materials.
Reflective planning; unit plan; developing lesson plans on different topics and through various approaches taking examples form upper primary, secondary and higher secondary stage (physical and chemical changes, redox reaction, light, magnetic effect of electric current, etc.).

Sessional Activities:

- Presentation on historical development of science concepts with a view to understand the nature of science.
- Pedagogical analysis (units for pedagogic analysis: any unit from VIII, IX or X physical science textbook).
- Drawing concept-maps for secondary level concepts.
- Presentation on the contributions of Physicists and Chemists to physical science.
- Readings on curriculum initiatives in secondary science with a special reference to NCF 2005.
- Comparison of different science curricula.
- Lab demonstration/exploration of science experiments.
- Exploring common mis-concepts in Physical Science by oMSErving science classes or interviewing science teachers or using VIII and IX textbooks.
- Stating learning objectives for teaching a topic in science.
- Demonstration of different methods of teaching of Physical Science.
- Experimentation of different methods of teaching of Physical Science.

References :

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.

4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSEV.6 :Pedagogy of Mathematics 1

Credits: 4 (2L+ 2T +0P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
On completion of the course the students will have

- understanding of nature of mathematics and its branches
- ability to analyse the relationship of mathematics within itself and with other subjects
- ability to categories mathematical knowledge into factual, conceptual, procedural and meta cognitive knowledge

- Appreciates the contributions made by Indian and other country mathematicians contribution
- ability to apply logical reasoning and problem solving ability in solving various mathematical problems

Unit I: Knowledge about Mathematics

Nature of mathematics- abstractness, preciseness, brevity, language and symbolism; Nature of mathematical propositions; Quantifiers- necessary and sufficient conditions(one and two way); structure of mathematics- undefined terms, defined terms, definitions, axioms, postulates and theorem; mathematical theorem and its variants- converse, inverse and contra positive; Pure and Applied mathematics; branches of mathematics- Arithmetic, algebra, geometry and their diversities; mathematization through- oMSErvation, conjecturing, hypothesing, testing and verifying; creation of conceptual knowledge and its importance; creation of procedural knowledge- derivation of laws/ theorems/ generalizations in mathematics; relationship of mathematics among different branches of science; relationship within and among branches of mathematics; Contribution of Indian and other Mathematician- Aryabhatta, Bhaskara, Ramanujuam, Guass, Euclid, Descarte, Cantor, Pythagarous;
Organization of Mathematical content- horizontal and vertical linkage (within and between classes IX and X); linkage between upper primary, secondary and senior secondary mathematics.

Unit II: Aims and objectives of teaching Mathematics

Aims of mathematics- Cultural, disciplinary, moral, social and utilitarian aims; General objectives of teaching mathematics Vis-a-Vis the objectives of secondary education; Major shifts in classroom teaching (societal and technological influence); characteristics of a good instructional objectives; Writing specific objectives of different content categories in mathematics; Unit plan and Lesson plan-its importance and writing unit plan and lesson plan for mathematics lessons using the format.

Unit III: Strategies for learning mathematical concepts

Nature of concepts, types of concept, process of concept formation; Moves in teaching concepts- a) Exemplar moves- giving examples and non-examples (with or without reasoning); comparing and contrasting ; giving counter example b) Characterization move- definition, stating necessary and/or sufficient condition; concept Attainment Model (Bruner); Advance Organizer Model (Ausubel); Planning and implementation of strategies for teaching various mathematical concepts(secondary level maths)

Unit IV: Teaching of Generalization

Teaching by exposition- Moves in teaching generalization:- Introductory move, focus move, objective move, motivation move, assertion move, application move, interpretation move, justification move; Planning for expository strategies of teaching generalization.

Teaching by guided discovery- nature and purpose of learning by- discovery, inductive, deductive, guided discovery strategies; maxims for planning and conducting discovery strategies; planning strategies involving either induction or deduction or both.

Sessional work:

Analysis of secondary level mathematics text books to identify various categories of mathematical knowledge presented and its horizontal and vertical linkage among 8, 9 and 10 standard text books.

Analysing the structure of mathematics present in selected chapter/unit.
Writing a unit plan for selected unit
Writing of specific instructional objectives for selected unit
Writing a lesson plan on selected content area
Writing a plan for teaching a concept of a generalization using the appropriate moves to teach them.

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc
6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education,Syndey, Croom Helm Australia Pty Ltd
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal publications Pvt Ltd

SIXTH SEMESTER

Core Course 1F :Physics

MSEVI.1 :CLASSICAL & QUANTUM MECHANICS AND SPECIAL THEORY OF RELATIVITY

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives: To enable students to understand the essentials of classical mechanics, quantum mechanics, quantum statistics and relativity.

COURSE CONTENT:

Unit I: Lagrangian formulations of Classical Mechanics

Constraints- sclerenomic and rheonomic constraints, holonomic and non holonomic constraints, Generalized co-ordinates and velocities, Principle of virtual work, D'Alembert's principle, Euler- Lagrange equations, Cyclic co-ordinates, Conservation laws and symmetry properties, applications of Lagrangian formulation (simple pendulum). Canonical momenta & Hamiltonian of a system. Hamilton's equations of motion. Hamiltonian for a harmonic oscillator.

Unit II: Special Theory of Relativity

Galilean transformation, Earth as an inertial frame of reference, Constancy of speed of light, Ether hypothesis, Michelson-Morley experiment, Postulates of Special Theory of Relativity, Lorentz transformations. Simultaneity and order of events. Length contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.

Unit III: Origin of Quantum Theory

Qualitative discussions on inadequacies of Classical Physics– black body radiation and photoelectric effect, Planck's hypothesis and explanation of black body radiation, Einstein's explanation of photoelectric effect with derivation, Wave-particle duality, de Broglie's hypothesis of matter waves, concept of group velocity and phase velocity and their relationship, experimental evidence for matter waves– Davisson and Germer experiment, electron diffraction experiment. Uncertainty Principle.

Unit IV: Development and application of Schrodinger Equation

Wave function, interpretation of wave function, postulates of quantum mechanics, probability density, Eigen functions and eigen values, expectation values, Normalization of wave functions, development of time dependent and time independent Schrodinger wave equation, operator method of deriving Schrodinger equation. Applications of Schrodinger wave equation– one dimensional infinite potential well, finite potential well, phenomenon of tunneling, one dimensional harmonic oscillator, hydrogen atom (only qualitative discussion).

Reference Books:

1. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
2. H.Goldstein, C.P. Poole, J.L. Safko, Classical Mechanics 3rdEdn., Pearson Education, 2002.
3. L. D. Landau and E. M. Lifshitz, Mechanics, Pergamon, 1976.
4. P.S. Joag, N.C. Rana, Classical Mechanics 1stEdn., McGraw Hall.
5. R. D. Gregory, Classical Mechanics, Cambridge University Press, 2015.
6. L. I. Schiff, Quantum Mechanics, 3rdEdn., Tata McGraw Hill, 2010.
7. R. Shankar, Principles of Quantum Mechanics 2nd edition, Springer, 2014.
8. David J Grififth, Introduction to Quantum Mechanics, Addison Wesley; 2 edition, 2004.
9. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
10. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
11. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
12. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Stefan’s constant.
2. Planck’s constant using LED’s (3no.s).
3. Absorption spectra.
4. Photoelectric effect.
5. Variation of resistance with temperature of copper wire (10 mts).
6. Laser Diffraction.
7. Laser-wavelength using transmission grating.
8. Photo conductivity using LDR.
9. Photovoltaic cells.

10. Numerical aperture of an optical fibre by semiconductor laser.
11. BG Absolute Capacity.
12. BG-High resistance by leakage method
13. BG Mutual inductance
14. e/m of electron.
15. Verification of inverse square law for light using photodiode.
16. Diffraction of light. Determination of wavelength λ.
17. Characterization of photo diode.

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2FChemistry

MSEVI.2 :ORGANIC CHEMISTRY – II

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
To develop an understanding of the chemistry of Functional groups and mechanism of Organic Reactions.

COURSE CONTENT:

Unit I: Alcohols and Phenols
Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).

Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols-oxidative cleavage [$Pb(OA_c)_4$ and HIO_4] and Pinacol-pinacolone rearrangement.
Trihydric alcohols: Nomenclature and methods of formation(from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI).
Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2- naphthols (one method each). Physical properties and acidic character of phenol. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit II: Carbonyl Compounds
Aldehydes and Ketones
Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic addition to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketones. An introduction to σ, β unsaturated aldehydes and ketones.

Carboxylic Acids and their Derivatives
Nomenclature, structure and bonding. Preparation of carboxylic acids – by oxidation, using Grignard reagents and hydrolysis of nitriles. Physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Reactions of carboxylic acids: HVZ reaction, synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions hydroxy acids – malic, tartaric and citric acids.

Unsaturated monocarboxylic acids: Methods of formation and chemical reactions
Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.
Carboxylic acid derivatives: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acid, base conditions).

Unit III: Organic synthesis via Carbanions

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of α – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; α,β – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.
Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; α, β – unsaturated acids – crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes, Alkylation and acylation of enamines.

Unit IV: Organic Compounds of Nitrogen

Nitro Compounds: Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Aliphatic and Aromatic amines: Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsberg's method). Structural features effecting basicity of amines. Amine salts as phase – transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts and azo coupling.

References :

1. Advanced organic chemistry Arun Bahl and B.S. Bhal
2. Organic Chemistry:Reagents and Reactions Agrawal, Goel Publishing House 53rd edition 2015
3. Organic Chemistry John Macmumy 9th Edition 2016.
4. Organic Chemistry J.Clayden,N.Greeves and S.Warren 2nd Edition 2012 Oxford University Press.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

- To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification
- To develop skills of separation techniques

COURSE CONTENT:

1. Qualitative organic analysis

1. Separation of organic mixtures containing two solid components using water , $NaHCO_3$, NaOH

2. Analysis of an organic compound: Detection of extra elements (N,S and X) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides) in simple organic compounds. Identification of organic compound based on functional group analysis, determination of physical constant (mp / bp).

2. Chromatographic Techniques

(i) Thin Layer Chromatography

(a) Determination of R_f values and identification of organic compounds:

(b) Identification of plant pigments by thin layer chromatography

(c) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone Using toluene : light petroleum (2:3 ratio)
(d) Separation of mixture of dyes

(ii) Paper Chromatography
Determination of R_f values and identification of organic compounds:
(a) Separation of mixture of amino acids
(b) Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water 4:5:1) ; Spray reagent: anilinehydrogenphthalate

(iii) Column Chromatography
Separation and identification of ortho and para nitro anilines

References :

1. A Text Book of Qualitative Organic Analysis, A I Vogel
2. A Text Book of Quantitative Organic Analysis, A I Vogel
3. Systematic experiments in Chemistry Arun Sethi, New Age International(P) Ltd.

Core Course 3F Mathematics

MSEVI.3 :GROUPS AND RINGS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
By the end of the semester the students will be able to develop understanding of the abstract concepts of groups and rings, and special classes of rings and to appreciate modern mathematical concepts.

COURSE CONTENT:
Unit I:
Groups, Examples, Properties and types, Sub-groups. Cyclic groups and properties, Cosets, Lagrange’s theorem and its Consequences, Dihedral groups, Normal subgroups, Quotient groups.

Unit II:
Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, , Fundamental theorem of Homomorphism, Cauchy’s theorem for abelian groups, Permutation group, Alternating Group, Cayley’s Theorem.

Unit III:
Rings, Integral Domains, Division Rings, Fields, Properties, Field of quotients. Ideals, Quotient rings Maximal, Prime and Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

Unit IV:

Homomorphism of a ring, Kernel, Isomorphism, Fundamental theorem of Homomorphism, Polynomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorisation Theorem, Eisenstein'sCriterion of irreducibility.

References :

1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
3. Modern Algebra by Vasishtha, Krishna Prakashan Media Pvt. Ltd.
4. Higher Engineering Mathematics by Kreyszig, Wiley
5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
6. Basic Abstract Algebra, 2nd Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.
7. Modern Algebra – An Introduction by Durban, 5th Edition, Wiley.
8. Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
9. A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

PROFESSIONAL EDUCATION COURSES

MSEVI.4 :CRITICAL UNDERSTANDING OF ICT

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

On completion of the course the students will be able to:

- Appreciate the historical, current and future trends in ICT and its implications to education
- Explain the meaning of ICT and its application in Education
- Demonstrate an understanding of the computer hardware and software fundamentals
- Use various digital hardware and software for creating resources and providing learning experiences
- Use a word processor, spread sheet, drawing and presentation software skillfully and intelligently to produce various teaching learning resources for educational use
- Use internet technologies efficiently to access remote information, communicate and collaborate with others
- Model collaborative knowledge construction using various web 2.0 tools and technologies
- Design and develop technology integrated learning experiences using ICT tools
- Develop skills in using various e-learning and e-content tools and technologies
- Plan, develop, and use multimedia based learning content using open source authoring software

- Use ICT for designing learning experiences using innovative pedagogical approaches
- Explain the role of ICT in authentic and alternative assessment
- Understand the social, economic, security and ethical issues associated with the use of ICT
- Appreciate the scope of ICT for improving the personal productivity and professional competencies
- Appreciate the use ICT in improving educational administration
- Explain the emerging trends in information and communication technology

COURSE CONTENT:

Unit I: ICT and Education

Information and Communication Technology: meaning and nature. Learning theories and its implications for ICT integration in education. National ICT policy, curriculum and schemes
Historical account of the development of various educational media (audio, print, video, storage, display, projection)
Role of technology in emerging pedagogical practices. Visual literacy, media literacy, and new media literacy
Computer hardware fundamentals, computer network-LAN, WANand Internet. Software – meaning and types: proprietary software and open source software, System software and application software
Emerging Trends in ICT and its educational applications: Augmented reality, e-books and rhizomatic learning, learning analytics, ubiquitous computing and mobile learning, Game based learning, cloud computing and software as service, 3D printing, and marker space

Unit II: e-content and e-resources

Educational applications of word processing, spreadsheet, presentation, and drawing tools – diagrams, concept maps, timelines, flow charts.
Reusable Learning Objects (RLO), e-content standards, authoring tools- open source and proprietary alternatives
Multimedia: meaning and types, multimedia tools-audio editing, video editing, screen casting, graphic editing, basics of animation, and creating interactive media. Evaluation of multimedia resources.
Open Educational Resources – Meaning and importance, various OER initiatives, creative common licensing
Locating internet resources – browsing, navigating, searching, selecting, evaluating, saving and bookmarking
Use of digital still and video camera, digital sound recorder, scanner, printer, interactive white board, visualizer, and multimedia projector for creating and using multimedia resources

Unit III: ICT and Pedagogy

Techno pedagogical content knowledge (TPCK). Approaches to integrating ICT in teaching and learning
Web 2.0 tools for creating, sharing, collaborating, and networking: Social networking, social book marking, blog, wiki, instant messaging, online forums/discussion groups and chats, and media streaming.
E-learning: concept, types, characteristics, e-learning tools and technologies, Learning Management Systems (LMS)
Subject specific ICT tools for creating and facilitating learning. Designing technology integrated authentic learning designs and experiences

ICI integrated Unit plan – Web 2.0 for creating constructivist learning environment
Technology for pedagogical innovations: web quest, PBL, virtual tours, MOOC, flipped classroom
Assistive technology for special needs and inclusion: tools and processes, ICT and Universal design for Learning (UDL)

Unit IV: ICT for Assessment,Management, and professional development
ICT and Assessment**:** e-portfolio, electronic rubrics, online and offline assessment tools – rubrics, survey tools, puzzle makers, test generators, reflective journal, and question bank. Use of web 2.0 tools for assessment,
ICT for professional development - tools and opportunities: electronic teaching portfolio, web 2.0 technologies, technology and design based research, ICT for self-directed professional development, web conferencing, role of OER and MOOCs
ICT for personal management: email, task, events, diary, networking. ICT for educational administration: scheduling, record keeping, student information, electronic grade book, connecting with parents and community, school management systems.
Managing the ICT infrastructure: software installation, troubleshooting of hardware, seeking and providing help, storage and backup, updating and upgrading software
Computer security: privacy, hacking, virus, spy ware, misuse, abuse, antivirus, firewall, and safe practices, fare use and piracy

Sessional Work

1. Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices
2. Using word processor, spread sheet, drawing and presentation software to produce various teaching learning resources and sharing it online
3. Locating internet resources – navigating, searching, selecting, saving, evaluating(use standard internet evaluation criteria), and bookmarking using social bookmarking
4. Creating digital concept maps, flow charts, timelines, and other graphics for a particular content
5. Creating screen cast video and podcast of a lesson
6. Shooting, editing, and sharing of videos segment on any educational topic
7. Creating account in YouTube/slide share and sharing the video/presentation. View and comment on others contributions
8. Creating account in wikispace/wikipedia/mediawiki and adding/editing content
9. Developing an educational blog in www.blogger.com, www.wordpress.com, or www.edublog.com
10. LMS experience- hands on various features of LMS – the ICT course may be provided through LMS
11. Enrolling and completing some MOOC courses of interest
12. Creating resources for flipped classroom and Practicing flipped learning in school during internship
13. Evaluating OER resources. Creating and sharing OER materials- may be in NROER
14. Developing technology integrated unit/lesson plan and trying out this in the school during internship
15. Hands on experience on subject specific software tools like Geogebra, PhET
16. Developing a multimedia e-content for a topic using eXe Learning
17. Field visit to the Edusat center and take part in teleconferencing
18. Planning and creating digital rubrics for any topic and create an e-portfolio

19. Organize web conferencing using Skype or any other tools
20. Review of ICT labs (plans and equipments/resources) in school from internet
21. Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
22. Readings on emerging ICT trends in education
23. Review of national ICT policy and curriculum
24. Using FOSS tools for timetabling, grade sheet

References:

1. Andrew A Kling(2010).Web 2.0 (Technology 360). Lucent Books : New Delhi.
2. Andrew M. St. Laurent. (2004). Understanding Open Source and Free Software Licensing. Oreilly:Cambridge
3. Athanassios Jimoyiannis (Editor) (2011). Research on e-Learning and ICT in Education. Springer: USA
4. Barbara B. Levin, Lynne Schrum.(2012). Leading Technology-Rich Schools (Technology & Education, Connections (Tec). Teachers College Press: New York
5. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi
6. Bruce M. Whitehead, Devon Jensen, Floyd A. Boschee.(2013). Planning for Technology: A Guide for School Administrators, Technology Coordinators, and Curriculum Leaders.Corwin:New Delhi
7. Cabmbridge, D.(2010).E-Portfolios for Lifelong Learning and Assessment.John Wiley and Sons
8. Christopher Moersch(2009). Beyond Hardware-Using Existing Technology to promote Higher-Level thinking. Viva Books: New Delhi.
9. Conrad, Keri (2001). Instructional Design for Web based Training. HRD Press
10. Costantino,P.M., DeLorenzo,M.N., Kobrinski,E.J.(2006).Developing a professional teaching portfolio: a guide for success. Pearson
11. Crumlish Christian (1999). The Internet No Experience Required. BPB Publications: New Delhi
12. Curtis J. Bonk (2011).The World Is Open: How Web Technology Is Revolutionizing Education. Jossey- Bass: San Fransisco
13. Imison,T., Taylor,P.H.(2001). Managing ICT in the Secondary Schools. Heinemann:Oxford
14. James,K.L. (2003). The Internet: A User's Guide. Prentice Hall of India Pvt.Ltd: New Delhi
15. Jane Hunter (2015).Technology Integration and High Possibility Classrooms: Building from TPACK
16. Jean-Eric Pelet (2014).E-Learning 2.0 Technologies and Web Applications in Higher Education (Advances in Higher Education and Professional Development (Ahepd)).Idea Group: U.S.
17. Liz Arney (2015.)Go Blended!: A Handbook for Blending Technology in Schools
18. Loveless Avril(2001). ICT-pedagogy and the curriculum-Subject to change.RoutledgeFalmer: London.
19. Lynne Schrum, Barbara B. Levin. (2010).Leading 21st-Century Schools: Harnessing Technology for Engagement and Achievement. Corwin: New Delhi
20. ManojkunarDash(2010). ICT in teacher development. Neelkamal Publications: New Delhi.

21. Mary Webband Margaret Cox (2014). Information and Communication Technology-Assessment for Learning in the ICT Classroom (Inside the Black Box).Learning Sciences :US.
22. M. D. Roblyer, Aaron H. Doering (2012). Integrating Educational Technology into Teaching (6th Edition)
23. Michael Thomas (2009). Handbook of Research on Web 2.0 and Second Language Learning. Information Science Reference: US.
24. Rena M. Palloff, Keith Pratt (2011).The Excellent Online Instructor: Strategies for Professional Development. Wiley: San Francisco
25. Ronghuai Huang and Kinshuk(2014). ICT in Education in Global Context: Emerging Trends Report 2013-2014 (Lecture Notes in Educational Technology). Springer: New York.
26. Rosemary Papa.(2010).Technology Leadership for School Improvement. Sage:New Delhi.
27. Sarkar, S.K. & Gupta, A.K.(1998). Elements of Computer Science. S.Chand& Company: New Delhi
28. Semenov, Alexy (2005). Information and Communication Technologies in Schools. A handbook for Teachers. UNESCO
29. ShalinHai-Jew. (2012). Open-Source Technologies for Maximizing the Creation, Deployment, and Use of Digital Resources and Information. Information Science Reference:USA
30. Theodore Lee(2008). Professional Development of ICT Integration for Teachers.VDM Verlag : Germany.
31. W.J. Pelgrum and N.Law(2003). ICT in Education around the world-Trends ,Problems and Prospects . UNESCO : Paris.
32. Viva Lachs (2000). Making Multimedia in the Classroom-A Teacher's Guide. Routlegde Farmer :London.

MSEVI.5:PEDAGOGY OF PHYSICAL SCIENCE 2

Credits: 4 (2L+ 2T +0P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

- Enable the students to write the unit plans and lesson plan as per the norms of NCF 2005.
- Applying the different teaching methods based on a constructivist point of view.
- Enable the students to oMSErve the lesson systematically.
- Selecting the learning resource and effective use of the same.
- Using of ICT in physical science teaching and learning.
- Explore various assessment strategies for evaluating learning in Physical science.
- Explore various professional development opportunities.
- Plan and conduct action research in secondary schools.
- Identify various teaching- learning resources.
- Develop skills of facilitation as they teach in simulated situations.
- Reflecting the methods in the class.

COURSE CONTENT:

Unit I: Learning Resources in Physical Science

Print resources: Textbook as a learning resource, criteria for evaluation of a textbook, handbooks, teacher resource books, laboratory manuals, science journals and magazines, encyclopedia, newspaper.

Dale's cone of experience and its use in teaching- learning.

Developing and using resources such as charts, models, science kits, posters, science parks.

Science laboratories: designing, management, and safe practices.

Making low-cost equipment from locally available resources, using the immediate environment and the community resources for teaching of physical science.

Exploring and using digital resources: websites, videos, games, simulations, mobile apps, presentations, OER, interactive multimedia resources, e-books, podcasts, digital concept maps, and digital graphics.

ICT integration in physical science teaching: different forms of ICT and its application in science education.

Unit II: Need and Importance of Assessment for Learning Physical Science

Learning standards in science, process and product assessment in Physical Sciences, importance of metacognition and reflection in assessment, importance feedback in facilitating learning.

Meaning of the terms test, examination, measurement, assessment and evaluation in proper context, Continuous and Comprehensive Evaluation (CCE) and its features.

Assessment and evaluation as intertwined process of classroom experiences performance based assessment, planning assessment framework, Learning Indicators (Lis) and its types, developing LIs for activity, presentation, group work, assignments etc.

Recording and reporting of learning evidences – measurement of students' achievement – marks and grading.

Unit III: Tools and Techniques Assessment for Learning Physical Science

Tools and technique of assessment-- assessment of written and oral work, project work, laboratory work, field trips, journal writing, concept map; assessment of learners with special needs.

Use of oMSErvation, questioning, concept mapping, rating scales, worksheets, reflective journals/diary, peer and self-assessment in physical science.

Use of rubrics, and portfolio assessment in Physical Science, diagnosing learning difficulties and misconception in Physical Science.

Use of ICT in assessment.

Constructing different types test items in Physical Science at different levels of taxonomy, preparation of blue print/table of specification and constructing unit test.

Unit IV: Professional development of Physical Science teachers

Professional competencies of a physical science teacher.

Need for updating content and pedagogical competencies, pre-service and in-service courses and initiatives, agencies to nurture the best teachers, NCERT activities for teachers.

Participation in science fairs, exhibitions, and science club activities

Planning contextual activities- celebration of science day, birthdays of great physicists and chemists, seminars, conferences, online sharing, distance learning, membership to organisations- NSTA, IPA, IAPT, Indian Chemical Society, INSC. NCERT publications and journals

Meaning, nature, scope, designing and implementing innovative approaches to teaching science.
Teacher as a Researcher: meaning of research and its importance, action research versus research, selecting the problem for action research, format of research plan, action research in physical sciences, steps in action research, examples of action research from the primary, secondary, and higher secondary levels.

Sessional Activities:
(Any TEN from the following)

- Design and development of unit test.
- Developing rubrics for laboratory work, assignment, field trip, project etc.
- Facilitating the development of digital portfolio by a couple of school students.
- Designing and implementing science lab experiments.
- Text book analysis for content organization/ validness of curriculum mentioned in NCF 2005.
- Analysis of process skills and planning lessons for developing process skills.
- Identifying, selecting, and evaluating various media for chosen unit.
- Case studies of successful teacher leaders.
- Presentation and discussion on sample action research studies.
- Planning and conducting an action research.
- Debates on various ethical issues.
- Visit to a special school, oMSErvation of inclusion strategies in regular classroom.
- Development of teaching portfolio.
- Analysis of teacher competency framework of various organization.
- Study of a science professional organization.
- Review of an action research article/teaching of Physical science related research article.
- Organizing a science exhibition.
- Formation of a science club and conducting various activities.
- School visit to study the CCE practice.
- Conducting field trips to science muesuem, science park, botanical garden.
- Writing unit plan for at least 2 units of secondary science.
- Writing lesson plan for at least 2 topics of secondary science.
- Classroom Experience 2: Classroom OMSErvation for studying teacher's facilitation skills and how student work is distributed (with emphasis on pedagogical aspects-strategies/materials used).
- Preparing and demonstrating low cost/improvised teaching aids based on Class VII, VIII and IX class Physical Science.
- Simulated teaching of class VII-X topics.
- Developing and analysing a Physical Science achievement test.
- Develop an assessment rubric in Physical Science.
- Visit to a Science museum / Science park /Science teacher resource centres.
- Organize a seminar related to Science day. Developing an action research plan for teaching-learning Physical Science.

References:

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSEVI.6 : PEDAGOGY OF MATHEMATICS 2

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

On completion of the course the students will have

- understanding of nature of teaching proof and problem solving in mathematics
- ability to analyse the purposes of teaching algebra and geometry
- ability to select suitable tools for mathematical construction and measurements
- Appreciates the usefulness of mathematics in day today activity in various fields
- adopt different strategies to meet the diversified needs of learners and appreciates the availability of various learning resources in mathematics
- Decision making ability to use appropriate assessment tools for mathematical assessment

COURSE CONTENT:

Unit I : Teaching of Proof and Teaching of Problem-solving

Meaning and nature of Proof; kinds of proof- direct, proof by mathematical induction, proof by contradiction, proof by contrapositive, proof by cases, proof by counter examples ; planning and teaching of various theorems in mathematics (secondary level)

Problem-solving

Definition of problem, problem solving; Meaning and nature of PrOblem solving, strategies of problem solving- Means-ends analysis, backtracking, backward movement, heuristics; Polya's Problem solving steps; solving various mathematical problems

Unit II: Teaching of Algebra and Geometry

Introduction of basic ideas of algebra- variable, constant, coefficient, expression, equation; nature and purpose of teaching algebra; Contextualization of practical situation into algebraic expressions or equations(mathematization); solving various algebraic relations problems of secondary level.

Nature of geometry; purpose of teaching geometry; construction of different geometrical figures; Role of geometry in comprehending mathematics as whole; developing skills in selecting, drawing, using appropriate geometrical instruments and its utility in real life situation; scale drawing; topology and its application in mathematics.

Unit III: Meeting diverse needs of learners (Gifted and Slow learners) and Learning resources in mathematics

Gifted child in mathematics- their characteristics, identification and enrichment programmes slow learners in mathematics- their characteristics, identification and remedial measures; overcoming dyscalculia and dysgraphia problems in mathematics and their remediation.

Creation of **visual aids**-charts, models, graphs; usage of **graphical tools**- calculator, logo, cabri, geogebra, sketch pad, ready reckoners; selection and integration of tools in relation to content and learning environment; **Audio-visual aids**- animations, film shows; mathematics lab; mathematics club; e-resources and open and free software; **community resources**- library, museum, theatre, knowledgeable person or experts

Unit IV: Assessment of learning in mathematics

Selection of appropriate tools for formative and summative assessment; diagnosing the learning difficulties of learners (Error analysis- procedural errors, conceptual errors, computational errors) and providing remedial measures (Peer tutoring, direct instruction, mentoring); creation of rubric, portfolios, Criterion reference test, Norm referenced test based on set criteria; construction, administration, scoring, interpretation of a unit test and providing feedback to learners.

For all the Pedagogical transactions the following content knowledge (8^{th}, 9^{th} , 10^{th}, 11^{th}, and 12^{th} standard syllabus) to be made use of, and these can be revised as per the change in curriculum of respective state or changes in CMSE syllabus or in NCERT text books.

Arithmetic: Number system, Ratio and Proportion, Fractions, Commercial mathematics and Data handling, sets, Matrices

Algebra: Polynomials, Graphical representations of various equations, trigonometry,

Geometry: Lines and angles; Triangles and its related theorems; polygons; analytical geometry,

Differential calculus; Integration, Trigonometry; graph theory; computing using ICT.

Sessional work:

Selecting any one of the theorem and teaching it by adopting the strategies of teaching proof
Selecting any one kind of problem in mathematics and demonstrate its procedure of solving
Selecting a topic in algebra or in geometry and teaching it using appropriate learning resources
Construction of unit test (administration, scoring, statistical analysis and reporting) on a selected unit
Analysing the errors committed by learners at secondary level, in regular test (FA1or FA2) and analysing its causes and suggesting various remedial measures for it

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc

6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education, Syndey, Croom Helm Australia Pty Ltd
10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal Publications Pvt Ltd

SEVENTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

DSE 1 A : Physics

MSEVII.1 :NUCLEAR AND PARTICLE PHYSICS

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Nucleus
Nuclear structure, Failure of proton-electron hypothesis– neutron, its discovery and properties, Proton-neutron hypothesis, Constituents of nucleus and their Intrinsic properties, Basic properties of nucleus– charge, spin, radii, mass, magnetic moment. Nuclear forces and their characteristics. Yukawa's Theory (Qualitative), Packing fraction and binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, Nuclear stability, Segre chart.

Unit II: Nuclear Models

Nuclear Models– Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Unit III: Radioactivity

Review: Radioactive decay – Half life, mean life, Activity-decay constant. Radioactive displacement laws. Theory of α decay, α-emission, Gamow factor. Geiger-Nuttal law. Beta decay, energy kinematics for Beta decay, positron emission Beta spectra. Neutrino hypothesis, K electron capture, internal conversion, Gamma decay, pair production, successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions, nuclear fission and fusion. Energy liberated in nuclear fission, energy production in stars, Nuclear reactors.

Unit IV:

Particle Accelerators and Detectors: Cockroft– Walton voltage multiplier, LINAC, Cyclotron, Betatron.
Nuclear Detectors: GM counter, scintillation detector, bubble chamber, principle of semiconductor detector.
Particle Physics: Particles and anti-particles, Classification of particles, Symmetries and Conservation Laws, Qualitative introduction to quarks, Structure of hadrons.

References:

1. I. Kaplan, Nuclear Physics, Narosa, 2002.
2. Kenneth S. Krane, Introductory nuclear Physics, Wiley India Pvt. Ltd., 2008.
3. Bernard L. Cohen, Concepts of nuclear physics, Tata Mcgraw Hill, 1998.
4. Subramanyam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.
5. R.A. Dunlap, Introduction to the physics of nuclei & particles, Thomson Asia, 2004.
6. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
7. D. Griffith, Introduction to Elementary Particles, John Wiley & Sons, 2008.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. GM Counter characteristics.
2. GM Counter– Absorption coefficient.
3. Determination of Half life of Co-60.
4. Simulation experiment on radioactive decay.
5. Verification of inverse square law for beta rays.
6. Verification of inverse square law for gamma rays.
7. Rutherford model– Simulation technique.
8. Ionization potential of Xenon.
9. Measurement of Mercury spectrum wavelength.
10. Spectrometer-Quartz prism-Refractive indices of quartz for the ordinary and extra-ordinary rays.
11. LCR Parallel resonance

12. LCR Series resonance.
13. FET characteristics.
14. Hartley oscillator.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11^{th} Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7^{th} Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4^{th} Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2AChemistry

MSEVII.2 :ELECTROCHEMISTRY AND PHOTOCHEMISTRY

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- Explain the nature of Electrolytic conduction involving theories of electrolytes.
- Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.
- To have knowledge about the commercial cells and their applications
- To obtain information about the basic photophysical and photochemical processes

COURSE CONTENT:

Unit I: Electrochemistry – I

To study the behaviour and reactions of ions in a variety of environments through the laws that govern them. Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.
Applications of conductivity measurements : Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit II: Electrochemistry – II

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-metal insoluble salt, Amalgam and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes–standard electrode potential, sign conventions, electrochemical series and its significance.
To draw up a scheme for discussing the equilibrium position for an ionic reaction in terms of the electrode potential. Electrolytic and Galvanic cells–reversible and irreversible cells, conventional representation of electrochemical cells.
EMF of a cell and its measurements. Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), Chemical cells with and without transport.

Unit III : Electrochemistry – III

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.
Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods, polarization, over potential and hydrogen over voltage Power storage, Lead Battery,Ni-Cd cells, Fuel Cells, Hydrogen–Oxygen cell. Thermodynamic and Kinetic basis of corrosion, methods of inhibition of corrosion

Unit IV : Photochemistry

Discussing the Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram showing various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radioactive processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples), Chemiluminescence.

References :

1. Photochemistry Gurudeep Raj Goel Publishing House
2. Principles of Physical Chemistry Puri, Sharma, Pathania 47th Edition
   Vishal Publishing Co.
3. Elements of Elecrochemistry by Samuel Glasstone and Lewis
4. Principles of Physical chemistry -Marron and prutton

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the elecrical behaviour of weak and strong electrolytes
- Quantitative estimation of electrolytes by conductometric and potentiometric titration

COURSE CONTENT:

1. To determine the equivalent conductance of a strong electrolyte at several concentrations and verify Onsager's equation.
2. Conductometric titration of a strong acid Vs. strong base, strong base Vs. weak acid, strong base Vs mixture of acids (strong and weak) to determine the concentration of acids in a given solution and in mixture.
3. To determine the concentration of the given acid solution and concentration of acids in a mixture by potentiometric titration using sodium hydroxide solution.
4. Determination of Pka value of a weak acid by potentiometry.
5. Determination of the dissociation constant of a weak acid by conductometry
6. To determine the equivalent conductance of a weak electrolyto at different concentrations and verify Ostwald's dilution law.Also to find out the dissociation constant of a weak electrolyte.
7. To determine the solubility and solubility constant of a weak electrolyte conductometrically.
8. To find the composition of the complex formed between iron(III) and salicylic acid by Job's method.
9. To find out the amount of copper sulphate in the given solution by titrating with standard alkali by conductometry.
10. To determine the amount of FAS in the given solution by potentiometric titration with standard potassium dichromate and potassium permanganate solutions.
11. Estimation of Silver nitrate by potentiometric titration with standard potassium chloride solution.

References :

1.Systematic experimentas in chemistry Arun Sethi New Age International (P) Ltd New Delhi.

DSE 3AMathematics

MSEVII.3 :LINEAR ALGEBRA

Credits: 3 (1L + 2T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable the students to understand and apply the concepts of linear algebra in solving appropriate problems.

COURSE CONTENT:

Unit I:

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space – some properties. Quotient spaces, Homomorphisms and Isomorphisms of vector spaces, Direct sums.

Unit II:

Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Cauchy-Schwarz inequality, Orthogonal and orthonormal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

Unit III:

Matrices of Linear maps, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

Unit IV :

Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation, Characteristic polynomial, Cayley - Hamilton Theorem, Minimal Polynomial.

References :

1. Theory and Problems of Linear Algebra, Saymour Lipschitz, Schaum Outline Series.
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
3. Modern Algebra, Vol.II, by Narayanan and Manicavachagam Pillay, S. Vishwanathan and Co.
4. Brief Survey of Modern Algebra, Brikhoff and Maclane, IBH
5. Linear Algebra by Serge Lang, Addison Wesley Publishing company Inc.
6. Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.
7. Linear Algebra by Larry Smith, Spinger Verlag.
8. Elementary Linear Algebra with Applications, Keith Nicholson, PWS – Kent Publishing Company
9. Linear Algebra, Surjith Sinth, Vikas Publishing House Pvt. Ltd.
10. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.
11. Linear algebra – a geometric approach by Kumaresan. S

PROFESSIONAL EDUCATION COURSES

MSEVII.4 :CREATING AN INCLUSIVE SCHOOL

Credits: 4 (2L+ 2T +1P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understanding the meaning and significance of inclusive education.
- Appreciate the special needs of Individuals with diverse needs.
- Get Familiarized themselves with the concept of Inclusive Education.
- Understand the nature and needs of different categories of disabled children.
- Understand the concept of Special Education, Integration and Inclusion.
- Understand the different considerations and provisions for facilitating inclusion.
- Understand and Acquire the Skills of Adapting Curriculum to meet the need of the Students with Diverse needs

COURSE CONTENT

Unit I :Basic Concepts and Introduction to Inclusive Education

Meaning of Impairment, Disability and Handicap;Concept of Special Educational Needs and Diverse Needs, Difference between Special Education, Integration and Inclusive Education. Significance of Inclusive Education;Factors Affecting and Promoting Inclusion.

Unit II : Nature and Needs of Diverse Learners-Identification of Diverse Learners in the Classroom

Sensory Impairment: Hearing impairment and Visual impairment

Physical Disabilities: Orthopaedic impairment, Cerebral Palsy, Special Health Problems, Congenital defects; Slow Learners and Under Achievers; Intellectual Disability; Learning disabilities and ADHD; Autism Spectrum Disorders; Multiple disabilities ; Emotional and Behavioural Problems; Gifted and Creative; Socially Disadvantaged, Economically Deprived, Religious and Linguistic Minorities, Inhabitants of Geographically Difficult Areas

Unit III: Preparing Schools for Inclusion-General Considerations and Provisions Concept of Inclusive School, Competenciencies and Characteristics of inclusive Teacher

Physical Consideration, Socio-Emotional Considerations, Curricular Considerations

Provision of Assistive devices, equipment's and technological support. Special provisions in Evaluation

Unit IV :Inclusive Practices in Classroom

Making learning more meaningful: Responding to special needs by developing strategies for differentiating content, curriculum adaptation and adjustment, lesion planning and TLM.

Pedagogical strategies to respond to needs of individual students: Cooperative learning strategies in the classroom, peer tutoring, buddy system, reflective teaching, multisensory teaching. Use of IT suitable for different disabilities.

Practicum

- Collection of data regarding children with special needs.
- Visit to Inclusive Schools and to oMSErve classroom transaction of any one of such school and make a report of the same.
- Identifying one/two pupils with special needs in the primary schools and preparing a profile of these pupils.
- Preparation of teaching aids, toys, charts, flash cards for children having any one type of disability. (Visit to Resource Room)
- Preparation of Lesson Plan, instruction material for teaching students with disability in inclusive school.
- Developing list of teaching activities of CWSN in the school.

Visits to different institutions dealing with different disabilities and OMSErvation of their Classroom.
* In addition, school and community based activities may be organized.

References:

1. Fimian, M.J., Fafard, M., and Howell, K.W.: *A Teacher's guide to Human Resources in Special Education: Para Professionals, Volunteers, and peer tutors.* Boston: Allyn and Bacon, Inc.
2. Furth, H. (1964). *Thinking without Language.* New York: Free Press.
3. Hallahan, D.P. and Kauffman, J.K. (1988). *Exceptional Children: Introduction to special Education.* N.J.: Englewood Cliffs.
4. Jangira, N.K. (1986). *Special Education Scenario in Britain and India*. Gurgaon: The Academic Press.
5. Jangira, N.K. (2013). NCERT: The Mother of Inclusive Education, Regional Institute of Education NCERT, Ajmer. (Also available on Google search Jangira special education).
6. Julba, A. (2014) Teachers creating Inclusive classrooms: Issues and challenges – A research study
7. Kapoor, S. (2015). Index of Inclusive School Quality, Brotherhood, Delhi.
8. Kothari, R.G. and Mistry, H.S. (2011). *Problems of students and Teachers of the special schools – A study of Gujarat state*. Germany: VDM Publication.
9. Maitra, K. & Saxena, V. (ed)(2008) *Inclusion: Issues and Perspectives*, Kanishka.
10. Meadow, K.P. (1980*). Deafruss and child development.* Berkley, C.A.: University of California Press.
11. Messily,K. (2012). Confronting Marginalisation in Education: A Framework for Promoting inclusion, Routledge, London.
12. Mithu, A. and Michael, B. (2005). *Inclusive Education: From rhetoric to Reality,* New Delhi: Viva Books Pvt. Ltd.
13. NCERT (2006) Position Paper: National Focus Group on Education of Children with Special Needs, NCERT, New Delhi.
14. NCERT (2013) Training and Resuorce Material on Adolescence Education, New Delhi, available on www.aeparc.org
15. Oza, D. and Pandit, R. (2011). *Management of behavioural problems of children with mental retardation*. Germany: VDM publication.

16. Premavathy, V. and Geetha, T. (2006): Integrated and Inclusive Education DSE(VI) Manual: New Delhi, Krishana Publication.
17. Reed, M. (1984). *Educating Hearing Impaired Children.* Milton Keynes: Open University Press.
18. Sharma, P.L. (1988). *A Teacher's Handbook on Integrated Education of the Disabled*. New Delhi: NCERT.
19. Ramaa S : Website: s-ramaa.net (for various publications)
20. Voluntary Health Association of India. *Disabled 'Village Children' – A Guide for Community Health Workers*, *Rehabilitation Workers*, *and Families*.
21. World Bank (2003) Inclusoive Education: Achieving Education for all including those with Disabilities and special Education Needs

Web Resources

- IBE-UNESCO (2016). Training Tools for Curriculum Development - Reaching Out To All Learners: a resource pack for supporting Inclusive Education, Ibe.training@unesco.org, http.//www.ibe.unesco
- Video on A World for Inclusion (2007) by UNESCO, directed by David Atrakchi, 20 minutes,http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=213
- Children with Disabilities (2012), by UNESCO, 23 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2758
- Inclusive Education: Approaches, scope and Content (2008), by UNESCO, produced by International Bureau of education, 11 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3314
- Inclusive Education: Learners and Teachers (2008), by UNESCO, produced by International Bureau of education, 14 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3316
- Preparing Teachers in Asia-Pacific for Inclusive Education, (2012), by UNESCO, 3 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2030
- Preparing teachers for inclusive education: Part 3 & 4, by UNESCO, produced by Lesotho, Ministry of Education, 21 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=418
- Toward Inclusive schools - Special needs in the classroom, by UNESCO, directed by Mike Fowler, 6 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=488
- Training Video: Special Needs in the Classroom, (1992), by UNESCO, directed by Mel Ainscow, 46 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=405
- Including Children with Special Needs Primary Stage (2014), NCERT,http://www.ncert.nic.in/pdf_files/SpecialNeeds.pdf
- Including Children with Special Needs Upper Primary Stage, (2015), NCERT, http://www.ncert.nic.in/gpPDF/pdf/tiicsnups101.pdf
- Julka, A. (2007) Meeting Special Needs in Schools: A Manual, NCERT, http://www.ncert.nic.in/html/pdf/inclusive_education/COVER.pdf
- Position Paper National Focus Group on Education of Children with Special Needs, NCERT, http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/special_ed_final1.pdf

- Learning Curves, Inclusive education (2014), Azim Premji Foundation, http://www.teachersofindia.org/en/periodicals/learning-curve-issue-xxiii

MSEVII.5 : HEALTH AND PHYSICAL EDUCATION

Credits: 2 (1L+ 0T +1P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- to build a scenario of Health Education in India.
- to develop a Knowledge Base of the Most Common and Uncommon Diseases in India; their Diagnosis & Remediation.
- Prospective Teacher Educators to learn the Techniques Related to Health Risks & Learn How to Fix these.
- Prospective Teacher Educators to study the Health Education Vision & Mission of India.
- To acquire the skills for physical fitness, correct postures, habits and activities for development
- Acquire skills to practice yogasanas and meditation and learn the skills of concentration, relaxation, dealing with stress and strain
- Understand and develop psychological abilities as life skills to deal with growing up issues like HIV and AIDS and prevention of substance issues
- Understand the process of assessment

COURSE CONTENT

Unit I: Health Education Scenario in India

Introduction to the concept of health, significance and importance in the context of ancient and modern Indian perspective
Identity of Educational Institutional Plants: Structure, Infra-Structure and Environment, Time-Space-Personnel-Material Constellation Educational Management System, Emerging Health & Total Quality of the Educational Institutions, Status of Health Education in India from Pre-Natal Education through Higher Education, Yoga & Yog, Health & Hygiene, Clean Toilets, Work & Leisure, Quality of Health – Role of Education, Administrators, Teachers, Students, Supporters,

Unit II: Tech-related Health Risks

Identification of the technological health hazards – Smartphone Stress, Acne caused by the Cell Phones, Blackberry Stress Injuries to the Thumb, Radiation from the cell phones, Cell Phone Sickness, Cell Phone & Car Accidents, Allergies & Phones, Crazy Phones, Computers Causing Wrist Pain, Back & Neck Pain, Decreased Sperm Count from the WIFI, Laptop Burns, Laptop Headaches, Sleeping Problems from the Laptops, Decreased attention span from using Face-book, The Internet Causing Anxiety, Headphone Use leading to Accidents, Hearing Loss from Headphones, Visual Impairment, Death from Social Networking, Environmental Degradation, Aggression, Social Crimes--- Evolving Controlling & Regulatory Mechanisms.

Unit III: Approaches to Sound Health

Games, Sports & Athletics.
Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.
Games and sports – athletics (general physical fitness exercises), games (lead-up games, relays and major games) rhythmic activities, gymnastics and their impact of health.
Fundamental skills of games and sports; Sports for recreation and competition; Rules and regulation of sports; sports ethics; sports awards and scholarships, sports- personship.
Yoga – Raja Yoga, Karma Yoga, Bhakti Yoga, Jnana Yoga.
Safety and security – disasters in and outside schools, ways of prevention, safety from snake and dog bites, animal attacks, prevention and treatment.
Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhabitation.
Libraries, Laboratories, Classrooms, Halls, Play Fields, Water Tanks, Swimming Pools, Community Pools, Roads Human Development Index (HDI), Health: Vision, Goals and Objectives of Government of India, Experiments on Influence of Surroundings & Thought, Science of Laughter & Smiles, Health OMSErvation Programs, Impact of TV Serials.
Role of Institutions (schools, family and sports), health services, policies and major health and physical education-related programme, blood banks, role of media.

Unit IV: First Aid – Principles and Uses

Structure and function of human body and the principles of first aid.,First aid equipments. Fractures-causes and symptoms and the first aid related to them, Muscular sprains cause, symptoms and remedies, First aid related to hemorrhage, respiratory discomfort, First aid related to Natural and artificial carriage of sick and wounded person, Treatment of unconsciousness, Treatment of heat stroke, General disease affecting in the local area and measures to prevent them.

Practicum

Surfing to know the diseases in India.

Preventive & Ameliorative measures for health hazards.

Playing Games.

Athletics.

Yoga.

Reflective Dialogues on Serials, such as, Satyamev Jayate on Health of the People.

Preparation of inventories on myths on exercises and different type of food.

Make an inventory of energy rich food and nutritious food (locally available) indicating its health value.

Make an inventory of artificial food and provide critical oMSErvations from health point of view.

Home remedies as health care.

Role of biopolymers (DNA) in health of child.

Medicinal plants and child health.

Strategies for positive thinking and motivation.

Preparation of first aid kit.

*** In addition, school and community based activities may be organised.**

References:

1. Arora,P. (2005) Sex Education in schools, Prabhat Prakashan
2. K..Park "Preventive and Social Medicine" Banarsidas Bhanoth, Publishers Nagpur Road, Jablapur, India.
3. NCERT(2013). Training and Resource materials on Adolescence Education, NCERT, New Delhi (This material is also available on www.aeparc.org.www.ncert.nic.in
4. NCERT(2014). Population Education, Source Material, NCERT, New Delhi.
5. Stephen, J. Williams, Paul R. Torrents, "Introduction to Health Service", Delmore Publications.

Physical Education

1. Deboarh, A. Wuest, Charles, A. Bucher: "Foundation of Physical Education Exercise Science and Sports", Tata McGraw Hill Pvt. Ltd., New Delhi.
2. John, E. Mixton, Ann, E. Jewett: "An Introduction to Physical Education, W.B. Saunders Company, London.
3. John, Cheffers; Tom, Evaul: "Introduction to Physical Education – Concept of Human Movement". Prentice Hall Engle Wood: New Jersey.
4. Bette J., Logdson & Others, "Physical Education for Children", Lea and Febiger, Philadelphia..
5. Roberts, S. Weinberg & Daniel Gould, "Foundation of Sports and Exercise Psychology", Human Kinetics Publication.
6. A.K. Uppal, Lawrance Gray Kumar, "Biomechanics in Physical Education and Exercise Science: Friends Publication, New Delhi.
7. Jack, H. Wilmore, David, L.. Costil, W. Larry Kenney, "Physiology of Sports and Exercise: Human Kinetics Publication.

Yoga

1. Swami Satyanand Saraswati, "Asana Pranayama Mudra Bandh", Bihar School of Yoga, Munger.
2. M.M. Ghore, "Anotomy and Physiology of Yogic Practices". Lonavala Yoga Institute, Lonavala.
3. Gharote, M.L. (2004). Applied Yoga, Kaivalyadhama S.M.Y.M. Samiti, Lonavala.
4. "Yogasana" Morarji Desai National Institute of Yoga, New Delhi.
5. "Pranayama" Morarji Desai National Institute of Yoga, New Delhi.
6. MDNIY (2010). "Yoga Teachers Manual for School Teachers, New Delhi.
7. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi.
8. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi.
9. Agarwal, Satya P. (1998). The social role of the Gītā: how and why, Motilal Banarsidass, ISBN 978-81-208-1524-7, retrieved 17 June 2010.
10. Goel, Devraj & Goel, Chhaya (2013). Universe of Swami Vivekananda & Complete.
11. Wholistic Social Development, CASE Publication under UGC SAP, The M.S. University of Baroda, Vadodara.
12. Jason Liu and Dr. Gwendalle Cooper (2009) *Scientific Analysis of the Effects of Falun Dafa* Presented at International Conference of Psychologists, February 27, 2009 by Catherine Hennessy.
13. Mehroo D. Bengalee (1976).*Child Guidance*. Sheth Publishers, Educational Publishers, 35, Everest, Pedder Road, Bombay.

14. Ministry of Health & Family Welfare, Government of India, *Annual Report to the People on Health*, December 2011.
15. Porter, Noah (2003). *Falun Gong in the United States*: An Ethnographic Study, Master Thesis, Department of Anthropology, College of Arts and Sciences, University of South Florida.
16. Wu JY, Feng, L, Park , H-T, Havlioglu N, Wen L, Tang H, Bacon KB, Jiang Z, Zhang X, Rao Y. (2001). *Molecule that guides Nerve Calls Directs Immune Cells*, Science Daily, Apr. 20.

Web Resources

Position Paper National Focus Group on Health and Physical Education, NCERT http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/health_prelims_final.pdf
Learning curves: sports in education, (2013) Azim Premji Foundation http://azimpremjifoundation.org/pdf/learning-curve-17.pdf
www.FalunDafa.org
www.http://greatist.com/health/*19-worst-tech-related-health-risks*

MSEVII.6 :READING AND REFLECTING ON TEXT

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understand the meaning, process, importance and characteristics of reading.
- Understand and apply different levels, types, techniques and methods of reading.
- Acquaint with the skills of reading different types of texts.
- Develop different types of reading skills through various activities and met cognition
- Learn the skills of reading comprehension and to enhance vocabulary.
- Acquaint with the problems of reading across curriculum.

COURSE CONTENT

Unit I: Introduction to Reading

Reading – Meaning and Process, Importance of Reading across Curriculum, Characteristics of Reading, Developing reading skills.Role of libraries in promoting reading habits

Unit II: Techniques and Methodology of Reading

Levels of reading – literal, interpretative, critical and creative, Types of reading – intensive and extensive reading, oral & silent reading, Reading techniques – skimming and scanning. Methodology of reading

Unit III: Reading the Text

Types of Texts – Narrative, expository, descriptive, suggestive, empirical, conceptual, ethnography, policy documents, field notes; Importance of Different Texts in Curriculum

Unit IV :Developing Reading Skills and Reading Comprehension

Developing Critical Reading Skills, Developing Reflective Skills, Activities for Developing Reading Skills, Developing Metacognition for Reading, Developing Reading Comprehension Developing Vocabulary for Reading, Problems of Reading

Practicum

- Divide the class in small group and provide different kinds of texts and instruct them to read and reflect according to the nature of text.
- Divide the group and provide one text and suggest students to make different interpretations.
- Design vocabulary games to enhance vocabulary.
- Read the text and provide a five words summary to each paragraph.
- Reading and comprehension exercises.
- Skim through the text and give suitable title to the text.
- Complete given text in stipulated time and summarize it in 6/7 lines with a suitable title.
- Making an oral presentation
- Organising a debate, discussion based on their reading
- Preparation of a poster
- Making a collage
- Displaying appropriate texts/graphic on bulletin board
- Addressing morning assembly during their internship in schools
- Making a power point presentation on selected topic
- Submission of written articles/assignments
- Writing maintaining reflective journals

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.**

References:

1. Bright, J.A., and McGregor, G.P. (1970). *Teaching English as a Second Language.* ELBS: Longman.
2. Doff, A. (1988). *Teach English: Training Course for Teachers.* Cambridge: Cambridge University Press.
3. Hill, L.A., and Dobbyn, M.A. (1979). *Training Course, Trainer's Book.* London: Cassell.
4. Hubbard, P., and Hywel, J. et al (1983). *A Training Course for TEFL.* Oxford University Press.
5. Joseph, K.S. (2004). *Self Instruction in English Grammar and Figures of Speech.* Vadodara: Gold Rock Publications.
6. Mukalel, J.C. (1998). *Approaches to English Language Teaching.* New Delhi: Discovery Publishing house.
7. Mukalel, J.C. (1998). *Creative Approaches to Classroom Teaching.* New Delhi:

Discovery Publishing house.

8. Mukalel, J.C. (1998). *Psychology of Language Teaching.* New Delhi: Discovery Publishing House.
9. Mukalel, J.C., and Ahmed, S. B. (1984). *Teaching English in India.* New Delhi: Arya Book Depot.
10. Nagaraj, G. (1996). *English Language Teaching Approaches, Methods and Techniques.* Calcutta: Orient Longman.
11. Richard, J.; Theodore, S. and Rodgers, T.S. (1968). *Approaches and Methods in Language.* Cambridge University Press.
12. Venkateswaran, S. (1995). *Principles of Teaching English.* New Delhi: Vikas Publishing House.
13. Wilkins, D.A. (1982). *Linguistics in Language Teaching.* London: Edward Arnold.
14. Willis, J. (1981). *Teaching English through English ELBS.* England: Longman Ltd.
15. Yule, G. (1985). *The Study of Language.* Cambridge: Cambridge University Press.
16. My experiments with the truth – *Autobiography of Mahatma Gandhi*
17. The Little Prince – *Antain de Saint* – Exupery
18. Cultural Heritage – Dr. S. Radhakrishnan
19. Periodicals Like – Outlook, India Today, Economic and Political Weekly, Business Today, Journals of Education, Organiser – weekly
20. Recognizing Different Types of Text

Web Resources

- http://www.bbc.co.uk/skillswise/factsheet/en03text-l1-f-different-types-of-text

Models of Reading Process

- http://people.ucalgary.ca/~mpeglar/models.html
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/
- http://www.tarleton.edu/Faculty/gentry/reading%20models.html

Reflective Skills

- http://www.skillsyouneed.com/ips/reflecting.html
- http://www.skillsyouneed.com/ps/reflective-practice.html

MSE VII.7A INTERNSHIP IN SCHOOL SUBJECT 1 – PHYSICAL SCIENCE
&
MSE VII.7B : INTERNSHIP IN SCHOOL SUBJECT 2 – MATHEMATICS

Credits : 6+6	**Marks: 100**
Duration : 10 Weeks	**C1 + C2 : 50**
	C3 : 50

The activity is divided into three phases:

A. Pre – internship - 2 weeks
B. Internship - 6 weeks
C. Post internship - 2 weeks

A. Pre internship

Objectives:

- To facilitate student teachers in designing and executing lessons in each pedagogy.
- To develop in student teachers the skills of observrvation and evaluating teaching of their peers

Activities
The student teachers will
- plan and teach minimum 3 lessons in each pedagogy
- observe minimum 5 lessons of their peers in each pedagogy
- participate in the mentoring sessions to plan lessons under the guidance of mentors.

B. Internship

Objectives:

To provide the student teachers with the field experience of getting attached to a school for a long duration and develop professional skills of teaching, participate in various day to day functions of schools, and in organizing various activities.

Activities

- The student teachers will teach 20 lessons at secondary level in each pedagogy.
- The student teachers will observe minimum of 5 lessons at upper primary level and 10 lessons at secondary level of their peers in each pedagogy.
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records

- The student teachers will carry out action research project, analyse and write the report.

C. Post Internship

Activities

- Submission of internship records - evaluation records, activity record, observation records, reflective diary
- PPT Presentation of reflectiions

Evaluation in each pedagogy is as follows:
C1 – Pre-internship activities
C2 – Internship records and post-internship presentation
C3 – Internship in teaching

EIGHTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

PHYSICS

MSEVIII.1 :SOLID STATE PHYSICS

Credits: 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics for an understanding of physics of nuclei and of solids.

COURSE CONTENT:

Unit I: Crystal Structure

Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices.Brillouin Zones. Coordination number, packing fraction for cubic crystals (sc, bcc and fcc). Diffraction of X-rays by Crystals. Bragg's Law.

Unit II:

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law.
Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Curie-Weiss Law, Discussion of B-H Curve. Hysteresis and Energy Loss.

Unit III:

Electrical Properties: Free electron model of a metal, solution of one dimensional Schroedinger equation in constant potential, Density of states. Fermi energy, Energy bands in solids, Distinction between metals, semiconductors and insulators. Kronig- Penney model. P and N type Semiconductors. Conductivity of Semiconductors, mobility. Hall effect-Expression for Hall coefficients. Applications of Hall effect.
Dielectrics: Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation.

Unit IV:Superconductivity

Superconductivity: Qualitative description,.Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's

Equation and Penetration Depth. Isotope effect. High temperature superconductors Applications

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, 8th Ed., Wiley India Pvt.Ltd., 2004.
2. A J Dekker, Solid State Physics, Macmillan, 1965.
3. J.P. Srivastava, Elements of Solid State Physics, 2nd Ed., Prentice-Hall of India, 2006.
4. Leonid V. Azaroff, Introduction to Solids, Tata Mc-Graw Hill, 2004.
5. M. A. Wahab, Solid State Physics: Structure and Properties of Materials,Alpha Science International, Ltd., 2005.
6. Neil W. Ashcroft and N. David Mermin, Solid State Physics, Cengage Learning, 1976.
7. S O Pillai, Solid State Physics, NEW AGE, 2009.
8. G. I. Epifanov, Solid State Physics, Central Books Ltd., 1979.
9. M. Ali Omar,Elementary Solid State Physics, Pearson India, 1999.
10. H. Ibach and H Luth, Solid-state Physics, Springer, 2009.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Measurement of susceptibility of a paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. Determination of Hall coefficient in semiconductors.
5. Determination of Curie temperature– ferromagnet.
6. Determination of work function of a metal using R-D equation.
7. To measure the Dielectric Constant of a dielectric Materials with frequency.
8. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR).
9. To determine the refractive index of a dielectric layer using SPR.
10. To study the PE Hysteresis loop of a Ferroelectric Crystal.
11. To draw the B- H curve of iron using a Solenoid and determine the energy loss from Hysteresis.

12. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150^{o} C) and to determine its band gap. Franck-Hertz experiment.
13. Powder XRD pattern of KCl.
14. Powder XRD pattern of NaCl.
15. Powder XRD pattern of $CaCl_2$.
16. Solar cell experiment.
17. Frequency resonance of LR circuit.
18. Polarisation by reflection-Brewster's law.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2BChemistry

MSEVIII.2 :SPECTROSCOPY, NATURAL PRODUCTS AND HETEROCYCLICS

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To develop an understanding of the

- basic principles of Spectroscopy and apply the principles in the structural elucidation of simple organic compounds.
- chemistry of natural products, dyes and drugs, macromolecules and heterocyclic compounds

COURSE CONTENT:

Unit I : Spectroscopy

UV and Visible spectroscopy: Introduction, absorption laws, instrumentation, formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward – Fieser rules for calculating absorption maximum in dienes and α,β-unsaturated carbonyl compounds.

IR spectroscopy: Introduction, theory of molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, finger print region and applications of IR spectroscopy.

NMR spectroscopy: Introduction, instrumentation, number of signals, position of signals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts- inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemical exchange and coupling constant.
Structural determination of simple organic compounds using UV, IR and NMR spectral data.

Unit II: Natural Products
Carbohydrates: Introduction, classification and nomenclature. Configuration of monosaccharides. Erythro and threo diastereomers. Interconversions in carbohydrates – glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation. Constitution of disaccharides - maltose, sucrose and lactose. Introduction to polysaccharides (starch and cellulose) without involving structure determination.
Alkaloids : Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine
Terepinoids : Introduction, isoprene rule, structural elucidation of Citral and Menthol
Amino acids, Peptides, Proteins and Nucleic acids
Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α-amino acids.Classification of proteins. Peptide structure determination - end group analysis, selective hydrolysis of peptides. Solid-phase peptide synthesis. Primary and secondary structures of proteins. Protein denaturation.
Nucleic acids : Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. The double helical structure of DNA. Types of different RNA and their functions in the synthesis of protiens. Genetic code.

Unit III: Dyes, Drugs and Macromolecules
Dyes: Introduction, Classification of dyes, Colour and constitution (electronic concept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.
Drugs: Introduction, classification, structure and synthesis of sulpha drugs- sulphapyridine, sulphathiazole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials – plasmaquin, mepacrine and chloroquin.

Macromolecules: Introduction, Classification, Types of polymerization – chain polymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers – buna S , butyl rubber and neoprene. Synthetic fibres – nylon 6, nylon 6,6, terylene. Conducting polymers – polypropylenes and polyanilines. Bio-degradable polymers.

Unit IV: Heterocyclic Compounds

Introduction, methods of formation of five membered heterocycles – furan, thiophene and pyrrole. Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and their chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Six membered heterocycles: methods of formation of pyridine, mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles, preparation and reactions of Indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

References :

1. Organic Spectroscopy by P S Kalsi
2. Organic Chemistry : I L Finar Vol II
3. Application of absorption Spectroscopy to Organic Compounds : John R Dyer
4. Organic Spectroscopy : William Kemp
5. Fundamentals of Molecular Spectroscopy : C N Banwell

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop skills of synthesis and Estimation of organic compounds

COURSE CONTENTS:

1. Two step organic synthesis

1. Synthesis of p-bromoaniline from acetanilide
2. Preparation of o-iodobenzoic acid from anthranilic acid
3. Preparation of m-nitrobenzoic acid from methyl benzoate
4. Preparation of Paracetamol
5. Synthesis of Quinoline

2. Quantitative organic analysis

1. Estimation of aniline/ phenol by bromate-bromide method
2. Estimation of glucose by Fehlings method/ Spectrophotometry using 3,5 dinitro salicylic acid
3. Determination of iodine value of an oil by Wij’s method/ Chloramine-T method
4. Determination of saponification value of an ester / oil
5. Estimation of amino acid by formal titration method
6. Estimation of ascorbic acid in Vitamin C tablets by Volumetry

7. Estimation of Paracetamol by titrimetric and spectro photo metric methods.
8. Colorimetric Estimation of proteins by Biuret method

References :

1. Organic synthesis-special techniques V.K. Ahluwalia, 2nd Edition Narosa Publishing House
2. Organic Synthesis A.I. Vogel

DSE 3BMathematics

MSE VIII.3:COMPLEX ANALYSIS& NUMERICAL ANALYSIS

Credits : 3 (1L + 2T + 0P)	**Marks: 100**
Contact hrs per week: 5	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 50**

OBJECTIVES:
To develop the understanding & application of the concepts of complex analysis in problem solving situations. To enable and apply Numerical methods in solving problems related to real life situations with help of computers, which have become indispensable in modern world.

COURSE CONTENT:

Unit I:
Functions of a Complex Variable, Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions, Conformal Mappings.Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations.

Unit II:
Complex Integration: Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula, Higher Derivatives. Power Series**:** Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions.

Unit III:
Numerical Methods: Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Iteration method, Newton-Raphson method.
Finite differences, Forward and Backward differences, Weierstrass theorem, Interpolation, Newton-Gregory forward and backward interpolation formulae, Divided differences, Lagrange's interpolation formula.

Unit IV:
Numerical Differentiation: Finding first and second derivatives using interpolation formulae, Difference equations.

Integration: General quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Newton-Cotes quadrature formula, Gauss quadrature.

References:

1. Complex Analysis by Ahlfors McGraw Hill International Edition.
2. Introduction to the Theory of Functions of a Complex Variable by Palka, Springer Verlag.
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
5. Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, OxfordUniversity Press.
7. Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
8. Functions of One Complex Variable by Conway, Narosa Publishing House.
9. Theory and Problems of Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
10. Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.
11. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
12. Finite Differnece and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
14. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
15. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
16. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
17. Numerical Calculus by William Edmund Milne, Princeton University Press.
18. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
19. Numerical Analysis by Schield, Schaum's Outline Series.
20. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.

GENERIC ELECTIVE 2

MSEVIII.4 : INDIAN CONSTITUTION AND HUMAN RIGHTS

Credits 2 (2L+0T+0P)	**Max. Marks: 100**
Contact Hours per week: 2	**C1+ C2: 50**
Exam duration: 2 Hrs	**C3: 50**

Objectives:

On completion of this course, the student teacher will be able to

•know the importance, preamble and salient features of Indian Constitution

•appreciate the significance of Fundamental Rights, Duties and Directive Principles of State Policy.

•develop an understanding of the strength of the Union Government.

•understand the functioning of the State Government for the unity and the strength of the Democracy.

- know the importance of local self-Government and Panchayati Raj Institutions in India.
- know the meaning, significance, the growing advocacy of Human Rights.

Transaction Mode:
Through Lectures, Group discussions, Interactive sessions, field activities and use of Education Technology.

COURSE CONTENT:

Unit I: Meaning and Importance of the Constitution
Preamble, Salient features, Constituent Assembly and the Spirit of the Indian Constitution.

Unit II: Fundamental Rights, Duties and Directive Principles
Fundamental Rights, Fundamental Duties, and the Directive Principles of the state policy of the Indian Constitution.

Unit III: Union, State and Local Self Governments
Union Government: Parliament, the President and Prime Minister: State Government: Governor and the Council of Minister: Judiciary: Functions and Powers: Panchayat Raj System.

Unit IV: Human Rights
Origin and Development of Human Rights, Growing Advocacy and Declining Trends of Human Rights, Rights of Scheduled Casts, Scheduled Tribes, Minorities, Children and Women, Human Rights Defenders, Human Rights Violation and Human Rights Organizations.

References:
1.M.V.Pylee, **Indian Constitution**, OUP, New Delhi
2.Granveille Austin, **Indian Constitution**, OUP, New Delhi
3.Rajani Kotari, **Politics in India**, OUP, New Delhi
4.Johari, J C, **Indian Government and Politics**.
5.S R Maheswari, **Local Governments in India (Latest Edition)**
6.R K Arora and Rajani Goyal, **Indian Public Aministration 1995.**
7.C P Bhambri, **Introduction to Indian Constitution**.
8.Subash C Kashyap, **The Working of Indian Constitution,** NBT, New Delhi
9.Subash C Kashyap,**Our Parliament**, NBT, New Delhi
10.Granveille Austin, **Functioning of the Indian Constitution**, NBT, New Delhi.
11.Bipan Chandra**, India after Independence**. Roopa, New Delhi 2000.
12.Arjun Dev, **Source Book on Human Rights**, NCERT, New Delhi.
13.**Human Rights in India: Theory and Practice**, National Book Trust, 2001.

PROFESSIONAL EDUCATION COURSES

MSEVIII.5 :KNOWLEDGE AND CURRICULUM

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

This course is designed to help student teachers to

- Understand the concept and the need for curriculum in schools.
- Explore the influences of the knowledge categories, social, cultural, economic and the technological aspects in shaping the present school curriculum and the text books.
- Analyze the principles employed in sequencing the school curriculum and the syllabus at different levels.
- Identify various learning sites and resources operating as curriculum supports in the system.
- Analyze the multiple roles of schools in implementation of curriculum.
- Discuss the roles and responsibilities of curriculum stakeholders.
- Analyse the role of teachers in operational sing the curriculum.
- Examine the processes and criteria commonly used to evaluate curriculum in pursuit of improvement.
- Explore the evaluation approaches adopted to revise the curriculum at the national and state levels.
- Analyze the national curriculum frameworks for necessary reforms proposed and their implications at school level.
- Develop an image of oneself as a curriculum informant, designer, agent, and evaluator.

COURSE CONTENT:

Unit I: Concept and the nature of curriculum

a) Meanings of curriculum; different perspectives of curriculum; need for curriculum in schools.
b) Educational policy reforms leading to curriculum reforms; Relationship between curriculum framework, curriculum , syllabus and text books- their significance in school education.
c) Meaning and concerns of core curriculum-its need and significance in Indian context; Meaning and concerns of Hidden curriculum and spiral curriculum and their relevance to learning.
d) Types of curriculum: subject-centered, activity-centered, environmental centered, and community-centered and their relevance.

Unit II: Foundations of Curriculum Development

a) **Forms of knowledge & Curriculum:** Forms of knowledgeand structure of a Discipline, and their characterization in different school subjects; Logical grammar of different school subjects

b) **Nature of learner& learning:** Nature of learner - needs and interests, and different perspectives on learning (behaviourists, cognitivists and social constructivists) and their implications to curriculum development

c) **Socio –cultural**: Importance of society-school relationships ; Societal factors that affect the curriculum ; Multiculturalism, multilingual aspects, and societal aspirations; Social reconstruction, social efficiency, inequality in educational standards, need for common goals and standards;

d) **Technological determinants** : Science and technological advancements, Using the resources of the information society in curriculum development

e) **Some of the critical issues**: environmental concerns, gender concerns .inclusiveness, value concerns, social sensitivity, and globalization.

Unit III: Process of curriculum Development

a) Understanding shifts in emphasis in approach to curriculum; from subject centered and behaviouristic learning to integrated approach involving development of perspectives, activity centered and constructivist orientation;

b) **Behaviouristic orientation**: Formulating aims and objectives – (general, specific - subject wise and level wise); Selecting content and learning experiences – Principles involved; Organizing the content and learning experiences- Principles (continuity, sequence and integration: organizing elements- concepts, skills, and values); breadth of coverage and depth of understanding; applicability and relevance to school curriculum planning

c) **Constructivists orientation**: curriculum embedded in real life contexts; authentic learning in real life contexts leading to knowledge construction; applicability and relevance to school curriculum planning

Unit IV Curriculum Implementation and Curriculum evaluation

a) Operationalising curriculum into learning situations; Planning and converting curriculum into syllabus and curriculum engagement activities.

b) Role of teachers in operationalising curriculum in generating dynamic curricular experiences through i) flexible interpretation of curricular aims ii) concept mapping iii) contextualization of learning v) selecting varied experiences and long range and daily planning, choice of resources, planning assessment etc.

c) Planning and use of curricular materials: Text book; teachers hand book, source book, work book, manuals, and other learning materials such as kits, AV and software materials..

d) School culture and climate in implementing the curriculum.

e) Supports to curriculum engagement: available infrastructure and curriculum sites and resources (library, laboratory, playground, neighbourhood etc); Use of community resources in curriculum engagement .

f) Role of external agencies – National, Regional and State in developing the learning supports (including training of teachers) for curriculum implementation.

g) Meaning of curriculum evaluation; Need for curriculum evaluation

h) Process of curriculum evaluation and renewal: collecting opinions and views on school curriculum and text books from different stakeholders; students' attainability of curricular standards as one of the criterion; evaluation of the discrepancies oMSErved between anticipated and oMSErved inputs, transactions and outputs; critical analysis of text books ;evaluation of other curricular materials;

i) Role of National, Regional and State bodies in empowering the teachers in evaluating curriculum

Sessional Work:

- Review of national curriculum frame works and write a report for presentation and discussion
- Analysis of teachers' handbooks, text books, workbooks, source books followed by Presentations.
- Readings of certain curriculum reviews and articles bearing significance to the course outlined and reflections on them

References:

1. Olivia, P (2004): Developing the curriculum (6th Ed). Allyn & Bacon, Inc. ISBN: 0205412599.
2. Curriculum planning for better teaching and learning by J.G. Saylor and W Alexander (Holt, Rinehart and Winston).
3. Yashpal Committee (1993): Learning without Burden, MHRD, and India.
4. Position paper: National Focus Group on 'Curriculum, Syllabus, Textbooks', NCERT.
5. Lewy, Arieh (1977): Handbook of Curriculum Evaluation, International Institute for educational Planning, France and Longman Inc.
6. Giroux, Henry et.al (1981): Curriculum and Instruction: Alternatives in Education by MC Cutchan Public Corp, Printed in USA.
7. Dewey, John (1959): The Child and the Curriculum, Chicago, the University of Chicago Press.
8. Hilda T (1962): Curriculum and Development- Theory and Practice; Harcourt, Brace and World, Inc.
9. Howson, Geoffrey (1978): Developing a New Curriculum, London: Heinmann
10. NCERT (1988) National Curriculum for Elementary and Secondary Education: A framework.
11. NCERT (2000) National Curriculum Framework For school Education.
12. NCERT (2005) National Curriculum Framework. NCERT publications
13. Schubert W (1986): Curriculum Perspectives, Paradigms and Possibilities, New York: Macmillan.
14. Zias, R (1976): Curriculum Principles and Foundations; New York; Thomas Crowwell.
15. Hirst, Paul (1975) : Knowledge and curriculum, (International Library of the Education volume 12): A collection of Philosophical papers, International library of Philosophy of Education, Routledge publishers
16. Kumar, Krishna and Malla Reddy : Curriculum Development and Educational Technology.

MSEVIII.6 :GUIDANCE AND COUNSELLING

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- appreciate the nature, purpose and need for guidance and counselling;
- sensitise the student-teachers with the need and relevance of Guidance and counselling.
- demonstrate an understanding of educational, vocational and personal guidance
- develop an understanding of the process of Guidance and Counselling
- understand the process of organization of guidance services in schools
- develop capacity of applying the techniques and procedures of guidance and counselling
- describe various testing and non- testing techniques
- develop the skill of administration and interpretation of psychological tests
- understand the concept and importance of career development.
- analyse the role of the teacher in the provision of Guidance and Counselling
- know the qualities required for good Counsellor

COURSE CONTENT

Unit I: Meaning and Nature of Guidance

Guidance: Concept, aims, objectives, functions and principles.
Need & Procedure for (Educational, Psychological and Social) guidance.
Purposes and Principles of organization of different guidance Services
Organization of guidance services at Secondary Level: Need and Importance
Group Guidance: Concept, Need, Significance and Principles, Organization of Guidance programs in schools.
Role of Guidance Personnel in organization of guidance services in School :Counsellor, Career Master, Psychologist, Doctor, Teacher Counsellor, Head of the Institution, Teacher, Social Worker

Unit II: Meaning and Nature of Counselling

Counselling: Meaning,and nature; Difference between Guidance &Counselling; Principles and approaches of counselling, Individual and Group Counselling; Skills in Counselling-Skills for Listening, Questioning, Responding, & Communicating, Listening Attentively to the concerns of the counselee, Negotiating Self Discovery, Decision Making, Problem Solving etc and values such as Patience, Empathy etc.; Methods and Process of Counselling
Academic, Personal, Career and Behaviour problems of students with special needs, viz. socio-emotional problems of children with disabilities and deprived groups such as SC, ST and girls, need for Counselling; Professional Ethics and Code of Conduct ; Qualities and Qualifications of an effective Counsellor

Unit III:Tools and Techniques of Guidance

Testing and Non-Testing Techniques for Studying and Appraisal of students : a) Testing Techniques: Intelligence/Mental Ability tests, Aptitude tests, attitude scales, Interest inventories, and Personality Tests, b) Non-testing Techniques: Interview, OMSErvation,and Case Study, c) Tools-Questionnaire, anecdotal record, Cumulative Record Cardsetc,
Role of the teacher in Assessment and Testing.

Unit IV: Career Guidance and Counselling

Educational and Career Information in Guidance and Counselling: Meaning, Importance, collection, types, classification of occupational information; Dissemination of Occupational Information: Class talk, career talk, Group discussion, Preparation of Charts and Poster, Career Exhibition, Career conference; Guidance for gifted, slow learner, socio-economically disadvantaged children; Career development: Meaning and Importance; Teacher's role in Career planning, Vocational training and placement opportunities for CWSN.Broad outline with respect to the emerging courses and career options available in India; Guidelines for Establishment of Guidance Cell or Career Corners in Schools

Suggestive List of Activities:

- Group Guidance-Preparation of Class Talk and One Career Talk
- Visit to different Guidance Centre
- Design a checklist/Questionnaire to collect information on students and classify them under educational, psychological or social problem.
- Preparation of Cumulative Record
- To prepare a Case study and Analysis of Case study
- Administration, Scoring & interpretation of at least two tests: One Mental Ability Test and One Aptitude Test
- Job Analysis of a Counsellor
- Preparation of list of problem behaviours based on oMSErvation. Detailed study of the Guidance and Counselling Services available in a given School
- Prepare a Chart and Poster for dissemination of Career Information
- Familiarise and write a report of any one of the Personality Tests used in Guidance and Counselling

References:

1. Aggarwal, J. C. (2004). Educational Vocational Guidance and Counselling, Delhi: Doaba House.
2. Asch, M. (2000). Principles of Guidance and Counselling, New Delhi: Sarup and Sons.
3. Bhatia, K. K., (2002). Principles of Guidance and Counselling, Ludhiana: Vinod Publications
4. Bhatnagar, R. P.; Rani. S. (2001); Guidance and Counselling in Education and Psychology.
5. Chauhan, S. S. (2008). Principles and Techniques of Guidance. UP: Vikas Publishing House Pvt. Ltd.
6. Coorey,S.M (1953).Action Research to Improve School Practices, New York:Teacher's ,Columbia University
7. Gibson, R.L. and Mitchell (2008). Introduction to counselling and Guidance. New Delhi:PHI Learning Pvt. Ltd.
8. Granz, R. M. (2005). Foundation and Principle of Guidance, Boston: Allyn& Bacon.

9. Gupta, V. K. (2004). Educational Guidance and Counselling, Ludhiana: Ankur Publications.
10. Jones, J. A. (1970). Principles of Guidance, Bombay: Tata, New York: McGraw Hill.
11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication
12. Kakkar, S.B (2015) Educational Psychology, *PHI Learning: Publications*
13. Kocher, S. K. (2007). Educational Guidance and Counselling, New Delhi: Sterling.
14. Myres, G. E. (2005). Principles and Techniques of Vocational Guidance, New York: McGraw Hill.
15. Nanda, S. K.andSagar, S. (1972). Fundamentals of Guidance. Chandigarh: N.B.S. Educational Publishers.
16. Nayak A.K. (2004); Guidance and Counseling
17. NCERT (2008). Counselling Process and Strategies (Module 2). New Delhi: NCERT.
18. NCERT (2008). Guidance for Human Development and Adjustment (Module3) New Delhi: NCERT.
19. NCERT (2008). Introduction to Guidance (Module 1). New Delhi: NCERT.
20. NCERT (2005). National Curriculum Framework-2005,NCERT,New Delhi

Web resources

- Introduction to Guidance and Counseling African Virtual university http://oer.avu.org/bitstream/handle/123456789/153/GUIDANCE%20AND%20COUNSELING.pdf?sequence=1
- Ethical Principles of Psychologists and Code of Conduct by APA, http://www.apa.org/ethics/code/principles.pdf
- Guidance and Counselling, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/pdf/guidelines_for_guidance_and_counseling.pdf
- http://www.egyankosh.ac.in/

MSEVIII.7 :VALUE AND PEACE EDUCATION

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understand the need and importance of education for peace and values.
- Understand the nature, characteristics and types of human values.
- Understand the five core values of Truth, Righteous conduct, Peace, Love and Non-Violence.
- Appreciate the developments in Peace Education in India and Abroad.
- Understand various methods, techniques and approaches of value development.
- Appreciate the preamble to the constitution and values inherent in it.
- Understand various models of value education.
- Appreciate the importance of living together and imbibe in their attitude and behaviour.

COURSE CONTENT

Unit I: Concept, Meaning and Nature of value

Concept and meaning of value and Peace:

Indian and Western perspectives on value and Peace.

Reflections of great Indian thinkers on values and Peace(Gandhiji, Swami Vivekananda,Sri Aurobindo, Rabindratha Tagore, J. Krishmamurthi)

Understanding Peace in the individual, Social, National and International context

Nature and characteristics of values

Sources and selection of values -culture and human needs

Unit II : Concept, Meaning and Nature of Peace

Historical development of Peace education in India and in the world

Preamble to the Indian Constitution and values inherent in it

Exposition of the five human values of Truth, Righteous Conduct, Peace, Love and Non-Violence with illustrations from life and literature.

Creation of United Nations, UNESCO, UNICEF and their role in promoting value and Peace Education.

Judgement of the Supreme Court on Value Education

Unit III : Concept and need for Value-based Education and Education for Peace

Concept of value based education and Education for Peace with special reference to peace to Indian view of life;

Paradigm shift from Peace education to Education for Peace.

Need for and importance of value based education and Education for Peace in the present scenario.

Aims and objectives of value based and Peace education

Recommendations of Sri Prakasha Committee (1959) on value education.

Recommendations of Parliamentary Committee of HRD on Values Education (1996-90) headed by Shri S.B. Chauhan.

Curriculum development and Models of Value Education.

Models of value education; Rationale building model, the consideration model, valuing process and clarification model.

Curriculum development; State specific approach – Elementary, Secondary, Higher Secondary and Higher Education.

Integration of human values with all (school) academic subjects.

Unit IV :Pedagogy of Value Education and Education for Peace

- Approaches and Techniques of teaching human values:-

  Direct approach: value based Story-telling, Group activities (dramatization, literary activities, games and sports, service activities), Counselling, organizing value based co-curricular activities.

  Indirect Approach; Incidental Approach with illustrations

  Integrated approach: Integration into curricular, co-curricular activities and subjects (with illustrations of integration from Language, Mathematics, science and social science , art and aesthetics , Yoga and health education,
- Teacher as Role Model.
- Role of school ambience and environment in development of values.

Practicum

- Develop / compile stories with values from different sources and cultures, organize value based co-curricular activities in the classroom and outside the classroom, develop value based lesson plans, integrating values in school subjects.
- Study of any Model of integrated value education – case study of models expressed by Sri Sathya Sai, J. Krishnamurti, etc.
- Visit to Ramakrishna Institute of Moral and spiritual Education

In addition, school and community based activities may be organised.

Evaluation Strategies

1. Reflective reading based presentations.
2. Unit tests.
3. Quiz based evaluation
4. Seminar presentation
5. Submission of case reports on violation of peace as reported through mass-media.

References:

1. Barash, P. David (2000). Approaches to Peace, Oxford University Press, New York.
2. Bernard, Jessie (1957). The Sociological study of conflict. International Sociological Association, The Nature of Conflict, UNESCO Paris.
3. Galtung, J. (2003). Searching for Peace – The road to TRANSCEND, Sterling Virginia.
4. Galtung, Johan (1996). Peace by Peaceful Means: Peace and Conflict, Development and Civilization. Sage Publications, New Delhi.
5. Galtung, Johan (1984). The Struggle for Peace Gujarat Vidyapith, Ahmedabad.
6. Gandhi, M.K. (1944). Non-Violence in Peace and War Navajivan Publishing House, Ahmedabad.

7. Govt of India (1983). Report on Education in Human Values in Teacher Training Programmes, New Delhi, Ministry of Human Resource Development.
8. Harris Ian. M. (1998). "Peace Education" Mc Farland & Company, Inc Publisher London
9. Howlett, Charles F., John Dewey and Peace Education, Encyclopedia of Peace Education, Teacher College, Columbia University 2008.
10. Kapani, Madhu (2000). Education in Human Values – concept and practical implications, New Delhi; Sterling Publishers.
11. Krishnamurti, J.: "Total Freedom", Krishnamurti Foundation Chennai.
12. NCERT National Curriculum Framework (2005). Position Paper, National focus Group on Education for Peace, NCERT, New Delhi (2006).
13. National Curriculum Framework (2005) position paper, National Focus group on Education for Peace, NCERT, New Delhi.
14. NCTE (1998). Curriculum Framework for Quality Teacher Education, NCTE, New Delhi.
15. Pandey, S. (2004). Education for Peace, Self Instructional Package for Teacher Education, NCERT, New Delhi.
16. Sri Sathya Sai Bal Vikas Education Trust (1985). Curriculum and Methodology for integrating Human Values Education, Prashanthi Nilayam (International Education).
17. Sri Sathya Sai International Center for Human Values (2009). Education in Human Values: Course Book for Training of Master Trainers, New Delhi.
18. The Curriculum framework for Quality Teacher Education (1998) NCTE, New Delhi
19. UNESCO (2001) Learning the way of Peace, "A Teacher Guide to Education for Peace", UNESCO, New Delhi.

Web resources

Education for values in schools- a framework, NCERT
http://www.ncert.nic.in/pdf_files/Framework_educationCOMPLETEBOOK.pdf

Values Education A Handbook for Teachers (2012), CMSE
http://cMSEacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf
Position Paper National Focus Group on Education for Peace,
NCERT http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/education_for_peace.pdf

NINTH SEMESTER

MSE(M)-IX.1 : ABSTRACT ALGEBRA

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:
Unit I: Introduction to Groups (Review); Lagrange's theorem and its applications, cyclic groups, homomorphism and isomorphism, Normal subgroups, Quotient groups, class equations, Fundamental theorem of group homomorphism. Isomorphism theorems.

Unit II: Cauchy's theorem, Permutation groups, Cycles and transpositions, Alternative groups, Cayleys theorem, Sylow's theorems, p-Sylow subgroups, structure of abilean groups.

Unit III: Rings, Integral domains, Fields (Review). Homomorphism's, Ideals and quotient rings, prime and maximal ideals, ED, PID, UFD, Polynomial rings, factorization, irreducibility criteria.

Unit IV: Extension fields, Algebraic extension, Finite fields, separable extensions, perfect fields, primitive element theorem, Introduction to Galois Theory.

References :

1. Hungerford T W,*Algebra*, Springer International Edition, New York.
2. Artin Michael, *Algebra*, Prentice-Hall of India, New Delhi.
3. Gallian J A,*Contemporary Abstract Algebra*, Narosa, 4th Ed.,
4. Dummit D S and Foote R M (1999),*Abstract Algebra*, John Wiley and Sons, 2nd Ed.,
5. Herstein I N, *Topics in Algebra*, Vikas Publishing House, New Delhi.
6. FraleighJ B,*A First course in Abstract Algebra*, Addison-Wesley,
7. Gopalakrishnan N S,*University Algebra*, New Age International, 2nd ed.,

MSE(M)-IX.2 : LINEAR ALGEBRA

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:
Unit I: Vector Spaces, Subspaces, Linear Dependence and Linear Independence, Bases and Dimension, Quotient Spaces.
Linear Transformations, Null Spaces, and Ranges, Rank-Nullity theorem, The Matrix Representation of a Linear Transformation, Linear operators, Invertibility. The Change of Coordinate Matrix, The Dual Space, annihilators.

Unit II: Eigenvalues and Eigenvectors, Diagonalizability, Invariant Subspaces and the Cayley-Hamilton Theorem for Linear operators;Inner Products and Norms, The Gram-Schmidt Orthogonalization Process, Orthogonal Complement.

Unit III: The adjoint of a Linear Operator, Normal and Self-Adjoint Operators, Unitary and Orthogonal Operators and Their Matrices, Orthogonal Projections and the Spectral Theorem; Bilinear and Quadratic Forms.

Unit IV: Canonical forms- Triangular form; Nilpotent form,Jordan Form; Minimal Polynomial; The Rational Canonical Form.

Books for Reference:

1. Friedberg S, Insel A, and Spence L (2009), *Linear Algebra*, Fourth Edition, PHI
2. Jimmie Gilbert and Linda Gilbert, *Linear Algebra and Matrix Theory*, Academic Press, An imprint of Elsevier.
3. I. N. Herstein, *Topics in Algebra*, Wiley Student Edition
4. Hoffman and Kunze (1978), *Linear Algebra*, Prentice Hall of India, 2nd Ed.,
5. P. R. Halmos (1958), *Finite Dimensional Vector Space*, D. Van Nostrand.
6. S. Kumeresan (2000),*Linear Algebra - A Geometric approach*, Prentice Hall India.

MSE(M)-IX.3 : ANALYSIS I

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:
Unit I: Extended Real number System, Countable and Uncountable sets, Topology of Real line- open, closed, compact and connected sets and properties; Continuity and properties, Uniform Continuity, Discontinuities, Monotonicity.

Unit-II: Numerical sequences, convergent sequences, Cauchy sequences, limit inferior and limit superior. Continuity of a function - sequencial approach. Series of real numbers, series of non-negative terms, the number ‘e’, tests of convergence.

Unit III: Sequences and series of functions, Uniform convergence, Uniform convergence and continuity, Uniform convergence and integration, Uniform convergence and differentiation. Power series, The exponential and logarithmic functions, The trigonometric functions.

Unit-IV: Multiplications of series, re-arrangements. Double series, infinite products. Improper integrals and their convergence.

References :

1. Rudin Walter,*Principles of Mathematical Analysis*, International Student edition, McGraw-Hill, 3rd Ed.
2. T.M. Apostal, *Mathematical Analysis*, Addison Wesley, Narosa, 2nd Ed.,
3. R.R. Goldberg,*Methods of Real Analysis*, Oxford and IBH, New Delhi.
4. D.V. Widder, *Advanced Calculus*, Prentice Hall of India, New Delhi, 2nd Ed.
5. Tao Terrence (2006),*Analysis I*, Hindustan Book Agency, India.
6. Tao Terrence(2006),*Analysis II*, Hindustan Book Agency, India.
7. Ross Kenneth (2004),*Elementary Analysis: The Theory of Calculus*, Springer International Edition.

MSE(M)-IX.4 : DISCRETE MATHEMATICS

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complements, Boolean Algebra, Boolean expressions, Application to switching circuits.

Unit II: Permutations and Combinations, Pigeon-hole principle, Principle of inclusion and exclusion.

Unit III: Graphs, Vertices of graphs, Walks and connectedness, Degrees, Operations on graphs, Blocks - Cutpoints, bridges Block graphs and Cutpoint graphs.

Unit IV: Trees - Elementary properties of trees, Center, Connectivity, Connectivity and line connectivity, Menger's theorem, Partitions, Coverings, Coverings and independence number.

References :

1. Liu C L (1986), *Elements of Discrete Mathematics*, McGraw-Hill.
2. Rosen K H (2002),*Discrete Mathematics and its Applications*, McGraw-Hill.
3. Harary Frank (1969),*Graph Theory*, Addition Wesley Reading Mass.
4. Deo Narsingh (1987),*Graph Theory With Applications to Engineering and Computer Science*, Prentice Hall of India.
5. Parthasarathy K R (1994),*Basic Graph Theory*, Tata McGraw-Hill, New Delhi.
6. Chartand G and Lesniak L,*Graphs and Diagraphs*, Wadsworth and Brooks, 2^{nd} Ed.
7. Clark and Holton G A,*A First Look at Graph Theory*, Allied publishers.
8. West D B (2001),*Introduction to Graph Theory*, Pearson Education Inc., 2nd Ed.
9. Bondy J A and Murty U S R (1976),*Graph Theory with applications*, Elsevier.

DISCRETE MATHEMATICS

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:
Unit I: Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complements, Boolean Algebra, Boolean expressions, Application to switching circuits.

Unit II: Permutations and Combinations, Pigeon-hole principle, Principle of inclusion and exclusion.

Unit III: Graphs, Vertices of graphs, Walks and connectedness, Degrees, Operations on graphs, Blocks - Cutpoints, bridges Block graphs and Cutpoint graphs.

Unit IV: Trees - Elementary properties of trees, Center, Connectivity, Connectivity and line connectivity, Menger's theorem, Partitions, Coverings, Coverings and independence number.

References :

1. Liu C L (1986), *Elements of Discrete Mathematics*, McGraw-Hill.
2. Rosen K H (2002),*Discrete Mathematics and its Applications*, McGraw-Hill.
3. Harary Frank (1969),*Graph Theory*, Addition Wesley Reading Mass.
4. Deo Narsingh (1987),*Graph Theory With Applications to Engineering and Computer Science*, Prentice Hall of India.
5. Parthasarathy K R (1994),*Basic Graph Theory*, Tata McGraw-Hill, New Delhi.
6. Chartand G and Lesniak L,*Graphs and Diagraphs*, Wadsworth and Brooks, 2nd Ed.
7. Clark and Holton G A,*A First Look at Graph Theory*, Allied publishers.
8. West D B (2001),*Introduction to Graph Theory*, Pearson Education Inc., 2nd Ed.
9. Bondy J A and Murty U S R (1976),*Graph Theory with applications*, Elsevier.

MSE(M)-IX.5 : FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits : 3(2L + 1T +0P) **Max.Marks :100**
Contact Hrs per week : 4 **C_1 + C_2 : 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Objectives:
- Understand the concept of Education and its Epistemological premises
- Analyses the Discipline categories and their Logical distinctions
- Understands Education as a Discipline and its contribution to curriculum courses
- Analyses the societal problems and the necessity for Peace Education in schools
- Explores the possible sources of value conflicts , crisis among Higher secondary learners and teacher's role in helping to resolve value conflicts
- Analyses various perspectives and thoughts on Peace and Peace Education
- Analyses the role of Education in a Pluralistic society like India and a need for culture-specific pedagogy in School Education

- Reflects on the social discriminations , inequalities and the oppressed groups,as a teacher, as well as a member of the society and develops responsible attitude and commitment
- Understands the school as a sub system of society and its responsibilities in reflecting the cultural and social ethos in its aims and functions
- Examines the concerns and issues of contemporary Indian Society and their bearing upon Education

Transaction Mode:
Lectures followed by Discussions; Group Discussions; Seminars; Collaborative Presentations; Assignments

COURSE CONTENT:
Unit I :
Education as a critical concept and criteria of educative process; Knowledge and disciplines; Logical distinction between Scientific and Mathematical Knowledge; Education as a discipline; Multidisciplinary nature of education; Concept and nature of value and value education; Factors contributing to value development; Value shifts; Need for education for peace; Value crises in adolescent learners; Methods of resolving value conflicts; Human rights; Role of education in promoting peace; Use of curricular and co-curricular areas in promoting peace as a value; Rationality as a value to be developed in learners.

Unit II :
a) Styles of learning and thinking – implications for understanding the adolescent learner; Sociocultural factors influencing learning.
b) The process of adult learning – cognitive changes (Praget and Elkind); role of feedback and incentives; learner's experience in the construction of knowledge.
c) Personality and development of self; The intra and interpersonal realm – self perception, self-defeating behaviour, self presentation, impression and management, self-monitoring; search for identity (Erikson), time of turmoil.
d) Mental health and management – Issues and concerns; adjustment and adjustment mechanisms; role of teacher in management.

Unit III :
a) Characteristic of Indian society : Multicultural, Multilinguistic and Multireligion system and role of senior Secondary Teacher
b) Socialization and acculturation, etc. influence on personality development in education.
c) Modernisation, its attributes and effect on present system of education.
d) Democratic values, equality and social justice, its importance in classroom teaching at higher secondary level.

Unit IV : Issues and Concerns of Senior Secondary Education
Gender equality, Inclusive Education for Children with Diverse Needs. Environmental Concerns, Sustainable Education, Quality Teacher Education, Globalization and its Effect over Education System.

References:

1. Dewey,John(1956): The School and the Society, The University of Chicago,ptd in USA,1990.
2. Carnoy, Martin (1974): education as Cultural Imperialism, Longman Inc. London

3. Bruner,S,J(1972): the Relevance of Education,Pub by Redwood press Ltd, ptd in Great Britain.
4. Gross,R,B(1970): Analytical Philosophy- An Historical Introduction, Western Publishing company, Inc. USA
5. O'Connor.D.J(1956): Philosophy Of Education
6. Dewey, J(1916): Democracy and Education: An Introduction to Education, New York
7. Peters, R.S: The concept of Education
8. Peters, R.S: Education and Education of Teachers
9. Pathak, Avijit (2002), Social Implications of Schooling, Rainbow Publishers, Delhi
10. Introduction: Life at School, need for critical enquiry Ch. 2 Sociology of School Knowledge Ch 3. Looking Beyond Texts, culture of school and formation of consciousness
11. Kumar Krishna (2004), What is Worth Teaching? 3rd edition, Orient Longman Ch 3. Implications of a Divisive School System Ch. 6 Growing Up Male
12. Saraswathi, T.S. (1999), Culture, Socialization and Human Development, Sage Publications
13. Bhattacharjee, Nandini, Through the Looking Glass: Gender Socialization in a Primary School (Ch14)
14. Krishnamurti, J., Education and the Significance of Life, KFI Publications (Ch. 6)
15. Readings from 'The Social Character of Learning' by Krishna Kumar and from 'Inner World' by Sudhir Kakar could also be considered
16. Krishnamurthi.J (2002): Why are you being educated? Talks at Indian Universities Krishnamurthy Foundations of India, Ptd by Chennai
17. Banks, James A. and C. A. McGee Banks, eds(1989): Multicultural Education: Issues and Perspectives. Needham Heights, Mass.: Allyn & Bacon
18. Boocock, S. S(1980): Sociology of Education: An Introduction. Lanham, MD: University Press of America
19. Chesler, Mark A. and W.M.Cave(1981): A Sociology of Education. New York: Macmillan
20. Dreeben, Robert(1968): On What is Learned in School. Reading, Mass.: Addison-Wesley
21. Durkheim, Emile(1956): Education and Sociology. Tr. Sherwood D. Fox. New York: Free Press
22. Eggleston, John(1977): The Sociology of the School Curriculum. Boston: Routledge & K. Paul
23. Jackson, P.W.(1968):Life in Classrooms. New York: Holt.
24. Rayner Steve (2007): Managing Special and Inclusive Education. New Delhi : Sage Publications.
25. Woodfolk Anitha (2004) : Educational Psychology. Boston : Pearson.
26. Snowman, S and Bidher, R. (2004): Psychology Applied to Teaching. California: Wadsworth.
27. NCERT (2005) : Education of Children with Special Needs – Position Paper by National Focus Group. New Delhi: NCERT.
28. NCERT (2005): Education for Peace- Position Paper by National Focus Group. New Delhi : NCERT.
29. Byrne, D. and Baron, R. (2008): Social Psychology. Boston : Allyn and Bacon.
30. Palmer, Joy, A. (2003) : Environmental Education in the 21st Century – Theory, Practice, Progress and Promise. New York : Routledge.

TENTH SEMESTER

MSE(M)-X.1 :ANALYSIS II

Credits :5 (4L + 1T +0P) — **Marks: 100**
Contact hrs per week: 6 — **C_1+ C_2: 50**
Exam Duration : 2 hrs — **C_3 : 50**

COURSE CONTENT:

Unit I: Differentiability, mean value theorems, L' Hospital rule, Taylor's theorem, maxima and minima, Functions of bounded variation.

Unit II: The Riemann-Stieltje's integral, criterion for integrability. Properties of the integral, classes of integrable functions. The integral as the limit of a sum. First and second mean value theorems. Integration and differentiation.

Unit III: Functions of several variables, partial derivatives, continuity and differentiability, the chain rule, implicit differentiation, homogeneous functions, Jacobians.

Unit IV: The Implicit function theorem, Inversefunction theorem, Taylor's theorem, the Maxima and Minima, Lagrange's multipliers.

References :

1. Rudin Walter,*Principles of Mathematical Analysis*, International Student edition, McGraw-Hill, 3rd Ed.
2. Apostal T M,*Mathematical Analysis*, Addison Wesley, Narosa, 2nd Ed.,
3. Goldberg R R,*Methods of Real Analysis*, Oxford and IBH, New Delhi.
4. Widder D V, *Advanced Calculus*, Prentice Hall of India, New Delhi, 2nd Ed.
5. Torence Tao (2006),*Analysis I*, Hindustan Book Agency, India.
6. Torence Tao (2006),*Analysis II*, Hindustan Book Agency, India.
7. Kenneth A. Ross (2204), Elementary Analysis: The Theory of Calculus, Springer International Edition.
8. Ghorpade S R and Limaye B V (2010), *A Course in Multivariable Calculus and Analysis*, Springer Verlag.

MSE(M)-X.2 : COMPLEX ANALYSIS I

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Algebra of complex numbers, geometric representation of complex numbers. Riemann sphere and Stereographic projection, Lines, Circles. Limits and Continuity.

Unit II: Analytic functions, Cauchy-Riemann equations, Harmonic functions, Polynomials and Rational functions. Elementary theory of power series - sequences, series, uniform convergence of power series, Abel's limit theorem, the elementary functions.

Unit III: Topology of the complex plane. Linear fractional transformations, Cross-ratio, Symmetry, Elementary conformal mappings. Complex integration – Line integrals, Rectifiable arcs.

Unit IV: Cauchy's theorem for a rectangle. Cauchy's theorem in a Circular disk, Cauchy's integral formula. Local properties of analytic functions.

References :

1. Ahlfors L V (1979),*Complex Analysis*, McGraw-Hill, Kogakusha.
2. Conway J B, *Functions of one complex variable*, Narosa, New Delhi.
3. Boas R P (1987), *Invitation to Complex Analysis*, The Random House.
4. Palka B C (1991), An Introduction to Complex Function Theory, Springer.
5. Ponnusamy S (1995) Foundations of Complex Analysis, Narosa.

MSE(M)-X.3 : THEORY OF NUMBERS

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Prime numbers, The Fundamental theorem of Arithmetic, The series of Reciprocals of primes, The Euclidean Algorithm. Fermat and Mersenne numbers. Farey series, Farey dissection of the continuum,Irrational numbers-Irrationality of m^{th} root of N, e and π.

Unit II: Arithmetical Functions – The Mobius function, The Euler' function and Sigma function, The Dirichlet product of Arithmetical functions, Multiplicative functions. Averages of Arithmetical functions – Euler summation formula, Some elementary asymptotic formulas, The average orders of $d(n)$, $\sigma(n)$, $\varphi(n)$, $\mu(n)$. An application to the distribution of lattice points visible from the origin.

Unit III: Approximation of Irrational numbers, Hurwitz's Theorem, Representation of a number by two or four squares, Definition of g(k) and G(k), Proof of g(4)<50, Perfect numbers. The series of Fibonacci and Lucas.

Unit IV: Continued fractions - Finite continued fractions, Convergence of a continued fraction, Continued fractions with positive quotients. Simple continued fractions, The representation of an irreducible rational fraction by a simple continued fraction. The continued fraction algorithm and Euclid's algorithm. The difference between the fraction and its convergents, Infinite simple continued fractions, the representation of an irrational number by an infinite continued fraction, Equivalent numbers and periodic continued fractions, some special quadratic surds.

References:

1. Hardy G H and Wright E M (1979),*An Introduction to Theory of Numbers*, Oxford University Press, 5th Ed.
2. Niven I, Zuckerman H S and Montgomery H L (2004),*An Introduction to the Theory of Numbers*, New York, John Wiley and Sons, Inc., 5th Ed.
3. Berndt B C, *Ramanujan's Note Books Volume-1 to 5*, Springer.
4. Andrews G E (1995),*Number Theory*, Dover Books.
5. Apostol T M,*Introduction to Analytic Number Theory*, Narosa Publishing House, New Delhi.

MSE(M)-X.4 : TOPOLOGY I

Credits :5 (4L + 1T +0P)	**Marks: 100**
Contact hrs per week: 6	**C_1+ C_2: 50**
Exam Duration : 2 hrs	**C_3 : 50**

COURSE CONTENT:

Unit I: Set theoretic preliminaries.Topological spaces and continuous maps - topological spaces, basis for a topology, the order topology, the product topology on X x X, the subspace topology.

Unit II: Closed sets and limit points, continuous functions, the product topology, the metric topology, the quotient topology.

Unit III: Connectedness - connected spaces, connected sets on the real line, path connectedness.

Unit IV: Compactness - compact spaces, compact sets on the line, limit point compactness, local compactness.

References :

1. J. R. Munkres (2000), *A First Course in Topology*, Prentice Hall India, 2nd Ed.

2. G. F. Simmons (1968),*Introduction to Topology and Modern Analysis*, McGraw-Hill, Kogakusha.
3. S. Willard (1968), *General Topology*, Addison Wesley, New York.
4. J. Dugundji (1966),*Topology*, Allyn and Bacon.
5. J. L. Kelley (1955), *General Topology*, Van Nostrand and Reinhold Co., New York.

MSE(M)-X.5 : TEACHING OF MATHEMATICS

Credits : 3(2L + 1T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs	**C_3 : 50**

COURSE CONTENT:

Unit I :
Foundations of Teaching Mathematics: Teaching Mathematics; Reflections and Directions; Exploring what it means to do mathematics, Developing Understanding in Mathematics, Building Assessment into instruction.

Unit II :
Advanced Mathematical thinking and the role of mathematical structure.

Unit III :
Complex Mathematical cognition, Emergence of an alternative paradigm, Basic conceptualisation, sequential processes, general problem of flexibility, metaphor and isomorphism.

Unit IV :
Thinking, reasoning and problem solving, Means – ends Analysis, Working backward, Back tracking, Reasoning by Analogy, Critical Thinking, Deductive Reasoning, Inductive reasoning, The Componential Approach, Heuristics Approach and Mental Models Approach.

References :

1. Development of Mathematical Thinking edited by Herbert P., Giusburg, Academic Press.
2. Cognitive Psychology in and out of the Laboratory, Second Edition by Kathleen M. Galotti.
3. Butler and Wren (1965), The Teaching of Secondary Mathematics, London, McGraw Hill Book Company.
4. Learning Mathematics by Robert B. Davis
5. Elementary and Middle School Mathematics; John A Van de Walle, Longman, An Imprint of Addison Wesley, Longman, inc.

ELEVENTH SEMESTER

MSE(M)-XI.1ELEMENTS OF FUNCTIONAL ANALYSIS

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Metric completion. Banach's contraction mapping theorem and applications, Baire' category theorem, Ascoli - Arzela theorem.

Unit II: Linear spaces and linear operators, Norm of a bounded operator, The Hahn – Banach extension theorem, Stone - Weirstrass theorem.

Unit III: Open mapping and Closed Graph theorems. The Banach - Steinhaus Principle of Uniform Boundedness.

Unit IV: Hilbert spaces- The orthogonal projection, Nearly orthogonal elements, Riesz's lemma, Riesz's representation theorem.

References :

1. Simmons G F,*Introduction to Topology and Modern Analysis*, Tata McGraw-Hill, New Delhi.
2. Taylor A E (1958), *Introduction to Functional Analysis*, Wiley, New York.
3. Page A and BrownA L,*Elements of Functional Analysis*.
4. Bachman George and Narici Lawrence,*Functional Analysis*, Dover Publications, Inc., Mineola, New York.
5. Conway J B (1985),*A Course in Functional Analysis*, GTM, Vol. 96, Springer.

MSE(M)-XI.2 : THEORY OF ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Credits :5 (4L + 1T +0P)	**Marks: 100**
Contact hrs per week: 6	**C_1+ C_2: 50**
Exam Duration : 2 hrs	**C_3 : 50**

COURSE CONTENT:

Unit I: Linear Second Order Equations - Initial value problem, Existence and Uniqueness by Picard's Theorem, Wronskian, separation and comparison theorems, Poincare phase plane, variation of parameters.

Unit II: Power series solutions - Solution near ordinary and regular singular point. Convergence of the formal power series, applications to Legendre, Bessel, Hermite, Laguerre and hypergeometric differential equations with their properties.

Unit III: Partial differential equations - Cauchy problems and characteristics, Classification of Second order PDE's, reduction to canonical forms, derivation of the equations of mathematical physics and their solutions by separation of variables.

Unit IV: Boundary value problems - Transforming Boundary value problem of PDE and ODE, Sturm - Liouvile system, eigen values and eigen functions, simple properties, expansion in eigen functions, Parseval's identity, Green's function method.

References :

1. Coddington E A and Levinson N, *An introduction to Ordinary Differential equations*, Tata McGraw-Hill, New Delhi.
2. Courant R and Hilbert D (1975), *Methods of Mathematical Physics, Vol. I. & II*, Tata McGraw-Hill, New Delhi.
3. Simmons G F (1991), *Differential Equations with applications and Historical Notes*, Tata McGraw-Hill, New Delhi.
4. Sneddon I N, *Theory of Partial differential equations*, McGraw-Hill, International Student Edition.
5. Deo S G and Raghavendra V, *Ordinary Differential Equations and Stability Theory*, Tata McGraw-Hill, New Delhi.

MSE(M)-XI.3 : COMPLEX ANALYSIS II

Credits :5 (4L + 1T +0P)	**Marks: 100**
Contact hrs per week: 6	**C_1+ C_2: 50**
Exam Duration : 2 hrs	**C_3 : 50**

COURSE CONTENT:

Unit I: The Calculus of Residues – The residue theorem, argument principle, Evaluation of definite integrals.

Unit II: Harmonic functions – Definition and basic properties, mean value property, Poisson's formula, Schwarz's theorem, reflection principle.

Unit III: Power series expansions – The Weierstrass theorem, The Taylor series, The Laurent series.

Unit IV: Partial fractions and factorization – Partial fractions, Mittag - Leffer's theorem, Infinite products, Canonical products, The Gamma and Beta functions, Sterling's formula. Entire functions – Jensen's formula, Hadamard's theorem.

References :

1. Ahlfors L V (1979),*Complex Analysis*, McGraw-Hill International Edition.
2. Conway J B, *Functions of one complex variable*, Narosa, New Delhi.
3. Boas R P, *Invitation to Complex Analysis*, The Random House, 1987.
4. Palka B C (1991),*An Introduction to the Complex Function Theory*, Springer.
5. Ponnusamy S (1995),*Foundations of Complex Analysis*, Narosa.

MSE(M)-XI.4 : TOPOLOGY II

Credits :5 (4L + 1T +0P)	**Marks: 100**
Contact hrs per week: 6	**C_1+ C_2: 50**
Exam Duration : 2 hrs	**C_3 : 50**

COURSE CONTENT:

Unit I: Countability and Separation axioms - the countability axioms, the separation axioms, normality of a compact Hausdorff space.

Unit II: Urysohn's lemma, Tietze's extension theorem, Urysohn's metrization theorem, Partitions of unity.

Unit III: Tychonoff's theorem on the product of compact spaces. Local finiteness, Paracompactness, Normality of a paracompact space.

Unit IV: The Fundamental group and the Fundamental group of a circle, The Fundamental group of the punctured plane, Essential and Inessential Maps, The Fundamental Theorem of Algebra.

References :

1. Munkres J R (2000),*A First Course in Topology*, Prentice Hall India, 2nd Ed.
2. Simmons G F (1968),*Introduction to Topology and Modern Analysis*, McGraw-Hill International Edition.
3. Willard S (1968),*General Topology*, Addison Wesley, New York.
4. Dugundji J (1966),*Topology*, Allyn and Bacon.
5. Kelley J L (1955),*General Topology*, Van Nostrand and Reinhold Co., New York.

MSE(M)-XI.5 : INTERNSHIP PROGRAMME

Credits: 4
Duration: 4 weeks **Max Marks: 100**
C1 + C2 : 50
C3 : 50

Objectives:
To provide field experience to the students to develop competencies and skills required for effective classroom teaching at the senior secondary level; class management; evaluation of student learning; organization of cocurricular activities; to enable students to develop proper professional attitudes, values and interests; to establish a closer professional link between RIE Mysore and schools in the region.

COURSE CONTENT:
The course is organized into activities distribution over two phases.

Phase 1 : Internship (3 weeks)

Phase 2 : Post-Internship and Critical Reflection of Internship Experience

Activities:
- Student teachers will teach 12 lessons (including 2 practicals) at Senior Secondary level
- Student teachers will observe a minimum of 5 lessons of their peers
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records
- The student teachers will carry out action research project, analyse and write the report

(C1 : Observation, Evaluation and Activity Records; C2 : Action Research Report & Post-Internship Activities; C3 : Teaching)

TWELFTH SEMESTER

MSE(M)-XII.1 : COMMUTATIVE ALGEBRA

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Rings and ideals - Rings and ring homomorphisms, Ideals, Quotient rings, zero-divisors, nilpotent elements, units, prime ideals and maximal ideals.

Unit II: The prime spectrum of a ring, the nil radical and Jacobson radical, operation on ideals, extension and contraction.

Unit III: Modules - Modules and modules homomorphisms, submodules and quotient modules, Direct sums, Free modules Finitely generated modules, Nakayama Lemma, Simple modules, Exact sequences of modules.

Unit IV: Modules with chain conditions - Artinian and Noetherian modules, modules of finite length, Artnian rings, Noetherian rings, Hilbert basis theorem.

References :

1. Atiyah M F and Macdonald I J,*Introduction to Commutative Algebra*, Addison-Wesley.
2. Musili C,*Introduction to Rings and Modules*, Narosa Publishing House.
3. Reid Miles,*Under-graduate Commutative Algebra*, Cambridge University Press.
4. Gopalakrishnan N S, *Commutative Algebra*, Oxonian Press.

MSE(M)-XII.2 : MEASURE THEORY

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Lebesgue measure – outer measure, measurable sets and Lebesgue measure, a non-measurable set, measurable functions, Ergroff theorem, Littlewood's three principles, Lusin's theorem.

Unit II: The Lebesgue integral – the Lebesgue integral of a bounded function over a set of finite measure, the integral of non-negative function, the general Lebesgue integral.

Unit III: Differentiation and Integration – differentiation of monotonic functions, functions of bounded variation, differentiation of an integral, absolute continuity.

Unit IV: Measure and Integration – measure spaces, measurable functions, integration, signed measures, the Radon-Nikodym theorem, measure and outer-measure, outer measure and measurability, the extension theorem, product measures.

References:

1. Royden H L, *Real Analysis,* Prentice Hall, 3rd Ed.
2. De Barra G, *Measure Theory and Integration,* Wiley Eastern Limited.
3. Rana I K (1997), *Introduction to Measure and Introduction,* Narosa.
4. Halmos P R, *Measure Theory,* Springer.

MSE(M)-XII.3 : ALGORITHMS AND COMPUTATION

Credits :5 (4L + 1T +0P)	**Marks: 100**
Contact hrs per week: 6	**C_1+ C_2: 50**
Exam Duration : 2 hrs	**C_3 : 50**

COURSE CONTENT:

Unit I: Introduction to Computers, Flowcharts, Algorithms and their features, Languages, Types of language and translators. Numerical Algorithms - Solving a simultaneous system of linear equations using iterative and direct methods.

Unit II: Interpolation algorithms - equal, unequal intervals, central difference and inverse interpolation.Numerical differentiation and integration and their error calculations.

Unit III: Graph theoretical algorithms - Connectivity, finding shortest path between two vertices, enumeration of all paths, construction of minimum spanning tree, cutest cut vertex, coding and decoding.

Unit IV: Computation - Algorithms complexities, strategies, Divide and conquer, greedy technique, Introduction to NP hard problems.

References :

1. Conte and D'Boor (1985), *Numerical Algorithms*, McGraw-Hill.
2. Deo Narsingh (1987),*Graph Theory With Applications to Engineering and Computer Science,* Prentice Hall of India.
3. Krishnamurthy E V(1980),*Introductory Theory of Computer Science,* Prentice Hall of India.
4. Horowitz and Sahni (1987), *Fundamentals of Computer Algorithms*, Addison Wesley.
5. Rajaraman V (1980),*Computer Oriented Numerical Methods*, Prentice Hall of India.

6. Rao Shankar G (1985),*Numerical Analysis*, Prentice Hall of India.

MSE(M)-XII.4: DIFFERENTIAL GEOMETRY

Credits :5 (4L + 1T +0P) **Marks: 100**
Contact hrs per week: 6 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I: Plane curves and Space curves – Frenet-Serret Formulae. Global properties of curves – Simple closed curves, The isoperimetric inequality, The Four Vertex theorem. Surfaces in three dimensions – Smooth surfaces, Tangents, Normals and Orientability, Quadric surfaces.

Unit II: The First Fundamental form – The lengths of curves on surfaces, Isometries of surfaces, Conformal mappings of surfaces, Surface area, Equi-areal Maps and a theorem of Archimedes.

Unit III: Curvature of surfaces – The Second Fundamental form, Normal and Principal Curvatures.Gaussianand mean Curvatures, The Pseudo sphere, Flat surfaces, Surfaces of Constant Mean Curvature, Gaussian Curvature of Compact surfaces, The Gauss' Map.

Unit IV: Geodesics- Definition and basic properties, Geodesic equations, Geodesics on surfaces of revolution, Geodesics as shortest paths, Geodesic co-ordinates.

References :

1. Pressley A,*Elementary Differential Geometry*, Under-graduate Mathematics Series, Springer.
2. Willmore T J,*An Introduction to Differential Geometry*, Oxford University Press.
3. Somasundaram D (2005), *Differential GeometryA First Course*, Narosa.

MSE(M)-XII.5 : RESEARCH IN MATHEMATICS EDUCATION

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **C_1 + C_2 : 50**
Exam. Duration: 2 hrs **C_3 : 50**

COURSE CONTENT:

Unit I :
Research methods in Mathematics Education. Contrasts and oblique connections in historical conceptual developments and classroom learning in Mathematics.

Unit II :

Complex interplay between theory in Mathematics Education and Teacher's Practice. Reflections and examples.

Unit III :
Linking researching with Teaching. Towards synergy of scholarly and craft knowledge.

Unit IV :
Linking Research and curriculum development. Making productive contributions to policy and practice.

References :

1. Fennama E. and Franks, M.L. (1992). Handbook of Research on Mathematics Teaching and Learning, MacMillan Publishing Company.
2. Handbook of International Research in Mathematics Education, Edited by Lyn D. English Second Edition, ROVTLEDGE, 270, Medison Ave, New York, NY10016.
3. Second Handbook of Research on Mathematics Teaching and Learning, NCTM, Edited by Frank K. Lester, Jr.

*****

UNIVERSITY OF MYSORE

REGIONAL INSTITUTE OF EDUCATION
[National Council of Educational Research and Training, New Delhi]

Regulations governing the Programme

1.0 Programme and Duration :

Integrated Programme of Teacher Education titled **'Master of Science Education' (Physics)** leading to the post-graduate degree**, M.Sc.Ed. (Physics).** The programme will be of six year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of 16 weeks of instruction excluding examination.

1.1 **Equivalence:**

The course content in the subjects, Physics, Chemistry and Mathematics in the first four years are equivalent to course content in the relevant subjects in the B.Sc. (PCM) Programme of the University of Mysore. The course content of the fifth and sixth years are equivalent to the M.Sc. Programme in Physics offered by the University of Mysore.

The course content related to Professional education are equivalent to the B.Ed. of University of Mysore and are as per the NCTE Regulations (2014).

In addition, in the last two years of the Programme, Professional Education components required for teaching of Mathematics at senior secondary level are also included. The composite degree, M.Sc.Ed., is thereby equivalent to B.Sc., B.Ed. and M.Sc. degrees of University of Mysore.

2.0 Eligibility for admission to M.Sc.Ed.

2.1 Candidates seeking admission to the programme should have passed CMSE Senior Secondary examination/ Pre-University examination of Karnataka or an equivalent examination of any state or UT of the Republic of India with 45% marks in the aggregate. Relaxation up to 5% of marks is given to the SC/ST candidates.

2.2 Candidates should have passed the qualifying examination with the following combinations of subjects: Physics, Chemistry, Mathematics/Statistics.

2.3 Admission shall be made by selection on the basis of marks in the qualifying examination and performance in a specially designed national level test (Common Entrance Examination) conducted by the NCERT. It shall be governed by the admission policies of NCERT and the guidelines of the University of Mysore.

It will also be governed by the reservation policies of Govt. of India as prevalent at the time of admission.

3.0 Scheme of Instruction :

Details of courses, scheme of study, credit distribution pattern and method of evaluation, etc. are provided in Table 1.

From semesters I to VIII Courses of Study are organized under the following categories:

a) Core Courses
b) Ability Enhancement Courses
c) Discipline Specific Electives
d) Skill Enhancement Courses
e) Generic Courses
f) Professional Education Courses.

From semesters IX to XII, courses of study are classified under the following categories:
a) Core Courses
b) Professional Education Courses

3.1 Core Courses:

The Programme offers three majors, Physics, Chemistry and Mathematics. Each Major comprises of 6 core courses. The titles of courses in each major and their positions are given in Tables 14 & 15.

3.2 **Ability Enhancement Courses :**

This is mandatory for all students. Comprises of 4 courses, two each in a language of student's choice and two in English
a) Language: Any one of the following: Hindi/ Kannada/ Malayalam/ Tamil / Telugu
b) English

3.3 Discipline Specific Elective:

Total of six advanced courses, two in each Major Subject are offered in the VII and VIII semesters of the Programme.

3.4 Skill Enhancement Course:

Two courses are offered in the third and fourth semesters of the Programme. Students can choose any two courses of their choice, cutting across disciplines, from a pool of courses that are being offered in each subject area.

3.5. Generic Course:

Two courses of inter-disciplinary nature are offered in the first and eighth semesters of the programme.

3.6 Professional Education Courses:

In accordance with the NCTE regulations – 2014, the programme includes 23 courses which are positioned in the first 8 semesters. The requirements of the 16 week internship proposed by the NCTE, are met through three rigorous phases of School Attachment Programmes. The first two Phases are of 2 week duration each which will be organized in the Demonstration School and selected schools in Mysore. The longer duration, ten weeks will be held in the third phase of School Attachment Programme, is primarily an internship in teaching Programme which will be organized in selected schools of NVS, Hyderabad Region or other schools.

An additional School attachment Programme is organized in the XI semester for a duration of 4 weeks. This will be organized in selected higher secondary schools where the student trainees will have a specialized internship in teaching experience at the higher secondary level.

4.0 Attendance

Each student has to attend a minimum of 7**5%** classes out of the classes conducted in each course. Failure to meet the minimum requirement renders disqualification from terminal examination and makes him/her ineligible for NCERT scholarship/ free ship. Such a student is deemed to have dropped the course and is not allowed to write the semester end examination (C3) of that course. He has to re-register for the course/s as and when they are offered by the institute.

5.0 Medium of Instruction:

The medium of instruction and examination is English.

6.0 Course Structure

TABLE 1: CREDIT BREAK-UP INTO B.SC., M.Sc. AND B.ED. COMPONENTS AND MODE OF EVALUATION

Semesters	Total Credits	Programme	Credits (Theory) (L)	Teaching hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Assessment C1+C2	Terminal Assessment C3)
I	24	B.Sc.	13	13	5	10	23	50	50
		B.Ed.	4	4	2	4	8	50	50
II	24	B.Sc.	13	13	5	10	23	50	50
		B.Ed.	4	4	2	4	8	50	50
III	23	B.Sc.	11	11	4	8	19	50	50
		B.Ed.	4	4	4	8	12	50	50
IV	23	B.Sc.	11	11	4	8	19	50	50
		B.Ed.	4	4	4	8	12	50	50
V	24	B.Sc.	9	9	3	6	15	50	50
		B.Ed.	7	7	5	10	17	50	50
VI	24	B.Sc.	9	9	3	6	15	50	50
		B.Ed.	6	6	6	12	18	50	50
VII	17	B.Sc.	3	3	6	12	15	50	50
	12*	B.Ed.	4	4	16**	8	8	50	50
VIII	21	B.Sc.	5	5	6	12	17	50	50
		B.Ed.	6	6	4	8	14	50	50
IX	23	M.Sc	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
X	23	M.Sc.	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
XI	20	M.Sc.	16	16	4	8	24	50	50
	4*	PE			4**	4	4	50	50
XII	23	M.Sc.	16	16	4	8	24	50	50
		PE	2	2	1	2	4	50	50
Total	**285**		183	183	102	176	359		

*internship   ** includes internship credits

L : Lectures: 1 credit =1hr/week x 16 weeks   T :Tutorial/ 1 credit = 2 hr/week x 16 weeks

P : Practicum/practical = 2 hr/week x 16 weeks   V: Credit value of a course is L+T+P

Tables 2 to 13: Detailed Course Structure for M.Sc.Ed.(Physics)

Total Credits = 285 ; B.Sc.Component = 112; M.Sc. 80; B.Ed. Component =80+13

TABLE 2: Semester I (Credits: B.Sc.12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course1A Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2A Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3A Mathematics	3	3	1	2	5	50%	50%
4	3	AEC 1A Language H/K/M/Tam/Tel	2	2	1	2	4	50%	50%
5	3	AEC 2A English	2	2	1	2	4	50%	50%
6	4	Language across the curriculum	3	3	1	2	5	50%	50%
7	2	Environmental Education	1	1	1	2	3	50%	50%
Total	**24**		**17**	**17**	**7**	**14**	**31**	**50%**	**50%**

Note:
Core Courses 1A, 2A & 3A – refer to the major subjects; A refers to the First course in each major; from Sem II to VI, papers in core courses are designated B, C, D, E & F.
AEC – Ability Enhancement Course
GE- Generic Elective

TABLE 3: Semester II (Credits: B.Sc. 12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1B Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2B Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3B Mathematics	3	3	1	2	5	50%	50%
4	3	AEC 1B Language H/K/M/Tam/Tel	2	2	1	2	4	50%	50%
5	3	AEC 2 B English	2	2	1	2	4	50%	50%
6	4	Contemporary Indian Education	3	3	1	2	5	50%	50%
7	2	Yoga Edu., self-understanding & development	1	1	1	2	3	50%	50%
Total	24		17	17	7	14	31		

TABLE 4: Semester III (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1C Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2C Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3C Mathematics	3	3	1	2	5	50%	50%
4	3	Skill Enhancement Course 1	2	2	1	2	4	50%	50%
5	4	Childhood & Growing up	3	3	1	2	5	50%	50%
6	2	Gender School & Society	1	1	1	2	3	50%	50%
7	2	School Attachment Programme 1	0	0	2	4	3 weeks	50%	50%
Total	23		15	15	8	16	31		

*** SEC 1 - Skill Enhancement Course 1 –** Each student will select any one from a list of courses offered.

TABLE 5: Semester IV (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessmet C3
1	4	Core Course 1D Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2D Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3D Mathematics	3	3	1	2	5	50%	50%
4	3	*Skill Enhancement Course 2	2	2	1	2	4	50%	50%
5	4	Learning & Teaching	3	3	1	2	5	50%	50%
6	2	Drama & Art Education	1	1	1	2	3	50%	50%
7	2	School Attachment Programme 2	0	0	2	4	3 weeks	50%	50%
Total	23		15	15	8	16	31		

*** SEC 2 - Skill Enhancement Course 2 –** Each student will select any one from among the courses offered.

TABLE 6: Semester V (Credits: B.Sc. 12; B.Ed. 12; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1E Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2E Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3E Mathematics	3	3	1	2	5	50%	50%
4	4	Assessment For Learning	3	3	1	2	5	50%	50%
5	4	Pedagogy of Physical Sciences	2	2	2	4	6	50%	50%
6	4	Pedagogy of Maths.	2	2	2	4	6	50%	50%
Total	24		16	16	8	16	32		

TABLE 7: Semester VI (Credits: B.Sc. 12; B.Ed. 12; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Course 1F Physics	3	3	1	2	5	50%	50%
2	4	Core Course 2F Chemistry	3	3	1	2	5	50%	50%
3	4	Core Course 3F Mathematics	3	3	1	2	5	50%	50%
4	4	Critical Under-standing of ICT	2	2	2	4	6	50%	50%
5	4	Pedagogy of Physical Sciences	2	2	2	4	6	50%	50%
6	4	Pedagogy of Maths	2	2	2	4	6	50%	50%
Total	**24**		**15**	**15**	**9**	**18**	**33**		

TABLE 8: Semester VII*(Credits: DSE 9; B.Ed. 20; Total 29**)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	3	DSE 1 A Physics	1	1	1+1	2+2	5	50%	50%
2	3	DSE 2 A Chemistry	1	1	1+1	2+2	5	50%	50%
3	3	DSE 3 A Mathematics	1	1	2	4	5	50%	50%
4	4	Creating an Inclusive School	2	2	2	4	6	50%	50%
5	2	Health & Physical Education	1	1	1	2	3	50%	50%
6	2	Reading & Reflections On Text	1	1	1	2	3	50%	50%
7*	6	Internship in School Subject 1 : Physical Sciences	0	0	6		10 weeks	50%	50%
	6	Internship in School Subject 2 : Mathematics	0	0	6			50%	50%
Total	**29**		**7**	**7**	**22**	**20**	**27**		

*Semester duration 24 weeks; Instructional duration -14 weeks; Engagement in field -10 weeks:

**includes Internship 12 credits; DSE – Discipline Specific Elective

TABLE 9: Semester VIII (Credits: DSE 9; GE 2; B.Ed. 10; Total 21)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	3	DSE 1 B Physics	1	1	1+1	2+2	5	50%	50%
2	3	DSE 2 B Chemistry	1	1	1+1	2+2	5	50%	50%
3	3	DSE 3 B Mathematics	1	1	2	4	5	50%	50%
4	2	GE 2 Indian Const. & Human Rights	2	2	0	0	2	50%	50%
5	4	Knowledge & Curriculum	2	2	2	4	6	50%	50%
6	4	Guidance & Counseling	3	3	1	2	5	50%	50%
7	2	Value & Peace Education	1	1	1	2	3	50%	50%
Total	**21**		**11**	**11**	**10**	**20**	**31**		

TABLE 10: Semester IX (Credits: M.Sc. 20: Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Physics 1	4	4	0	0	4	50%	50%
2	4	Core Physics 2	4	4	0	0	4	50%	50%
3	4	Core Physics 3	4	4	0	0	4	50%	50%
4	4	Core Physics 4	4	4	0	0	4		
5	2	Lab.I	0	0	2	4	4	50%	50%
6	2	Lab.II	0	0	2	4	4	50%	50%
7	3	Professional Education	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 11 : Semester X (Credits: M.Sc. 20 Prof. Edu. 3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Physics 5	4	4	0	0	4	50%	50%
2	4	Core Physics 6	4	4	0	0	4	50%	50%
3	4	Core Physics 7	4	4	0	0	4	50%	50%
4	4	Core Physics 8	4	4	0	0	4		
5	2	Lab.III	0	0	2	4	4	50%	50%
6	2	Lab.1V	0	0	2	4	4	50%	50%
7	3	PE	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 12: Semester XI (Credits: M.Sc. 20 Prof. Edu. 4; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Physics 9	4	4	0	0	4	50%	50%
2	4	Core Physics 10	4	4	0	0	4	50%	50%
3	4	Core Physics 11	4	4	0	0	4	50%	50%
4	4	Core Physics 12	4	4	0	0	4		
5	2	Lab.V	0	0	2	4	4	50%	50%
6	2	Lab .VI	0	0	2	4	4	50%	50%
7	4	PE - Internship	0	0	4	-	4 weeks	50%	50%
Total	**24**		**16**	**16**	**8**	**8**	**24**		

TABLE 13: Semester XII (Credits: M.Sc. 20 ; Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment C1+C2	Terminal Assessment C3
1	4	Core Physics 13	4	4	0	0	4	50%	50%
2	4	Core Physics 14	4	4	0	0	4	50%	50%
3	4	Core Physics 15	4	4	0	0	4	50%	50%
4	4	Core Physics 16	4	4	0	0	4	50%	50%
5	2	Lab.VII	0	0	2	4	4	50%	50%
6	2	Lab. VIII	0	0	2	4	4	50%	50%
7	3	PE	2	2	1	2	4	50%	50%
Total	**23**		**18**	**18**	**5**	**10**	**28**		

TABLE 14: PANORAMA OF COURSES IN THE EIGHT-SEMESTERS

Sl.No.	COURSE	CREDITS (L+T+P)								Credits	Total Credits In Prog.	Total Contact Hours per week (×16)
		I	II	III	IV	V	VI	VII	VIII			
	CORE COURSES:											
1	Physics	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24	30
2	Chemistry	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24	30
3	Maths	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	--	--	18+0+6	24	30
	ABILITY ENHANCEMENT COURSES											
1	Language H/K/M/Tam/Tel	2+1+0	2+1+0	--	--	--	--	--	--	4+2+0	6	8
2	English	2+1+0	2+1+0							4+2+0	6	**8**
	SKILL ENHANCEMENT COURSES											
1	Courses 1 & 2	--	--	2+0+1	2+0+1	--	--	--	--	4+0+2	6	8
	DISCIPLINE SPECIFIC ELECTIVE											
1	Physics							1+1+1	1+1+1	2+2+2	6	10
2	Chemistry							1+1+1	1+1+1	2+2+2	6	10
3	Maths							1+1+1	1+1+1	**2+2+2**	**6**	**10**
	GENERIC ELECTIVE											
1	Environmental Education	1+1+0								1+1+0	2	**3**
2.	Indian Constitution & Human Rights	1+1+0								1+1+0	2	3
	PROFESSIONAL EDUCATION COURSES											
1	Language Across Curriculum	3+1+0								3+1+0	4	5
2	Contemporary Indian Education		3+1+0							3+1+0	4	5
3	Yoga Edu., self-understanding & development		1+0+1							1+0+1	2	3
4	Childhood &Growing up			3+1+0						3+1+0	4	5
5	Gender School & Society.			1+1+0						1+1+0	2	3
6*	School Attachment Programme 1			0+0+2						0+0+2	4	3 weeks
7	Learning & Teaching				3+1+0					3+1+0	4	5
8	Drama & Art Education				1+1+0					1+1+0	2	3
9*	School Attachment Programme 2				0+0+2					0+0+2	4	3 weeks
10	Assessment for Learning					3+1+0				3+1+0	4	5
11	Pedagogy of Physical Science					2+2+0				2+2+0	4	6
12	Pedagogy Of Maths					2+2+0				2+2+0	4	6
13	Critical Under-standing of ICT						2+2+0			2+2+0	4	6
14	Pedagogy of Physical Science						2+2+0			2+2+0	4	6
15	Pedagogy of Maths.						2+2+0			2+2+0	4	6
16	Creating an inclusive school							2+2+0		2+2+0	4	6

17	Health & Physical Education							1+0+1		1+0+1	2	3
18	Reading & reflection on text							1+1+0		1+1+0	2	3
19*	Internship in School Subject 1: Physical Science							0+0+6		0+0+6	6	10 Weeks
20*	Internship in School Subject 2: Mathematics							0+0+6		0+0+6	6	
21	Knowledge & Curriculum								2+2+0	2+2+0	4	6
22	Guidance & Counselling								3+1+0	3+1+0	4	5
23	Value & Peace Education								1+1+0	1+1+0	2	3

***=** courses which do not have C3 Theory examination

TABLE 15: Semesters IX to XII

SL. NO.	COURSE	NO. OF CREDITS PER WEEK				TOTAL NO. OF CREDITS	TOTAL NO. OF CONTACT HOURS
		IX L+T+P	X L+T+P	XI L+T+P	XII L+T+P		
	Core papers						
1	Classical Mechanics	4+0+0				4	4
2	Mathematical Physics – I	4+0+0				4	4
3	Electrodynamics	4+0+0				4	4
4	Numerical Techniques and Computer Programming	4+0+0				4	4
5	Core Lab – I	0+0+2				2	6
6	Core Lab – II: Computer Lab – I	0+0+2				2	6
7	Quantum Mechanics -I		4+0+0			4	4
8	Mathematical Physics – II		4+0+0			4	4
9	Statistical Physics		4+0+0			4	4
10	Electronics		4+0+0			4	4
11	Core Lab – III		0+0+2			2	6
12	Core Lab – IV: Computer Lab – II		0+0+2			2	6
13	Quantum Mechanics - II			4+0+0		4	4
14	Spectroscopy			4+0+0		4	4
15	Solid State Physics – I			4+0+0		4	4
16	Digital And Communication Electronics (Systems)			4+0+0		4	4
17	Core Lab – V			0+0+2		2	6
18	Core Lab – VI - Solid State Physics Lab			0+0+2		2	4
19	Laser Physics				4+0+0	4	4
20	Materials Physics				4+0+0	4	4
21	Nuclear Physics				4+0+0	4	4
22	Solid State Physics II				4+0+0	4	4
23	Core Lab – VII				0+0+2	2	6

24	Core Lab – VIII: Nuclear Physics Lab				0+0+2	2	4
	Sub-total					**80**	**108**
	PROFESSIONAL EDUCATION						
25	Foundations of higher secondary education	2+1+0				3	4
26	Teaching of Physics		2+1+0			3	4
27	Internship Programme 2 (senior secondary level)			0+0+4		4	4 Weeks
28	Research in Physics Education				2+1+0	3	4
	Sub-Total					**13**	**16**
	GRAND TOTAL					**93**	**124**

L : Lectures: 1 credit =1hr/week x 16 weeks
T :Tutorial: 1 credit = 2 hr/week x 16 weeks
P : Practicum/practical = 2 hr/week x 16 weeks
V: Credit value of a course is L+T+P

Note : VII Semester consists of 24 weeks out of which 10weeks of School Attachment Programme- internship in Teaching will be organized in schools outside Mysore. 14 weeks are available for classroom instruction.

TABLE 16 : SUBJECTS AND TITLES OF COURSES IN THE PROGRAMME

SEMESTER	COURSE	CODE	SUBJECT	TITLE
FIRST	**Core course 1A**	MSE I.1	Physics	Mechanics
	Core Course 2A	MSE I.2	Chemistry	Atomic Structure and Bonding
	Core Course 3A	MSE I.3	Mathematics	Calculus – I and Matrices
	AEC 1A	MSE I.4A MSE I.4B MSE I.4C MSE I.4D MSE I.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2A	MSE I.5	English	
	GE 1	MSE I.6		Environmental Education
	Professional Education	MSE I.7		Language Across Curriculum
SECOND	**Core course 1B**	MSE II.1	Physics	Elasticity, Waves, Heat and Thermodynamics
	Core Course 2B	MSE II.2	Chemistry	States of Matter and Nuclear Chemistry
	Core Course 3B	MSE II.3	Mathematics	Calculus – II , Analytical Geometry and Number Theory
	AEC 1B	MSE II.4A MSE II.4B MSE II.4C MSE II.4D MSE II.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2B	MSE II.5	English	
	Professional Education	MSE II.6		Contemporary Indian Education
		MSE II.7		Yoga Edu., self-understanding &

				development
THIRD	**Core course 1C**	MSE III.1	Physics	Electricity and Electromagnetism
	Core Course 2C	MSE III.2	Chemistry	Organic Chemistry – I
	Core Course 3C	MSE III.3	Mathematics	Real Analysis
	SEC 1	MSE III.4A MSE III.4B MSE III.4C	Physics Chemistry Mathematics	Basic Instrumentation Skills Industrial Chemicals and Environment Combinatorics, Statistics & Basic Probability
	Professional Education	MSE III.5		Childhood &Growing up
		MSE III.6		Gender School & Society
		MSE III.7		School Attachment Programme 1
FOURTH	**Core course 1D**	MSE IV.1A	Physics	Optics
	Core Course 2D	MSE IV.2	Chemistry	Thermodynamics, Equilibrium and Solutions
	Core Course 3D	MSE IV.3	Mathematics	Differential Equations
	SEC 2	MSE IV.4 MSE IV.4C MSE IV.4D MSE IV.4E	Physics Chemistry Mathematics	Computational Physics Industrial Inorganic Materials Data Handling
	Professional Education	MSE IV.5		Learning&Teaching
		MSE IV.6		Drama & Art Education
		MSE IV.7		School Attachment Programme 2
FIFTH	**Core course 1E**	MSE V.1	Physics	Atomic and Molecular Physics
	Core Course 2E	MSE V.2	Chemistry	Transition Elements, Coordination Compounds and Chemical Kinetics
	Core Course 3E	MSE V.3	Mathematics	Multivariate Calculus and Vector Calculus
	Professional Education	MSE V.4		Assessment For Learning
		MSE V.5		Pedagogy Of Physical Sciences
		MSE V.6		Pedagogy of Mathematics
SIXTH	**Core course 1F**	MSE VI.1	Physics	Classical and Quantum Mechanics and Special Theory of Relativity
	Core Course 2F	MSE VI.2	Chemistry	Organic Chemistry II
	Core Course 3F	MSE VI.3	Mathematics	Groups and Rings
	Professional Education	MSE VI.4		Critical Understanding of ICT
		MSE VI.5		Pedagogy of Physical Science
		MSE VI.6		Pedagogy of Mathematics
SEVENTH	**Discipline Specific Elective 1**	MSE VII.1	Physics	Nuclear and Particle Physics
		MSE VII.2	Chemistry	Electrochemistry and Photochemistry
		MSE VII.3	Mathematics	Linear Algebra
	Professional Education	MSE VII.4		Creating an inclusive school
		MSE VII.5		Health & Physical Education

		MSE VII.6		Reading & reflection on text
		MSE VII.7A		Internshipin School Subject 1 : Physical Science
		MSE VII.7B		Internship in School Subject 2: Mathematics
EIGHTH	**Discipline Specific Elective 2**	MSE VIII.1	Physics	Solid State Physics
		MSE VIII.2	Chemistry	Spectroscopy, Natural Products and Heterocyclics
		MSE VIII.3	Mathematics	Complex Analysis and Numerical Analysis
	Generic Elective 2	MSE VIII.4		Indian Constitution and Human Rights
	Professional Education	MSE VIII.5		Knowledge &Curriculum
		MSE VIII.6		Guidance & Counselling
		MSE VIII.7		Value & Peace Education

Semesters : IX to XII

NINTH	**Core Physics**	MSE(P)-IX.1	Classical Mechanics
		MSE(P)-IX.2	Mathematical Physics – I
		MSE(P)-IX.3	Electrodynamics
		MSE(P)-IX.4	Numerical Techniques and Computer Programming
		MSE(P)-IX.5	Core Lab – I
		MSE(P)-IX.6	Computer Lab – I
	Professional Education	MSE(P)-IX.7	Foundations of Higher Secondary Education
TENTH	**Core Physics**	MSE(P)-X.1	Quantum Mechanics –I
		MSE(P)-X.2	Mathematical Physics – II
		MSE(P)-X.3	Statistical Physics
		MSE(P)-X.4	Electronics
		MSE(P)-X.5	Core Lab – II
		MSE(P)-X.6	Computer Lab – II
	Professional Education	MSE(P)-X.7	Teaching Physics
ELEVENTH	**Core Physics**	MSE(P)-XI.1	Quantum Mechanics – II
		MSE(P)-XI.2	Spectroscopy
		MSE(P)-XI.3	Solid State Physics – I
		MSE(P)-XI.4	Digital And Communication Electronics (Systems)
		MSE(P)-XI.5	Core Lab – III
		MSE(P)-XI.6	Solid State Physics Lab
	Professional Education	MSE(P)-XI.7	Internship Programme 2 (Senior Secondary Level)
TWELFTH	**Core Physics**	MSE(P)-XII.1	Laser Physics
		MSE(P)-XII.2	Materials Physics
		MSE(P)-XII.3	Nuclear Physics
		MSE(P)-XII.4	Solid State Physics II
		MSE(P)-XII.5	Core Lab – IV
		MSE(P)-XII.6	Nuclear Physics Lab
	Professional Education	MSC(P)-XII.7	Research in Mathematics Education

7.0 Change to another programme

Candidates admitted to M.Sc.Ed.(Physics) programme have the option of changing to M.Sc.Ed. Chemistry or Mathematics programme in the beginning of IX semester, after successful completion of first eight semesters without dropping any course, and subject to conditions laid down by the Academic Commmittee constituted for the purpose.

8.0 Scheme of Examination

8.1 There shall be a terminal (C3) Examination conducted by the University of Mysore at the end of each semester in Theory and/or Practical as the case may be.

8.2 Detailed Scheme of Examination along with course titles and breakup of marks is given below.

- All the courses will be evaluated for a total of 100 marks in the C1, C2 and C3 pattern.
- C1= 25; C2 = 25 and C3 = 50 will be followed uniformly for all the courses.
- In Courses with both theory and practicals, Theory C3 = 50 & Practical C3 =50
- Courses without a C3 theory are separately indicated in the following table

X is the marks scored out of 50 in C_3 in Theory
Y is the marks scored out of 50 in C_3 in Practical
Z is the marks scored out of 50 in C_3 in Tutorial

8.3 Duration of semester end examination for all theory courses will be 2 hours and for practical examination, it is 3 hours.
Each theory paper comprises of 9 questions of 10 marks each. Each Unit will have two questions with internal choice. Question 9 will consist of objective type questions drawn from all the units.

9.0 Question paper setting, valuation, declaration of results, challenge valuation and all other examination related issues will be as per the rules and procedures followed by the University of Mysore.

9.1 Question paper setting for C_3.

(i) There shall be a separate Board of Examiners for each subject approved by the University, for preparing, scrutinizing and approving the question papers and scheme of valuation for use in the examination/s.

(ii) The question papers shall be drawn from the question bank, through a computer.

(III) For Semesters IX to XII, a separate PG board approved by the University will be constituted. All question papers will be set by the internal examiner but valuation shall be done only by external examiners.

9.2 Coding of Answer Scripts:

Before valuation, the answer scripts shall be coded using false numbers. For each paper code separate false number shall be given.

9.3 Valuation and Classification of Successful Candidates

All papers including practicals will be valued by an internal examiner and there will be single valuation.
The performance of a student in a course will be assessed for a maximum of 100 marks as explained below.
A semester is divided into three discrete components namely C_1, C_2 and C_3.
The evaluation of the first component C_1 will be done during the first half of the semester while the first the I and II units of the syllabus is covered. This will have a weightage of 25%. This will be consolidated during the 8^{th} week of the semester.
The evaluation of the second component C_2 will be done during the second half of the semester when units III and IV of the syllabus are completed. This will have a weightage of 25%. This will be consolidated during the 16^{th} week of the semester. In general C_1, and C_2 should be evaluated through Test/seminar/ dissertation /presentation/ assignment.

Between the 18th and 20th week of the semester, the semester end examination, C3 will be conducted by the University and this forms the third component of evaluation, with weightage of 50%.

If a candidate has not scored at-least 30% in C_1 and C_2 put together, he/she is **not allowed** to appear for C_3.

It should be noted that evaluated papers/assignments of C_1 and C_2 of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.

For the courses that has both Theory and Practical components, as part of C_3, both theory and practical examinations shall be conducted for 50 marks each.

The final marks of a course, M of C_3,will be computed as per the following table :

	Probable Credit Distribution patterns	**Formula for calculating M**
1.	L : T : P	M = ((L+T)*X+ (P*Y)) / (L+T+P))
2.	L : T : P = 0	X
3.	L : T = 0 : P	(L*X + P*Y) / (L+P)
4.	L = 0 : T : P	Y
5.	L : T = 0 : P = 0	X
6.	L = 0 : T = 0 : P	Y
7.	L = 0 : T : P = 0	Z

Where,
X is the marks scored out of 50 in C_3 in Theory
Y is the marks scored out of 50 in C_3 in Practical
Z is the marks scored out of 50 in C_3 in Tutorial

The total marks in a course is P = $C_1 + C_2$ + M (after rounding to nearest integer. The grade (G) and grade point (G.P) will be calculated as follows where V is the credit value of the course.

P	G	GP = V × G
90 – 100	10	V × 10
80 – 89	9	V × 9
70 – 79	8	V × 8
60 – 69	7	V× 7
50 – 59	6	V × 6
40 – 49	5	V × 5
30 – 39	4	V ×4
0 -29	0	V × 0

If a candidate scores in **$C_1 + C_2 \geq$ 30%, M $\geq$ 30% M and G $\geq$ 5** in a course, then he is considered to be successful in that course.

After successful completion of the required number of credits, then the overall cumulative grade point average (CGPA) of a candidate is calculated using the formula CGPA = ΣGP / Total number of credits and the class is declared as follows :

	FGP	
CGPA	Numerical Index	Qualitative Index
$4 \leq CGPA < 5$	5	Second Class
$5 \leq CGPA < 6$	6	
$6 \leq CGPA < 7$	7	First Class
$7 \leq CGPA < 8$	8	
$8 \leq CGPA < 9$	9	Distinction
$9 \leq CGPA \leq 10$	10	

Overall percentage = 10 * CGPA or is said to be 50% in case CGPA < 5.

However, if **$C_1 + C_2 \geq 30\%$, $M \geq 30\%$ and with grade G = 4,** then a candidate has three options namely conditional success or make up of a course or dropping a course.

A. **Conditional Success**: A candidate is said to be successful conditionally in a course if his score in $C_1 + C_2 \geq 30\%$, $M \geq 30\%$ and grade G = 4. But this benefit will be available upto a maximum 48 credits for the entire programme of M.Sc.Ed. of 6 years. The candidate has to exercise this option within 10 days from the date of notification of results.

B. **Make Up of a Course**: Under the following circumstances, a candidate can have option to choose MAKE-UP OPTION for C_3:

1. scores $\geq 30\%$ in $C_1 + C_2$ and $M < 30\%$
2. scores $\geq 30\%$ in $C_1 + C_2$; $M \geq 30\%$ but with grade G = 4

The candidate has to exercise this option within 10 days from the date of notification of results. Once he has chosen the option he has to write the examination which will be conducted within 25 days from the date of notification of results or as directed by the University. There can be two or more examinations on the same day and they may be held on Saturdays and Sundays also.

If the candidate is unsuccessful in make up, also then he/she is deemed to have withdrawn / dropped the course.

C. **Dropping a Course**

Under the following circumstances a candidate is said to have DROPPED a course,
If the candidate :

1. fails to put in 75% attendance in a course,
2. decides to discontinue/ withdraw from the course,
3. scores less than 30% in $C_1 + C_2$ together,
4. scores in
   i) $C_1 + C_2$ is $\geq 30\%$ and $M < 30\%$ or
   ii) $C_1 + C_2$ is $\geq 30\%$, $M \geq 30\%$ and Grade G = 4 and exercises option to drop the course within 10 days from the date of notification of final results,
5. is unsuccessful in the MAKE-UP examination.

A candidate who has dropped a course has to **re-register** for the course when the course is offered again by the Institute.

9.4 Each student can go with a normal pace of 24 credits per semester. However, he/she has provision to go with a slow pace of 20 credits per semester or an accelerated pace of 28 credits per semester. In any case it should not exceed 28 credits in a semester including re-registered courses.

9.5 The tuition fee and the examination fee of a semester will be in accordance with the number of credits registered by each student in that semester.

9.6 The student may avail a maximum of two blank semesters in one stretch. However, he has to pay a nominal fee for maintaining a semester blank to the institution.

9.7 The Institute shall follow the CBCS guidelines of the University and its amendments thereof provided they are beneficial to the system.

10.0 Provision for Appeal

A candidate, if dissatisfied with the grades that he/she has got with a feeling that he/she is unnecessarily penalized can approach the grievance cell with the written submission together with all facts and all the assignments, test papers etc. which were evaluated. He/She can do so before the semester-end examination (based on 2 continuous assessment components already completed) or after the semester-end examination. The grievance cell is empowered to review the grades if the case is genuine and is also empowered to penalize the candidate if his/her submission is found to be baseless and unduly motivated. This Cell may recommend to take disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the Grievance Cell is final.

The Registrar (Evaluation) will be the Chairman and Convener of the Grievance Cell. The composition of the Grievance Cell is as follows:

1. The Principal
2. The Dean of instruction
3. Heads of DESM, DESSH and I/c Sections. An external expert from the University of Mysore in the concerned subject.
4. The Registrar (Evaluation) ex-officio Chairman/Convener.
5. Additional lady faculty member (in case not covered by 1,2,3,4,6 and 7).
6. Additional faculty member from a minority community (in case not covered by 1,2,3,4,5 and 7) and

The appropriate fee as fixed by the University shall be collected from the candidate who goes for an appeal to the Grievance Cell.

11.0 Marks Cards:

11.1 The marks card shall be laminated after affixing the hologram only when a candidate passes all the courses/papers of a particular semester.

12.0 Barring of Simultaneous Study

12.1 No student admitted to a degree course in a college under the jurisdiction of this university, shall be permitted to study simultaneously in any other course leading to a degree (regular, evening, morning) offered by this/any other university.

12.2 If a candidate gets admitted to more than one course, the university shall without giving prior notice cancel his/her admission to all the courses to which he/she has joined.

13.0 Miscellaneous:

13.1 These revised regulations will apply to the candidates admitted for the academic year 2016-17 and onwards for the course mentioned in Regulation No.1.0 above.

13.2 Other regulations not specifically mentioned above are as per the Regulations of the University as applicable from time to time.

13.3 Any other issue not envisaged above, shall be resolved by the Vice-Chancellor in consultation with the appropriate Bodies of the University, which shall be final and binding.

SYLLABUS

FIRST SEMESTER

Core course 1A: Physics

MSEI.1 :MECHANICS

Credits: 4 (3L+ 0T +1P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:

- The students will be able to understand Newtonian mechanics and apply its principles to explain natural physical phenomena.
- The teacher will be able to enable the students to identify and modify alternative conceptions in the domains of Newtonian Mechanics.

COURSE CONTENT:

Unit I

Vectors: Vector and scalar products. Scalar triple product and Vector triple product. Differentiation of a vector with respect to scalars (such as time). Gradient, Divergence, Curl- definitions, physical meaning, and operations, Laplacian, Line, Surface, and Volume integrals. Gauss', Stokes, and Greens theorem.

Ordinary Differential Equations: 1^{st} order homogeneous differential equations. 2^{nd} order homogeneous differential equations with constant coefficients.

Unit II

Laws of Motion: Newton's Laws of motion. Frames of reference, inertial and non inertial, pseudo forces, Galilean transformations; Galilean invariance, Dynamics of a system of particles. Centre of Mass.

Momentum and Energy: Principle of conservation of momentum for a system of particle, Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Conservation of energy. Momentum of variable-mass system: motion of rocket.

Unit III

Rotational Motion: Angular velocity and angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum.

Gravitation: Newton's Law of Gravitation. Central force and motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). two-body central force problem and reduction to the equivalent one body problem, inverse square law potential and different forms of orbit, Kepler's laws of planetary motion. Satellitein circular orbit and applications. Geosynchronous orbits. Weightlessness.

Unit IV

Oscillations: Simple Harmonic Motion (Basic idea), Differential equation of SHM and its solutions (simple pendulum, compound pendulum, loaded spring), Kinetic and Potential Energy, Total Energy and their time averages. Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats), Lissajous figures with equal an unequal frequency and their uses. Damped vibrations. Forced vibrations.

Reference Books:

1. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons Inc.
2. Harris Benson,University Physics, Revised Edition, John Wiley and Sons, Inc.
3. FW Sears, MW Zemansky and HD Young,University Physics, 1986. Addison-Wesley.
4. K. R. Symon, Mechanics, Addison Wesley, 1971.
5. Basudeb Bhattacharya,Engineering Mechanics, 2nd edn., 2015, Oxford University Press
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
7. Y. R. G. Takwale and P. S. Puranik,Introduction to classical mechanics, Tata McGraw Hill.
8. Charles Kittel et. al., Mechanics Berkeley Physics course, 2007, Tata McGraw-Hill.
9. H C Verma,Concepts of Physics, Bharati Bhawan; Revised Reprint 2015 edition

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following)

1. Study of the motion of an air bubble.
2. Study of the motion of a freely falling body.
3. Study of the acceleration of a body subjected to different unbalanced forces.
4. Study of accelerations of different masses under a constant unbalanced force.
5. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
6. Study of conservation of momentum and energy of a collision in a plane.

7. Conservation of momentum in a mechanical explosion.
8. To study the relation between length and time period of a simple pendulum.
9. To study the relation between force and extension produced in a stretched spring.
10. Study of the variation of the time period of a bar pendulum with different length and determination of ‘g’ at the given place.
11. Study of the dependence of the period of oscillation of a spring-mass system on mass
12. The Spiral spring: Determination of the acceleration due to gravity by the graphical method.
13. Determination of moment of Inertia, mass and density of the flywheel.
14. Moment of inertia of a disc supported on strings.
15. The moment of inertia of a wheel and axle.
16. The Bifilar Suspension

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7thEdition, Cengage Learning, 2009.

Core Course 2A- Chemistry

MSEI.2 :ATOMIC STRUCTURE AND BONDING

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

- To understand and appreciate the development of various atomic theories
- To develop an understanding of principles of Atomic structure
- To justify the need for quantum mechanical structure of atoms
- To develop an understanding of the periodic trends, preparation and uses of s- and p-block
- elements and their compounds in terms of structure and bonding
- To understand the nature of bonding and to predict the shapes of molecules
- To construct MO energy level diagrams and predict the properties of molecules

COURSE CONTENT:

Unit I: Atomic Structure

History of an atom. List the Characteristics of Black-body radiation- Planck's radiation law, photoelectric effect, Compton effect and their explanation using quantum theory. Bohr's model of hydrogen atom and its limitations. Summarise the evidence for the wave nature of matter. State de Broglie hypothesis and Heisenberg uncertainty principle.

Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of ψ and ψ^2, postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals , Multi-electron atoms, Aufbau and Pauli exclusion principles and Hund's multiplicity rule- Electronic configurations of the elements(s,p,d blocks), effective nuclear charge.Explanation for the stability of completely filled and half filled shells with examples. Screening effect: Slaters' rule, Energy level diagram for multi –electron atoms.

Unit II: Periodic Properties and s -and p-Block Elements

Atomic radii, Covalent radii, ionic radii and Vander waal's radii- definition with explanation with examples in a group and period Explanation of oMSErved trwends.Comparision of the ionic size of atoms with the corresponding anion and cation. Variatioin of ionic radii in isoelectronic ions. Additive nature of covalent radii.
Ionization energy: Definition,the factors influencing ionization energy, variation in a group and period. Effect of the size and electronic configuration on successive ionization energies.

Electron affinity :Definition, variation in a group and in a period (oMSErved trends in the values to be accounted for).
Electronegativity: Definition,variation in a group and in a period (oMSErved trends in the values to be accounted for), calculation of electronegativity by Pauling and Mulliken methods.
s- and p-block elements: Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls –salient features of hydrides, Action of Liquid Ammonia , Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium.
To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Unit III: Chemical Bonding - I
Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule, Metallic bond-free electron, valence bond and band theories. Weak interactions – Hydrogen bonding, van der Waals forces. Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICl_2, and H_2O.

Unit IV:Molecular Orbital theory, boranes and Xenon compounds

Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO – H_2^+ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ*, π, π* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. Models.
Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and NO) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference.
Hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, silicates (structural principle), - Chemistry of xenon: structure and bonding in xenon compounds.

References :

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee , fifth Edition,Wiley Publishers
3. An Introduction to Inorganic chemistry Mackay and Mackay
4. Advanced Inorganic Chemistry Satya Prakash, G.D.Tuli,S.K.Basu,R.D.Madan
5. S.Chand & Company Pvt. Ltd.Principles of Physical Chemistry Puri, Sharma,Pathania 47^{th} Edition,Vishal Publishing Co.
6. Text book of Inorganic Chemistry P.L. Soni Sultan Chand & sons.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To develop the concept of good lab practices including safety, glasswares handling,
- chemicals handling, chemical/glassware waste management, error analysis, note
- book maintenance
- To strenghten the concepts of mole and stoichiometry
- To develop analytical skills of volumetric technique

COURSE CONTENT :

1. Calibration and handling of balances, pipette,burette, and standard flask. Basic principles underlying the preparation of solutions, knowledge of primary and standard substances, Indicators used intitrations, their working principles range and their uses. Concept of Molarity, Normality, Molality,Equivalent weight and related calculations.
2. Stoichiometry of neutralization reactions of Sulphuric, Hydrochloric and Nitric acid using sodium hydroxide solution.

3. Preparation of standard Sodium Carbonate solution, Standardisation of Hydrochloric acid andestimation of Sodium hydroxide present in the given solution.
4. Estimation of carbonate and hydroxide present in a mixture.
5. Estimation of Carbonate and Bicarbonate in a given mixture by double indicator method.
6. Estimation of ammonium chloride in a given solution by back titration
7. Estimation of oxalic acid present in the given solution using sodium hydroxide solution and purecrystals of potassium hydrogen phthalate.
8. Estimation of Ferrous ammonium sulphate present in the given solution using potassium
   permanganate solution and pure crystals of oxalic acid.
9. Estimation of iron(II) using Potassium dichromate with internal and external indicators.
10. Estimation of ferrous and ferric ions in a given mixture using potassium dichromate solution.
11. Standardisation of Sodium thiosulphate using potassium dichromate and estimation of copper by Iodometry.
12. Estimation of Copper in the given Copper salt by Iodimetry.
13. Estimation of total hardness of water using EDTA solution and pure crystals of Zinc sulphate.

References :

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Systematic Experiments in Chemistry Arun Sethi New Age International (p) Ltd. Cochin.

Core Course 3A Mathematics

MSEI.3 :CALCULUS - I AND MATRICES

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

At the end of the course students will be able to understand and to apply the concepts, principles and techniques of calculus and matrix theory in problem solving.

COURSE CONTENT:

Unit I: Differential calculus:

Limits revisited, Continuous functions, Discontinuous functions and types. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem.Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection. Angle of intersection between two curves.

Differentiability theorems, Rolle’s theorem, Mean Value theorems,Taylor’s theorem, Maclaurin’s theorem, Taylor’s and Maclaurin’s infinite series, Indeterminate forms.

Unit II: Integral Calculus:
The integral of a function, Techniques of integration, Integration of Rational Functions, Rationalizable Integrals.
Definite Integral, Properties, Definite integral as the limit of a sum,The fundamental theorem of Calculus, Reduction formulae, Area, Volume and Length.

Unit III: Matrices – I
Matrices of order mXn, Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants, Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

Unit IV : Matrices - II
System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems and their uniqueness.
Characteristic equation of a square matrix, Eigen values and Eigen vectors, Finding them for a real symmetric matrix, Diagonalization of a real symmetric matrix, Cayley – Hamilton theorem and its applications.

References :

1. Calculus by Anton, Addison-Wiley.
2. First Course in Calculus, Serge Lang, Addison-Wiley
3. Calculus by Lipman Bers, Vols. 1 and 2, IBH.
4. Advanced Calculus, Frank Ayres, Schaum Publishing Co.
5. Higher Algebra by Bamard and Child, MacMillan India Ltd.
6. Integral Calculus by Shanthinarayan, S.Chand and Co.Ltd.
7. Differential Calculus by Gorakhprasad, Pothishala Ltd.
8. Calculus and Analytical Geometry by Thomas – Finney, Narosa Publishing House.
9. Algebra by Natarajan, Manicavachagon Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
10. Matrices by Frank Ayres, Schaum Publishing Co.
11. Textbook of Matrix Algebra by Suddhendu Biswas.

Ability Enhancement Course 1 A : Language

MSEI.4A :HINDI

Credits 3 (2L+1T+0P)	**Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs.	**C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Functional language

Prayojanmoolak Hindi: Saidhantik Pakchh

Prayojanmook Hindi: Zaroorat, Swaroop, Visheshtayen, Prayukti ke Madhyam, Mukhya tatwa-Paribhashik Shabdavali aur Anuvad, Simayen aur Smabhavnayen,

Unit II: Communication skills

Samooh Charcha (Group discussion): Introduction – Definition – Characteristics – Types of Discussion –Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.

Sachhatkar (Interview): Characteristics – Definition – Types of Interviews – Preparation for Interview –Models – Exercises.

Unit III: Collection of Poetries:

Maithilisaran Gupt- Nar Ho Na Nirash Karo Man ko
Jayshankar Prasad- Himadri Tung Sring Se Prabudh Sudhha Bharti
Suryakant Tripathi Nirala- Joohi ki Kali
Sumitranandan Pant- Drut Jharo Jagat Ke Jirn Patra
Mahadevi Verma-Mai Neer Bhari Dhukh Ki Badli,
Sacchidanand Heeranad Vatasyayan Aggey-Kalgi Bajre Ki
Gajanan Madhav Muktibodh- Bhool Galti,
Kedarnath Agrawal- Chandra Gahna Se Lautati Ber
Nagarjun- Aakal Aur Uske Bad
Kedarnath Singh- Aakal Me Saras

Unit IV: Collection of Short Stories:

Chandradhar Sharma Guleri- Usne Kaha Tha
Jayshankar Prasad- Puraskar
Premchand- Panch Parmeshwar
Aggey-Gaingreen (Rooj)
Phanishwar Nath Renu- Teesari Kasam

Bhism Sahani- Cheef ki Dawat
Krisna Sobti-Dadi Amma
Sudha Aroda-Annapurna Mandal Ki Aakhiri Chitthi
Maitreyee Pushpa- Goma Hasti Hai
Omprakash Valmiki- Shavyatra

References:

1. Bhasha, Yugbodh aur Kavita: Dr Ramvilas Sharma, Vani Prakashan, Delhi
2. Kavita ka Vartmaan: Dr P Ravi, Vani Prakashan, Delhi
3. Hindi Kvaya ka Itihas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
4. Kavita ki Zameen aur Zameen ki Kavita: Namvar Singh, Rajkamal Prakashan, Delhi
5. Naee Kavita aur Astitvawad: Ramvilas Sharma, Rajkamal Prakashan,Delhi
6. Chhayavad: Namvar Singh, Rajkamal Prakashan, Delhi
7. Hindi Kavita ka Atit aur Vartmaan: Maneger Panday, Vani Prakashan, Delhi
8. Hindi Kahani- Antarang Pahchan: Dr Ramdars Mishra, Vani Prakashan, Delhi
9. Hindi Kahani-Sanrachana aur Samvedana: Dr Rachna Saah, Vani Prakashan, Delhi
10. Galp Ka Yatharth-Kathaloochan ke Aayam: Suvas Kumar, Vani Prakashan, Delhi
11. Hindi Ka Gadyaparva: Namvar Singh, Rajkamal Prakashan,Delhi
12. Sahitya ki Pahchan: Namvar Singh, Rajkamal Prakashan,Delhi
13. Katha Vivechan aur Gadyashilp: Ramvilas Sharma, Vani Prakashan, Delhi
14. Kahani Anubhav aur Abhivyakti: Rajendra Yadav, Vani Prakashan, Delhi
15. Kahani- Swaroop aur Samvedana: Rajendra Yadav, Vani Prakashan, Delhi
16. Kahani-Sankramansheel Kala: Khagendra Thakur, Vani Prakashan, Delhi
17. Aadhoonik Hindi Kahani: Laxminarayan Laal, Vani Prakashan, Delhi
18. Hindi Kahani-Vakt Ki Shinakht aur Srijan ka Raag: Rohini Agarwaal, Vani Prakashan, Delhi
19. Kahani Samkaleen Chunautiyan: Dr Sambhoo Gupt, Vani Prakashan, Delhi
20. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
21. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
22. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
23. Sarkari Karyalayon mein Hindi ka Prayog- GopiNath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
24. Hindi Prayog: Ramchandra Verma, Rajkamal Prakashan Samooh, Delhi
25. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
26. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
27. Effective Communication Skills, by Omkar N Kour
28. http://www.hindisamay.com

MSEI.4B :KANNADA

Credits 3 (2L+1T+0P) **Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive Grammar
Sandhi (Agama, Adesa, Dwitva, etc) A suitable grammar book on Sandhi will be followed in the classroom.

Unit II: Functional Language
Group Discussion: Introduction – Definition – characteristics – types of discussions – round-table sy lecture forum etc. – relevance of Group Discussion – exercises.

Conversation: Definition – styles of conversation – formats of conversation – telephonic conversation, etc. – Exercises

Unit III: Modern Poetry
i) Kalki – Kuvempu
ii) Thilisaru-Videhi
iii) Balegaarana Haadu –K S Narashimha Swamy
iv) Nanna nayi- Pu Thi Na
v) Nanna avathara – M Gopalakrishna Adiga
vi) Puttavidhave –DA. RA.Bendre
Selected from Aunika Kannada Kavya Part I, University of Mysore.

Unit IV: Prose: Collection of short stories
Collection of Short Stories
i) Danbaru Banbudu- Devanuuru Mahadeva
ii) Kallina Kolalu – Chaturanga
iii) Rotti- P Lankesh
iv) Cappaligalu – Sara Abubakkar
Selected from Sanna Kathegalu, Mysore University, Mysore

References:

1. Kannada Kaipidi, Prasaranga Publication, University of Mysore.
2. Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company(Publishers).

MSEI.4C :MALAYALAM

Credits 3 (2L+1T+0P) **Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I :Descriptive Grammar - Sandhi

Unit II: Functional Language
Group Discussion- Introduction – Definition – characteristics – types of discussions – round-table symposium – panel – lecture forum etc. – relevance of Group Discussion – exercises

1. Conversation - Definition – styles of conversation – formats of conversation– telephonic conversation, etc. – Exercises

Unit III: Modern Poetry
Lessons from " Kavya Mala, University of Kerala publications,Kerala

1. Mazhuvinte Katha
2. Sabhalamee yaatra
3. Shanta
4. Kochiyile Vrikshangal
5. Bharatheeyam

Unit IV:Literature
Collection of Short Stories:
From Katha malika, University of Kerala publications

1. Kadal theerathu
2. Shavadaham
3. Ammayum makanum
4. Perumazhayude pittennu
5. Chaya

References:

1. Kerala Panineeyam by A R Rajaraja Varma, NBS, Kottayam
2. Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

MSEI.4D :TAMIL

Credits :3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive grammar – Sandhi

Unit II: Functional Language
Group Discussion: Introduction-Definition-Characteristics-types of discussions-round table-symposium-panel-lecture forum etc.-relevance of group Discussions –Exercises
Conversation: Defination-styles of conversation-formats of conversation-telephonic conversation, etc-Exercises
.
Unit III: Poetry:Modern Poetry
Ikkalak Kavithaikal, Kannan En Sevegan, Thiru Arutpa, An Anthology of Tamil Poetry

Unit IV: Prose: Collection of Short Stories
Naatru – (Collection of Short Stories)

References:

1. Tamil Ningalum Thavarillamal Ezuthalam- Dr. Porko
2. Efective Group Discussion – Theory and Practice,Gloria J. Galanes, McGraw Hill Company (Publishers)
3. Naatru, Vaanathi Pathippagam, 13 Deenadayalu Street, T. Nagar, Chennai 600 017

MSE I.4E: TELUGU

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region

which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I : Functional language (Styles and Registers):

1. Letter writing: Characteristics – Definition – Types of Letters – E-mails – Language of Letters –Exercises
2. NEWS Reporting: Characteristics – Definition – Language of NEWS Reporting - Models – Role of Median NEWS Reporting – Exercises.

Unit II: Communication skills (Effective speaking and effective writing) in language:

1. Group discussion: Introduction – Definition – Characteristics – Types of Discussion – Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.
2. Interview: Characteristics – Definition – Types of Interviews – Preparation for Interview – Models – Exercises.

Unit III: Modern Poetry and Folk literature

1. Desha Charitralu – Sree Sree (From Maha Prasthanam, Visalandhra Publications, Hyderabad).
2. Folk Songs from 'Rayalaseema Raagalu' & 'Triveni' Published by Telugu Academy, Hyderabad

Unit IV: Genre of literature (Piece of a Drama/Portion of Autobiography)
Selected scenes from drama '**Kanyashulkam'** by Gurazada Apparao (available at Visalandhra Publication, Hyderabad.

References:

1. A Hand book of writing activities, Prasaranga, University of Bangalore.
2. The perfect Interview by Max Eaggert, Random House, UK.,
3. Interview Secrets by Heather Salter, Publications: Collins, London,
4. Effective Group Discussion – Theory and Practice be Gloria J.Galanes, McGraw Hill Company.
5. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
6. Effective Communication Skills, by Omkar N Kour

Ability Enhancement Course 1B : English

MSEI.5 : PROFICIENCY IN ENGLISH

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs.	**C 3: 50**

Objectives:
Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: Descriptive Grammar

1. Tenses:

a) Simple Present: Habitual action, General truths, Future time, Verbs of state, Verbs of perception, Verbs of sensation, Narration, Use of simple present for demonstration and commentaries, Present perfect, present perfect continuous, Present continuous also indicative of future action.

b) Simple past: Past time reference, Present time reference, Future time reference, Past continuous, Past perfect, past, perfect continuous

Unit II: Skills in Communication

1. Negotiating a point of view – learning to talk persuasively so as to get across one's perspective.
2. Debating on an issue – agreeing / disagreeing.

Unit III: Study and Reference Skills
Note making; Note- taking; Summary writing.
Comprehension Skills
Extracts from literary, scientific and educational journals.

Unit IV: Skills of Communication
Advanced Writing Skills, writing advertisement copy; Writing a project proposal and Writing Resume, sending an application.
Listening effectively; Talking about one self (likes, dislikes, interests, beliefs, personality traits, ambitions); Expressing an opinion about personal belief on a current issue. (Ability to speak fluently for 3-4 minutes. Focus would be on organized, logical, sequential presentation of thought through spontaneous speech).

Suggested Activities:

- Politeness competitions- students with partners take turns in using a given number of utterances for negotiation / requests/complaints/small talk.
- Students introduce themselves though using symbols/ metaphors.
- Students collect newspaper/magazine cuttings on topical and/ or cultural issues of interest-write and share their opinion with peers.

References:

1. Block, C.C. (1997). Teaching the Language Arts, 2 nd Ed. Allyn and Bacon
2. Mckay. et al. (1995). The Communication Skills Book, 2 nd Ed. New Harbinger Publications.
3. Hornby,A.S.(2001).Oxford Advanced Learner's Dictionary,OUP
4. Thomsan,A.J. & Martinet.(2002).A Practical English Grammar.OUP

GENERIC ELECTIVE 1

MSEI.6 :ENVIRONMENTAL EDUCATION

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student-teacher will be able to:

- Develop awareness and concern for environmental issues and sustainable development.
- Acquaint with the concept, objectives and importance of Environmental Education (EE).
- Introduce multi-disciplinary approach to environmental problems.
- Acquaint how to design, develop and implement strategies for Environmental Education (EE).
- Acquaint with the different methods and techniques of teaching Environmental Education (EE).
- Undertake practical activities for school cleanliness, neighbourhood cleanliness drive, and healthy personal hygiene in relation to Swachh Bharat and healthy living. (These activities would have been oMSErved and practiced during the 16-week Internship in schools)
- Inculcate environment friendly values through EE.

COURSE CONTENT :

Unit I :Meaning and Concepts

Meaning as evident from Indian literature and contemporary texts, Definition, Objectives, Importance of EE with special reference to Indian view of life and sustainable development Sustainable Development Goals.

Unit II: Basic Environmental Concepts

Ecosystem, Biotic and Abiotic factors, Inter-relationship, Factors affecting environment, population, air, water, soil, noise; Acid rain, Greenhouse effect, Extinction of species, Soil erosion, Energy crisis, Environment and sustainable development; Role of specially designed strategies for cleanliness, Role of mass media and technology in developing awareness about nvironmental problems and its prevention, Role of NGO and governmental organizations in developing EE.

Unit III: Curriculum, Methods and Techniques of EE

Designing, developing strategies for EE, Evaluation of EE resources materials; Field trips, Role play, Poster presentation, Quiz, Debate, Projects, Swachh Bharat Abhiyan sustainability

Unit IV: Value Development through EE as in Indian View of Life

Practical work in relation to school cleanliness and neighbourhood watch, Text book evaluation for contents on environment and cleanliness, Field trip on environmental degradation, and school and neighbourhood cleanliness, Visit to nature park, industry polluted areas.

Practicum

- Study sustainable development initiative in the country.
- Visits to polluted sites and preparation of report.
- Interviewing people and reporting the inconveniences due to any of the environmental problems.
- To study innovations done by to improve the environment of that area.
- To study the implementation of Environmental Education Programmes in schools/stated country.
- To prepare models and exhibits for general awareness of public regarding environmental hazards.
- To prepare a programme for environmental awareness and school cleanliness, and to conduct the same with school children.
- To visit industries and study alternative strategies of Environmental pollution management.
- To prepare a resource material on any of the environmental problems along with a suitable evaluation strategy. To prepare quizzes and games on environmental issues.
- Organise Swacch Bharat Abhiyan as sustainable activity.
- To study the contribution of NGOs in improving the environment of the city. Classroom. Prepare posters/chart on Sustainable Development Goals.

* In addition, school and community based activities may be organised.

Evaluation Strategies

1. Assignments/sessional work.
2. Unit tests.
3. Portfolio assessment of exhibits, model of charts prepared by student teachers.
4. Seminar presentations followed by group discussion.

References:

1. Trivedi, M.M. and Pathak, Y.P. (1994). *Manav ane Paryavaran: Bhaugolic Paripekshma, Universitygranth Nirman.* Board Publication, Ahmedabad, Gujarat.
2. Garg, B. and Tiwana (1995). *Environmental Pollution and Protection*. New Delhi: Deep & Deep Publication.
3. Sharma, R.C. (1981). *Environmental Education.* New Delhi: Metropolitan Publication.
4. UNESCO, Environmental Education in the light of the Tbilisi Conference, UNESCO.
5. NCERT (2009), *Project Book in Environmental Education from Class I-X*. New Delhi: NCERT.
6. NCERT (2004), *Environmental Education in Schools.* New Delhi: NCERT.
7. **Web Resources**Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT
8. http://www.ncert.nic.in/departments/nie/dee/publication/pdf/Towards%20A%20green%20School.pdf
9. Swachh Bharat Swachh Vidyalaya: A National Mission, Clean India: Clean Schools A Handbook,
MHRD, http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/Eng_Swachch-Bharat-Swachch-Vidhalaya.pdf

PROFESSIONAL EDUCATION COURSES

MSEI.7 :Language Across Curriculum

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The student teacher will be able to:

- Understand nature, function and role of different kinds of languages in curriculum transaction
- Acquaint with obstacles in language usage while using the language and ways to overcome them.
- Understand importance and use of first and second language, multilingualism and impact of culture.
- Acquire knowledge about the communication process and verbal and nonverbal communication skills.
- Familiarize the students with of barriers to (Listening, Speaking, Reading, Writing) LSRW skills and activities for developing these skills.

COURSE CONTENT :

Unit I Nature and Functions of Language

Language – Meaning and Concept, Functions of Language, Role of Language in Curriculum Transaction, Theories of Language Learning, Barriers in Using a Language & Strategies to Overcome them, Verbal and Non-verbal communication

Unit IILanguage across Curriculum in the Indian Context

Language as a determinant of Access, Language proficiency and students' attitude towards Learning and Schooling/ dropouts, Language/oral proficiency and critical thinking

Unit IIIStrategies for Multilingual Classrooms

Role Plays and Discussions as tools for learning, 'Questioning' to stimulate thought and to encourage and motivate to respond, Preparing Subject/content based exercises in reading, comprehension and usage, Sensitizing, Reflecting and Facilitating, Understanding the learner and his/her language background, Creating sensitivity to the language diversity, Using oral & written language in the classroom for optimal learning

Unit IVDeveloping Receptive Skills and Productive Skills

Barriers to Listening Skills, Activities for Developing Listening Skills, Barriers to Reading Skills, Activities for Developing Reading Skills, Barriers to Writing Skills, Activities for Developing Writing Skills, Need and Importance of Classroom Discourse. Barriers to Speaking Skills, Activities for Developing Speaking Skills

Practicum

1. School Visit to Find out Communication Problem/Apprehension in Students
2. Designing Games and Exercises for Developing Listening, Speaking, Reading and Writing Skills
3. Assignments on Developing Writing Skills- Summary, Letter, Paragraph, Essays, Speech
4. Assignments on Developing Speaking Skills – Oral Presentations, Debate, Elocution, Discussion, Brain-storming

Assignments on Developing Listening Skills – Listening to speech, directions

***** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.

References:

1. Akmajian, A. et al. (2010). *Linguistics: Introduction to Language and Communication.* (6thed.). Cambridge: MIT Press.
2. Fasold, R. & Connor-Linton, J. (2013). *An Introduction to Language and Linguistics*. (6thed.). Cambridge: Cambridge University Press.
3. Floyd, K. (2009). *Interpersonal Communication*. New York: McGraw Hill Companies Inc.
4. Fromkin, V., Rodman, R. & Hyms, N. (2011). *Introduction to Language.* (9thed.). Canada: Cengage Learning.
5. Pearson, J.C. et al (2011). *Human Communication.* (4th ed.). New York: McGraw Hill Companies Inc.

Web Resources

6. First and Second Language Acquisition – A Brief Comparison.
Retrieved from https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf
7. Similarities and Differences between First and Second Language Acquisition

Retrieved
from http://multilingualism.pbworks.com/w/page/21913433/Similarities%20and%20Differences%20between%20First%20and%20Second%20Language%20Acquisition
8. Activities for Developing Speaking Skill
Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm
9. http://www.educ.ualberta.ca/staff/olenka.Bilash/best%20of%20bilash/speaking.html
10. Activities for Developing Listening Skill Retrieved from
http://www.educ.ualberta.ca/staff/olenka.bilash/best%20of%20bilash/listening.html
11. https://blog.udemy.com/listening-skills-exercises/
12. Learning curves: Language Education (2009), by Azim Premji
Foundation http://azimpremjifoundation.org/pdf/LCIssue13.pdf
13. Courses on Communication Skills, http://nptel.ac.in/courses/109104030/

SECOND SEMESTER

Core Course I B Physics

MSEII.1 :ELASTICITY, WAVES, HEAT, AND THERMODYNAMICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- The students will be able to understand principles of elasticity, waves, heat, thermodynamics and classical statistical mechanics and apply its principles to explain natural physical phenomena.
- The teacher will enable the students to identify and modify alternative conceptions in the domains of elasticity, waves, heat, thermodynamics and classical statistical mechanics.

COURSE CONTENT:

Unit I: Elasticity

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli- Dependence of Young's modulus on temperature and its applications, Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Elastic potential Energy, Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, η and σ by Searle's method.

Unit II: Waves

Review of Mechanical waves, types of waves, travelling waves, the superposition principle, wave speed, power and intensity in wave motion. Transverse waves on a string- travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, interference of waves, standing waves, resonance, Doppler effect. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave.

Unit III: Thermodynamics-I

Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P& C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient. Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem.

Unit IV: Thermodynamics-II

Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams.Third law of thermodynamics, Unattainability of absolute zero. Thermodynamic potentials. Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations& applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (C_P – C_V), C_P/C_V, TdS equations.

References:

1. David Halliday, Robert Resnick and Jay Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons, Inc.
2. Harris Benson, University Physics, Revised Edition, John Wiley and Sons Inc.
3. Zeemanskyand R. Dittman, Heat and Thermodynamics, McGraw Hill, 7th edition, 1996.
4. H J Pain, Physics of Vibration and Waves, Wiley; Sixth edition, 2006.
5. Brijlal and Subramaniam, Heat and Thermodynamics, S Chand, 2008.
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S.Chand (G/L) & Company Ltd., 2010.
8. A. B. Gupta and H. Ray, Heat and Thermodynamics, New central publications.
9. D. S. Mathur, Heat and Thermodynamics, SultanChand.
10. M. N. Saha and B. N. Srivastava, Treatise on Heat, The Indian Press.
11. A. Kumar and S.P. Taneja,Thermal Physics, R. chand Publications, 2014.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following).

1. Study of the oscillations of a column of water as a function of its length and study of damped oscillation.
2. To determine the velocity of sound at 0^{o} C and the end correction by setting up a resonance column (first resonance length).
3. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire.
4. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method.
5. Study of Newton's law of cooling.
6. Determination of solar constant.
7. J by Joules Calorimeter.
8. Study of the rate of flow of water through a capillary tube under different pressure heads.
9. Study of the relation between pressure and volume of a gas at constant temperature

10. Study of variation of pressure and temperature of a gas at constant volume.
11. To study the variation of thermo emf across two junctions of a thermocouple with temperature
12. Surface Tension-capillary rise method-radius by vernier microscope
13. Study of the motion of a steel sphere in a viscous liquid and determination of the coefficient of viscosity of the liquid.
14. Melde's experiment – determination of frequency.
15. Lees and Charlton disc – Thermal conductivity of a bad conductor.
16. Specific heat of a solid by the method of mixtures.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11^{th} Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7^{th}Edition, Cengage Learning, 2009.
7. D.P. Khandelwal,A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication, 1985.

Core Course 2 B :Chemistry

MSEII.2 :STATES OF MATTER AND NUCLEAR CHEMISTRY

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

- Illustrate how a scientific model can be constructed based on the experimental oMSErvations of the behaviour of gases and to explain the properties in terms of microscopic organization.
- To develop an understanding of properties of Gases, Liquids,colloids and Solutions.
- To understand the shapes of molecules in terms of symmetries and to relate the properties of matter in solid state to the structure.
- To develop an understanding of the concept of acids and bases, characteristics of non-aqueous solvents.
- To familiarize radioactivity as a nuclear phenomenon in understanding the nuclear reactions

COURSE CONTENT

Unit I : Gaseous and Solid State

Review of kinetic theory of gases and van der walls equation. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liqefaction of gases based on Joule-Thomson effect.

Explanation of the macroscopic properties of solids in terms of structure, bonding and defects. Definition of space lattice, unit cell.

Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystals.

X-ray diffraction by crystals. Derivation of Bragg equation. Predicting crystal structure . Defects in solids , Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of state. Critical Phenomena : P-V isotherms of real gases, continuity of states, the isotherms of van der Waals equation, Derive a relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).

Unit II : Liquids and Colloids

Accounting the Isotropic and intermediate behaviour of liquids as a link between solids and gases. Also tracing the role of liquids as solvents and reaction regulators Intermolecular forces, structure of liquids (a qualitative description).

Structural differences between solids, liquids and gases.

Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

Definition of colloids, classification of colloids.

Solids in liquids (sols) : Properties – kinetic, optical and electrical; stability of colloids, protective action, Hardy – Schulze law, gold number.

Liquids in liquids (emulsions) : Types of emulsions, preparation. Emulsifier.

Liquids in Solids (gels) : Classification, preparation and properties, inhibition, general applications of colloids.

Unit III : Acids and bases

A discussion on changing concepts of acids and bases involving concentrations and effects of solvent medium. Arrhenius, Bronstead-Lowry and Lewis concepts of acids and bases.

Hard and Soft Acids and Bases (HSAB) -Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Non-aqueous Solvents- Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Unit IV : Nuclear Chemistry

Fundamental particles of nucleus, Concept of Nuclides, isotopes, isobars and isotones (with specific examples), nuclear forces,qualitative idea of stability of the nucleus (n/p ratio), binding energy, packing fraction,Natural and artificial radioactivity, Radioactive Disintegration series, half life, average life,nuclear reactions, artificial transmutation, nuclear fusion and fission. Nuclear fusion as a future source of energy ,Nuclear reactors, Application of Radioactivity and Radio isotopes as tracers in chemistry, , biology,medicine, agriculture and industry.Isotope dilution analysis,Neutron activation analysis.

References :

1. Essentials of Physical Chemistry Arun Bahl B.S.Bahl, G.D.Tuli, S.Chand & Company Ltd.
2. Principles of Physical Chemistry : Marron and Prutton
3. Elements of Physical Chemistry : Samuel Glasstone and Lewis
4. Physical Chemistry : P W Atkins
5. Nuclear Chemistry V.N.Darls Sultan Chand & sons.
6. Essentials of Nuclear Chemistry Arnikar, Hari jeevan, 4th edition, New age international.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To evolve a scheme of qualitatively analyzing an inorganic mixtureclassification of anions and cations.
- Quantitative inorganic analysis of mixtures containing four radicals.
- To develop skills of synthesizing coordination compound

COURSE CONTENT:

1. To arrive at a scheme of analysis of anions and cations based on solubility products and common ion effect: Systematic qualitative analysis by micro-scale methods of a mixture containing two acidic and two basis radicals from the following list(not more than one interfering radical):
   Cations: lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, sodium potassium, ammonium.
   Anions: carbonate, bicarbonate, acetate, fluoride, chloride, bromide, iodide, nitrate, sulphate,
   borate, oxalate, phosphate.
2. Preparation of the complexes:
   Tris(thiourea)copper(I)sulphate monohydrate, Mercury tetra thiocyanato cobaltate(II), simple cobalt and chromium complexes and their analysis.

References:

1. A Text Book of Quantitative Inorganic Analysis, A .I . Vogel
2. Advanced Practical Inorganic Chemistry, Gurudeep

Core Course 3 B Mathematics

MSEII.3 :CALCULUS – II, ANALYTICAL GEOMETRY AND NUMBER THEORY

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
At the end of the course students will be able to understand the concepts of number system and analytical geometry and principles and techniques of calculus of several variables in problem solving.

COURSE CONTENT:

Unit I: Partial Derivatives – I
Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Linear approximation theorem. Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Directional Derivative, Partial Derivatives of higher order, Taylor's Theorem, Derivative of Implicit functions, Jacobians.

Unit II: Analytical Geometry – I
Cartesian coordinates in three dimensional spaces, Relation between Cartesian coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations of straight lines (Cartesian and Vector form).

Unit III: Analytical Geometry – II
Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Shortest distance between two skew lines.
Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Classification theorem on second degree equation.

Unit IV: Theory of Numbers
Division Algorithm – Prime and Composite Numbers – proving the existence and uniqueness of GCD and the Euclidean Algorithm – fundamental theorem of Arithmetic - the least common multiple – congruences – linear congruences – Wilson's theorem – Simultaneous congruences – Theorem of Euler – Fermat and Lagrange.

References :

1. Calculus by Anton,Wiley.
2. Calculus with Analytic Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.

4. First Course in Calculus by Serge Lang, Addison-Wiley.
5. Calculus, Vols. 1 and 2 by Lipman Bers, IBH.
6. Introduction to Calculus and Analytical Geometry by Courant and John, Narosa Publishing House.
7. Advanced Calculus by Frank Ayres, Schaum Publishing Co.
8. Higher Algebra by Bamard and Child, Macmillan India Ltd.
9. Integral Calculus by Shanthinarayan, S.Chand and Co. Ltd.
10. Differential Calculus by Gorakhprasad, Pothishala Ltd.
11. A Course in calculus and Real Analysis-Iby Ghorpade S R and Limaye B V (2006), Springer Verlag
12. Elementary Number Theory by David M. Burton.
13. Elementary Number Theory with applications (2nd edition) by Thomas Koshy, Academic Press.

ABILITY ENHANCEMENT COURSE AEC 1B : LANGUAGE

MSEII.4A:HINDI

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I : Functional Language
Prayojanmoolak Hindi: Prayog ke Chhetra
Prayojanmoolak Hindi: Rajbhasha Hindi-Samvaidhanik Pravdhan, Raajbhasha Adhiniyam Aadi**,** Sarkari Karyalayon mein Prayukt Hindi-Karyalayee Aalekhan, Tippan, Patrachar, Sanchhepan

Unit II :**Communication skills**
Varta (Conversation): Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.
Bahas (Debate): Characteristics – Definition – Need of Debate – Technique to conduct Debates,etc. Exercise.

Unit III :DramaandNovel :
Hanoosh by Bhishm Sahani Published by Rajkamal Prakashan, Delhi
Karmbhoomi by Premchand, Swaraj Prakashan, Delhi

Unit IV : Modern Literature
Collection of Essays:

a) Baalkrisna Bhatt- Manusya Ke Jivan Ki Sarthakta
b) Mahaveer Prasad Diwedi- Sahitya Ki Mahatta
c) Sardar Purn Singh- Aacharan Ki Sabhyata
d) Hajari Prasad Diwedi- Kutaj
e) Harishankar Parsai- Thithurta Hua Gantantra
f) Nirmal Verma- Dharm Aur Dharmnirpechhata

References:

1. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
2. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
3. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
4. Hindi Nibandh Sahitya ka Sanskritik Addhyan: Dr Baburam,Vani Prakashan, Delhi
5. Hindi Gadhya-Vinayas aur Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
6. Aadhunik Hindi Ka Gadhya Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
7. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Maneger Panday, Vani Prakashan, Delhi
9. Bhakti Ke Aayam: Dr P Jayraaman, Vani Prakashan, Delhi
10. Bhartiya Bhakti Sahitya: Dr Rajmal Bora, Vani Prakashan, Delhi
11. Bhaktikavya ka Samajdarshan: Dr Premshankar, Vani Prakashan, Delhi
12. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
13. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
14. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
15. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
16. Sarkari Karyalayon mein Hindi ka Prayog- GopiNath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
17. Alankar Mimansh: Murlimanohar Prsad Singh, Swaraj Prakashan, Delhi
18. Saral Hindi Vyakaran: Swaraj Prakashan, Delhi
19. Upanyas aur Lokjeevan: Railph Fox, Vani Prakashan, Delhi
20. Upanyas ka Uadai: Aayan Waat, Hariyana Grantha Academy,Haryana

MSEII.4B:KANNADA

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C3:50**

Objectives*:*

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: Descriptive Grammar
Samasa and Alankara

Unit II: Functional Language
a) News reporting: Characteristics – definition – language of news reporting–model of news report-patterns – role of media in news reporting – exercises.
b) Interview: Characteristics – definitions – preparation for interview – various types of interviews (business – employment – literary etc) – exercises.

Unit III: Medieval Poetry
i) Enna Devange Jagavella Hennu Noada - Akkamahadevi
ii) Kaayuttirdanirulu Hagalennade-Raghavanka
iii) Parahimseyam Madi Manavam Baldapane – Lakshmeesha
(Kaavya Sanchaya – 3- Mysore University, Mysore).

Unit IV: Collection of Essays
i) Prajle Mattu Parisara-U R Ananthamurthy
ii) Samakalina Prajne– G S Shivarudrappa
iii) Samaanaavakaasha – S L Bhairappa
iv) Namma Prachinara Jivana Moulyagalu- T V Venkatachalashastri
(Selected from Gadya Vihara Part III) Mysore University, Mysore

References:
1. Kannada Kaipidi, Prasaranga Publication, University of Mysore
2. Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, MarquetteBooks LLC, Washington.
3. The Perfect Interview by Max Eggert, Random House, UK.

MSE II.4C: MALAYALAM

Credits 3 (2L+1T+0P) — **Max. Marks: 100**
Contact Hours per week: 4 — **C1+C2:50**
Exam duration: 2 Hrs — **C3:50**

Unit I. Descriptive Grammar
Samasa and Alamkara

Unit II :Functional Language

1. News reporting- Characteristics –definition – language of news reporting– model of news report- patterns – role of media in news reporting – exercises
2. Interview- Characteristics – definitions – preparation for interview – various types of Interviews (business – employment – literary etc) – exercises.

Unit III: Poetry - Medieval

VEENA POOVU by Kumaaran ashan, Published by Devi Book Stall, Kodungalloor

Unit IV: Collection of Essays

Lessons from "Bharatha Paryatanam by Kutti Krishna Maraar, Published by Maraar Sahitya Prakasha, Kozhikode

1. Yudhathinte parinaamam
2. Amba
3. Karnante arangettram
4. Markandeyante chiri

References:

1. Bhashaa bhushanam and Kerala Paanineeyam, NBS, Kottayam
2. Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, MarquetteBooks LLC, Washington.
3. The Perfect Interview by Max Eggert, Random House, UK.

MSE II.4D:TAMIL

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I: **Aspects of Style**

Styles of writing

Idioms, Phrases and Proverbs

Unit II: Functional Language:

News Reporting: Characteristics-Definition-language of news reporting-model of news reporting-patterns-role of media in news reporting –exercises.

Interview: Characteristics-definition-preparation for interview-various types of interviews (business-employment-literary etc.)-exercises

Unit III: Medieval Poetry
Periya Puranam Selection of poems
Naladiyar – Selection of poems
An Anthology of Tamil Poetry

Unit IV: Collection of Essays
Ariviyal Tamilzhakkam-S. V. Shanmugam (3 Essays), New Century Book House (P) Ltd, 41 – B SIDCO Industrial Estate Chennai 600 017, Tamil Nenjam-Dr. M. Varadharajan (3 Essays)

References:

1. Tamil Ningalum Thavarillamal Ezhuthalam, Dr. Porka
2. Fundamentals of journalism, Report Writing and editing by R. Thomas Berner, Maruette BooksLLC, Washington.
3. The perfect Interview by Max Eggert, Random House, UK.

MSEII.4E:TELUGU

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:
Unit I: Functional language (Styles and Registers)
1. Essay Writing: Characteristics – Definition – Format of Essays – Types of Essays (Literary, Scientific, etc.) – Models – Exercises.
2. Translation: Characteristics – Definition – Need of Translation – Translation Models – Exercises (From English to Regional Languages).
.

Unit II : Communication skills (Effective speaking and effective writing) in language
1. Conversation: Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.
2. Debate: Characteristics – Definition – Need of Debate – Technique to conduct Debates, and other Exercise.

Unit III: Ancient Poetry and medieval poetry

1. Damayanthee Swayamvaram by Nannaya (First 18 Poems)
2. Sathyabhama Santhwanam by Nandi Timmana (Poems 82 to 104)
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

Unit IVGenre of literature (Prose: Literary Work)

1. Andrula Sanghika Acharamulu by Khandavalli Lakshmi Ranjanam.
2. Telugu Samethalu by Nayani Krishna Kumari
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

References:

1. A Hand book of writing activities, Prasaranga, University of Bangalore.
2. About Translation by Peter Newmark, Multi lingual Motters, Clavedon, UK,
3. The art of Translation (A Symposium), Ministry of Scientific Research and Cultural Affairs, Govt.of India.
4. Effective Group Discussion – Theory and Practice be Gloria J.Galanes, McGraw Hill
5. Anuvada Samsyalu by Rachamallu Ramachandra Reddy, Published by VisalandhraBooks,Hyderabad
6. Aspects of Translation, Prof K V V L Narasimha Rao, CIIL Publication, Mysore

Ability Enhancement Course AEC 2B : English

MSEII.5 : PROFICIENCY IN ENGLISH-1I

Credits 3 (2L+1T+0P)	**Max. Marks: 100**
Contact Hours per week: 4	**C1+C2:50**
Exam duration: 2 Hrs	**C 3:50**

Objectives :

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: **Descriptive Grammar**

Function of Auxiliaries; Modals; Question form

Clauses: Noun Clause; Reported Speech and Change of Voice.

Unit II:Development of Language Competence
To be based on the use of multiple texts which address issues of multiculturalism, gender, racism and texts which relate with current issues and contemporary trends. Short stories, comic strips, cartoons and animations (both print and non-print media) to be used. Speeches of famous persons, diaries, travelogues can also be used.

Unit III:Writing for Functional Purposes
Letter-writing (Professional / Personal)

Unit III: Creative Skills in Writing
Writing dialogues, poems and essays

Unit IV: Basic Phonetics
Sounds of English language, intonation and transcription using IPA.

References:

1. Chan. et al. (1997) Professional Writing Skills, San Anselma, CA
2. Fiderer, A. (1994) Teaching Writing: A Workshop Approach. Scholastic.
3. Block, C.C. (1997). Teaching the Language Arts, 2 nd Ed. Allyn and Bacon
4. Mckay. et al. (1995). The Communication Skills Book, 2 nd Ed. New Harbinger Publications.
5. Merrriam, E. (1964). It Doesn't Always Have to Rhyme. Atheneum.
6. Hyland, Ken (2004) Second Language Writing. University of Michigan Press.
7. Graves,D (1992). Explore Poetry: The reading /writing teacher's companion.Heinemann
8. Stone Douglas (1999). Difficult conversations: How to discuss what Matters Most, New York.:Penguin Books.
9. Gabor Don (2001). How to start a Conversation and Make Friends, New York: Fireside.

PROFESSIONAL EDUCATION COURSES

MSE II.6: CONTEMPORARY INDIAN EDUCATION

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
The course enables the student teachers to:
- Understand different perspectives of Education.
- Analyse the concept of Education and its related terms
- Analyse the Aims of Education and their determinants
- Reflect on the educational ideas and systems of various thinkers and develop the ability to theorize educational practices;
- Collect evidences for the influence of socio-cultural aspects on Education
- Analyse the role of Education on society by gathering various evidences and illustrations

- Understand and appreciate the need of autonomy to teacher and learners
- See the relationship between autonomy, accountability, and commitment
- Arrive at a list of qualities of a committed teacher through discussions.

COURSE CONTENT:

UnitI: Education: Concept, Nature, and Purpose

Education as concept and its distinct nature; Classical, Liberalists and Progressivists view on Education; Analytical concept of education - education as a normative concept; Education as a family of Processes; Education as worthwhile activity; Cognitive and normative dimensions of education; Education and Educated person;
Education as System; Modes of education- formal, informal, non-formal;
Education and its related concepts- Training, Instruction and teaching
Education: Purpose(s) and Determinants - Determinants of Purpose-individual, Community, Religion, State and Market; Brief historical inquiry into purposes and determinants of education (from ancient India to contemporary India); social context of purposes of education
Education as a Discipline and Interdisciplinary in nature
Aims of Education from ancient to contemporary Indian society
Education as value development
Determinants of Aims of Education in emerging India

UnitII: Education and Socio-cultural context

Education as an instrument of social change; Influence of education on society and family; Socio-cultural influences on the aims of education; Emerging trends in societies and their influence on education
Education and Development
Globalization and Internationalization of education

UnitIII: Educational thoughts and practices

Critical reflection on the educational thoughts of Indian and Western thinkers and on their relevance to the present education system
Indian: Mahatma Gandhi, Rabindranath Tagore, Aurobindo, Swami Vivekananada, Jiddu Krishnamurthy, Gijju Bhai Badheka; B R Ambedkar; Vinova Bhave
Western: Plato, Rousseau, John Dewey, Froebel, Montessori, Ivan Iliach, Paulo Frieri

UnitIV: Autonomy of Teacher and Learner

Autonomy: Meaning and extent
Teacher autonomy: Meaning, extent and nature; Teacher as autonomous professional; Areas of teacher autonomy: Their limit-situations - Curriculum making; Learning resources and material selection and use; Pedagogical practices; Assessment modalities;Limit-situations: Structures- Structured curriculum, and examination system; Time-tables;
Learner Autonomy: Meaning, extent and nature; Learning as an autonomous act; Meaning making and learners' autonomy-opportunities and constraints
Autonomy and Accountability: Teacher Accountability; Teacher commitment

Sessional Activities:

- Presentations on Educational thoughts of Various thinkers
- Preparation of an Album or posters on different thoughts of great thinkers
- Analysis of aims of education from ancient Vedic times to modern times
- Collection of examples/evidences to show the influence of Education on social change and the socio-cultural influences on Educational aims
- Comparative study of National curriculum frameworks of NCERT on aims of education
- Readings on Position paper on " Aims of Education"-NCF 2005
- Comparative study of Aims of Education of few countries
- Collection of case studies that exemplifies teacher accountability and commitment

References:

1. Alfred North Whitehead (1967), 'The Aims of Education and Other Essays', The McMilan Company, New York. .
2. Debra Hayes, Martin Hills, Pam Christie & Bob Lingard (2007) Teachers & Schooling: Making a Difference, Allen and Unwin, Australia.
3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
4. Diane Tellman (2000), Living Values: An Educational Program, Sterling Publishing Private Limited, USA.
5. Freiri, Paulo (1968). Pedagogy of the Oppressed, Sea burry Press, New York, USA
6. Hirst,Paul(1970). The Logic of Education, Taylor & Francis, London
7. JJ Rousseau, (1956) Emile
8. John S Brubacher, (1969) Modern Philosophies of Education. Tata McGraw Hill Pub., Co.,Pvt., Ltd, New Delhi.
9. Krishna Murthy, J. (1947) On Education, Orient Longman, New Delhi.
10. Mani, R.S. (1964). Educational Ideas and Ideals of Gandhi and Tagore, New Book Society, New Delhi.
11. Manoj Das (1999). Sri Aurobindo on Education, National Council for Teacher Education, New Delhi.
12. Margaret (1999). The Open Classroom: A Journey through Education, Orient Longman, New Delhi.
13. Mathur S.S. (1988). A Sociological Approach to Indian Education, Vinod Prakashan, Agra.
14. NCERT (2013). Basics in Education, National Council of Educational Research and Training, New Delhi.
15. NCERT, (2005). National Curriculum Framework-2005. National Council of Educational Research and Training, New Delhi.
16. O'Connor,J (1958) Philosophy of Education, pub by Duke university Press on behalf of philosophical review.
17. Peters, R.S. (1967), The Concept of Education, Routledge, United Kingdom.
18. Peters, RS (1968). Ethics and education.(5th edn), George Allen & Unwin Ltd, London
19. Prema Clarke (2001). Teaching & Learning: The Culture of pedagogy, Sage Publication, New Delhi.
20. Scheffler, Israel (1966).Philosophy and Education: Modern Readings, Allyn and Bacon, Boston, US
21. Stella Van Petten Henderson (1960) Introduction to Philosophy, The University of Chicago press, Chicago.
22. Steven H. Cahn (1970). The Philosophical Foundation of Education, Harper & Row Publishers, New York.

MSEII.7:YOGA EDUCATION, SELF UNDERSTANDING AND DEVELOPMENT

Credits: 2 (1L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives :

The student teacher will be able to:

- Understand the meaning and importance of self-concept and self-esteem.
- Be aware of different factors related to self-concepts and self-esteem. Record a brief history of development of yoga through the ages. Discuss how yoga and yoga practices are important for healthy living.
- Explain some important principles of yoga.
- Explain the different limbs of *Astañga* yoga.
- State the different types of yoga.
- Derive how Hatha yoga and *Astañga* yoga are complementary to each other.
- Enable the student to have good health.
- Practice mental hygiene.
- Possess emotional stability.
- Integrate moral values.
- Attain higher level of consciousness.
- Demonstrate some important *asanas* and *pranayama*.

COURSE CONTENT :

Unit I : Introduction to Yoga and Yogic Practices

Yoga: meaning and initiation, What is Yoga? Misconnects of Yoga, History of development of yoga, The streams of Yoga: Astanga yoga Raja yoga, Yogic practices for healthy living

Unit II Introduction to Yogic Texts

Historicity of yoga as a discipline, Classification of yoga and yogic texts, Hatha yogic practices, Meditational processes

Unit III: Yoga and Health

Need of yoga for positive health, Role of mind in positive health as per ancient yogic literature, Concept of health, healing and disease: yogic perspectives, Potential cause of ill health, Yogic principles of healthy living

Unit IV: Personality Development and Stress Management through Yoga

Yogic Practices for Personality Development : Surya Namaskar, Asanas : Tadasana, Simhasana, Kukkutasana, Akarna Dhanurasana, Matsyasana, Prnayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Banda, Uddiyana Bandha, Dhyana (Meditation) , Meditation, What is Stress, Yoga as a Way of Life for Stress Management: Ahara, Vihara, Achara, Vichara, Vyavahara, Yogic Practices for Stress Management ; Asanas, Hastottanasana, Padahastasana, Trikonasana, Shashankasana, Ushtrasana, Ardhamatsyendrasana , Bhujangasana, Makarasana, Sarvangasana, Matsyasana, Shavasana; Pranayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Sheetali Pranayama; Meditation, Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs **C_3 : 50 marks**

Practicum

- General guidelines for performance of the practice of yoga for the beginners

1. Guidelines for the practice of *āsanas*
2. Guidelines for the practice of *prāṇāyāma*
3. Guidelines for the practice of *meditation*

- Select yoga practices for persons of average health for practical yoga sessions

5. Supine position
6. Prone position
7. Sitting position
8. Standing position
9. Mudras
10. Prāṇāyāmas

*** In addition, school and community based activities may be organised.**

Evaluation Strategies

The evaluation will be done through practicals/ assessment of ability to develop and design softwares for selected contents.

References:

1. Adair, J. and Allen, M. (1999). *Time Management and Personal Development.* London: Hawksmere.
2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
3. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi. (Also available in Hindi)
4. Rohrer, J. (2002). *ABC of Awareness.* Oberurnen: UTD Media.
5. Simanowitz, V. and Pearce, P. (2003). *Personality Development.* Beckshire: Open University Press.
6. Stevens, N. (2008). *Learning to Coach.* United Kingdom: How to books.

THIRD SEMESTER

Core Course 1 C : Physics

MSEIII.1 :ELECTRICITY AND ELECTROMAGNETISM

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable students to acquire a broad conceptual framework of electrostatics electromagnetic phenomena.

COURSE CONTENT:

Unit I: Electrostatics

Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss's theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere and continuous charge distributions (charged rod, ring, disk). Calculation of electric field from potential.

Unit II: Electric Fields in Matter and DC circuits

Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Combination of capacitors, energy stored in a capacitor, Energy per unit volume in electrostatic field. Atomic view of dielectrics, Polarization, Displacement vector. Gauss's theorem in dielectrics. Dielectric constant, Parallel plate capacitor completely filled with dielectric. Polarizability and susceptibility, Clausius-Mossotti equation.
DC Circuits: Kirchhoff's laws, Voltage and Current dividers, Mesh analysis and Loop analysis, RC circuits, Maximum power transfer theorem.

Unit III: Magnetism

Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Magnetic force between two parallel current carrying conductors. The Divergence and Curl of **B**, Magnetic vector potential. Ampere's circuital law. Magnetic field due to a very long solenoid and a toroidal coil.
Magnetism in matter: Magnetic intensity, magnetic induction,, Magnetic susceptibility, permeability. Classification of magnetic substances- a brief introduction of dia-, para- and ferro-magnetic materials.

Unit IV: Electromagnetic Induction and AC Circuits

Electromagnetic Induction: Review of Faraday's law of induction, Lenz's law, Motional EMF. Inductance:Self inductance, energy in a magnetic field, magnetic energy density.

AC circuits: The *j* operator.sinusoidal voltage, current voltage relation in resistance, capacitance and inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance. Mutual inductance and transformers.

Reference Books:

1. David J. Griffiths, Introduction To Electrodynamics, 4th Edition, Pearson
2. D C Tayal, Electricity and Magnetism, 1988, Himalaya Publishing House.
3. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley, Inc.
4. A N Matveev, Electricity and Magnetism, Mir Publishers, Moscow.
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.
6. A F Kipp, Fundamentals of Electricity and Magnetism, McGraw Hill.
7. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill Education, 1986.
8. J.H. Fewkes & J. Yarwood, Electricity and Magnetism, Vol. I, Oxford Univ. Press, 1991.
9. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To study the variation of Magnetic field along the axis of a circular coil.
2. To determine M & H using deflection magnetometer & vibration magnetometer.
3. To determine horizontal component of Earth's magnetic field using a Tangent galvanometer.
4. To calibrate an ammeter using a potentiometer and Daniel cell.
5. Mapping of magnetic field due to a current carrying straight conductor.
6. Determination of resistance & resistivity using Meter Bridge.
7. Charging & Discharging of a Capacitor.
8. Deflection magnetometer-Tan A, Tan B positions.
9. Deflection magnetometer -Tan C Position-moment of moments.

10. Mapping of magnetic field lines for a current carrying solenoid.
11. Searle's vibration magnetometer-moment & ratio of moments.
12. Box type vibration magnetometer- M &B_h.
13. Caparison of emf and determination of internal resistance of a cell using a potentiometer.
14. Determination of resistance & resistivity using PO Box.
15. Comparison of capacitance by Desauty's bridge using BG.
16. Determination of frequency of AC mains using Sonometer & electromagnet.
17. Variation of phase angle with capacitance for a RC circuit.
18. Conversion of Galvanometer to Voltmeter.
19. Unknown resistance by Carey Foster bridge.
20. Induced emf.
21. Maximum power transfer theorem.
22. To verify the Thevenin's and Norton's theorem

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 Chemistry

MSEIII.2 :ORGANIC CHEMISTRY – I

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To review the concept of isomerism and its types
- To develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.

COURSE CONTENT:

Unit I: Stereochemistry of Organic Compounds

Review of Concept of Isomerism and Types of isomerism with examples.

Optical Isomerism: Structural changes responsible for properties: elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization and asymmetric synthesis.
Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism: Determination of configuration of geometric isomers. Cis – trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism: Difference between configuration and conformation. Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives. Review of Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

Unit II: Aliphatic Hydrocarbons
Alkanes: Review of IUPAC nomenclature of branched and unbranched alkanes. Isomerism in alkanes and industrial source. Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes: Nomenclature, methods of formation (from acetoacetic ester / malonic ester and Dieckmann reaction), chemical reactions (halogenation), Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Alkenes: Accounting for Reactions due to unsaturation in compounds. Nomenclature of alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism. Regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanism of hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration followed by oxidation, oxymercuration – reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$. Polymerization of Alkenes. Substitution at the allylic and vinylic positions of alkenes.

Cycloalkenes: Methods of formation and chemical reactions of cycloalkenes.

Alkadienes: Nomenclature and classification of dienes: Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions. Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding in alkynes. Methods of formation (alkylation of acetylene and by elimination reactions). Acidity of alkynes. Chemical reactions of alkynes: Mechanism of electrophilic and nucleophilic addition reactions, hydroboration, oxidation, metal-ammonia reductions, oxidation and polymerization.

Unit III: Aromatic Hydrocarbons

Factors responsible for the characteristic reactions of Aromatic compounds. Nomenclature of benzene derivatives. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity: The Huckel rule, aromatic ions.

Aromatic electrophilic substitution: General pattern of the mechanism, role of σ- and π-complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/ para ratio. Side chain reactions of benzene derivatives. Birch reduction.

Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.

Unit IV: Alkyl and Aryl Halides

Alkyl halides: A study of Alkyl halides highlighting its synthetic applications. Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanism of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams. Polyhalogen compounds: chloroform, carbon tetrachloride.

Aryl halides: Methods of formation of aryl halides, nuclear and side chain reactions. The addition- elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

References :

1. Organic Chemistry : Seyhand N Ege
2. Organic Chemistry : Morrison and Boyd
3. Organic Chemistry : I L Finar
4. Organic Chemistry : Hendricson, Cram and Hammond
5. Organic Chemistry : Stanley H. Pine

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop basic skills in organic synthesis and purification of organic compounds

COURSE CONTENT:

1. Calibration of Thermometer using naphthalene / acetanilide / urea

2. Determination of melting point of Benzoic acid / cinnamic acid / m – dinitro benzene / p-dichlorobenzene
3. Determination of boiling point of aniline / nitrobenzene / chlorobenzene
4. Distillation of water – alcohol mixture using water condenser; Distillation of chlorobenzene –nitrobenzene mixture using air-condenser
5. Cystallization: Benzoic acid from hot water, naphthalene from ethanol
6. Sublimation of camphor / phthalic acid / succinic acid

Organic synthesis:

1. Preparation of Iodoform from ethanol / acetone using sodium hypochlorite and KI
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration
3. Preparation of *p*-bromoacetanilide from acetanilide by bromination
4. Preparation of 2,4,6-tribromo phenol from phenol / 2,4,6-tribromoaniline from aniline
5. Preparation of Acetanilide from aniline by acetylation
6. preparation of benzoic acid from benzamide by base hydrolysis
7. preparation of aspirin from salicylic acid by acetylation
8. preparation of p-bromoaniline from acetanilide
9. preparation of 0-iodobenzoic acid from anthranilic acid
10. preparation of p-nitroacetanilide from acetanilide by nitration

References :

A Text Book of Qualitative organic Analysis, A .I . Vogel

Core Course 3 C :Mathematics

MSEIII.3 :REAL ANALYSIS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

At the end of the course students will be able to understand the concepts of real number system, real sequences, infinite series and the convergence tests. Also understand the concept of Riemann integration and its properties.

COURSE CONTENT:

Unit I:

The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important suMSEts, Intervals, Countable and Uncountable sets. Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness,Connectedness.

Unit II:

Introduction to sequences, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, SuMSEquences.

Unit III:
Introduction to Infinite Series, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Maclaurin's integral test.

Unit IV:
Riemann Integration: Upper and lower sums, Criterion for inerrability, Inerrability of continuous functions and monotone functions, Fundamental theorem of Calculus, Change of variables, Integration by parts, First and Second Mean Value Theorems of Integral Calculus.

References:

1. Real Analysis by J.M.Howie, Springer 2007.
2. Real Analysis by Malik, Wiley Eastern.
3. Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.
4. Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
5. Real Analysis by Royden, Prentice Hall of India Pvt. Ltd.
6. Mathematical Analysis by T M Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition.
7. Introduction to Real Analysisby Bartle R G & Sherbert , Wiley India
8. Kumar Ajit & Kumaresan S, *Real Analysis*, CRC Press
9. Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.
10. Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006.
11. Elementary Analysis – The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International Ltd.
14. Textbook of Mathematical Analysis by Leadership Project, Bombay University, Tata McGraw Hill Publishing Media Pvt. Ltd.

Skill Enhancement Course- 1 Physics

MSEIII.4A :BASIC INSTRUMENTATION SKILLS

Credits: 3 (2L+ 0T +1P)	**Max. Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

Unit I: Basic of Measurement

Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

Unit II: Cathode Ray Oscilloscope and its uses

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Unit III:

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Unit IV:

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

References :

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. , U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

(A minimum of EIGHT experiments to be selected from the following)

1. Circuit tracing of a given laboratory electronic equipment.
2. Use of Digital multimeter/VTVM for measuring voltages.
3. Winding a coil / transformer.
4. Study the layout of receiver circuit.
5. Trouble shooting a circuit.
6. To oMSErve the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
7. To oMSErve the limitations of a multimeter for measuring high frequency voltage and currents.
8. To measure Q of a coil and its dependence on frequency, using a Q- meter.
9. Measurement of voltage, frequency, time period and phase angle using CRO.
10. Measurement of time period, frequency, average period using universal counter/ frequency counter.
11. Measurement of rise, fall and delay times using a CRO.
12. Measurement of distortion of a RF signal generator using distortion factor meter.
13. Measurement of R, L and C using a LCR bridge/ universal bridge.

References:

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

Skill Enhancement Course 1 :Chemistry

MSEIII.4B : INDUSTRIAL CHEMICALS AND ENVIRONMENT

Credits: 3 (2L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To understand the basic techniques of chemical industry
- To gain idea about the energy sources
- To understand the properties and application of lubricants
- To study the effects of green house phenomena
- To study the water quality parameter and waste water management
- To acquire the basic knowledge about commom pesticides

COURSE CONTENT:

Unit I:

Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology.

Unit II:

Fuel Chemistry: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and non fuel) in various industries, its composition, carbonization of coal.Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro Gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Unit III:

Air Pollution: Pollutants and their sources, pollution by SO2, CO2, CO, NOx, H2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Green

House effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluent from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

Unit IV:
Pesticides General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil) , Anilides (Alachlor and Butachlor).

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:
- To monitor the water quality parameters
- To prepare simple indusrial products
- To analyse food adultrants

COURSE CONTENT:
1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method.
   ($AgNO_3$ and potassium chromate)
6. Estimation of total alkalinity of water samples (CO_3, HCO_3) using double titration method.
7. Preparation of borax/ boric acid.
8. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
9. Preparation of simple organophosphates, phosphonates and thiophosphates
10. Preparation of Magnesium bisilicate (Antacid).
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

References:

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.

2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
3. B.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut.
4. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
5. R. Cremlyn: Pesticides, John Wiley. 7. William O. Foye, Thomas L., Lemke , David A. William:
6. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
7. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
8. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
9. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi. 10. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.

Skill Enhancement Course 1 : Mathematics

MSEIII.4C : COMBINATORICS, STATISTICS AND BASIC PROBABILITY

Credits :3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives:
To enable the students to understand the basic concepts of combinatorics, statistics and probability, to obtain the skills and apply them in problem-solving and teaching.

COURSE CONTENT:
Unit I:
Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complements, Boolean Algebra, Boolean expressions, Application to switching circuits.

Unit II:
Permutations and Combinations, Pigeon-hole principle, Principle of inclusion and exclusion. Solving real life problems based on them.

Unit-III:
Introduction to statistics, Mean, Mode and Median of grouped and ungrouped data, Graphical representations; Pie Charts, Line Graphs, Bar Graphs, Histographs, frequency polygon. Measures of dispersion; Range, Mean deviation, Variance and Standard deviation, Analysis of frequency distribution.

Unit-IV: Random experiment, Concept of probability, Sample space, Events- different kinds Probability definitions – Mathematical or Classical or Statistical, Conditional probability, Independent events, Baye’s theorem.
Random variable, Discrete and continuous random variables, Probability function, Probability density function, Distribution function. Mean Variance and standard deviation of a random variable.

References:

1. Elements of Discrete Mathematics by C. L. Liu , McGraw-Hill, 1986.
2. Discrete Mathematics and its Applications by Kenneth H. Rosen, McGraw-Hill, 2002.
3. Introduction to the Theory of Statisticsby Alexander M. Mood and Others (1988), New York, McGraw Hill.
4. Introduction to Probabilityby Charles M. Grinstead and Laurie Snell J. (1991), Rhode Island, American Mathematical Society.
5. Fundamentals of Mathematical Statistics by Gupta S.C and Kapur (2011), New Delhi, Sultan Chand and Co.
6. Basic Probability Problemsby Richard Serfozo (2003), London, Springer.
7. Introduction to Mathematical Statisticsby Robert V. Hogg and Allen T. Craig (1978), McMillan Publishing Co.

PROFESSIONAL EDUCATION COURSES

MSE III.5: CHILDHOOD AND GROWING UP

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understand the salient features and problems of growth and development during childhood to adolescence.
- Understand the dynamics of personality development in order to facilitate student trainees' and their students' personal growth.
- Develop the ability to apply the knowledge provided by Educational Psychology to classroom problems of various kinds.
- Understand the intra and inter individual differences in the learners and their Implications for organizing educational programmes.
- Acquire the skills of understanding the needs of all the learners in the classroom and meeting their needs.
- Appreciate the contribution of psychology in realizing the objectives of education.

COURSE CONTENT

Unit I : Nature of Human Development and Educational Implications

Concept and Branches of Psychology; Importance of Study of Psychology by Classroom Teachers, Meaning of Growth and Development. Differences between growth and development, importance of growth and development for the teachers. Principles of Development, Factors Influencing Growth and Development; Role of Heredity and Environment in determining individual Differences in Development. Developmental Stages and Tasks, Development during Early Childhood, Late Childhood and Adolescence-Characteristics, Factors Influencing and Educational Implications:(a) Physical (b)

Psychomotor (c) Intellectual (d) Language (e)Emotional (f) Social and (g) Moral and ValueDevelopment

Unit II : Management of Issues and Concerns of Adolescent Students

Factors Affecting Adolescent development; Issues and Concerns during Adolescence - Physical and Health concerns,Emotional Issues, Social Issues, Socio-cultural diversity, Adverse Life experiences, Identity Vs Role Confusion; Adolescent Cognition and its effect on Adjustment, Need and Importance of Adolescence Education, Significance of Life Skill Education for Adolescence, Role of Schools for the Balanced Personality

Unit III: Individual Differences in Learners

Individual Differences in - Psycho-Motor skills, Intelligence, Aptitude, Personality, Learning styles and Cognitive Preferences, Self concept and Self esteem, Social-Emotional Development, Aptitude, Interest,Attitude and Values and Study Habits.

Unit IV : Assessment of Individual and Intra Individual Differences in Learners

Tools and Techniques: Psychological Tests, OMSErvation Schedules, Inventories, Checklists, Anecdotal Records, Cumulative Records, Sociometry, Interview Techniques, Achievement and Diagnostic Tests.

Meeting the Individual Differences in the Classroom- General Approaches; Remedial Instruction, Guidance and Counseling, Whole School Approach.

Practicum

Administering Group Tests
Conducting Case Studies
Diagnosing the deviations
Studying School Record and preparing Reports.
Getting Famililiarised with Individual Psychological Tests.

References:

1. Bigge, M.L. (1982). *Learning Theories for Teachers*, (4th edition). New York, Harper and Row Publishers, pp. 89-90.
2. Bolles, R.C. (1975). *Learning Theory*. New York, Holt, Rinehart and Winston, pp. 18-19.
3. Chauhan, S.S. (1978). *Advanced Educational Psychology,* Vikas Publishing House Pvt. Ltd., New Delhi.
4. Dandapani, S. (2001). *A textbook of Advanced Educational Psychology*. New Delhi: Anmol Publications.
5. Dunn, R. (1983). *Can students identify their own Learning Styles?* Educational Leadership, 40, pp. 60-62.
6. Dash, M. (1988). *Educational Psychology*. Delhi: Deep and Deep Publication.
7. Duric, L. (1975). *Performance of Pupils in the Process of Instruction*. Bratislava, SPN, pp. 54-90.

8. Duric, L. (1990). *Educational Sciences: Essentials of Educational Psychology*. International Bureau of Education, UNESCO, New Delhi, Sterling Publishers, p. 81.
9. Fontana, D. (1995). *Psychology for Teachers* (3rd edition). The British Psychological Society, London: McMillan in association with BPS Books.
10. Kumar, S. (2014). Child Development and Pedagogy, Pearson.
11. Kundu C.L. and Tutoo, D.N. (1993). *Educational Psychology*, Sterling Publishers Pvt. Ltd.
12. Lindgren, H.C. (1967). *Educational Psychology in Classroom* (3rd edition). New York: John Wiley and sons.
13. Mohan J. and Vasudeva P.N. (1993). *Learning Theories and Teaching, In Mohan Jitendra (ed.) Educational Psychology*, New Delhi, Wiley Eastern Limited, P. 146.
14. Murthy, CGV and Rao, AVG. (2005). *Life skills Education: Training Package*, Mysore: Regional Institute of Education.
15. NCERT (2013) *Training and Resource materials in Adolescence Education*, New Delhi
16. Oza, D.J. and Ronak, R.P. (2011). *Management of behavioral problems of children with mental retardation*. Germany: VDM publication.
17. Papalia D.E., and Sally, W.O. (1978). *Human Development*. McGraw Hill Publishing Company.
18. Phens, J.M., and Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational Psychology*. New York: Holt Rinehart and Winston Inc.
19. Tessmer, M., and Jonassen, D. (1988). *Learning Strategies: A New Instructional Technology*. In Harris Duncun (1988) Education for the New Technologies, World Year Book of Education. London: Kogan page Inc.
20. Skinner, E.C. (1984). *Educational Psychology*-4th Edition. New Delhi: Prentice Hall of India Pvt. Ltd.
21. Spinthall, N., and Spinthall, R.C. (1990). *Educational Psychology* 5th Edition. McGraw Hill Publishing Company.

Web Resources

- Animated Videos from Study.com, http://study.com/academy/course/educational-psychology-course.html
- Seifert, K. and Sutton, R. 2011). Educational Psychology Third Edition http://www.oercommons.org/courses/educational-psychology/view
- Introduction to Psychology, Open Textbook, http://open.lib.umn.edu/intropsyc/
- Generic Issues, NCERT, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/PDF/generic.pdf
- www.aeparc.org

MSEIII.6 : Gender, School and Society

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

This course enables the student teachers to

- Understand and contextualize ideals of the Constitution of India;
- Appreciate humanistic agenda of the Constitution of India;
- Value and recognize the role of education in realizing the ideals of the Constitution;
- Analyse various educational contexts to see whether the child's rights are ensured
- Understand and develop positive attitudes towards various forms of exclusions;
- Appreciate the measures taken at the national level to universalize elementary and secondary education;
- Analyse the contextual examples to understand the gender issues and concerns;
- Develop positive attitude and values towards promoting gender equality;
- Evolves strategies and mechanisms as a teacher to ensure equality in school and learning contexts

COURSE CONTENT:

Unit I: Education as Fundamental Right

Constitution of India: Fundamental rights; Education as Fundamental right; Human Rights: Meaning, Nature, and classification; Rights of Children: International covenants and Indian Constitution; Education as Fundamental Right of Children: 2009, Rights of girl child

Unit II: Policy framework for public Education in India and its implementation

Education in Post-Independent India: Significant recommendations of commissions and committees, National Policy on Education-1986,Revised 1992, Delors Report: learning the treasure within, Universalization of elementary education: Need and significance; Government schemes and efforts with special focus on Sarva Shiksha Abhiyan, Issues in implementing RTE-2009: A critical understanding.Issues that affect and negate the children's right to education(Child labour: Street children, abandoned and orphans; Differently abled children; Attitude towards the girl child and her participation in schooling; Punishment, abuse and violence in schools). alternative schooling, Secondary education: Universalization of secondary education; universal access, universal enrollment, universal retention, universal success; Issues and Quality concerns- Recommendations of CABE; interventions of RMSA, Initiatives and measures taken at national level to improve teacher education at secondary level: Role of NCTE and NCERT

Unit III: Contemporary Indian Schooling: Concern and Issues

Equality of Educational Opportunity: Meaning and nature; Forms of inequality: Caste, Gender, Transgender, regional, religious and other marginalized groups;

Inequality in Schooling: Public- private schools, Rural-urban schools, Mass-elite schools, single teachers' schools and many other forms of in equal school systems. Positive discrimination: concept and issues and policy intervention;

Understanding Exclusion in schooling: Exclusion: Meaning, and nature; Forms of Exclusion:

Physical/physiological Exclusion; Different kinds/types of differently abled children: Measures to address the issues of leaning of differently abled children and professional preparedness of institutions;

Socio-cultural and economic exclusion

Understanding different forms of socio-cultural and economic exclusion in schooling—Caste, Class, Gender, Minority, and other Marginalized sections of the society;

Critical understanding of 'ascribed identities' on educational opportunities;

Unit IV: Gender: Issues and concerns

Basic Gender concepts: Difference between Gender and Sex; Social construction of Gender; Gender roles as viewed in Indian context; Concept of Transgender
Gender roles in society through various institutions such as family, caste, religion, culture, media and popular culture (films, advertisements, songs etc), law and State; stereotype in gender roles
Issues related to women/girl child: female infanticide and feticide, sex ratio, honour killing, dowry, child marriage, property rights, divorce, widowhood.
Gender bias in school enrolments, household responsibilities, societal attitude towards girl's education
Issues related to gender in school: sexual abuse, sexual harassment, perception of safety at school, home and beyond
Representation of gendered roles, relationships and ideas in textbooks and curricula.
Role of schools, peers, teachers, curriculum and textbooks in challenging gender inequalities or reinforcing gender parity
The Indian constitution and provisions accorded to women; women's rights; legal aspects related to women, indecent representation of women (Prohibition act), cybercrime:
Educational and Employment provisions for Transgender: Legal aspects; social recognition

Sessional activities

- A critical study, with the help of survey and oMSErvational study, of alternative schools- child labour schools, night schools, mobile schools and boat schools.
- Critical analysis of different committees and commissions on Education
- Readings on National Policy on Education, RTE Act 2009, Delors Report
- Survey of schools to see the implementation of various incentives of government to equalize educational opportunities
- Textbook analysis for identifying integration of gender issues.
- Prepare presentation on laws related to women harassment, early marriage, property inheritance, trafficking etc.
- Prepare presentations on constitutional provisions and other government measures to promote girl child's education
- Presentation of Case study reports on girl child's problems in schools and at home.

Suggested Readings

- Anand, C.L. et.al. (1983). Teacher and Education in Emerging in Indian Society, NCERT, New Delhi.
- Govt. of India (1986). National Policy on Education, Min. of HRD, New Delhi.
- Govt. of India (1992). Programme of Action (NPE). Min of HRD.
- Mistry, S.P. (1986). Non-formal Education-An Approach to Education for All, Publication, New Delhi.
- Mohanty, J., (1986). School Education in Emerging Society, sterling Publishers.
- Mukherjee, S.N. (1963). Secondary School Administration, Acharya Book Depot, Baroda.
- Mukherji, S.M., (1966). History of Education in India, Acharya Book Depot, Baroda.
- Naik, J.P. & Syed, N., (1974). A Student's History of Education in India, MacMillan, New Delhi.
- NCERT (1986). School Education in India – Present Status and Future Needs, New Delhi.
- Salamatullah, (1979). Education in Social context, NCERT, New Delhi.
- Sykes, Marjorie (1988): The Story of Nai Talim, Naitalim Samiti: Wardha.
- UNESCO; (1997). Learning the Treasure Within.

- Dr. Veda Mitra. Education in Ancient India, Arya book Depot, New Delhi – 1967
- Reports of SSA and RMSA
- NCTE (2009) National curriculum framework for teacher education
- Agarwal, N (2002). Women and Law in India. New Delhi: New century Pub
- Sen,S.(2013). Women's rights and empowerment. New Delhi: Astha Pub.
- Siddiqi, F.E.& Ranganathan,S.(2001). Handbook on women and human rights, New Delhi: Kanishka Pub

Web Resources: Video on improving Gender Equality- EFA Crowdsourcing Challenge, 2012, UNESCO, Pub by The Pearson Foundation, 3 minutes.

MSEIII.7 : School Attachment Programme 1

Credits : 2	**Marks: 100**
Duration: 3 Weeks	**C1+C2 : 50**
	C3 : 50

Objectives

- To familiarize the student teachers to school environment, its structure, functions and processes.
- To familiarize the student teachers with different types of schools existing in the community.

COURSE CONTENT:

1. The student teachers will visit the neighbourhood schools for one week to get acquainted with the school environment and its functions and processes and submit the report.
2. The student teachers will familiarize themselves with school structure and administration.
3. The student teachers will visit different types of schools such as Government, Government aided and private schools to study their governing norms, regulations and participation in the community.
4. The student teachers will visit the schools run by community/NGO or other organizations like minority run schools, schools in SC/St dominated areas, schools in slum areas, special and inclusive schools and submit the report.

Evaluation:

C1 – Report 1
C2 – Report 2
C3 – Presentation through PPT.

FOURTH SEMESTER

Core Course 1D :Physics

MSEIV.1 :OPTICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable students to

- understand that light is a wave phenomenon.
- apply the understanding of wave phenomenon to light.

COURSE CONTENT:

Unit I: Nature of Light and Scattering

Brief discussion on theories of light. Dual nature of electromagnetic radiation, electromagnetic spectrum, energy and monmentum of em wave. Electromagnetic nature of light. Definition and Properties of wave front. Huygen's Principle.
A brief discussion on Tyndall, Rayleigh and Raman scattering of light. A qualitative account of fluorescence and phosphorescence, the Raman Effect experiment and its explanation, intensity and polarisation of Raman lines, some applications of Raman Effect.

Unit II: Interference

Definition of Coherence, Methods of production of Coherent sources by division of wavefront and division of amplitude. Theory of interference (condition for constructive and destructive interference). Young's double slit experiment, Lloyd's Mirror and Fresnel's Biprism. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.
Michelson and Fabry-Perot interferometers: determination of wavelength of light. Wavelength difference, Refractive index and Visibility of fringes

Unit III: Diffraction

Fraunhoffer Diffraction, Diffraction at a single slit, double slit, multiple slits, Diffraction grating, Resolving power – Rayleigh's criterion, Resolving power of a grating and telescope.
Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge, a slit and a wire using half-period zone analysis.

Unit IV: Polarisation

Polarization by reflection, Brewster's law, Malus law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polariods, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity, Fresnel's theory, Rotatory polarization, use of biquartz.

Reference Books:

1. F A Jenkins and H E White, Fundamentals of Optics, McGraw-Hill, 1976.
2. B.K. Mathur, Principles of Optics, Gopal Printing, 1995.
3. H.R. Gulati and D.R. Khanna, Fundamentals of Optics, R. Chand, 1991.
4. Eugene Hecht,Optics, Pearson Education India, 2012.
5. N. Subramaniam, Brijlal, and M. N. Avadhanulu Textbook of Optics, S. Chand Limited, 2004.
6. A K Ghatak, Optics, Tata McGraw-Hill Education, 2009.
7. Ariel Lipson,Stephen G. Lipson,Henry Lipson, Optical Physics, Cambridge University Press, 2010.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To determine the refractive index (n) of a liquid by Liquid Lens.
2. Determination of 'R' of a Lens using the Newton's ring arrangement.
3. Determination of thickness of a paper foil using Air wedge setup.
4. Refractive index (n) of the material of Prism by Spectrometer- measuring angle of minimum deviation.
5. To determine the refractive index (n) of glass & water by apparent depth method.
6. Specific rotation of sugar solution using Polarimeter.
7. Spectrometer- i_1- i_2 curve.
8. Refractive index of glass prism (i-d curve).
9. Spectrometer-solid prism- Dispersive power.
10. Wavelength of sodium D1 & D2 lines using Diffraction grating.
11. Newton's rings-wavelength of sodium light.
12. Cauchy's constants A & B using spectrometer.
13. p– n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 D :Chemistry

MSEIV.2 :THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermochemical equations.
- Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts.
- Apply the concept of equilibrium to construct and interpret the phase diagrams.
- To understand the colligative properties of solutions and the behaviour of immiscible liquids.

COURSE CONTENT:

Unit I: Thermodynamics – I

Concept of Energy, Historical perspectives, Generalisation of laws of Thermodynamics based on human experience with Nature and natural Processes. Language of thermodynamics : system, surroundings, etc. Types of system, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics**:** Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule, Joule–

Thomson coefficient and inversion temperature. Calculation of w.q. dU and dT for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.
Thermochemistry: Standard state, standard enthalpy of formation. Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoff's equation.

Unit II : Thermodynamics – II

Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics , different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.
Concept of Entropy : Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical changes, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.
Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.

Unit III : Chemical Equilibrium and Phase Equilibria

Recognising a system at Chemical Equilibrium. Attributes of Chemical Equilibrium, Thermodynamic derivation of law of mass action, Equilibrium constant and free energy. Factors that affect the chemical equilibrium and Le Chatelier's principle. Calculations involving equilibrium constant Ionic equilibria in aqueous solutions, sparingly soluble salts, solubility product common ion effect, selective precipitation, applications in qualitative analysis.
Ionisation of water, pH scale, weak acids and bases, hydrolysis, buffer solutions, acid base indicators, acid base titrations and multi stage equilibria. Reaction isotherm and reaction isochore.
To establish a systematic way of discussing the changes systems undergo when they are heated and cooled and when their composition is changed. Clapeyron equation and Clausius – Clapeyron equation, applications.
Statement and meaning of the terms–phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system–water, CO_2 and Sulphur systems. Phase equilibria of two component system–solid-liquid equilibria–simple eutectic–Bi–Cd. Pb-Ag Systems, desilverisation of lead. Simple eutectics, systems forming compounds with congruent melting points.

Unit IV: Solutions

To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction.
Dilute Solution : Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.
Solid solutions – compound formation with congruent melting point (Mg – Zn) and incongruent melting point (NaCl– H_2O), ($FeCl_3$–H_2O) and ($CuSO_4$–H_2O) system. Freezing mixtures, acetone dry ice.
Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes–HC– H_2O and ethanol–water systems.
Partially miscible liquids– Phenol-water, trimethylamine– water, nicotine– water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.
Immiscible liquids, steam distillation. Nernst distribution law – thermodynamic derivation, applications.

References :

1. Principles of physical chemistry : Puri,Sharma and Pathania, 47th edition
2. Physical Chemistry : Atkins
3. Phase rule: Gurdeep Raj, Goel publicing house.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the energetics of chemical reactions
- To find out the equilibirium constants of selected systems
- To study the behaviour of immiscible liquid systems
- To appreciate the physical properties of liquids and liquid mixtures

COURSE CONTENT:

1. Determination of heat of neutralization of acids and bases .Verification of Hess's law of constant heat summation.
2. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
3. pH titration of acid versus base (oMSErvation of change in pH
4. Determination of equilibrium constant of hydrolysis of an ester(ethyl acetate/methyl acetate)
5. Determination of dissociation constant of a weak acid.
6. Determination of solubility product constant (K_{sp}) of a sparingly soluble salt
7. Determination of dissociation constant of phenolphthalein/methyl orange by colorimetric method.
8. Determination of molecular weight of a given liquid by steam distillation.
9. Determination of percentage composition of the given NaCl solution by miscibility temperature method (phenol-water system).
10. Determination of distribution coefficient of benzoic acid between water and toulene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
12. Determination of molecular weight of a given substance by Rast's method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.
14. Determination of refractive index of pure liquids and liquid mixtures.

.

References :

Systematic Experiments in Chemistry by Arun Sethi.

Core Course 3D :Mathematics

MSEIV.3 :DIFFERENTIAL EQUATIONS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
By the end of the semester the students will be able to understand the concept of ordinary and partial differential equations, and their uses in solving real life problems.

COURSE CONTENT:

Unit I:
Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form – Reducible to homogeneous form, Linear equations, Bernoulli's equation, Exact equations, Equations reducible to exact equations.

Unit II:
Equations of the first order and higher degree, Clairaut's equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendre's differential equations, Simultaneous differential equations.

Unit III:
Equations which do not contain x, Equation whose one solution is known, Equations which can be solved by changing the independent variable and dependent variable, Variation of parameters, Total differential equation :$Pdx + Qdy + Rdz = 0$, Simultaneous equations of the form $dx/P = dy / Q = dz / R$.

Unit IV:
Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrange's linear equations $Pp + Qq = R$, Standard types of first order non-linear partial differential equations, Charpit's method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

References :

1. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
4. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
7. Differential Equations by Ayres, Schaum Publishing Company.

8. Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co.
9. Differential Equations by Vasishta and Sharma, Krishna Prakashan Mandir.
10. A Textbook of Differential Equations by Mittal, Har Anand Publications

Skill Enhancement Course - SEC 2 Physics

MSE IV.4A : COMPUTATIONAL PHYSICS

Credits: 3 (2L + 0T +1P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics.

- To use of computational methods to solve physical problems.
- To use computer language as a tool in solving physics problems (applications).

COURSE CONTENT:

Unit I: Introduction

Importance of computers in Physics, paradigm for solving physics problems for solution. Algorithms and Flowcharts, Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples (Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal).

Unit II: Scientific Programming

Concept of high level language, steps involved in the development of a Program, Compilers and Interpreters. Development of C, Basic elements of C. Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Data types, Type declaration of variables, Symbolic constants, Arithmetic operators, Increment and decrement operators, Conditional operator, Bitwise operators, Hierarchy, Arithmetic expressions, Logical operators and expressions, Assignment operators, Arithmetical and assignment statements, Mathematical functions, Input/output statements (unformatted/ formatted), Relational operators, Decision making and branching, Go to, if, if…else, switch statements, Looping, While, do and for, Arrays (Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Handling characters and strings, Functions and voids, structures, Pointers (elementary ideas only), File operations(defining and opening, reading, writing, updating and closing of files, Enough examples from physics problems.

Unit III:Scientific word processing

Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. Equation representation: Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors.

Unit IV:Visualization

Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot.

References:

1) S.S. Sastry, Introduction to Numerical Analysis, 5th Edn., 2012, PHI Learning Pvt. Ltd.
2) V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3) Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4) J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5) J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6) F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7) Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8) Leslie Lamport, LaTeX– A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9) Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10) R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11) U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12) K.E. Atkinson, Elementary Numerical Analysis, , 3rd edition, 2 007, Wiley India.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics and to provide hands on training on the Problem solving on Computers.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To print out all natural even/ odd numbers between given limits.
2. To find maximum, minimum and range of a given set of numbers.
3. Calculating Euler number using exp(x) series evaluated at x=1
4. To compile a frequency distribution and evaluate mean, standard deviation etc.
5. To evaluate sum of finite series and the area under a curve.
6. To find the product of two matrices
7. To find a set of prime numbers and Fibonacci series.
8. To write program to open a file and generate data for plotting using Gnuplot.
9. Plotting trajectory of a projectile projected horizontally.
10. Plotting trajectory of a projectile projected making an angle with the horizontally.
11. Creating an input Gnuplot file for plotting a data and saving the output for seeing on the screen. Saving it as an eps file and as a pdf file.
12. To find the roots of a quadratic equation.
13. Motion of a projectile using simulation and plot the output for visualization.
14. Numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
15. Motion of particle in a central force field and plot the output for visualization.

References:

1. S.S. Sastry, Introduction to Numerical Analysis, 5th Edn, 2012, PHI Learning Pvt. Ltd.
2. V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3. Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4. J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5. J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6. F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7. Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8. Leslie Lamport, LaTeX– A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9. Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10. R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11. U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12. K.E. Atkinson, Elementary Numerical Analysis, 3rd edition, 2 007, Wiley India.

Skill Enhancement Course - SEC2 Chemistry

MSE IV.4B : INORGANIC MATERIALS

Credits : 3 (1L + 0T +1P) **Marks: 100**
Contact hrs per week: 3 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 50**

Objectives :

- To understand the production, handling and storage of indusrial gases
- To gain knowledge about the manufacture, application and hazardous in handling the inorganic chemicals
- To know the composition, properties and application of silicate minerals in indusry
- To acquire the knowledge of simple fertilizers, surface coatings, alloys, and chemical explosives

COURSE CONTENT

UNITI : Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate. Industrial Metallurgy - Preparation of metals (ferrous and nonferrous) and ultra pure metals for semiconductor technology.

UNITII : Silicate Industries

Glass: Glassy state and its properties, classification (silicate and non silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, super conducting and semi conducting oxides, fullerenes carbon nanotubes and carbon fiber.

Cements : Classification of cement, ingredients and their role, Manufacture of cement and the settingprocess, quick setting cements.

UNIT III :

Fertilizers: Fertilizers: Different types of fertilizers. Manufacture of the following fertilizers: Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphates; Polyphosphate, Super phosphate, Compound and mixed fertilizers Potassium Chloride, Potassium sulphate.
Surface Coatings: Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electroless), metal spraying and anodizing

UNIT IV:
Alloys: Classification of alloys, Ferrous and Non-Ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, Page 39 of 80 demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.
Chemical Explosive: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction of rocket propellant.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To analyse the chemical composition, properties of simple fertilizer and alloys
- To familiarise with the preparation of inorganic salts, dyes and pigments

COURSE CONTENT:

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Estimation of Cu-Zn in brass
5. Determination of composition of dolomite (by complexometric titration).
6. Analysis of Cu-Ni or (Cu, Zn) in alloy or synthetic samples.
7. Analysis of Cement.
8. Preparation of pigment (zinc oxide).
9. Estimation of Available Oxygen in Hydrogen Peroxide.
10. Determination of phosphoric acid in commercial sample of phosphoric acid.
11. Preparation of chrome alum.
12. Preparation of potash alum from alluminium scarp
13. Preparation of mthyl orange.

References:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, NewDelhi.
3. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
5. A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
6. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New

Skill Enhancement Course –SEC 2 : Mathematics

MSE IV.4C :DATA HANDLING

Credits : 2 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives:
On completion of this course, the students will be able to:

- understand the types of educational data, procedures of data validation and its analysis.
- appreciate the analysis of educational data by using statistical tests.
- Develop skill of using the application software for data analysis and computation of various statistical measures.
- Compute the different statistical measures by using computerized application software.
- Drawing meaningful conclusions based on the interpretation of analysed data.

Unit I: Data Collection- Nature and types of data
Data collection- primary sources and secondary sources; Scales of measurement (NOIR)
Coding: Variable names; Coding responses; Coding open-ended questions
Tabulation, Constructing frequency distribution table, Graphical representation of data – Pie diagram, Histogram, frequency curve.

Unit II : Descriptive Analysis of Data-1
Measures of dispersion – Range; Quartile deviation; Standard deviation; Coefficient of dispersion; Skewness and Kurtosis.

Unit III: Descriptive Analysis of Data-2
Normal Probability Curve – Meaning, Purpose and Applications, Derived Scores (Z & T Scores).
Measures of Reltionships: Meaning of Correlation and Methods of computing correlation - Product Moment Correlation; Rank Difference Method of Correlation

Unit IV: Inferential Statistics

Sampling Procedures –Random sampling, Systematic Random sampling, (with and without repetitions), Stratified random sampling, Cluster sampling, Snow ball sampling.

Hypothesis – Meaning and types; testing of hypothesis – one sample t-test, independent samples t-test, paired samples t-test, Chi-square test.

Practicum:

1. Collect data live – class test scores/ survey data and generate frequency distribution table and represent it graphically.
2. Collect test scores of any school subject of any class and compute Mean, Quartile Deviation and Standard Deviation.
3. Compute coefficient of correlation among language subject papers and core subject papers like – English and History, Mathematics and Science, etc.
4. Study the sampling procedures adopted by taking various school contexts like selecting a team for school reports, team for debate competition, etc.

PROFESSIONAL EDUCATION COURSES

MSE IV.5: LEARNING AND TEACHING

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

The student teacher will be able to:

- Gain the knowledge about the scientific knowledge about the process of learning.
- Understands the Conditions Essential for Facilitating Learning and Retention.
- Apply the Principles and Strategies of Major Approaches to Learning in Classroom Environment.
- Understands the Process of Effective Teaching and Qualities of Effective Teachers.
- Understands various Approaches to Teaching and will be able to apply them in the relevant situations.
- Understands the Principles and Strategies for Creating Conducive Classroom Environment.
- Appreciates the role of a teacher as leader, organizer, a facilitator & a humane reflective practitioner.
- Realize the difficulties in learning and teaching.

COURSE CONTENT

Unit I : Concept and Nature of Learning

Factors Associated with Learning

Maxims of Learning and their Educational Implications
Approaches to Learning(Concept, Associated Concepts Basic Principles and Educational Implications)-Habitual Learning, Associative Learning (Classical and Instrumental Conditioning), Spatial Learning/Cognitive Maps, oMSErvational Learning, Learning by Insight, Information Processing Approach, Humanistic Approach, Constructivist Learning Approach
Types of Learning-Concept Learning, Skill Learning, Verbal Learning, Learning of Principles and Problem Solving (Meaning, Nature, Stages, Principles and Approaches/Strategies)

Unit II

Attention-Meaning, Factors Influencing Attention, Strategies for Enhancing Attention; Perception-Meaning, Laws of Perceptual Organization (Gestalt Psychologists' View) and Educational Implications.
Process of Memory- Sensory Registration, Retention(Storing), Recognition, Recall;

Factors Influencing Retention; Strategies for Enhancing Memory.
Transfer of Learning- Concept, Types, Theories; Strategies for Enhancing Positive Transfer of Learning
Achievement Motivation- Concept, Intrinsic and Extrinsic Motivation; Strategies for enhancing Achievement Motivation in Students.

Unit III: Understanding the process of Teaching-Learning

Teaching as a Profession
Teaching as an Art and Science.
Understanding the Process of Teaching as a Profession
Identifying the need and importance of classroom teaching-learning
Reflective teaching
skillful teaching
Applying the knowledge of Maxims of Teaching
Role of teacher in identifying classroom related problems

Unit IV: Teacher and Teaching as a profession

Various Approaches to Teaching: Behaviourist, Cognitivist, Constructivist, Connectionist, Participatory, Cooperative, Collaborative, Personalized, and Holistic
Teacher as a Facilitator and Guide/Philosopher/Friend
Teachers commitment towards fulfilling Felt Need of Learners
Professional Characteristics of Teacher in Classroom Management.
Skills & Competencies of a TeacherCommunication:Meaning,mode::input/process/output
Basic Model of Communication: Sender, Message, Medium, Receiver & Reach;Factors facilitating communication
Effective Classroom Management-Principles and Strategies
Leadership Qualities in Teachers

Practicum
Conducts Projects on –
Identifying the Learning Difficulties of Students in Different School Subjects and the Possible Reason for them;
Providing Remedial Instruction to the Students with Learning Difficulties;

Study the Qualities of Effective Teachers through oMSErvation, interview, case study etc., Visiting Model Schools and Prepare Reports

References:

- Benjamin S., Bloom et al. (1964). *Taxonomy of educational objectives*. Longman Group.
- Bruce Joyce (1985) *Models of teaching* (2nd ed.) Prentice Hall**.**
- Encyclopaedia of Modern Methods of Teaching and Learning (Vol. 1-5).
- Gage N.L. Scientific Basis of art of Teaching
- Gavriel Salomon (1981) *Communication and education* Sage.
- Lieberman, M. (1956) *Education as a profession*. Prentice Hall, Inc.
- Karthikeyan, C. (2004). *A Text book on instructional technology*, RBSA.
- Kumar, S. (2014). Child Development and Pedagogy, Pearson.
- Ohles, J.F. (1970). *Introduction to Teaching*. New York: Random House, INC.
- Siddiqui, Mujibul Hasan (2005). *Techniques of classroom teaching* A.P.H
- Skinner, E.C.(1984). *Educational Psychology. 4th Edition***.** New Delhi: Prentice Hall of India Pvt. Ltd.
- Snowman & Baihler (2006). *Psychology Applied to teaching*. Boston: Houghton Mifflin Company.
- Stephens, L.M. & Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational psychology*. New York: Holt, Rinehart and Winston, Inc.
- Tanner, L.N. & Lindgren, H.C. (1971). *Classroom Teaching and Learning*. New York: Holt, Rinehart and Winston, Inc.

Web Resources

- Courses on Communication Skills, http://nptel.ac.in/courses/109104030/
- Jane Ciumwari Gatumu, Reflective Teaching, http://oer.avu.org/bitstream/handle/123456789/155/REFLECTIVE-TEACHING.pdf?sequence=1
- School leadership (2011), http://azimpremjifoundation.org/pdf/learning-curve-16.pdf

MSE IV.6 :DRAMA AND ART EDUCATION

Credits: 4 (3L+ 1T +0P) — **Marks: 100**
Contact hrs per week: 5 — **C1 + C2: 50**
Exam Duration: 2 hrs — **C3: 50**

Objectives

The student teacher will be able to:

- Understand the use of 'Drama' as a Pedagogy.
- Use 'Role play' technique in the teaching learning process.
- Understand the importance of dramatic way of presentation.
- Integrate singing method in teaching learning process.
- Understand various 'Dance forms' and their integration in educational practices.
- Use art of drawing and painting in teaching learning process.
- Develop creativity through different creative art forms.
- Understand the efficacy of different art forms in education.

COURSE CONTENT

Unit I : Drama and its Fundamentals

Creative writing – Drama writing, Drama as a tool of learning, Different Forms of Drama Role play and Simulation, Use of Drama for Educational and social change (Street play, Dramatization of a lesson), Use of Drama Techniques in the Classroom: voice and speech, mime and movements, improvisation, skills of oMSErvation, imitation and presentation

Unit II: Music (Vocal & Instrumental)

Sur, *Taal and Laya (Sargam),* Vocal - Folk songs, Poems, Prayers, Singing along with "*Karaoke*", Composition of Songs, Poems, Prayers, Integration of *Vocal & Instrumental* in Educational practices

Unit III: The Art of Dance

Various Dance Forms - Bharat Natyam, Kathakali, Kuchipudi, Yakshagana- Folk dance and various other dances
Integration of Dance in educational practices
(Action songs, *Nritya Natika*)

Unit IV: Drawing and Painting

Colours, Strokes and Sketching- understanding of various means and perspectives, Different forms of painting- Worli art, Madhubani art, Glass painting, Fabric painting and various forms of painting, Use of Drawing and Painting in Education -Chart making, Poster making, match-stick drawing and other forms, Model making – Clay modeling, Origami, Puppet making, Decorative – Rangoli, Ekebana, Wall painting (Mural), Kalameshuthu or any other local art

Transactional Strategies

Lecture cum Discussion for each Unit (Unit 1 to 4) followed by simulated/ authentic practices, Workshop schedule, Slide / Film show, Project work, Demonstration, Simulation, Group work and field trips involving meetings with folk singers and other skilled practitioners will especially form part of the transaction scheme. In addition to the above any one or more of the following:

Practicum

Suggestive List:

1. Developing a script of any lesson in any subject of your choice to perform a Play / Drama.
2. Developing a script for the street play focusing on "Girl's education and Women empowerment".
3. Preparing a pictorial monograph on "Various folk dance of South India.
4. Preparing a pictorial monograph on "Various Classical Dance forms in India".
5. Preparing a calendar chart on "Various Musical Instruments in India".
6. Develop an Audio CD based on newly composed Poems of any Indian language.
7. Preparing some useful, productive and decorative models out of the waste materials.
8. Visit the Faculty of Performing Arts in your city and prepare a detailed report on its multifarious functioning.
9. Development a Review of a theatre programme if possible
10. Organize a competition on some Decorative / Performing Art forms in the school during your School Internship programme and prepare a report on it.
11. Organizing a workshop on some selected Creative Art forms in the school during your School Internship programme and prepare a report on it.

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc.Action research based on teaching learning and school and community could be conducted.**

Evaluation Strategies

Sessional, practicum, unit test project work related presentations.

Suggested Readings

1. Natyashastra by Bharathamuni
2. Deva, B.C. (1981). An Introduction to Indian Music. Publication Division, Ministry of Information and Broadcasting, Government of India.
3. NCERT (2006). Position Paper by National Focus Group on Arts, Music, Dance and Theatre
4. Theory of Drama by A. Nicoll

Web Resources

Position Paper National Focus Group on Arts, Music & Dance, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/art_education.pdf
Arts in school education, (2012), http://azimpremjifoundation.org/pdf/LCXVIII.pdf
Online courses on Arts, http://www.dsource.in/course/index.php
Learning Indicators and Learning Outcomes at the Elementary Stage, (2014), NCERT
http://www.ncert.nic.in/departments/nie/dee/publication/pdf/LI_Final_Copy_Revised_29.12.

14.pdf

MSE IV.7 : School Attachment Programme 2

Credits : 2 | **Marks: 100**
Duration : 3 weeks | **C1 + C2:50**
C3: 50

Objectives:

- To familiarize student teachers with classroom processes and skills employed in teaching-learning process
- To provide field experience of assessment practices including record maintenance and report cards followed in schools at elementary and secondary levels.

COURSE CONTENT:

1. The student teachers will observe minimum 3 classes of regular teachers for understanding the skills and strategies used in teaching by them.
2. The student teachers will take two classes in each pedagogy by integrating various skills of teaching.
3. The student teachers will oMSErve the integrated skills of teaching given by their peers and submit the oMSErvation records. (minimum 3 classes in each pedagogy).
4. The student teachers will visit schools and interact with teachers to know about the assessment practices like CCE, grading patterns and reporting the performance of students and submit the report
5. Students will analyse the assessment records and the report cards to study the models of assessment and procedures followed in reporting students' performance. The students will attend the PTA meetings where feedback about students' performance is given by the teachers and submit the report.

Community Based Activities:

Objectives

- To develop an awareness and understanding of educational status of the community.
- To create an awareness of the implementation of various progrmmes of the government related to school education through field experiences and community participation.

Activities

- The student teachers will visit the local community to study the drop out/ out of school children and the modes of alternative education received by them.
- Organize awareness programmes in the selected community on literacy, human rights, gender sensitization, environmental conservation etc through street play, role play and dramatization.
- To interact with community members like zilla parishat members, SDM and PTA members to study about their participation in school development programmes

Evaluation:

C1 – Report 1
C2 – Report 2

C3 – PPT presentation of community based activities

FIFTH SEMESTER

Core Course 1 E : Physics

MSE V.1 : ATOMIC AND MOLECULAR PHYSICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Physics-I

The Electron: Determination of e/m of an electron by Thomson method, Determination of charge of an electron by Millikan's oil drop method.
Atomic Spectra: Inadequacy of Bohr atomic model, correction due to finite mass of the nucleus, Rydberg constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, relativistic mass correction, vector model of an atom, Electron spin, space quantisation, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

Unit II: Atomic Physics-II

Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valence electron and a brief mention of L-S and J-J coupling for multi electron atoms. Fine structure lines of Sodium Zeeman effect.Explanation of Zeeman effect on the basis of vector model of atom, Expression for Zeeman shift and experimental details. Mention on anomalous Zeeman effect, A qualitative mention of Paschen – Back and Stark effects.

Unit III : Molecular Spectra

Molecular formation, the H_2^+ molecular ion, H_2 – molecule. Salient features of molecular spectra. Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules.Theory of pure rotation and rotation- vibration spectra, Raman and Infrared (IR) spectra, simple applications. UV-Visible, Fourier Transform IR, Nuclear Magnetic resonance (NMR) and Laser Raman spectra of organic molecules and their interpretations.

Unit IV: X-Rays

Electromagnetic spectrum, production of X-rays, X-ray spectra, Continuous X-ray spectra Characteristic X-ray. Duanne and Hunt limit. Moseley's law and its significance, X-ray energy levels.Bragg's law and Bragg spectrometer. A brief mention of different types of crystals. Structures of NaCl and KCl crystals. Compton Effect, Expression for Compton Shift.X-ray diagnostics and imaging

Reference Books:

1. H. S. Mani and G. K. Mehta, Introduction to Modern Physics, Affiliated East-West Press,India, 1990.
2. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
3. J.R. Taylor, C.D. Zafiratos,Modern Physics, M.A. Dubson, PHI Learning, 2009.
4. R.A. Serway, C.J. Moses, and C.A.Moyer, Modern Physics, Cengage Learning, 2005.
5. G. Kaur and G.R. Pickrell, Modern Physics, McGraw Hill, 2014.
6. Rich Meyer, Kennard, Coop, Introduction to Modern Physics, Tata McGraw Hill, 2002.
7. R. Murugeshan and K. Sivaprasath Modern Physics, S. Chand Publisher, 1994.
8. J. R. Reitz, F. J. Milford, and R. W. Christy, Foundations of Electromagnetic Theory, Addison-Wesley; 4 edition, 2008.
9. Banwell and E. Mccash, Fundamentals for Molecular Spectroscopy, McGraw Hill Education; 4 edition, 1994.
10. H. E. White, Atomic Spectra –, MacGraw-Hill, 1954.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Franck-Hertz experiment.
2. Study of sodium lines using discharge tubes.
3. Study of hydrogen lines using discharge tubes.
4. Study of helium lines using discharge tubes.
5. Dissociation energy of Iodine.
6. Hartmann's formula for wavelength.
7. Benzene IR spectrum.
8. Rydberg Constant – Solar Spectrum
9. Excitation of Brass spectrum using Arc method

10. Rutherford model – Simulation technique.
11. Zener diode characteristics.
12. Transistor characteristics and transfer characteristics in Common Base configuration-current gain.
13. Transistor characteristics and transfer characteristics in Common Emitter configuration-current gain.
14. CE Transistor Amplifier-Frequency response.
15. Basic operational amplifier.
16. Energy gap of a semiconductor.
17. Bi-prism experiment.
18. Resolving power of grating.
19. Current balance experiment- the effects of a magnetic field on a current carrying conductor.
20. Resolving power of a telescope.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2EChemistry

MSE V.2 : TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To develop an understanding of Principles of Chemical Kinetics and Surface Chemistry.
- To explain the properties of d and f block elements and their compounds in terms of their electronicconfiguration and bonding.
- To understand the properties of coordination compounds in terms of bonding theories.

COURSE CONTENT:

Unit I: d-block and f-block elements

To relate the electronic configuration to the properties and structure of transition metals and their compounds. Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. Powder metallurgy – extraction of tungsten. Position of lanthanides and actinides in the periodic table, lanthanide contraction and its consequences, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides. General properties of actinides:

Extraction of Thorium, Uranium and Plutonium from burnt nuclear fuels.

Unit II : **Coordination Compounds**

To apply theories that explain certain properties and structure of transition metal complexes. Werner's coordination theory and its experimental verification, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of VBT. Elementary treatment of crystal field theory, splitting of d-orbitals in square planar, tetrahedral and octahedral complexes, factors affecting crystal field parameters, Explanation of magnetic behavior and color of complexes using CFT, effective atomic number concept.Metal carbonyl, 18 electron rule, Preparation, structure and reactions of $Ni(CO)_4$, $Fe(CO)_5$ and $V(CO)_6$, nature of bonding in metal carbonyls.

Unit III: Chemical Kinetics

Understanding the factors that influence a chemical reaction and rationalising them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method. Radioactive decay as a first order phenomenon.

Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy, Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Unit IV :Surface Phenomena

Adsorption: Introduction-Absorption and adsorption(definition, examples and differences) types 0f adsorptions-physical and chemical(definition, examples and differences between them), factors influencing the adsorptionof gases on solids. Adsorption isotherms: definition, Mathematical expression for Freundlich and Langmuir's adsorption isotherms. applications of adsorptions.

Catalysis: Definition, general characteristics, action of catalytic promoters and inhibitors. Homogeneous catalysis (definition and examples),Heterogeneous catalysis(definition and examples) mechanism of hetwerogeneous catalysis(based on adsorption theory) enzyme catalysis (definition and examples) Mechanism of enzyme catalysed reaction(lock and key mechanism)

References :

1. Inorganic Chemistry : James Huhey
2. Essentials of physical chemistry Arun Bahl,B.S. Bahl,G.D. Tuli
3. Concise Inorganic Chemistry J.D.Lee 5th edition,Wiley publishers.
4. Advanced Inorganic Chemistry Satya Prakash G.D. Tuli S.K. Basu, R.D. Madan S.Chand and company pvt. Ltd.
5. Principles of Physical Chemistry Puri,Sharma and Pathania.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To understand the kinetics of chemical reactions
- To familiarise with the analysis of ores
- To prepare and analyse inorganic complexes
- To study the adsorption phenomena

COURSE CONTENT:

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar
8. Colorimetric study of kinetics of oxidation of Indigo carmine by Chloromine-T.
9. To study the adsorption of acetic acid on activated charcoal
10. To determine the relative strength of Hydrochloric acid and sulphuric acid by studying thekinetics of hydrolysis of ethyl acetate.
11. To study kinetically the reaction rate of decomposition of iodine by hydrogen peroxide.
12. Determination of Copper by colorimetric method using ammonia as the complexing agent.
13. Determination of Ferric ion by colorimetric method using potassium thiocyanate as the complexing agent.
14. Estimation of Manganese in pyrolusite by volumetric method
15. Preparation of a complex: potassium trioxalato aluminate(III) trihydrate or potassium trioxalato cobaltate(III)
16. To determine the rate constant for the inversion of sucrose using polarimeter.

References :

1. Advanced practical inorganic chemistry by Gurdeep Raj, Goel Publication House, Meerut-India.
2. Systematic Experiements in chemistry by Arun Sethi, New age International Pvt.Ltd, New Delhi.

Core Course 3E : Mathematics

MSE V.3 : MULTIVARIATE CALCULUS & VECTOR CALCULUS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
To enable the students to understand the concepts of multi-variate calculus and vector clculus, and also to compute the areas of plain regions, surfaces and volume of solids.

COURSE CONTENT:

Unit I:
Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral.

Unit II:
Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula.

Unit III:
Quadratic Curves, surfaces, sphere, cylinder, cone, Ellipsoid, Hyperbloid, Parabloid, Ruled surfaces.

Unit IV:
Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane.

References

1. Calculus by Lipman Bers, Vols 1 and 2.
2. First Course in Calculus by Serge Lang
3. Calculus – Single and Multivariable by Hughes Hallet
4. Calculus and analytic geometry by Thomas and Finny.
5. Advanced Calculus by David Widder

PROFESSIONAL EDUCATION COURSES

MSE V.4 : ASSESSMENT FOR LEARNING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
This course is designed to help student teachers to:

- Understand the nature of assessment and evaluation and their role in teaching- learning process.
- Understand the importance of assessment in continuous and comprehensive manner
- Plan assessment tasks, techniques, strategies and tools to assess learner's competence and performance in curricular and co-curricular areas,
- Devise marking, scoring and grading procedures,
- Analyse, manage and interpret assessment data.
- Devise ways of reporting on student performance
- Develop the skills of reflecting-on and self-critiquing to improve performance.

COURSE CONTENT:

Unit I: Introduction to Assessment & Evaluation

(a) Concept of test, measurement, Assessment, examination, appraisal and evaluation in education and their inter relationships.
(b) Purpose and objectives of assessment/ Evaluation- for placement, providing feedbacks, grading promotion, certification, diagnostic of learning difficulties.
(c) Importance of assessment & evaluation for Quality Education – as a tool in Pedagogic decision making (writing instructional objectives, selection of content, teaching learning resources, methodology, strategies & assessment procedures followed).
(d) Forms of assessment : -
    (i) (Formative, Summative, diagnostic; prognostic, placement; Norm referenced; Criterion referenced based on purpose)
    (ii) (Teacher made tests Standardizedtests: based on nature & scope)
    (iii) (Oral, written, performance: based on mode of response)
    (iv) (Internal, External, self, peer, & teacher, group Vs individual- based on context)
    (v) Based on nature of information gathered (Quantitative, Qualitative)
    (vi) CCE, school based assessment ; Standard Based- based on Approach
(e) Recent trends in assessment and evaluations:
    - Assessment for learning, assessment of learning and assessment as learning; Relationship with formative and summative, Authentic assessment.
    - Achievement surveys- State, National and International; Online assessment; On demand assessment/ evaluation.
    - Focus on Assessment and Evaluation in Various Educational commissions and NCFs

Unit II: Developing Assessment Tools,Techniquesand Strategies -1

(a) Concept of Cognitive, Affective, Psychomotor domain of learning
(b) Relationship between educational objectives learning experiences and evaluation.
(c) Revised taxonomy of objectives (2001) and its implications for assessment and stating the objectives-
  - Knowledge dimensions:- factual, conceptual, procedural and meta-cognition.
  - Cognitive, Affective, Psychomotor domains – Classification of objectives
(d) Stating objectives as learning out comes: General, Specific.
(f) Construction of achievement tests- steps, procedure and uses (Teacher made test/Unit Tests)
  - Constructing table of specifications & writing different forms of questions –(VSA, SA, ET & objective type, situation based) with their merits and demerits; assembling the test, preparing instructions, scoring key and marking scheme; and question wise analysis
(g) Construction of diagnostic test – Steps, uses & limitation; Remedial measures- need types and strategies
(h) Quality assurance in tools – Reliability: Meaning &Different methods of estimating reliability (Test-retest; equivalent forms, split- half); Validity: Meaning &Different methods of estimating reliability (Face, content, construct), Objectivity and Practicability/ Usability
(i) Inter dependence of validity, reliability and objectivity

Unit III: Developing Assessment Tools,Techniquesand Strategies -II

(a) Concept of CCE, need for CCE its importance; relationship with formative assessment and problems reported by teachers and students
(b) Meaning & construction of process-oriented tools- Interview; Inventory; oMSErvation schedule; check-list; rating scale; anecdotal record;
(c) Assessment of group processes-Nature of group dynamics; Socio-metric techniques; steps for formation of groups, criteria for assessing tasks; Criteria's for assessment of social skills in collaborative or cooperative learning situations.
(d) Promoting Self assessment and Peer assessment – concepts and criteria's
(e) Portfolio assessment – meaning, scope & uses; developing & assessing portfolio; development of Rubrics

Unit IV: Analysis, Interpretation, Reporting and Communicating of student's performance

a) Interpreting student's performance
  (i) Descriptive statistics (measures of central tendency & measures of variability, percentages, rank correlation)
  (ii) Graphical representation (Histogram, Frequency Curves)
(b) Grading – Meaning, types, and its uses
(c) Norms – Meaning, types, and its uses
(d) Reporting student's performance – Progress reports, cumulative records, profiles and their uses, Portfolios, Using descriptive Indicators in report cards
(e) Role of feedback to stake holders (Students, Parents, Teachers) and to improve teaching – learning process; Identifying the strengths & weakness of learners.

Sessional Works

1. Discussion on existing assessment practices in schools and submitting the report.
2. Constructing a table of specification on a specific topic (subject specific)
3. Constructing a unit test using table of specifications and administering it to target group and interpreting the result.
4. Construction of any one of the process oriented tools and administering it to group of students & interpreting it.
5. Analysis of question papers:teacher madeandvarious Boards
6. Analysis of report cards-State and Central (CMSE)
7. Analysis of various education commission reports and NCFs for knowing various recommendations on Assessment and Evaluation

References:

1. Ebel, R.L. and Fresbie, D.A. (2009).Essentials of Educational Measurement. New Delhi: PHI Learning PVT. LTD.
2. Garrett, H.E. (2008). Statistics in Psychology and Education. Delhi: Surjeet Publication.
3. Gupta, S.K. (1994). Applied Statistics for Education. Mittal Publications.
4. Mehta, S.J. & Shah, I.K. (1982).Educational Evaluation. Ahmedabad: Anand Prakashan (Gujarati).
5. NCERT (2015) Learning Indicator, New Delhi
6. NCERT (2015) CCE Packages, New Delhi
7. Rani, P. (2004).Educational Measurement and Evaluation. New Delhi: Discovery Publishers.
8. Rawat, D.S. (1970). Measurement, Evaluation and Statistics in Education. New Delhi: New Raj Book Depot.
9. Reynolds, C.R., Livingston, R.B., and Willson, V. (2011).Measurement and Assessment in Education. New Delhi: PHI Learning PVT. LTD.
10. Ten Brink, T.D. (1974). Evaluation – A Practical Guide for Teachers. New York: McGraw Hill Book Co.
11. Thorndike, R.M. (2010). Measurement and Evaluation in Psychology and Education. New Delhi: PHI Learning Pvt. Ltd.
12. Yadav, M.S. and Govinda, R. (1977). Educational Evaluation, Ahmedabad: SahityaMudranalaya.
13. Linn, Robert and Norman E Gronland (2000); Measurement and Assessment in teaching, 8th edition, by Prentice Hall, Inc, Pearson Education, Printed in USA
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi
15. Tierney, R. J., Carter, M. A., & Desai, L. E. (1991). Portfolio Assessment in the Reading – Writing Classroom. Norwood, MA: Christopher-Gordon Publishers
16. Glatthorn, A. A. (1998). Performance Assessment and Standards-based Curricula: the Achievement Cycle. Larchmont, NY: Eye no Education
17. Gredler, M. E. (1999). Classroom Assessment and Learning. USA: Longman.
18. Likert, R. (1932). A technique for the Measurement of Attitudes. Archives Psychology, 40.
19. Mehrens, W. A. & Lehmann, I. J. (1991). Measurement and Evaluation in Education and Psychology (8th ed.): Chapter 10: Describing Educational Data.

20. Oosterhof, A. (1994). Classroom Applications of Educational Measurement (Second Edition). New York: Macmillan College Publishing Company Inc.
21. Payne, D.A (2003).Applied Educational Assessment. Australia: Wadsworth: Thomson Learning.
22. Popham, W.J. (1981). Modern Educational Measurement. New Jersey, Engle Wood Cliffs: Prentice-Hall Inc.
23. Popham, W. J. (2002). Classroom Assessment: What teachers need to know (Third Edition). Boston: Allyn& Bacon.

Web Resources

1. Assessment in school education, (2013) http://azimpremjifoundation.org/sites/default/files/userfiles/files/Issue%20XX%20Section%20C.pdf
2. Compendium of Tools, (2013), CMSE
3 http://cMSE.nic.in/ePub/webcMSE/webcMSE/Revised%20Compendium%20of%20Tools/Revised%20Compendium%20of%20Tools/docs/Revised%20Compendium%20of%20Tools.pdf
4. http://www.cMSE.nic.ib/cce/index.html
5. www.ncert.nic.in
6. http://nroer.in/home/

MSE V.5 : Pedagogy of Physical Science 1

Credits: 4 (2L+ 2T +0P) | **Marks: 100**
Contact hrs per week: 6 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:
Student teachers will be able to

- Explain the nature of science.
- Specify the goals and objectives of science teaching.
- Review the contributions of major scientists.
- Explore several methods of teaching science.
- Apply various theories science learning and analyze the implications for teaching science.
- Review the science curriculum, syllabus, and text books.
- Explore constructivist practices in teaching of science.
- Create unit plans, lesson plans in an artistic and scientific way.
- Explore the inter-relation between science and other subjects.

COURSE CONTENT:

Unit I: Nature of Science

Nature of science -Scientific method, how science works, science as a process and product. Science as a way of thinking: inquiry, oMSErvation, problem-solving, rational thinking, reasoning, science as an empirical body of knowledge.Structure of knowledge: facts, concepts, principles, generalizations, theories.Historical development of physical science with illustrations from topics such as structure of atoms, laws of chemical combinations, stoichiometry, equivalent mass, models of the universe, nature of light, electricity and magnetism etc.Contributions of Indian and international figures in science to the knowledge domain of physical science. Basic branches of physical science and applications of physical science to human life.Evolution of Physical Science as a knowledge field; science and technology; science and society; inter-relation between science and other subjects, sole of science teacher.

Unit II:

a. Aims and learning objectives of Physical Science

Aims of teaching physical science in the school curriculum.

Development of process skills of science, scientific attitude and temper by learning Physics and Chemistry as experimental sciences.

Nurturing curiosity, creativity and aesthetic sense.
Science and society– relating physical science with the natural and social environment and technology, relating science to daily life, social interaction and science.
Values through science teaching-open mindness, objectivity, truthfulness, critical thinking, logical thinking, development of problem solving skill, social learning.
Ethics of using the knowledge of science and technology.

b. Physical Science Curriculum

Recommendations of major commissions in India and policies on science teaching.
The school science curriculum with regard to NCF 2005: major themes in secondary school science.
Brief study of famous curricular reform projects such as Nuffield, STEM, PSSC, Chemical Bond Approach, CHEMSTUDY etc.
Comparison of international secondary schools science syllabus- Singapore, Oxford, CIE (Cambridge).

Unit III: Pedagogical shift, Approaches and Strategies of learning Physical Science

Role of prior knowledge in constructing new knowledge (Ausubel), Piaget's theories of learning (schema- disequilibrium).
Development of concepts in Science- real-life as the basis of conceptions; personal vs. verified knowledge of science. Conceptions, alternate concepts, and misconceptions in science.
Teaching concepts and generalizations, inductive approaches, using advance organizers, problem solving approach, investigatory approach, project method, cooperative learning method.
Vygotsky's theories of role of language and context in learning, Van Glasersfeld's theory. Development of constructivist practices in science teaching, 5E learning model, 7E model, conceptual change model of teaching, challenges in using constructivism in the classroom.
Collaborative learning approach, problem solving approach, concept mapping, experiential learning, cognitive conflict, inquiry approach, analogy strategy.
Facilitating learning: teacher's role as a facilitator, grouping students, multiple learning experiences, discussing ideas, scaffolding, consolidating students' ideas, questioning-techniques and strategies, higher order and metacognitive questioning.
Maintaining positive learning environment. Catering to children with varied needs and abilities, context in learning, gender and science.
Scope and importance inclusiveness in science class room.
Role of learner: each learner as unique individual, involving learner in learning process, role of learner in negotiating and mediating learning, encouraging learner to raise and ask questions.

Unit IV: Planning for Physical science Teaching-learning

Importance of planning, unit plan and lesson plan.
Anderson and Krathwohl's revised Bloom's taxonomy: knowledge domains and cognitive processes, action words. types of knowledge- factual, conceptual, procedural and metacognitive knowledge.
Identification and organization of concepts.
Elements of physical science lesson plan: learning Objectives, introduction, development, assessment, extended learning, assignment.
Designing learning experiences, pre-existing knowledge, selecting approach/strategy, arrangement of teaching learning materials, group learning, formation of groups, organizing activities.
Planning the lesson by using ICT applications and laboratory materials.
Reflective planning; unit plan; developing lesson plans on different topics and through various approaches taking examples form upper primary, secondary and higher secondary stage (physical and chemical changes, redox reaction, light, magnetic effect of electric current, etc.).

Sessional Activities:

- Presentation on historical development of science concepts with a view to understand the nature of science.
- Pedagogical analysis (units for pedagogic analysis: any unit from VIII, IX or X physical science textbook).
- Drawing concept-maps for secondary level concepts.
- Presentation on the contributions of Physicists and Chemists to physical science.
- Readings on curriculum initiatives in secondary science with a special reference to NCF 2005.
- Comparison of different science curricula.
- Lab demonstration/exploration of science experiments.
- Exploring common mis-concepts in Physical Science by oMSErving science classes or interviewing science teachers or using VIII and IX textbooks.
- Stating learning objectives for teaching a topic in science.
- Demonstration of different methods of teaching of Physical Science.
- Experimentation of different methods of teaching of Physical Science.

References :

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSE V.6 : Pedagogy of Mathematics 1

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
On completion of the course the students will have
- understanding of nature of mathematics and its branches
- ability to analyse the relationship of mathematics within itself and with other subjects
- ability to categories mathematical knowledge into factual, conceptual, procedural and meta cognitive knowledge
- Appreciates the contributions made by Indian and other country mathematicians contribution
- ability to apply logical reasoning and problem solving ability in solving various mathematical problems

UnitI: Knowledge about Mathematics
Nature of mathematics- abstractness, preciseness, brevity, language and symbolism; Nature of mathematical propositions; Quantifiers- necessary and sufficient conditions(one and two way); structure of mathematics- undefined terms, defined terms, definitions, axioms, postulates and theorem; mathematical theorem and its variants- converse, inverse and contra positive; Pure and Applied mathematics; branches of mathematics- Arithmetic, algebra, geometry and their diversities; mathematization through- oMSErvation, conjecturing, hypothesing, testing and verifying; creation of conceptual knowledge and its importance; creation of procedural knowledge- derivation of laws/ theorems/ generalizations in mathematics; relationship of mathematics among different branches of science; relationship within and among branches of mathematics; Contribution of Indian and other Mathematician- Aryabhatta, Bhaskara, Ramanujuam, Guass, Euclid, Descarte, Cantor, Pythagarous;
Organization of Mathematical content- horizontal and vertical linkage (within and between classes IX and X); linkage between upper primary, secondary and senior secondary mathematics.

Unit II: Aims and objectives of teaching Mathematics

Aims of mathematics- Cultural, disciplinary, moral, social and utilitarian aims; General objectives of teaching mathematics Vis-a-Vis the objectives of secondary education; Major shifts in classroom teaching (societal and technological influence); characteristics of a good instructional objectives; Writing specific objectives of different content categories in mathematics; Unit plan and Lesson plan-its importance and writing unit plan and lesson plan for mathematics lessons using the format.

Unit III: Strategies for learning mathematical concepts

Nature of concepts, types of concept, process of concept formation; Moves in teaching concepts- a) Exemplar moves- giving examples and non-examples (with or without reasoning); comparing and contrasting ; giving counter example b) Characterization move- definition, stating necessary and/or sufficient condition; concept Attainment Model (Bruner);

Advance Organizer Model (Ausubel); Planning and implementation of strategies for teaching various mathematical concepts(secondary level maths)

Unit IV: Teaching of Generalization

Teaching by exposition- Moves in teaching generalization:- Introductory move, focus move, objective move, motivation move, assertion move, application move, interpretation move, justification move; Planning for expository strategies of teaching generalization.

Teaching by guided discovery- nature and purpose of learning by- discovery, inductive, deductive, guided discovery strategies; maxims for planning and conducting discovery strategies; planning strategies involving either induction or deduction or both.

Sessional work:

Analysis of secondary level mathematics text books to identify various categories of mathematical knowledge presented and its horizontal and vertical linkage among 8, 9 and 10 standard text books.

Analysing the structure of mathematics present in selected chapter/unit.

Writing a unit plan for selected unit

Writing of specific instructional objectives for selected unit

Writing a lesson plan on selected content area

Writing a plan for teaching a concept of a generalization using the appropriate moves to teach them.

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc
6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education,Syndey, Croom Helm Australia Pty Ltd
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal publications Pvt Ltd

SIXTH SEMESTER

Core Course 1F : Physics

MSE VI.1 : CLASSICAL & QUANTUM MECHANICS AND SPECIAL THEORY OF RELATIVITY

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives: To enable students to understand the essentials of classical mechanics, quantum mechanics, quantum statistics and relativity.

COURSE CONTENT:

Unit I: Lagrangian formulations of Classical Mechanics

Constraints- sclerenomic and rheonomic constraints, holonomic and non holonomic constraints, Generalized co-ordinates and velocities, Principle of virtual work, D'Alembert's principle, Euler- Lagrange equations, Cyclic co-ordinates, Conservation laws and symmetry properties, applications of Lagrangian formulation (simple pendulum). Canonical momenta & Hamiltonian of a system. Hamilton's equations of motion. Hamiltonian for a harmonic oscillator.

Unit II: Special Theory of Relativity

Galilean transformation, Earth as an inertial frame of reference, Constancy of speed of light, Ether hypothesis, Michelson-Morley experiment, Postulates of Special Theory of Relativity, Lorentz transformations. Simultaneity and order of events. Length contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.

Unit III: Origin of Quantum Theory

Qualitative discussions on inadequacies of Classical Physics– black body radiation and photoelectric effect, Planck's hypothesis and explanation of black body radiation, Einstein's explanation of photoelectric effect with derivation, Wave-particle duality, de Broglie's hypothesis of matter waves, concept of group velocity and phase velocity and their relationship, experimental evidence for matter waves– Davisson and Germer experiment, electron diffraction experiment. Uncertainty Principle.

Unit IV: Development and application of Schrodinger Equation

Wave function, interpretation of wave function, postulates of quantum mechanics, probability density, Eigen functions and eigen values, expectation values, Normalization of wave functions, development of time dependent and time independent Schrodinger wave equation, operator method of deriving Schrodinger equation. Applications of Schrodinger wave equation– one dimensional infinite potential well, finite potential well, phenomenon of tunneling, one dimensional harmonic oscillator, hydrogen atom (only qualitative discussion).

Reference Books:

1. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
2. H.Goldstein, C.P. Poole, J.L. Safko, Classical Mechanics 3rd Edn., Pearson Education, 2002.
3. L. D. Landau and E. M. Lifshitz, Mechanics, Pergamon, 1976.
4. P.S. Joag, N.C. Rana, Classical Mechanics 1st Edn., McGraw Hall.
5. R. D. Gregory, Classical Mechanics, Cambridge University Press, 2015.
6. L. I. Schiff, Quantum Mechanics, 3rd Edn., Tata McGraw Hill, 2010.
7. R. Shankar, Principles of Quantum Mechanics 2nd edition, Springer, 2014.
8. David J Grififth, Introduction to Quantum Mechanics, Addison Wesley; 2 edition, 2004.
9. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
10. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
11. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
12. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Stefan's constant.
2. Planck's constant using LED's (3no.s).
3. Absorption spectra.
4. Photoelectric effect.
5. Variation of resistance with temperature of copper wire (10 mts).
6. Laser Diffraction.
7. Laser-wavelength using transmission grating.

8. Photo conductivity using LDR.
9. Photovoltaic cells.
10. Numerical aperture of an optical fibre by semiconductor laser.
11. BG Absolute Capacity.
12. BG-High resistance by leakage method
13. BG Mutual inductance
14. e/m of electron.
15. Verification of inverse square law for light using photodiode.
16. Diffraction of light. Determination of wavelength λ.
17. Characterization of photo diode.

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2FChemistry

MSE VI.2 :ORGANIC CHEMISTRY – II

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:
To develop an understanding of the chemistry of Functional groups and mechanism of Organic Reactions.

COURSE CONTENT:

Unit I: Alcohols and Phenols
Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).

Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols-oxidative cleavage [$Pb(OA_c)_4$ and HIO_4] and Pinacol-pinacolone rearrangement.
Trihydric alcohols: Nomenclature and methods of formation(from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI).
Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2- naphthols (one method each). Physical properties and acidic character of phenol. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit II: Carbonyl Compounds
Aldehydes and Ketones
Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic addition to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketones. An introduction to σ, β unsaturated aldehydes and ketones.

Carboxylic Acids and their Derivatives
Nomenclature, structure and bonding. Preparation of carboxylic acids – by oxidation, using Grignard reagents and hydrolysis of nitriles. Physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Reactions of carboxylic acids: HVZ reaction, synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions hydroxy acids – malic, tartaric and citric acids.

Unsaturated monocarboxylic acids: Methods of formation and chemical reactions
Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.
Carboxylic acid derivatives: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acid, base conditions).

Unit III: Organic synthesis via Carbanions

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of α – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; α,β – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.
Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; α, β – unsaturated acids – crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes, Alkylation and acylation of enamines.

Unit IV: Organic Compounds of Nitrogen

Nitro Compounds: Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Aliphatic and Aromatic amines: Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsberg's method). Structural features effecting basicity of amines. Amine salts as phase – transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts and azo coupling.

References :

1. Advanced organic chemistry Arun Bahl and B.S. Bhal
2. Organic Chemistry:Reagents and Reactions Agrawal, Goel Publishing House 53rd edition 2015
3. Organic Chemistry John Macmumy 9th Edition 2016.
4. Organic Chemistry J.Clayden,N.Greeves and S.Warren 2nd Edition 2012 Oxford University Press.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

- To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification
- To develop skills of separation techniques

COURSE CONTENT:

1. Qualitative organic analysis

1. Separation of organic mixtures containing two solid components using water , $NaHCO_3$, NaOH

2. Analysis of an organic compound: Detection of extra elements (N,S and X) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides) in simple organic compounds. Identification of organic compound based on functional group analysis, determination of physical constant (mp / bp).

2. Chromatographic Techniques

(i) Thin Layer Chromatography

(a) Determination of R_f values and identification of organic compounds:

(b) Identification of plant pigments by thin layer chromatography

(c) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone using toluene : light petroleum (2:3 ratio)

(d) Separation of mixture of dyes

(ii) Paper Chromatography

Determination of R_f values and identification of organic compounds:

(a) Separation of mixture of amino acids

(b) Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water 4:5:1) ; Spray reagent: anilinehydrogenphthalate

(iii) Column Chromatography

Separation and identification of ortho and para nitro anilines

References :

1. A Text Book of Qualitative Organic Analysis, A I Vogel
2. A Text Book of Quantitative Organic Analysis, A I Vogel
3.Systematic experiments in Chemistry Arun Sethi, New Age International(P) Ltd.

Core Course 3F Mathematics

MSE VI.3 :GROUPS AND RINGS

Credits: 4 (3L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

By the end of the semester the students will be able to develop understanding of the abstract concepts of groups and rings, and special classes of rings and to appreciate modern mathematical concepts.

COURSE CONTENT:

Unit I:

Groups, Examples, Properties and types, Sub-groups. Cyclic groups and properties, Cosets, Lagrange's theorem and its Consequences, Dihedral groups, Normal subgroups, Quotient groups.

Unit II:

Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, , Fundamental theorem of Homomorphism, Cauchy's theorem for abelian groups, Permutation group, Alternating Group, Cayley's Theorem.

Unit III:

Rings, Integral Domains, Division Rings, Fields, Properties, Field of quotients. Ideals, Quotient rings Maximal, Prime and Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

Unit IV:
Homomorphism of a ring, Kernel, Isomorphism, Fundamental theorem of Homomorphism, Polynomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorisation Theorem, Eisenstein'sCriterion of irreducibility.

References :

1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
3. Modern Algebra by Vasishtha, Krishna Prakashan Media Pvt. Ltd.
4. Higher Engineering Mathematics by Kreyszig, Wiley
5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
6. Basic Abstract Algebra, 2nd Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.
7. Modern Algebra – An Introduction by Durban, 5th Edition, Wiley.
8. Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
9. A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

PROFESSIONAL EDUCATION COURSES

MSE VI.4 : CRITICAL UNDERSTANDING OF ICT

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives
On completion of the course the students will be able to:

- Appreciate the historical, current and future trends in ICT and its implications to education
- Explain the meaning of ICT and its application in Education
- Demonstrate an understanding of the computer hardware and software fundamentals
- Use various digital hardware and software for creating resources and providing learning experiences
- Use a word processor, spread sheet, drawing and presentation software skillfully and intelligently to produce various teaching learning resources for educational use
- Use internet technologies efficiently to access remote information, communicate and collaborate with others
- Model collaborative knowledge construction using various web 2.0 tools and technologies
- Design and develop technology integrated learning experiences using ICT tools
- Develop skills in using various e-learning and e-content tools and technologies

- Plan, develop, and use multimedia based learning content using open source authoring software
- Use ICT for designing learning experiences using innovative pedagogical approaches
- Explain the role of ICT in authentic and alternative assessment
- Understand the social, economic, security and ethical issues associated with the use of ICT
- Appreciate the scope of ICT for improving the personal productivity and professional competencies
- Appreciate the use ICT in improving educational administration
- Explain the emerging trends in information and communication technology

COURSE CONTENT:

Unit I: ICT and Education

Information and Communication Technology: meaning and nature. Learning theories and its implications for ICT integration in education. National ICT policy, curriculum and schemes

Historical account of the development of various educational media (audio, print, video, storage, display, projection)

Role of technology in emerging pedagogical practices. Visual literacy, media literacy, and new media literacy

Computer hardware fundamentals, computer network-LAN, WANand Internet. Software – meaning and types: proprietary software and open source software, System software and application software

Emerging Trends in ICT and its educational applications: Augmented reality, e-books and rhizomatic learning, learning analytics, ubiquitous computing and mobile learning, Game based learning, cloud computing and software as service, 3D printing, and marker space

Unit II: E-content and e-resources

Educational applications of word processing, spreadsheet, presentation, and drawing tools – diagrams, concept maps, timelines, flow charts.

Reusable Learning Objects (RLO), e-content standards, authoring tools- open source and proprietary alternatives

Multimedia: meaning and types, multimedia tools-audio editing, video editing, screen casting, graphic editing, basics of animation, and creating interactive media. Evaluation of multimedia resources.

Open Educational Resources – Meaning and importance, various OER initiatives, creative common licensing

Locating internet resources – browsing, navigating, searching, selecting, evaluating, saving and bookmarking

Use of digital still and video camera, digital sound recorder, scanner, printer, interactive white board, visualizer, and multimedia projector for creating and using multimedia resources

Unit III: ICT and Pedagogy

Techno pedagogical content knowledge (TPCK). Approaches to integrating ICT in teaching and learning

Web 2.0 tools for creating, sharing, collaborating, and networking: Social networking, social book marking, blog, wiki, instant messaging, online forums/discussion groups and chats, and media streaming.

E-learning: concept, types, characteristics, e-learning tools and technologies, Learning Management Systems (LMS)

Subject specific ICT tools for creating and facilitating learning. Designing technology integrated authentic learning designs and experiences
ICI integrated Unit plan – Web 2.0 for creating constructivist learning environment
Technology for pedagogical innovations: web quest, PBL, virtual tours, MOOC, flipped classroom
Assistive technology for special needs and inclusion: tools and processes, ICT and Universal design for Learning (UDL)

Unit IV: ICT for Assessment,Management, and professional development
ICT and Assessment**:** e-portfolio, electronic rubrics, online and offline assessment tools – rubrics, survey tools, puzzle makers, test generators, reflective journal, and question bank.
Use of web 2.0 tools for assessment,
ICT for professional development - tools and opportunities: electronic teaching portfolio, web 2.0 technologies, technology and design based research, ICT for self-directed professional development, web conferencing, role of OER and MOOCs
ICT for personal management: email, task, events, diary, networking. ICT for educational administration: scheduling, record keeping, student information, electronic grade book, connecting with parents and community, school management systems.
Managing the ICT infrastructure: software installation, troubleshooting of hardware, seeking and providing help, storage and backup, updating and upgrading software

Computer security: privacy, hacking, virus, spy ware, misuse, abuse, antivirus, firewall, and safe practices, fare use and piracy

Sessional Work

1. Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices
2. Using word processor, spread sheet, drawing and presentation software to produce various teaching learning resources and sharing it online
3. Locating internet resources – navigating, searching, selecting, saving, evaluating(use standard internet evaluation criteria), and bookmarking using social bookmarking
4. Creating digital concept maps, flow charts, timelines, and other graphics for a particular content
5. Creating screen cast video and podcast of a lesson
6. Shooting, editing, and sharing of videos segment on any educational topic
7. Creating account in YouTube/slide share and sharing the video/presentation. View and comment on others contributions
8. Creating account in wikispace/wikipedia/mediawiki and adding/editing content
9. Developing an educational blog in www.blogger.com, www.wordpress.com, or www.edublog.com
10. LMS experience- hands on various features of LMS – the ICT course may be provided through LMS
11. Enrolling and completing some MOOC courses of interest
12. Creating resources for flipped classroom and Practicing flipped learning in school during internship
13. Evaluating OER resources. Creating and sharing OER materials- may be in NROER
14. Developing technology integrated unit/lesson plan and trying out this in the school during internship
15. Hands on experience on subject specific software tools like Geogebra, PhET
16. Developing a multimedia e-content for a topic using eXe Learning

17. Field visit to the Edusat center and take part in teleconferencing
18. Planning and creating digital rubrics for any topic and create an e-portfolio
19. Organize web conferencing using Skype or any other tools
20. Review of ICT labs (plans and equipments/resources) in school from internet
21. Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
22. Readings on emerging ICT trends in education
23. Review of national ICT policy and curriculum
24. Using FOSS tools for timetabling, grade sheet

References:

1. Andrew A Kling(2010).Web 2.0 (Technology 360). Lucent Books : New Delhi.
2. Andrew M. St. Laurent. (2004). Understanding Open Source and Free Software Licensing. Oreilly:Cambridge
3. Athanassios Jimoyiannis (Editor) (2011). Research on e-Learning and ICT in Education. Springer: USA
4. Barbara B. Levin, Lynne Schrum.(2012). Leading Technology-Rich Schools (Technology & Education, Connections (Tec). Teachers College Press: New York
5. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi
6. Bruce M. Whitehead, Devon Jensen, Floyd A. Boschee.(2013). Planning for Technology: A Guide for School Administrators, Technology Coordinators, and Curriculum Leaders.Corwin:New Delhi
7. Cabmbridge, D.(2010).E-Portfolios for Lifelong Learning and Assessment.John Wiley and Sons
8. Christopher Moersch(2009). Beyond Hardware-Using Existing Technology to promote Higher-Level thinking. Viva Books: New Delhi.
9. Conrad, Keri (2001). Instructional Design for Web based Training. HRD Press
10. Costantino,P.M., DeLorenzo,M.N., Kobrinski,E.J.(2006).Developing a professional teaching portfolio: a guide for success. Pearson
11. Crumlish Christian (1999). The Internet No Experience Required. BPB Publications: New Delhi
12. Curtis J. Bonk (2011).The World Is Open: How Web Technology Is Revolutionizing Education. Jossey- Bass: San Fransisco
13. Imison,T., Taylor,P.H.(2001). Managing ICT in the Secondary Schools. Heinemann:Oxford
14. James,K.L. (2003). The Internet: A User’s Guide. Prentice Hall of India Pvt.Ltd: New Delhi
15. Jane Hunter (2015).Technology Integration and High Possibility Classrooms: Building from TPACK
16. Jean-Eric Pelet (2014).E-Learning 2.0 Technologies and Web Applications in Higher Education (Advances in Higher Education and Professional Development (Ahepd)).Idea Group: U.S.
17. Liz Arney (2015.)Go Blended!: A Handbook for Blending Technology in Schools
18. Loveless Avril(2001). ICT-pedagogy and the curriculum-Subject to change.RoutledgeFalmer: London.
19. Lynne Schrum, Barbara B. Levin. (2010).Leading 21st-Century Schools: Harnessing Technology for Engagement and Achievement. Corwin: New Delhi
20. ManojkunarDash(2010). ICT in teacher development. Neelkamal Publications: New Delhi.

21. Mary Webband Margaret Cox (2014). Information and Communication Technology-Assessment for Learning in the ICT Classroom (Inside the Black Box).Learning Sciences :US.
22. M. D. Roblyer, Aaron H. Doering (2012). Integrating Educational Technology into Teaching (6th Edition)
23. Michael Thomas (2009). Handbook of Research on Web 2.0 and Second Language Learning. Information Science Reference: US.
24. Rena M. Palloff, Keith Pratt (2011).The Excellent Online Instructor: Strategies for Professional Development. Wiley: San Francisco
25. Ronghuai Huang and Kinshuk(2014). ICT in Education in Global Context: Emerging Trends Report 2013-2014 (Lecture Notes in Educational Technology). Springer: New York.
26. Rosemary Papa.(2010).Technology Leadership for School Improvement. Sage:New Delhi.
27. Sarkar, S.K. & Gupta, A.K.(1998). Elements of Computer Science. S.Chand& Company: New Delhi
28. Semenov, Alexy (2005). Information and Communication Technologies in Schools. A handbook for Teachers. UNESCO
29. ShalinHai-Jew. (2012). Open-Source Technologies for Maximizing the Creation, Deployment, and Use of Digital Resources and Information. Information Science Reference:USA
30. Theodore Lee(2008). Professional Development of ICT Integration for Teachers.VDM Verlag : Germany.
31. W.J. Pelgrum and N.Law(2003). ICT in Education around the world-Trends ,Problems and Prospects . UNESCO : Paris.
32. Viva Lachs (2000). Making Multimedia in the Classroom-A Teacher's Guide. Routlegde Farmer :London.

MSE VI.5: PEDAGOGY OF PHYSICAL SCIENCE 2

Credits: 4 (2L+ 2T +0P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

- Enable the students to write the unit plans and lesson plan as per the norms of NCF 2005.
- Applying the different teaching methods based on a constructivist point of view.
- Enable the students to oMSErve the lesson systematically.
- Selecting the learning resource and effective use of the same.
- Using of ICT in physical science teaching and learning.
- Explore various assessment strategies for evaluating learning in Physical science.
- Explore various professional development opportunities.
- Plan and conduct action research in secondary schools.
- Identify various teaching- learning resources.
- Develop skills of facilitation as they teach in simulated situations.
- Reflecting the methods in the class.

Unit I: Learning Resources in Physical Science

Print resources: Textbook as a learning resource, criteria for evaluation of a textbook, handbooks, teacher resource books, laboratory manuals, science journals and magazines, encyclopedia, newspaper.

Dale's cone of experience and its use in teaching- learning.

Developing and using resources such as charts, models, science kits, posters, science parks.

Science laboratories: designing, management, and safe practices.

Making low-cost equipment from locally available resources, using the immediate environment and the community resources for teaching of physical science.

Exploring and using digital resources: websites, videos, games, simulations, mobile apps, presentations, OER, interactive multimedia resources, e-books, podcasts, digital concept maps, and digital graphics.

ICT integration in physical science teaching: different forms of ICT and its application in science education.

Unit II: Need and Importance of Assessment for Learning Physical Science

Learning standards in science, process and product assessment in Physical Sciences, importance of metacognition and reflection in assessment, importance feedback in facilitating learning.

Meaning of the terms test, examination, measurement, assessment and evaluation in proper context, Continuous and Comprehensive Evaluation (CCE) and its features.

Assessment and evaluation as intertwined process of classroom experiences performance based assessment, planning assessment framework, Learning Indicators (Lis) and its types, developing LIs for activity, presentation, group work, assignments etc.

Recording and reporting of learning evidences – measurement of students' achievement – marks and grading.

Unit III: Tools and Techniques Assessment for Learning Physical Science

Tools and technique of assessment-- assessment of written and oral work, project work, laboratory work, field trips, journal writing, concept map; assessment of learners with special needs.

Use of oMSErvation, questioning, concept mapping, rating scales, worksheets, reflective journals/diary, peer and self-assessment in physical science.

Use of rubrics, and portfolio assessment in Physical Science, diagnosing learning difficulties and misconception in Physical Science.

Use of ICT in assessment.

Constructing different types test items in Physical Science at different levels of taxonomy, preparation of blue print/table of specification and constructing unit test.

Unit IV: Professional development of Physical Science teachers

Professional competencies of a physical science teacher.

Need for updating content and pedagogical competencies, pre-service and in-service courses and initiatives, agencies to nurture the best teachers, NCERT activities for teachers.

Participation in science fairs, exhibitions, and science club activities

Planning contextual activities- celebration of science day, birthdays of great physicists and chemists, seminars, conferences, online sharing, distance learning, membership to organisations- NSTA, IPA, IAPT, Indian Chemical Society, INSC. NCERT publications and journals

Meaning, nature, scope, designing and implementing innovative approaches to teaching science.
Teacher as a Researcher: meaning of research and its importance, action research versus research, selecting the problem for action research, format of research plan, action research in physical sciences, steps in action research, examples of action research from the primary, secondary, and higher secondary levels.

Sessional Activities:
(Any TEN from the following)

- Design and development of unit test.
- Developing rubrics for laboratory work, assignment, field trip, project etc.
- Facilitating the development of digital portfolio by a couple of school students.
- Designing and implementing science lab experiments.
- Text book analysis for content organization/ validness of curriculum mentioned in NCF 2005.
- Analysis of process skills and planning lessons for developing process skills.
- Identifying, selecting, and evaluating various media for chosen unit.
- Case studies of successful teacher leaders.
- Presentation and discussion on sample action research studies.
- Planning and conducting an action research.
- Debates on various ethical issues.
- Visit to a special school, oMSErvation of inclusion strategies in regular classroom.
- Development of teaching portfolio.
- Analysis of teacher competency framework of various organization.
- Study of a science professional organization.
- Review of an action research article/teaching of Physical science related research article.
- Organizing a science exhibition.
- Formation of a science club and conducting various activities.
- School visit to study the CCE practice.
- Conducting field trips to science muesuem, science park, botanical garden.
- Writing unit plan for at least 2 units of secondary science.
- Writing lesson plan for at least 2 topics of secondary science.
- Classroom Experience 2: Classroom OMSErvation for studying teacher's facilitation skills and how student work is distributed (with emphasis on pedagogical aspects-strategies/materials used).
- Preparing and demonstrating low cost/improvised teaching aids based on Class VII, VIII and IX class Physical Science.
- Simulated teaching of class VII-X topics.
- Developing and analysing a Physical Science achievement test.
- Develop an assessment rubric in Physical Science.
- Visit to a Science museum / Science park /Science teacher resource centres.
- Organize a seminar related to Science day. Developing an action research plan for teaching-learning Physical Science.

References:

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSE VI.6 : PEDAGOGY OF MATHEMATICS 2

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

On completion of the course the students will have

- understanding of nature of teaching proof and problem solving in mathematics
- ability to analyse the purposes of teaching algebra and geometry
- ability to select suitable tools for mathematical construction and measurements
- Appreciates the usefulness of mathematics in day today activity in various fields
- adopt different strategies to meet the diversified needs of learners and appreciates the availability of various learning resources in mathematics
- Decision making ability to use appropriate assessment tools for mathematical assessment

COURSE CONTENT:

Unit I : Teaching of Proof and Teaching of Problem-solving

Meaning and nature of Proof; kinds of proof- direct, proof by mathematical induction, proof by contradiction, proof by contrapositive, proof by cases, proof by counter examples ; planning and teaching of various theorems in mathematics (secondary level)

Problem-solving

Definition of problem, problem solving; Meaning and nature of PrOblem solving, strategies of problem solving- Means-ends analysis, backtracking, backward movement, heuristics; Polya's Problem solving steps; solving various mathematical problems

Unit II: Teaching of Algebra and Geometry

Introduction of basic ideas of algebra- variable, constant, coefficient, expression, equation; nature and purpose of teaching algebra; Contextualization of practical situation into algebraic expressions or equations(mathematization); solving various algebraic relations problems of secondary level.

Nature of geometry; purpose of teaching geometry; construction of different geometrical figures; Role of geometry in comprehending mathematics as whole; developing skills in selecting, drawing, using appropriate geometrical instruments and its utility in real life situation; scale drawing; topology and its application in mathematics.

Unit III: Meeting diverse needs of learners (Gifted and Slow learners) and Learning resources in mathematics

Gifted child in mathematics- their characteristics, identification and enrichment programmes slow learners in mathematics- their characteristics, identification and remedial measures; overcoming dyscalculia and dysgraphia problems in mathematics and their remediation.

Creation of **visual aids**-charts, models, graphs; usage of **graphical tools**- calculator, logo, cabri, geogebra, sketch pad, ready reckoners; selection and integration of tools in relation to content and learning environment; **Audio-visual aids**- animations, film shows; mathematics lab; mathematics club; e-resources and open and free software; **community resources**-library, museum, theatre, knowledgeable person or experts

Unit IV: Assessment of learning in mathematics

Selection of appropriate tools for formative and summative assessment; diagnosing the learning difficulties of learners (Error analysis- procedural errors, conceptual errors, computational errors) and providing remedial measures (Peer tutoring, direct instruction, mentoring); creation of rubric, portfolios, Criterion reference test, Norm referenced test based on set criteria; construction, administration, scoring, interpretation of a unit test and providing feedback to learners.

For all the Pedagogical transactions the following content knowledge (8^{th}, 9^{th} , 10^{th}, 11^{th}, and 12^{th} standard syllabus) to be made use of, and these can be revised as per the change in curriculum of respective state or changes in CMSE syllabus or in NCERT text books.

Arithmetic: Number system, Ratio and Proportion, Fractions, Commercial mathematics and Data handling, sets, Matrices

Algebra: Polynomials, Graphical representations of various equations, trigonometry,

Geometry: Lines and angles; Triangles and its related theorems; polygons; analytical geometry,

Differential calculus; Integration, Trigonometry; graph theory; computing using ICT.

Sessional work:

Selecting any one of the theorem and teaching it by adopting the strategies of teaching proof
Selecting any one kind of problem in mathematics and demonstrate its procedure of solving
Selecting a topic in algebra or in geometry and teaching it using appropriate learning resources
Construction of unit test (administration, scoring, statistical analysis and reporting) on a selected unit
Analysing the errors committed by learners at secondary level, in regular test (FA1or FA2) and analysing its causes and suggesting various remedial measures for it

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc

6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education, Syndey, Croom Helm Australia Pty Ltd
10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal Publications Pvt Ltd

SEVENTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

DSE 1 A : Physics

MSE VII.1 : NUCLEAR AND PARTICLE PHYSICS

Credits: 3 (1L + 1T +1P)
Contact hrs per week: 5
Exam Duration: 2 hrs

Marks: 100
C1 + C2: 50
C3: 50

Objectives:
To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Nucleus
Nuclear structure, Failure of proton-electron hypothesis– neutron, its discovery and properties, Proton-neutron hypothesis, Constituents of nucleus and their Intrinsic properties, Basic properties of nucleus– charge, spin, radii, mass, magnetic moment. Nuclear forces and their characteristics. Yukawa's Theory (Qualitative), Packing fraction and binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, Nuclear stability, Segre chart.

Unit II: Nuclear Models

Nuclear Models– Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Unit III: Radioactivity

Review: Radioactive decay – Half life, mean life, Activity-decay constant. Radioactive displacement laws. Theory of α decay, α-emission, Gamow factor. Geiger-Nuttal law. Beta decay, energy kinematics for Beta decay, positron emission Beta spectra. Neutrino hypothesis, K electron capture, internal conversion, Gamma decay, pair production, successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions, nuclear fission and fusion. Energy liberated in nuclear fission, energy production in stars, Nuclear reactors.

Unit IV:

Particle Accelerators and Detectors: Cockroft– Walton voltage multiplier, LINAC, Cyclotron, Betatron.
Nuclear Detectors: GM counter, scintillation detector, bubble chamber, principle of semiconductor detector.
Particle Physics: Particles and anti-particles, Classification of particles, Symmetries and Conservation Laws, Qualitative introduction to quarks, Structure of hadrons.

References:

1. I. Kaplan, Nuclear Physics, Narosa, 2002.
2. Kenneth S. Krane, Introductory nuclear Physics, Wiley India Pvt. Ltd., 2008.
3. Bernard L. Cohen, Concepts of nuclear physics, Tata Mcgraw Hill, 1998.
4. Subramanyam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.
5. R.A. Dunlap, Introduction to the physics of nuclei & particles, Thomson Asia, 2004.
6. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
7. D. Griffith, Introduction to Elementary Particles, John Wiley & Sons, 2008.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. GM Counter characteristics.
2. GM Counter– Absorption coefficient.
3. Determination of Half life of Co-60.
4. Simulation experiment on radioactive decay.
5. Verification of inverse square law for beta rays.
6. Verification of inverse square law for gamma rays.
7. Rutherford model– Simulation technique.
8. Ionization potential of Xenon.
9. Measurement of Mercury spectrum wavelength.
10. Spectrometer-Quartz prism-Refractive indices of quartz for the ordinary and extra-ordinary rays.
11. LCR Parallel resonance
12. LCR Series resonance.
13. FET characteristics.
14. Hartley oscillator.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2AChemistry

MSE VII.2 : ELECTROCHEMISTRY AND PHOTOCHEMISTRY

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- Explain the nature of Electrolytic conduction involving theories of electrolytes.
- Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.
- To have knowledge about the commercial cells and their applications
- To obtain information about the basic photophysical and photochemical processes

COURSE CONTENT:

Unit I: Electrochemistry – I

To study the behaviour and reactions of ions in a variety of environments through the laws that govern them. Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

Applications of conductivity measurements : Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit II: Electrochemistry – II

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-metal insoluble salt, Amalgam and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes– standard electrode potential, sign conventions, electrochemical series and its significance.

To draw up a scheme for discussing the equilibrium position for an ionic reaction in terms of the electrode potential. Electrolytic and Galvanic cells–reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), Chemical cells with and without transport.

Unit III : Electrochemistry – III

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods, polarization, over potential and hydrogen over voltage Power storage, Lead Battery,Ni-Cd cells, Fuel Cells, Hydrogen–Oxygen cell. Thermodynamic and Kinetic basis of corrosion, methods of inhibition of corrosion

Unit IV : Photochemistry

Discussing the Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram showing various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radioactive processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples), Chemiluminescence.

References :

1. Photochemistry Gurudeep Raj Goel Publishing House
2. Principles of Physical Chemistry Puri, Sharma, Pathania 47th Edition
   Vishal Publishing Co.
3. Elements of Elecrochemistry by Samuel Glasstone and Lewis
4. Principles of Physical chemistry -Marron and prutton

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the elecrical behaviour of weak and strong electrolytes
- Quantitative estimation of electrolytes by conductometric and potentiometric titration

COURSE CONTENT:

1. To determine the equivalent conductance of a strong electrolyte at several concentrations and verify Onsager's equation.
2. Conductometric titration of a strong acid Vs. strong base, strong base Vs. weak acid, strong base Vs mixture of acids (strong and weak) to determine the concentration of acids in a given solution and in mixture.
3. To determine the concentration of the given acid solution and concentration of acids in a mixture by potentiometric titration using sodium hydroxide solution.
4. Determination of Pka value of a weak acid by potentiometry.
5. Determination of the dissociation constant of a weak acid by conductometry
6. To determine the equivalent conductance of a weak electrolyto at different concentrations and verify Ostwald's dilution law.Also to find out the dissociation constant of a weak electrolyte.
7. To determine the solubility and solubility constant of a weak electrolyte conductometrically.
8. To find the composition of the complex formed between iron(III) and salicylic acid by Job's method.
9. To find out the amount of copper sulphate in the given solution by titrating with standard alkali by conductometry.
10. To determine the amount of FAS in the given solution by potentiometric titration with standard potassium dichromate and potassium permanganate solutions.
11. Estimation of Silver nitrate by potentiometric titration with standard potassium chloride solution.

References :

1.Systematic experimentas in chemistry Arun Sethi New Age International (P) Ltd New Delhi.

DSE 3AMathematics

MSE VII.3 :LINEAR ALGEBRA

Credits: 3 (1L + 2T +0P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To enable the students to understand and apply the concepts of linear algebra in solving appropriate problems.

COURSE CONTENT:

Unit I:

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space – some properties. Quotient spaces, Homomorphisms and Isomorphisms of vector spaces, Direct sums.

Unit II:

Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Cauchy-Schwarz inequality, Orthogonal and orthonormal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

Unit III:

Matrices of Linear maps, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

Unit IV :

Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation, Characteristic polynomial, Cayley - Hamilton Theorem, Minimal Polynomial.

References :

1. Theory and Problems of Linear Algebra, Saymour Lipschitz, Schaum Outline Series.
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
3. Modern Algebra, Vol.II, by Narayanan and Manicavachagam Pillay, S. Vishwanathan and Co.
4. Brief Survey of Modern Algebra, Brikhoff and Maclane, IBH
5. Linear Algebra by Serge Lang, Addison Wesley Publishing company Inc.
6. Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.
7. Linear Algebra by Larry Smith, Spinger Verlag.
8. Elementary Linear Algebra with Applications, Keith Nicholson, PWS – Kent Publishing Company
9. Linear Algebra, Surjith Sinth, Vikas Publishing House Pvt. Ltd.
10. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.
11. Linear algebra – a geometric approach by Kumaresan. S

PROFESSIONAL EDUCATION COURSES

MSE VII.4 : CREATING AN INCLUSIVE SCHOOL

Credits: 4 (2L+ 2T +1P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understanding the meaning and significance of inclusive education.
- Appreciate the special needs of Individuals with diverse needs.
- Get Familiarized themselves with the concept of Inclusive Education.
- Understand the nature and needs of different categories of disabled children.
- Understand the concept of Special Education, Integration and Inclusion.
- Understand the different considerations and provisions for facilitating inclusion.

- Understand and Acquire the Skills of Adapting Curriculum to meet the need of the Students with Diverse needs

COURSE CONTENT

Unit I : Basic Concepts and Introduction to Inclusive Education

Meaning of Impairment, Disability and Handicap;Concept of Special Educational Needs and Diverse Needs, Difference between Special Education, Integration and Inclusive Education. Significance of Inclusive Education;Factors Affecting and Promoting Inclusion.

Unit II : Nature and Needs of Diverse Learners-Identification of Diverse Learners in the Classroom

Sensory Impairment: Hearing impairment and Visual impairment
Physical Disabilities: Orthopaedic impairment, Cerebral Palsy, Special Health Problems, Congenital defects; Slow Learners and Under Achievers; Intellectual Disability; Learning disabilities and ADHD; Autism Spectrum Disorders; Multiple disabilities ; Emotional and Behavioural Problems; Gifted and Creative; Socially Disadvantaged, Economically Deprived, Religious and Linguistic Minorities, Inhabitants of Geographically Difficult Areas

Unit III: Preparing Schools for Inclusion-General Considerations and Provisions Concept of Inclusive School, Competenciencies and Characteristics of inclusive Teacher

Physical Consideration, Socio-Emotional Considerations, Curricular Considerations
Provision of Assistive devices, equipment's and technological support. Special provisions in Evaluation

Unit IV : Inclusive Practices in Classroom

Making learning more meaningful: Responding to special needs by developing strategies for differentiating content, curriculum adaptation and adjustment, lesion planning and TLM. Pedagogical strategies to respond to needs of individual students: Cooperative learning strategies in the classroom, peer tutoring, buddy system, reflective teaching, multisensory teaching. Use of IT suitable for different disabilities.

Practicum

- Collection of data regarding children with special needs.
- Visit to Inclusive Schools and to oMSErve classroom transaction of any one of such school and make a report of the same.
- Identifying one/two pupils with special needs in the primary schools and preparing a profile of these pupils.
- Preparation of teaching aids, toys, charts, flash cards for children having any one type of disability. (Visit to Resource Room)
- Preparation of Lesson Plan, instruction material for teaching students with disability in inclusive school.
- Developing list of teaching activities of CWSN in the school.

Visits to different institutions dealing with different disabilities and OMSErvation of their Classroom.

* In addition, school and community based activities may be organized.

References:

1. Fimian, M.J., Fafard, M., and Howell, K.W.: *A Teacher's guide to Human Resources in Special Education: Para Professionals, Volunteers, and peer tutors.* Boston: Allyn and Bacon, Inc.
2. Furth, H. (1964). *Thinking without Language.* New York: Free Press.
3. Hallahan, D.P. and Kauffman, J.K. (1988). *Exceptional Children: Introduction to special Education.* N.J.: Englewood Cliffs.
4. Jangira, N.K. (1986). *Special Education Scenario in Britain and India*. Gurgaon: The Academic Press.
5. Jangira, N.K. (2013). NCERT: The Mother of Inclusive Education, Regional Institute of Education NCERT, Ajmer. (Also available on Google search Jangira special education).
6. Julba, A. (2014) Teachers creating Inclusive classrooms: Issues and challenges – A research study
7. Kapoor, S. (2015). Index of Inclusive School Quality, Brotherhood, Delhi.
8. Kothari, R.G. and Mistry, H.S. (2011). *Problems of students and Teachers of the special schools – A study of Gujarat state*. Germany: VDM Publication.
9. Maitra, K. & Saxena, V. (ed)(2008) *Inclusion: Issues and Perspectives*, Kanishka.
10. Meadow, K.P. (1980*). Deafruss and child development.* Berkley, C.A.: University of California Press.
11. Messily,K. (2012). Confronting Marginalisation in Education: A Framework for Promoting inclusion, Routledge, London.
12. Mithu, A. and Michael, B. (2005). *Inclusive Education: From rhetoric to Reality*, New Delhi: Viva Books Pvt. Ltd.
13. NCERT (2006) Position Paper: National Focus Group on Education of Children with Special Needs, NCERT, New Delhi.
14. NCERT (2013) Training and Resuorce Material on Adolescence Education, New Delhi, available on www.aeparc.org
15. Oza, D. and Pandit, R. (2011). *Management of behavioural problems of children with mental retardation*. Germany: VDM publication.
16. Premavathy, V. and Geetha, T. (2006): Integrated and Inclusive Education DSE(VI) Manual: New Delhi, Krishana Publication.
17. Reed, M. (1984). *Educating Hearing Impaired Children.* Milton Keynes: Open University Press.
18. Sharma, P.L. (1988). *A Teacher's Handbook on Integrated Education of the Disabled*. New Delhi: NCERT.
19. Ramaa S : Website: s-ramaa.net (for various publications)
20. Voluntary Health Association of India. *Disabled 'Village Children' – A Guide for Community Health Workers, Rehabilitation Workers, and Families*.
21. World Bank (2003) Inclusoive Education: Achieving Education for all including those with Disabilities and special Education Needs

Web Resources

- IBE-UNESCO (2016). Training Tools for Curriculum Development - Reaching Out To All Learners: a resource pack for supporting Inclusive Education, Ibe.training@unesco.org, http.//www.ibe.unesco
- Video on A World for Inclusion (2007) by UNESCO, directed by David Atrakchi, 20 minutes,http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=213

- Children with Disabilities (2012), by UNESCO, 23 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2758
- Inclusive Education: Approaches, scope and Content (2008), by UNESCO, produced by International Bureau of education, 11 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3314
- Inclusive Education: Learners and Teachers (2008), by UNESCO, produced by International Bureau of education, 14 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3316
- Preparing Teachers in Asia-Pacific for Inclusive Education, (2012), by UNESCO, 3 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2030
- Preparing teachers for inclusive education: Part 3 & 4, by UNESCO, produced by Lesotho, Ministry of Education, 21 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=418
- Toward Inclusive schools - Special needs in the classroom, by UNESCO, directed by Mike Fowler, 6 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=488
- Training Video: Special Needs in the Classroom, (1992), by UNESCO, directed by Mel Ainscow, 46 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=405
- Including Children with Special Needs Primary Stage (2014), NCERT,http://www.ncert.nic.in/pdf_files/SpecialNeeds.pdf
- Including Children with Special Needs Upper Primary Stage, (2015), NCERT, http://www.ncert.nic.in/gpPDF/pdf/tiicsnups101.pdf
- Julka, A. (2007) Meeting Special Needs in Schools: A Manual, NCERT, http://www.ncert.nic.in/html/pdf/inclusive_education/COVER.pdf
- Position Paper National Focus Group on Education of Children with Special Needs, NCERT, http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/special_ed_final1.pdf
- Learning Curves, Inclusive education (2014), Azim Premji Foundation, http://www.teachersofindia.org/en/periodicals/learning-curve-issue-xxiii

MSEVII.5 :HEALTH AND PHYSICAL EDUCATION

Credits: 2 (1L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- to build a scenario of Health Education in India.
- to develop a Knowledge Base of the Most Common and Uncommon Diseases in India; their Diagnosis & Remediation.

- Prospective Teacher Educators to learn the Techniques Related to Health Risks & Learn How to Fix these.
- Prospective Teacher Educators to study the Health Education Vision & Mission of India.
- To acquire the skills for physical fitness, correct postures, habits and activities for development
- Acquire skills to practice yogasanas and meditation and learn the skills of concentration, relaxation, dealing with stress and strain
- Understand and develop psychological abilities as life skills to deal with growing up issues like HIV and AIDS and prevention of substance issues
- Understand the process of assessment

COURSE CONTENT :

Unit I: Health Education Scenario in India

Introduction to the concept of health, significance and importance in the context of ancient and modern Indian perspective
Identity of Educational Institutional Plants: Structure, Infra-Structure and Environment, Time-Space-Personnel-Material Constellation Educational Management System, Emerging Health & Total Quality of the Educational Institutions, Status of Health Education in India from Pre-Natal Education through Higher Education, Yoga & Yog, Health & Hygiene, Clean Toilets, Work & Leisure, Quality of Health – Role of Education, Administrators, Teachers, Students, Supporters,

Unit II: Tech-related Health Risks

Identification of the technological health hazards – Smartphone Stress, Acne caused by the Cell Phones, Blackberry Stress Injuries to the Thumb, Radiation from the cell phones, Cell Phone Sickness, Cell Phone & Car Accidents, Allergies & Phones, Crazy Phones, Computers Causing Wrist Pain, Back & Neck Pain, Decreased Sperm Count from the WIFI, Laptop Burns, Laptop Headaches, Sleeping Problems from the Laptops, Decreased attention span from using Face-book, The Internet Causing Anxiety, Headphone Use leading to Accidents, Hearing Loss from Headphones, Visual Impairment, Death from Social Networking, Environmental Degradation, Aggression, Social Crimes--- Evolving Controlling & Regulatory Mechanisms.

Unit III: Approaches to Sound Health

Games, Sports & Athletics.
Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.
Games and sports – athletics (general physical fitness exercises), games (lead-up games, relays and major games) rhythmic activities, gymnastics and their impact of health.
Fundamental skills of games and sports; Sports for recreation and competition; Rules and regulation of sports; sports ethics; sports awards and scholarships, sports- personship.
Yoga – Raja Yoga, Karma Yoga, Bhakti Yoga, Jnana Yoga.
Safety and security – disasters in and outside schools, ways of prevention, safety from snake and dog bites, animal attacks, prevention and treatment.
Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhabitation.

Libraries, Laboratories, Classrooms, Halls, Play Fields, Water Tanks, Swimming Pools, Community Pools, Roads Human Development Index (HDI), Health: Vision, Goals and Objectives of Government of India, Experiments on Influence of Surroundings & Thought, Science of Laughter & Smiles, Health OMSErvation Programs, Impact of TV Serials.
Role of Institutions (schools, family and sports), health services, policies and major health and physical education-related programme, blood banks, role of media.

Unit IV: First Aid – Principles and Uses

Structure and function of human body and the principles of first aid., First aid equipments. Fractures-causes and symptoms and the first aid related to them, Muscular sprains cause, symptoms and remedies, First aid related to hemorrhage, respiratory discomfort, First aid related to Natural and artificial carriage of sick and wounded person, Treatment of unconsciousness, Treatment of heat stroke, General disease affecting in the local area and measures to prevent them.

Practicum

Surfing to know the diseases in India.

Preventive & Ameliorative measures for health hazards.

Playing Games.

Athletics.

Yoga.

Reflective Dialogues on Serials, such as, Satyamev Jayate on Health of the People.

Preparation of inventories on myths on exercises and different type of food.

Make an inventory of energy rich food and nutritious food (locally available) indicating its health value.

Make an inventory of artificial food and provide critical oMSErvations from health point of view.

Home remedies as health care.

Role of biopolymers (DNA) in health of child.

Medicinal plants and child health.

Strategies for positive thinking and motivation.

Preparation of first aid kit.

*** In addition, school and community based activities may be organised.**

References:

1. Arora,P. (2005) Sex Education in schools, Prabhat Prakashan
2. K..Park "Preventive and Social Medicine" Banarsidas Bhanoth, Publishers Nagpur Road, Jablapur, India.
3. NCERT(2013). Training and Resource materials on Adolescence Education, NCERT, New Delhi (This material is also available on www.aeparc.org.www.ncert.nic.in
4. NCERT(2014). Population Education, Source Material, NCERT, New Delhi.
5. Stephen, J. Williams, Paul R. Torrents, "Introduction to Health Service", Delmore Publications.

Physical Education

1. Deboarh, A. Wuest, Charles, A. Bucher: “Foundation of Physical Education Exercise Science and Sports”, Tata McGraw Hill Pvt. Ltd., New Delhi.
2. John, E. Mixton, Ann, E. Jewett: “An Introduction to Physical Education, W.B. Saunders Company, London.
3. John, Cheffers; Tom, Evaul: “Introduction to Physical Education – Concept of Human Movement”. Prentice Hall Engle Wood: New Jersey.
4. Bette J., Logdson & Others, “Physical Education for Children”, Lea and Febiger, Philadelphia..
5. Roberts, S. Weinberg & Daniel Gould, “Foundation of Sports and Exercise Psychology”, Human Kinetics Publication.
6. A.K. Uppal, Lawrance Gray Kumar, “Biomechanics in Physical Education and Exercise Science: Friends Publication, New Delhi.
7. Jack, H. Wilmore, David, L.. Costil, W. Larry Kenney, “Physiology of Sports and Exercise: Human Kinetics Publication.

Yoga

1. Swami Satyanand Saraswati, “Asana Pranayama Mudra Bandh”, Bihar School of Yoga, Munger.
2. M.M. Ghore, “Anotomy and Physiology of Yogic Practices”. Lonavala Yoga Institute, Lonavala.
3. Gharote, M.L. (2004). Applied Yoga, Kaivalyadhama S.M.Y.M. Samiti, Lonavala.
4. “Yogasana” Morarji Desai National Institute of Yoga, New Delhi.
5. “Pranayama” Morarji Desai National Institute of Yoga, New Delhi.
6. MDNIY (2010). “Yoga Teachers Manual for School Teachers, New Delhi.
7. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi.
8. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi.
9. Agarwal, Satya P. (1998). The social role of the Gītā: how and why, Motilal Banarsidass, ISBN 978-81-208-1524-7, retrieved 17 June 2010.
10. Goel, Devraj & Goel, Chhaya (2013). Universe of Swami Vivekananda & Complete.
11. Wholistic Social Development, CASE Publication under UGC SAP, The M.S. University of Baroda, Vadodara.
12. Jason Liu and Dr. Gwendalle Cooper (2009) *Scientific Analysis of the Effects of Falun Dafa* Presented at International Conference of Psychologists, February 27, 2009 by Catherine Hennessy.
13. Mehroo D. Bengalee (1976).*Child Guidance*. Sheth Publishers, Educational Publishers, 35, Everest, Pedder Road, Bombay.
14. Ministry of Health & Family Welfare, Government of India, *Annual Report to the People on Health*, December 2011.
15. Porter, Noah (2003). *Falun Gong in the United States*: An Ethnographic Study, Master Thesis, Department of Anthropology, College of Arts and Sciences, University of South Florida.
16. Wu JY, Feng, L, Park , H-T, Havlioglu N, Wen L, Tang H, Bacon KB, Jiang Z, Zhang X, Rao Y. (2001). *Molecule that guides Nerve Calls Directs Immune Cells*, Science Daily, Apr. 20.

Web Resources

Position Paper National Focus Group on Health and Physical Education, NCERT

http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/health_prelims_final.pdf

Learning curves: sports in education, (2013) Azim Premji Foundation http://azimpremjifoundation.org/pdf/learning-curve-17.pdf
www.FalunDafa.org
www.http://greatist.com/health/*19-worst-tech-related-health-risks*

MSE VII.6 : READING AND REFLECTING ON TEXT

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student teacher will be able to:

- Understand the meaning, process, importance and characteristics of reading.
- Understand and apply different levels, types, techniques and methods of reading.
- Acquaint with the skills of reading different types of texts.
- Develop different types of reading skills through various activities and met cognition
- Learn the skills of reading comprehension and to enhance vocabulary.
- Acquaint with the problems of reading across curriculum.

COURSE CONTENT

Unit I: Introduction to Reading

Reading – Meaning and Process, Importance of Reading across Curriculum, Characteristics of Reading, Developing reading skills.Role of libraries in promoting reading habits

Unit II: Techniques and Methodology of Reading

Levels of reading – literal, interpretative, critical and creative, Types of reading – intensive and extensive reading, oral & silent reading, Reading techniques – skimming and scanning. Methodology of reading

Unit III: Reading the Text

Types of Texts – Narrative, expository, descriptive, suggestive, empirical, conceptual, ethnography, policy documents, field notes; Importance of Different Texts in Curriculum

Unit IV : Developing Reading Skills and Reading Comprehension

Developing Critical Reading Skills, Developing Reflective Skills, Activities for Developing Reading Skills, Developing Metacognition for Reading, Developing Reading Comprehension Developing Vocabulary for Reading, Problems of Reading

Practicum

- Divide the class in small group and provide different kinds of texts and instruct them to read and reflect according to the nature of text.
- Divide the group and provide one text and suggest students to make different interpretations.

- Design vocabulary games to enhance vocabulary.
- Read the text and provide a five words summary to each paragraph.
- Reading and comprehension exercises.
- Skim through the text and give suitable title to the text.
- Complete given text in stipulated time and summarize it in 6/7 lines with a suitable title.
- Making an oral presentation
- Organising a debate, discussion based on their reading
- Preparation of a poster
- Making a collage
- Displaying appropriate texts/graphic on bulletin board
- Addressing morning assembly during their internship in schools
- Making a power point presentation on selected topic
- Submission of written articles/assignments
- Writing maintaining reflective journals

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.**

References:

1. Bright, J.A., and McGregor, G.P. (1970). *Teaching English as a Second Language.* ELBS: Longman.
2. Doff, A. (1988). *Teach English: Training Course for Teachers.* Cambridge: Cambridge University Press.
3. Hill, L.A., and Dobbyn, M.A. (1979). *Training Course, Trainer's Book.* London: Cassell.
4. Hubbard, P., and Hywel, J. et al (1983). *A Training Course for TEFL.* Oxford University Press.
5. Joseph, K.S. (2004). *Self Instruction in English Grammar and Figures of Speech.* Vadodara: Gold Rock Publications.
6. Mukalel, J.C. (1998). *Approaches to English Language Teaching.* New Delhi: Discovery Publishing house.
7. Mukalel, J.C. (1998). *Creative Approaches to Classroom Teaching.* New Delhi: Discovery Publishing house.
8. Mukalel, J.C. (1998). *Psychology of Language Teaching.* New Delhi: Discovery Publishing House.
9. Mukalel, J.C., and Ahmed, S. B. (1984). *Teaching English in India.* New Delhi: Arya Book Depot.
10. Nagaraj, G. (1996). *English Language Teaching Approaches, Methods and Techniques.* Calcutta: Orient Longman.
11. Richard, J.; Theodore, S. and Rodgers, T.S. (1968). *Approaches and Methods in Language.* Cambridge University Press.
12. Venkateswaran, S. (1995). *Principles of Teaching English.* New Delhi: Vikas Publishing House.
13. Wilkins, D.A. (1982). *Linguistics in Language Teaching.* London: Edward Arnold.
14. Willis, J. (1981). *Teaching English through English ELBS.* England: Longman Ltd.
15. Yule, G. (1985). *The Study of Language.* Cambridge: Cambridge University Press.
16. My experiments with the truth – *Autobiography of Mahatma Gandhi*
17. The Little Prince – *Antain de Saint* – Exupery

18. Cultural Heritage – Dr. S. Radhakrishnan
19. Periodicals Like – Outlook, India Today, Economic and Political Weekly, Business Today, Journals of Education, Organiser – weekly
20. Recognizing Different Types of Text

Web Resources

- http://www.bbc.co.uk/skillswise/factsheet/en03text-l1-f-different-types-of-text

Models of Reading Process

- http://people.ucalgary.ca/~mpeglar/models.html
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/
- http://www.tarleton.edu/Faculty/gentry/reading%20models.html

Reflective Skills

- http://www.skillsyouneed.com/ips/reflecting.html
- http://www.skillsyouneed.com/ps/reflective-practice.html

MSE VII.7A INTERNSHIP IN SCHOOL SUBJECT 1 – PHYSICAL SCIENCE
&
MSE VII.7B : INTERNSHIP IN SCHOOL SUBJECT 2 – MATHEMATICS

Credits : 6+6 **Marks: 100**
Duration : 10 Weeks **C1 + C2 : 50**
C3 : 50

The activity is divided into three phases:

A. Pre – internship - 2 weeks
B. Internship - 6 weeks
C. Post internship - 2 weeks

A. Pre internship

Objectives:

- To facilitate student teachers in designing and executing lessons in each pedagogy.
- To develop in student teachers the skills of obserrvation and evaluating teaching of their peers

Activities
The student teachers will
- plan and teach minimum 3 lessons in each pedagogy
- observe minimum 5 lessons of their peers in each pedagogy
- participate in the mentoring sessions to plan lessons under the guidance of mentors.

B. Internship

Objectives:

To provide the student teachers with the field experience of getting attached to a school for a long duration and develop professional skills of teaching, participate in various day to day functions of schools, and in organizing various activities.

Activities.

- The student teachers will teach 20 lessons at secondary level in each pedagogy.
- The student teachers will observe minimum of 5 lessons at upper primary level and 10 lessons at secondary level of their peers in each pedagogy.
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records
- The student teachers will carry out action research project, analyse and write the report.

C. Post Internship

Activities

- Submission of internship records - evaluation records, activity record, observation records, reflective diary
- PPT Presentation of reflectiions

Evaluation in each pedagogy is as follows:
C1 – Pre-internship activities
C2 – Internship records and post-internship presentation
C3 – Internship in teaching

EIGHTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

PHYSICS

MSE VIII.1 : SOLID STATE PHYSICS

Credits: 3 (1L + 1T +1P) | **Marks: 100**
Contact hrs per week: 5 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics for an understanding of physics of nuclei and of solids.

COURSE CONTENT:

Unit I: Crystal Structure

Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices.Brillouin Zones. Coordination number, packing fraction for cubic crystals (sc, bcc and fcc). Diffraction of X-rays by Crystals. Bragg's Law.

Unit II:
Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law.
Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Curie-Weiss Law, Discussion of B-H Curve. Hysteresis and Energy Loss.

Unit III:
Electrical Properties: Free electron model of a metal, solution of one dimensional Schroedinger equation in constant potential, Density of states. Fermi energy, Energy bands in solids, Distinction between metals, semiconductors and insulators. Kronig- Penney model. P and N type Semiconductors. Conductivity of Semiconductors, mobility. Hall effect-Expression for Hall coefficients. Applications of Hall effect.
Dielectrics: Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation.

Unit IV: Superconductivity
Superconductivity: Qualitative description,. Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's

Equation and Penetration Depth. Isotope effect. High temperature superconductors Applications

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, 8th Ed., Wiley India Pvt.Ltd., 2004.
2. A J Dekker, Solid State Physics, Macmillan, 1965.
3. J.P. Srivastava, Elements of Solid State Physics, 2nd Ed., Prentice-Hall of India, 2006.
4. Leonid V. Azaroff, Introduction to Solids, Tata Mc-Graw Hill, 2004.
5. M. A. Wahab, Solid State Physics: Structure and Properties of Materials,Alpha Science International, Ltd., 2005.
6. Neil W. Ashcroft and N. David Mermin, Solid State Physics, Cengage Learning, 1976.
7. S O Pillai, Solid State Physics, NEW AGE, 2009.
8. G. I. Epifanov, Solid State Physics, Central Books Ltd., 1979.
9. M. Ali Omar,Elementary Solid State Physics, Pearson India, 1999.
10. H. Ibach and H Luth, Solid-state Physics, Springer, 2009.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Measurement of susceptibility of a paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. Determination of Hall coefficient in semiconductors.
5. Determination of Curie temperature– ferromagnet.
6. Determination of work function of a metal using R-D equation.
7. To measure the Dielectric Constant of a dielectric Materials with frequency.
8. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR).
9. To determine the refractive index of a dielectric layer using SPR.
10. To study the PE Hysteresis loop of a Ferroelectric Crystal.
11. To draw the B- H curve of iron using a Solenoid and determine the energy loss from Hysteresis.
12. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150^{o} C) and to determine its band gap. Franck-Hertz experiment.

13. Powder XRD pattern of KCl.
14. Powder XRD pattern of NaCl.
15. Powder XRD pattern of $CaCl_2$.
16. Solar cell experiment.
17. Frequency resonance of LR circuit.
18. Polarisation by reflection-Brewster's law.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2BChemistry

MSE VIII.2 : SPECTROSCOPY, NATURAL PRODUCTS AND HETEROCYCLICS

Credits: 3 (1L + 1T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

To develop an understanding of the

- basic principles of Spectroscopy and apply the principles in the structural elucidation of simple organic compounds.
- chemistry of natural products, dyes and drugs, macromolecules and heterocyclic compounds

COURSE CONTENT:

Unit I : Spectroscopy

UV and Visible spectroscopy: Introduction, absorption laws, instrumentation, formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward – Fieser rules for calculating absorption maximum in dienes and α,β-unsaturated carbonyl compounds.

IR spectroscopy: Introduction, theory of molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, finger print region and applications of IR spectroscopy.

NMR spectroscopy: Introduction, instrumentation, number of signals, position of signals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts-inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemical exchange and coupling constant.
Structural determination of simple organic compounds using UV, IR and NMR spectral data.

Unit II: Natural Products
Carbohydrates: Introduction, classification and nomenclature. Configuration of monosaccharides. Erythro and threo diastereomers. Interconversions in carbohydrates – glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation. Constitution of disaccharides - maltose, sucrose and lactose. Introduction to polysaccharides (starch and cellulose) without involving structure determination.
Alkaloids : Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine
Terepinoids : Introduction, isoprene rule, structural elucidation of Citral and Menthol
Amino acids, Peptides, Proteins and Nucleic acids
Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α-amino acids.Classification of proteins. Peptide structure determination - end group analysis, selective hydrolysis of peptides. Solid-phase peptide synthesis. Primary and secondary structures of proteins. Protein denaturation.
Nucleic acids : Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. The double helical structure of DNA. Types of different RNA and their functions in the synthesis of protiens. Genetic code.

Unit III: Dyes, Drugs and Macromolecules
Dyes: Introduction, Classification of dyes, Colour and constitution (electronic concept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.
Drugs: Introduction, classification, structure and synthesis of sulpha drugs- sulphapyridine, sulphathiazole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials – plasmaquin, mepacrine and chloroquin.

Macromolecules: Introduction, Classification, Types of polymerization – chain polymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers – buna S , butyl rubber and neoprene. Synthetic fibres – nylon 6, nylon 6,6, terylene. Conducting polymers – polypropylenes and polyanilines. Bio-degradable polymers.

Unit IV: Heterocyclic Compounds

Introduction, methods of formation of five membered heterocycles – furan, thiophene and pyrrole. Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and their chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Six membered heterocycles: methods of formation of pyridine, mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles, preparation and reactions of Indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

References :

1. Organic Spectroscopy by P S Kalsi
2. Organic Chemistry : I L Finar Vol II
3. Application of absorption Spectroscopy to Organic Compounds : John R Dyer
4. Organic Spectroscopy : William Kemp
5. Fundamentals of Molecular Spectroscopy : C N Banwell

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop skills of synthesis and Estimation of organic compounds

COURSE CONTENTS:

1. Two step organic synthesis

1. Synthesis of p-bromoaniline from acetanilide
2. Preparation of o-iodobenzoic acid from anthranilic acid
3. Preparation of m-nitrobenzoic acid from methyl benzoate
4. Preparation of Paracetamol
5. Synthesis of Quinoline

2. Quantitative organic analysis

1. Estimation of aniline/ phenol by bromate-bromide method
2. Estimation of glucose by Fehlings method/ Spectrophotometry using 3,5 dinitro salicylic acid
3. Determination of iodine value of an oil by Wij’s method/ Chloramine-T method
4. Determination of saponification value of an ester / oil
5. Estimation of amino acid by formal titration method
6. Estimation of ascorbic acid in Vitamin C tablets by Volumetry

7. Estimation of Paracetamol by titrimetric and spectro photo metric methods.
8. Colorimetric Estimation of proteins by Biuret method

References :

1. Organic synthesis-special techniques V.K. Ahluwalia, 2nd Edition Narosa Publishing House
2. Organic Synthesis A.I. Vogel

DSE 3BMathematics

MSE VIII.3:COMPLEX ANALYSIS& NUMERICAL ANALYSIS

Credits : 3 (1L + 2T + 0P)	**Marks: 100**
Contact hrs per week: 5	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 50**

OBJECTIVES:

To develop the understanding & application of the concepts of complex analysis in problem solving situations. To enable and apply Numerical methods in solving problems related to real life situations with help of computers, which have become indispensable in modern world.

COURSE CONTENT:

Unit I:

Functions of a Complex Variable, Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions, Conformal Mappings.Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations.

Unit II:

Complex Integration: Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula, Higher Derivatives. Power Series**:** Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions.

Unit III:

Numerical Methods: Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Iteration method, Newton-Raphson method.
Finite differences, Forward and Backward differences, Weierstrass theorem, Interpolation, Newton-Gregory forward and backward interpolation formulae, Divided differences, Lagrange's interpolation formula.

Unit IV:

Numerical Differentiation: Finding first and second derivatives using interpolation formulae, Difference equations.
Integration: General quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Newton-Cotes quadrature formula, Gauss quadrature.

References:

1. Complex Analysis by Ahlfors McGraw Hill International Edition.
2. Introduction to the Theory of Functions of a Complex Variable by Palka, Springer Verlag.
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
5. Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, OxfordUniversity Press.
7. Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
8. Functions of One Complex Variable by Conway, Narosa Publishing House.
9. Theory and Problems of Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
10. Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.
11. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
12. Finite Differnece and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
14. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
15. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
16. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
17. Numerical Calculus by William Edmund Milne, Princeton University Press.
18. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
19. Numerical Analysis by Schield, Schaum's Outline Series.
20. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.

GENERIC ELECTIVE 2

MSE VIII.4 : INDIAN CONSTITUTION AND HUMAN RIGHTS

Credits 2 (2L+0T+0P)	**Max. Marks: 100**
Contact Hours per week: 2	**C1+ C2: 50**
Exam duration: 2 Hrs	**C3: 50**

Objectives:

On completion of this course, the student teacher will be able to

- know the importance, preamble and salient features of Indian Constitution
- appreciate the significance of Fundamental Rights, Duties and Directive Principles of State Policy.
- develop an understanding of the strength of the Union Government.
- understand the functioning of the State Government for the unity and the strength of the Democracy.
- know the importance of local self-Government and Panchayati Raj Institutions in India.
- know the meaning, significance, the growing advocacy of Human Rights.

Transaction Mode:
Through Lectures, Group discussions, Interactive sessions, field activities and use of Education Technology.

COURSE CONTENT:

Unit I: Meaning and Importance of the Constitution
Preamble, Salient features, Constituent Assembly and the Spirit of the Indian Constitution.

Unit II: Fundamental Rights, Duties and Directive Principles
Fundamental Rights, Fundamental Duties, and the Directive Principles of the state policy of the Indian Constitution.

Unit III: Union, State and Local Self Governments
Union Government: Parliament, the President and Prime Minister: State Government: Governor and the Council of Minister: Judiciary: Functions and Powers: Panchayat Raj System.

Unit IV: Human Rights
Origin and Development of Human Rights, Growing Advocacy and Declining Trends of Human Rights, Rights of Scheduled Casts, Scheduled Tribes, Minorities, Children and Women, Human Rights Defenders, Human Rights Violation and Human Rights Organizations.

References:
1.M.V.Pylee, **Indian Constitution**, OUP, New Delhi
2.Granveille Austin, **Indian Constitution**, OUP, New Delhi
3.Rajani Kotari, **Politics in India**, OUP, New Delhi
4.Johari, J C, **Indian Government and Politics**.
5.S R Maheswari, **Local Governments in India (Latest Edition)**
6.R K Arora and Rajani Goyal, **Indian Public Aministration 1995.**
7.C P Bhambri, **Introduction to Indian Constitution**.
8.Subash C Kashyap, **The Working of Indian Constitution,** NBT, New Delhi
9.Subash C Kashyap,**Our Parliament**, NBT, New Delhi
10.Granveille Austin, **Functioning of the Indian Constitution**, NBT, New Delhi.
11.Bipan Chandra**, India after Independence**. Roopa, New Delhi 2000.
12.Arjun Dev, **Source Book on Human Rights**, NCERT, New Delhi.
13.**Human Rights in India: Theory and Practice**, National Book Trust, 2001.

PROFESSIONAL EDUCATION COURSES

MSE VIII.5 : KNOWLEDGE AND CURRICULUM

Credits: 4 (2L+ 2T +0P) | **Marks: 100**
Contact hrs per week: 6 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives:

This course is designed to help student teachers to

- Understand the concept and the need for curriculum in schools.
- Explore the influences of the knowledge categories, social, cultural, economic and the technological aspects in shaping the present school curriculum and the text books.
- Analyze the principles employed in sequencing the school curriculum and the syllabus at different levels.
- Identify various learning sites and resources operating as curriculum supports in the system.
- Analyze the multiple roles of schools in implementation of curriculum.
- Discuss the roles and responsibilities of curriculum stakeholders.
- Analyse the role of teachers in operational sing the curriculum.
- Examine the processes and criteria commonly used to evaluate curriculum in pursuit of improvement.
- Explore the evaluation approaches adopted to revise the curriculum at the national and state levels.
- Analyze the national curriculum frameworks for necessary reforms proposed and their implications at school level.
- Develop an image of oneself as a curriculum informant, designer, agent, and evaluator.

COURSE CONTENT:

Unit I: Concept and the nature of curriculum

a) Meanings of curriculum; different perspectives of curriculum; need for curriculum in schools.
b) Educational policy reforms leading to curriculum reforms; Relationship between curriculum framework, curriculum , syllabus and text books- their significance in school education.
c) Meaning and concerns of core curriculum-its need and significance in Indian context; Meaning and concerns of Hidden curriculum and spiral curriculum and their relevance to learning.
d) Types of curriculum: subject-centered, activity-centered, environmental centered, and community-centered and their relevance.

Unit II: Foundations of Curriculum Development

a) **Forms of knowledge & Curriculum:** Forms of knowledgeand structure of a Discipline, and their characterization in different school subjects; Logical grammar of different school subjects

b) **Nature of learner& learning:** Nature of learner - needs and interests, and different perspectives on learning (behaviourists, cognitivists and social constructivists) and their implications to curriculum development

c) **Socio –cultural**: Importance of society-school relationships ; Societal factors that affect the curriculum ; Multiculturalism, multilingual aspects, and societal aspirations; Social reconstruction, social efficiency, inequality in educational standards, need for common goals and standards;

d) **Technological determinants** : Science and technological advancements, Using the resources of the information society in curriculum development

e) **Some of the critical issues**: environmental concerns, gender concerns .inclusiveness, value concerns, social sensitivity, and globalization.

Unit III: Process of curriculum Development

a) Understanding shifts in emphasis in approach to curriculum; from subject centered and behaviouristic learning to integrated approach involving development of perspectives, activity centered and constructivist orientation;

b) **Behaviouristic orientation**: Formulating aims and objectives – (general, specific - subject wise and level wise); Selecting content and learning experiences – Principles involved; Organizing the content and learning experiences- Principles (continuity, sequence and integration: organizing elements- concepts, skills, and values); breadth of coverage and depth of understanding; applicability and relevance to school curriculum planning

c) **Constructivists orientation**: curriculum embedded in real life contexts; authentic learning in real life contexts leading to knowledge construction; applicability and relevance to school curriculum planning

Unit IV Curriculum Implementation and Curriculum evaluation

a) Operationalising curriculum into learning situations; Planning and converting curriculum into syllabus and curriculum engagement activities.

b) Role of teachers in operationalising curriculum in generating dynamic curricular experiences through i) flexible interpretation of curricular aims ii) concept mapping iii) contextualization of learning v) selecting varied experiences and long range and daily planning, choice of resources, planning assessment etc.

c) Planning and use of curricular materials: Text book; teachers hand book, source book, work book, manuals, and other learning materials such as kits, AV and software materials..

d) School culture and climate in implementing the curriculum.

e) Supports to curriculum engagement: available infrastructure and curriculum sites and resources (library, laboratory, playground, neighbourhood etc); Use of community resources in curriculum engagement .

f) Role of external agencies – National, Regional and State in developing the learning supports (including training of teachers) for curriculum implementation.

g) Meaning of curriculum evaluation; Need for curriculum evaluation

h) Process of curriculum evaluation and renewal: collecting opinions and views on school curriculum and text books from different stakeholders; students' attainability of curricular standards as one of the criterion; evaluation of the discrepancies oMSErved between anticipated and oMSErved inputs, transactions and outputs; critical analysis of text books; evaluation of other curricular materials;

i) Role of National, Regional and State bodies in empowering the teachers in evaluating curriculum

Sessional Work:

- Review of national curriculum frame works and write a report for presentation and discussion
- Analysis of teachers' handbooks, text books, workbooks, source books followed by Presentations.
- Readings of certain curriculum reviews and articles bearing significance to the course outlined and reflections on them

References:

1. Olivia, P (2004): Developing the curriculum (6th Ed). Allyn & Bacon, Inc. ISBN: 0205412599.
2. Curriculum planning for better teaching and learning by J.G. Saylor and W Alexander (Holt, Rinehart and Winston).
3. Yashpal Committee (1993): Learning without Burden, MHRD, and India.
4. Position paper: National Focus Group on 'Curriculum, Syllabus, Textbooks', NCERT.
5. Lewy, Arieh (1977): Handbook of Curriculum Evaluation, International Institute for educational Planning, France and Longman Inc.
6. Giroux, Henry et.al (1981): Curriculum and Instruction: Alternatives in Education by MC Cutchan Public Corp, Printed in USA.
7. Dewey, John (1959): The Child and the Curriculum, Chicago, the University of Chicago Press.
8. Hilda T (1962): Curriculum and Development- Theory and Practice; Harcourt, Brace and World, Inc.
9. Howson, Geoffrey (1978): Developing a New Curriculum, London: Heinmann
10. NCERT (1988) National Curriculum for Elementary and Secondary Education: A framework.
11. NCERT (2000) National Curriculum Framework For school Education.
12. NCERT (2005) National Curriculum Framework. NCERT publications
13. Schubert W (1986): Curriculum Perspectives, Paradigms and Possibilities, New York: Macmillan.
14. Zias, R (1976): Curriculum Principles and Foundations; New York; Thomas Crowwell.
15. Hirst, Paul (1975) : Knowledge and curriculum, (International Library of the Education volume 12): A collection of Philosophical papers, International library of Philosophy of Education, Routledge publishers
16. Kumar, Krishna and Malla Reddy : Curriculum Development and Educational Technology.

MSE VIII.6 : GUIDANCE AND COUNSELLING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- appreciate the nature, purpose and need for guidance and counselling;
- sensitise the student-teachers with the need and relevance of Guidance and counselling.
- demonstrate an understanding of educational, vocational and personal guidance
- develop an understanding of the process of Guidance and Counselling
- understand the process of organization of guidance services in schools
- develop capacity of applying the techniques and procedures of guidance and counselling
- describe various testing and non- testing techniques
- develop the skill of administration and interpretation of psychological tests
- understand the concept and importance of career development.
- analyse the role of the teacher in the provision of Guidance and Counselling
- know the qualities required for good Counsellor

COURSE CONTENT

Unit I: Meaning and Nature of Guidance

Guidance: Concept, aims, objectives, functions and principles.
Need & Procedure for (Educational, Psychological and Social) guidance.
Purposes and Principles of organization of different guidance Services
Organization of guidance services at Secondary Level: Need and Importance
Group Guidance: Concept, Need, Significance and Principles, Organization of Guidance programs in schools.
Role of Guidance Personnel in organization of guidance services in School : Counsellor, Career Master, Psychologist, Doctor, Teacher Counsellor, Head of the Institution, Teacher, Social Worker

Unit II: Meaning and Nature of Counselling

Counselling: Meaning,and nature; Difference between Guidance &Counselling; Principles and approaches of counselling, Individual and Group Counselling; Skills in Counselling-Skills for Listening, Questioning, Responding, & Communicating, Listening Attentively to the concerns of the counselee, Negotiating Self Discovery, Decision Making, Problem Solving etc and values such as Patience, Empathy etc.; Methods and Process of Counselling
Academic, Personal, Career and Behaviour problems of students with special needs, viz. socio-emotional problems of children with disabilities and deprived groups such as SC, ST and girls, need for Counselling; Professional Ethics and Code of Conduct ; Qualities and Qualifications of an effective Counsellor

Unit III:Tools and Techniques of Guidance

Testing and Non-Testing Techniques for Studying and Appraisal of students : a) Testing Techniques: Intelligence/Mental Ability tests, Aptitude tests, attitude scales, Interest inventories, and Personality Tests, b) Non-testing Techniques: Interview, OMSErvation,and Case Study, c) Tools-Questionnaire, anecdotal record, Cumulative Record Cardsetc,
Role of the teacher in Assessment and Testing.

Unit IV: Career Guidance and Counselling

Educational and Career Information in Guidance and Counselling: Meaning, Importance, collection, types, classification of occupational information; Dissemination of Occupational Information: Class talk, career talk, Group discussion, Preparation of Charts and Poster, Career Exhibition, Career conference; Guidance for gifted, slow learner, socio-economically disadvantaged children; Career development: Meaning and Importance; Teacher's role in Career planning, Vocational training and placement opportunities for CWSN.Broad outline with respect to the emerging courses and career options available in India; Guidelines for Establishment of Guidance Cell or Career Corners in Schools

Suggestive List of Activities:

- Group Guidance-Preparation of Class Talk and One Career Talk
- Visit to different Guidance Centre
- Design a checklist/Questionnaire to collect information on students and classify them under educational, psychological or social problem.
- Preparation of Cumulative Record
- To prepare a Case study and Analysis of Case study
- Administration, Scoring & interpretation of at least two tests: One Mental Ability Test and One Aptitude Test
- Job Analysis of a Counsellor
- Preparation of list of problem behaviours based on oMSErvation. Detailed study of the Guidance and Counselling Services available in a given School
- Prepare a Chart and Poster for dissemination of Career Information
- Familiarise and write a report of any one of the Personality Tests used in Guidance and Counselling

References:

1. Aggarwal, J. C. (2004). Educational Vocational Guidance and Counselling, Delhi: Doaba House.
2. Asch, M. (2000). Principles of Guidance and Counselling, New Delhi: Sarup and Sons.
3. Bhatia, K. K., (2002). Principles of Guidance and Counselling, Ludhiana: Vinod Publications
4. Bhatnagar, R. P.; Rani. S. (2001); Guidance and Counselling in Education and Psychology.
5. Chauhan, S. S. (2008). Principles and Techniques of Guidance. UP: Vikas Publishing House Pvt. Ltd.
6. Coorey,S.M (1953).Action Research to Improve School Practices, New York:Teacher's ,Columbia University
7. Gibson, R.L. and Mitchell (2008). Introduction to counselling and Guidance. New Delhi:PHI Learning Pvt. Ltd.

8. Granz, R. M. (2005). Foundation and Principle of Guidance, Boston: Allyn& Bacon.
9. Gupta, V. K. (2004). Educational Guidance and Counselling, Ludhiana: Ankur Publications.
10. Jones, J. A. (1970). Principles of Guidance, Bombay: Tata, New York: McGraw Hill.
11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication
12. Kakkar, S.B (2015) Educational Psychology, *PHI Learning: Publications*
13. Kocher, S. K. (2007). Educational Guidance and Counselling, New Delhi: Sterling.
14. Myres, G. E. (2005). Principles and Techniques of Vocational Guidance, New York: McGraw Hill.
15. Nanda, S. K.andSagar, S. (1972). Fundamentals of Guidance. Chandigarh: N.B.S. Educational Publishers.
16. Nayak A.K. (2004); Guidance and Counseling
17. NCERT (2008). Counselling Process and Strategies (Module 2). New Delhi: NCERT.
18. NCERT (2008). Guidance for Human Development and Adjustment (Module3) New Delhi: NCERT.
19. NCERT (2008). Introduction to Guidance (Module 1). New Delhi: NCERT.
20. NCERT (2005). National Curriculum Framework-2005,NCERT,New Delhi

Web resources

- Introduction to Guidance and Counseling African Virtual university http://oer.avu.org/bitstream/handle/123456789/153/GUIDANCE%20AND%20COUNSELING.pdf?sequence=1
- Ethical Principles of Psychologists and Code of Conduct by APA, http://www.apa.org/ethics/code/principles.pdf
- Guidance and Counselling, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/pdf/guidelines_for_guidance_and_counseling.pdf
- http://www.egyankosh.ac.in/

MSE VIII.7 : VALUE AND PEACE EDUCATION

Credits: 2 (1L+ 1T +0P) | **Marks: 100**
Contact hrs per week: 3 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

Objectives

The student teacher will be able to:

- Understand the need and importance of education for peace and values.
- Understand the nature, characteristics and types of human values.
- Understand the five core values of Truth, Righteous conduct, Peace, Love and Non-Violence.
- Appreciate the developments in Peace Education in India and Abroad.
- Understand various methods, techniques and approaches of value development.
- Appreciate the preamble to the constitution and values inherent in it.
- Understand various models of value education.
- Appreciate the importance of living together and imbibe in their attitude and behaviour.

COURSE CONTENT

Unit I: Concept, Meaning and Nature of value

Concept and meaning of value and Peace:
Indian and Western perspectives on value and Peace.
Reflections of great Indian thinkers on values and Peace(Gandhiji, Swami Vivekananda,Sri Aurobindo, Rabindratha Tagore, J. Krishmamurthi)
Understanding Peace in the individual, Social, National and International context
Nature and characteristics of values
Sources and selection of values -culture and human needs

Unit II : Concept, Meaning and Nature of Peace

Historical development of Peace education in India and in the world
Preamble to the Indian Constitution and values inherent in it
Exposition of the five human values of Truth, Righteous Conduct, Peace, Love and Non-Violence with illustrations from life and literature.
Creation of United Nations, UNESCO, UNICEF and their role in promoting value and Peace Education.
Judgement of the Supreme Court on Value Education

Unit III : Concept and need for Value-based Education and Education for Peace

Concept of value based education and Education for Peace with special reference to peace to Indian view of life;
Paradigm shift from Peace education to Education for Peace.
Need for and importance of value based education and Education for Peace in the present scenario.
Aims and objectives of value based and Peace education
Recommendations of Sri Prakasha Committee (1959) on value education.

Recommendations of Parliamentary Committee of HRD on Values Education (1996-90) headed by Shri S.B. Chauhan.

Curriculum development and Models of Value Education.

Models of value education; Rationale building model, the consideration model, valuing process and clarification model.

Curriculum development; State specific approach – Elementary, Secondary, Higher Secondary and Higher Education.

Integration of human values with all (school) academic subjects.

Unit IV :Pedagogy of Value Education and Education for Peace

- Approaches and Techniques of teaching human values:-

  Direct approach: value based Story-telling, Group activities (dramatization, literary activities, games and sports, service activities), Counselling, organizing value based co-curricular activities.

  Indirect Approach; Incidental Approach with illustrations

  Integrated approach: Integration into curricular, co-curricular activities and subjects (with illustrations of integration from Language, Mathematics, science and social science , art and aesthetics , Yoga and health education,
- Teacher as Role Model.
- Role of school ambience and environment in development of values.

Practicum

- Develop / compile stories with values from different sources and cultures, organize value based co-curricular activities in the classroom and outside the classroom, develop value based lesson plans, integrating values in school subjects.
- Study of any Model of integrated value education – case study of models expressed by Sri Sathya Sai, J. Krishnamurti, etc.
- Visit to Ramakrishna Institute of Moral and spiritual Education

In addition, school and community based activities may be organised.

Evaluation Strategies

1. Reflective reading based presentations.
2. Unit tests.
3. Quiz based evaluation
4. Seminar presentation
5. Submission of case reports on violation of peace as reported through mass-media.

References:

1. Barash, P. David (2000). Approaches to Peace, Oxford University Press, New York.
2. Bernard, Jessie (1957). The Sociological study of conflict. International Sociological Association, The Nature of Conflict, UNESCO Paris.
3. Galtung, J. (2003). Searching for Peace – The road to TRANSCEND, Sterling Virginia.
4. Galtung, Johan (1996). Peace by Peaceful Means: Peace and Conflict, Development and Civilization. Sage Publications, New Delhi.
5. Galtung, Johan (1984). The Struggle for Peace Gujarat Vidyapith, Ahmedabad.
6. Gandhi, M.K. (1944). Non-Violence in Peace and War Navajivan Publishing House, Ahmedabad.

7. Govt of India (1983). Report on Education in Human Values in Teacher Training Programmes, New Delhi, Ministry of Human Resource Development.
8. Harris Ian. M. (1998). "Peace Education" Mc Farland & Company, Inc Publisher London
9. Howlett, Charles F., John Dewey and Peace Education, Encyclopedia of Peace Education, Teacher College, Columbia University 2008.
10. Kapani, Madhu (2000). Education in Human Values – concept and practical implications, New Delhi; Sterling Publishers.
11. Krishnamurti, J.: "Total Freedom", Krishnamurti Foundation Chennai.
12. NCERT National Curriculum Framework (2005). Position Paper, National focus Group on Education for Peace, NCERT, New Delhi (2006).
13. National Curriculum Framework (2005) position paper, National Focus group on Education for Peace, NCERT, New Delhi.
14. NCTE (1998). Curriculum Framework for Quality Teacher Education, NCTE, New Delhi.
15. Pandey, S. (2004). Education for Peace, Self Instructional Package for Teacher Education, NCERT, New Delhi.
16. Sri Sathya Sai Bal Vikas Education Trust (1985). Curriculum and Methodology for integrating Human Values Education, Prashanthi Nilayam (International Education).
17. Sri Sathya Sai International Center for Human Values (2009). Education in Human Values: Course Book for Training of Master Trainers, New Delhi.
18. The Curriculum framework for Quality Teacher Education (1998) NCTE, New Delhi
19. UNESCO (2001) Learning the way of Peace, "A Teacher Guide to Education for Peace", UNESCO, New Delhi.

Web resources

Education for values in schools- a framework, NCERT
http://www.ncert.nic.in/pdf_files/Framework_educationCOMPLETEBOOK.pdf

Values Education A Handbook for Teachers (2012), CMSE
http://cMSEacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf
Position Paper National Focus Group on Education for Peace,
NCERT http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/education_for_peace.pdf

NINTH SEMESTER

MSE(P) IX.1 : CLASSICAL MECHANICS

Credits: 4 (4L + 0T +0P) | **Marks: 100**
Contact hrs per week: 4 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

COURSE CONTENT:

Unit I: Survey of Elementary Principles

Mechanics of a particle and of a system of particles: Center of mass, conservation of linear and angular momentum in the absence of forces and torques. The energy equation and the total potential energy of a system of particles. Constraints and their classifications, Generalized coordinates. Virtual displacement , D'Alembert's principle and Lagrangean equations of the second kind. Examples of (I) single particle in (a) Cartesian coordinates, (b) spherical polar coordinates and (c) cylindrical polar coordinates, (II) Atwood's machine and (III) a bead sliding on a rotating wire in a force-free space. (IV) Simple pendulum. Hamilton's principle. Derivation of Lagrange equation from Hamilton's principle.

Unit II: Hamilton's Equations

Legendre transformations, Generalized momenta, Hamilton's equations of motion, Examples (i) the simple harmonic oscillator. (ii) Hamiltonian for a free particle in different coordinates. Cyclic coordinates and Conservation theorems. Physical significance of the Hamiltonian function. Derivation of Hamilton's equations from a variational principle. Some applications of the Hamiltonian formulation: A simple pendulum with a moving support, charged particle in an electromagnetic field.

Unit III: Canonical transformations

The equations of canonical transformations, Generating functions (Four basic types), examples of Canonical transformations, the harmonic oscillator treated by canonical transformations. The symplectic approach to canonical transformations, Examples of Lagrange and Poisson brackets as canonical invariants, properties of Poisson brackets, angular momentum and Pois-son bracket relations the equations of motion in the Poisson-bracket notation. The Hamilton-Jacobi equation, Example of the harmonic oscillator treated by the Hamilton- Jacobi method.

Unit IV: Mechanics of Rigid Bodies

Mechanics of Rigid Bodies: Degrees of freedom of a free rigid body, Angular momentum and kinetic energy of rigid body. Rate of change of a vector in space and body fixed coordinates. Moments and products of inertia, Moment of inertia tensor, principal moments of inertia, products of inertia, the inertia tensor. Euler's equations of motion for a rigid body, torque-free motion of a rigid body,Euler angles, Motion of a symmetric top.
Small oscillations of mechanical system: types of equilibria, Quadratic forms of kinetic and potential energies of a system in a equilibrium, General theory of small oscillations, secular

equation and Eigen value equation, small oscillations in normal coordinates and normal modes, examples of two coupled oscillators, vibrations of a linear triatomic molecule.

Reference Books:

1. H. Goldstein, C. P. Poole Jr., John L. Safko, Classical Mechanics, 3rd Edition, Pearson Education, India, 2002.
2. V. B. Bhatia, Classical Mechanics, Narosa Publications, 1997.
3. Arnold Sommerfeld, Books for reference: Mechanics- Lectures on Theoretical Physics, Vol. I, Academic Press.
4. N. C. Rana and P. S. Joag, Classical Mechanics, Tata McGraw Hill.
5. R. G. Takwale and P. S. Puranik, Introduction to Classical Mechanics, Tata McGraw Hill.
6. L. D. Landau and E. M. Lifshitz, Classical Mechanics, Pergamon Press, Oxford, 1985.
7. Atam P. Arya, Introduction to Classical Mechanics 2nd Edition, Addison Wesley 1998.
8. R. G. Takwale and P. S. Puranik, Introduction to Classical Mechanics, Tata McGraw, New Delhi 1991.

MSE(P) IX.2 : MATHEMATICAL PHYSICS – I

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I: Tensor analysis

Curvilinear coordinates, tensors and transformation theory: Tensors of rank r as an r-linear form in base vectors. Transformation rules for base vectors and tensor components. Invariance of tensors under transformation of coordinates. Sum, difference and outer products of tensors, Contraction. Curvilinear coordinates in the Euclidean 3-space. Covariant and contravariant basis vectors. Covariant and contravariant components of the metric tensor. Raising and lowering of indices. Differentials of base vector fields. Christoffel symbols. Covariant differentiation. The contracted Christoffel symbol. Grad, divergence, curl and Laplacian in arbitrary curvilinear coordinates.

Unit II: Special functions- I

Differential equations, Hermite and Lagaurre functions: Partial differential equations, Separation of variables- Helmholtz equation in cartesian, cylindrical and spherical polar coordinates. Differential equations: Regular and irregular singular points of a second order ordinary differential equations. Series solutions- Frobinius method. Examples of Harmonic oscillator and Bessel's equation. Linear dependence.and independence of solutions Wronskian.

Unit III: Special functions- II

Hermite functions: Solution to the Hermite equation, Generating functions, Recurrence relations, Rodrigues representation, Orthogonality. Laguerre functions: Differential equation and its solution,-Laguerre polynomials, Generating function, Recurrence relations, Rodrigues representation, Orthogonality. Associated Laguerre functions: Definition, Generating function, Recurrence relations and orthogonality. The gamma function and beta function; definition and simple properties.

Unit IV: Linear vector space

Definition. Linear dependence and independence of vectors. Dimension. Basis. Change of basis. Subspace. Isomorphism of vector spaces. Linear operators. Matrix representative of a linear operator in a given basis. Effect of change of basis. Invariant subspace. Eigenvalues and eigenvectors. Characteristic equation.The Schur canonical form. Diagonalisation of a normal matrix. Schur's theorem

Reference Books:

1. G. B. Arfken and H. J. Weber, Mathematical methods for physicists, 7th Edn., Academic Press, New York (Prism Books, Bangalore, India), 2012.
2. E. G. Harris, Introduction to modern theoretical physics, Vol. 1, John Wiley, New York, 1975.
3. K. N. Srinivasa Rao, The rotation and Lorentz groups and their representations for physicists, Wiley Eastern, New Delhi, 2003.
4. B. D. Guptha, Mathematical physics, 4th Edn, 2011.
5. J. Mathews and R. L. Walker, Mathematical Methods for Physics, Benjamin, Pearson Addison-Wesley; 2nd edition, 1971.
6. L. I. Pipes and L. R. Harvill , Applied Mathematics for Engineers and Physicists 3rd Edition, McGraw Hill, 2014.
7. E. Kreyzig, Advanced Engineering Mathematics 8th edition, Wiley, 2010
8. M. Greenberg, Advanced Engineering Mathematics 2nd edition, Pearson India, 2002.

MSE(P) IX.3 : ELECTRODYNAMICS

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I:

Electrostatics, Magnetostatics and Time varying fields: Coulomb's law, Gauss's law, Laplace and Poisson equations, Solutions, Boundary value problems, Green's identities and Green's function, uniqueness theorem, Method of images with simple examples, Multipole expansion of an arbitrary charge distribution, Ponderable media, Dielectrics. Biot-Savart law, Ampere's law, Boundary value problems, Ampere's theorem, Multipoles, Electromagnetic induction.

Time varying fields and Maxwell's equations: Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Time harmonic fields. Gauge transformations. The Lorentz, Coulomb and radiation gauges.

Unit II:

Electromagnetic waves: Monochromatic plane waves, velocity, phase and polarization. Propagation of plane electromagnetic waves in (a) conducting media and (b) ionized gases. Polarization, Reflection and refraction of electromagnetic waves— Fresnel formulae for parallel and perpendicular components. Brewster law. Normal and anomalous dispersion—

Clausius -Mossotti relation. Superposition of waves, Group velocity, Kramers Kronig relations.
Wave guides and cavity resonators: Penetration of fields into the conductors, Wave guides, Cylindrical, Rectangular, Energy flow and attenuation, Resonance cavities, Power losses, Fields and radiation of localized oscillating source, Electric dipole fields and radiation.
Unit III:
Fields of moving charges and radiation: The retarded potentials. The Lienard- Wiechert potentials. Fields due to an arbitrarily moving point charge. The special case of a charge moving with constant velocity.
Radiating systems: Radiation from an oscillating dipole. Power radiated by a point charges—Larmor formula. Lienard's generalisation of Larmor formula. Radiation reaction—Abraham-Lorentz formula.

Unit IV:
Relativistic electrodynamics: Charge and fields as observed in different frames. Magnetism as a relativistic phenomenon, Transformation of the field. Covariant formulation of electrodynamics. Electric field of a point charge moving uniformly, Electromagnetic field tensor, Electrodynamics in tensor notation, Transformation of fields - Field due to a point charge in uniform motion Potential formulation of relativistic electrodynamics. Lagrangian formulation of the motion of charged particle in an electromagnetic field.

Reference Books:

1. J. D. Jackson, Classical Electrodynamics 3rd edition, Wiley, 1999.
2. D. J. Griffiths, Introductory Electrodynamics, Prentice Hall of India, 1989.
3. Paul Lorrain, Dale R. Corson, and Dale Corson , Electromagnetic fields and waves, W.H. Freeman & Company; 3rd edition, 1987.
4. D. K. Cheng, Field and Wave Electromagnetics, Addisson Wesley, 1989.
5. B. B. Laud, Electromagnetics, Wiley Eastern Limited, India, 2000.
6. W. Miah, Fundamentals of Electromagnetics, McGraw-Hill Education, 1982.

MSE(P) IX.4 : NUMERICAL TECHNIQUES AND COMPUTER PROGRAMMING

Credits: 4 (4L + 0T +0P) — **Marks: 100**
Contact hrs per week: 4 — **C1 + C2: 50**
Exam Duration: 2 hrs — **C3: 50**

COURSE CONTENT

Unit I:

Roots of transcendental equations: Location theorem, Bisection (half interval) method Method of false position (Regula Falsi), Graphical Method, Newton-Raphson method, Geometric significance, inherent error, convergence of Newton Raphson method, Special procedure for Algebraic equations, Iteration Method, Geometry and convergence of iteration process.

Unit II:

Interpolation and curve fitting: Difference calculus, Detection of error, Forward, backward, Central & divided difference, Newtons forward, backward, general interpolation formula, Lagrange's Interpolation formula. Least square fitting (Linear & Non-linear).
Numerical integration and Ordinary differential equations: Trapezoidal and Simpson's methods, Newton-Cote's method, Gauss quadrature, Solution of ordinary differential equations - Euler's method, Milne's method, Runge-Kutta methods.

Unit III:

Determinants and Matrices: Evaluation of numerical determinants, Cramer's rule, Successive elimination of unknowns: division by the leading coefficients, Gauss method, Solution by Inversion of Matrices: solution of equation by matrix methods, Systems solvable by iteration and condition for convergence. The Eigen value problem – Eigen values of a symmetric tridiagonal matrix- Householder's method – QR method.

Unit IV:

C Programming fundamentals:Constants and variables, Data types, Type declaration of variables, Symbolic constants, Arithmetic operators, Increment and decrement operators, Conditional operator, Bitwise operators, Hierarchy, Arithmetic expressions, Logical operators and expressions, Assignment operators, Arithmetical and assignment statements, Mathematical functions, Input/output statements, Formatted I/O, Relational operators, Decision making and branching, Go to, if, if…else, switch statements, Looping, While, do and for, Arrays, Handling characters and strings, Functions and voids, structures, Pointers (elementary ideas only), File operations(defining and opening, reading, writing, updating and closing of files.

Reference Books:

1. S. S. Shastry, Introductory methods of numerical analysis, Prentice Hall of India,1983.
2. V. Rajaraman, Computer Programming in C, PHI Learning Pvt. Ltd., 1994.
3. E. Balaguruswamy, Programming in ANSI C, Tata-McGraw Hill, 1992.
4. Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
5. J. H. Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
6. J. B. Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, John Hopkins University Press, 1966.
7. Hildebrand, Numerical analysis, Dover Publications; 2 edition, 1987.

8. W. H. Press, S. A. Teukolsky, W. T. Vellerling & B. P. Flannery, Numerical Recipes in C, The art of scientific computing, Cambridge University Press, 2007.

MSE(P) IX.5 : CORE LAB – I

Credits: 2 (0L + 0T +2P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 4 hrs	**C3: 50**

COURSE CONTENT:

(Any TEN of the following experiments)

1) Birefringence of mica using a Babinet compensator.
2) Birefringence of mica using a quarter wave plate.
3) Determination of the size of lycopodium spores by the method of diffraction haloes.
4) Determination of wavelength– by using Fabry Perot Etalon.
5) Dispersion of the birefringence of quartz.
6) Determination of wavelength with laser based Michelson Interferometer.
7) Determination of the pressure dependence of the refractive index of air by an Interferometer.
8) Determination of the Stokes vector of a partially polarised light beam.
9) Determination of birefringence of mica using quarter wave plate.
10) Analysis of the sodium spectrum by Edser Butler fringes.
11) Cauchy's constants. – Liquid prism (different concentrations).
12) Michelson's interferometer - (a) wavelength of D1 and D2 lines of sodium light and (b) d thickness of mica sheet.
13) Determination of the refractive index of air by Jamin interferometer.
14) Verification of Brewster’s law of Polarisation.
15) Verification of Fresnel’s laws of reflection.

Reference books:

1. B. L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methusen & Co. 1950.
2. E. V. Smith, Manual of experiments in applied Physics, Butterworth, 1970.
3. R. A. Dunlap, Experimental Physics, Modern methods, Oxford University Press, 1988.
4. D. Malacara (ed), Methods of experimental Physic- series of volumes, Academic Press Inc., 1988.
5. S. P. Singh, Advanced Practical Physics – Vol I & II, Pragati Prakasan, Meerut, 2003.

MSE(P) IX.6 : CORE LAB II: COMPUTER LAB – I

Credits: 2 (0L + 0T +2P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 4 hrs	**C3: 50**

COURSE CONTENT:

(A minimum of EIGHT experiments to be selected from the following topics)

Linux operating system basics: Login procedure; creating, deleting directories; copy, delete, renaming files; absolute and relative paths; Permissions—setting, changing; Using text editor.
Scientific text processing with LATEX: Typeset text using text effects, special symbols, lists, table, mathematics and including figures in documents.
Using the plotting program GNUPLOT: Plotting commands; To plot data from an experiment and applying least-squares fit to the data points. Including a plot in a LATEX file.
Using the mathematics package OCTAVE: To compute functions, matrices, eigen-values, inverse, roots.

MSE(P) IX. 7 :FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits: 3 (2L+1T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs	**C_3 : 50**

Objectives:

- Understand the concept of Education and its Epistemological premises
- Analyses the Discipline categories and their Logical distinctions
- Understands Education as a Discipline and its contribution to curriculum courses
- Analyses the societal problems and the necessity for Peace Education in schools
- Explores the possible sources of value conflicts , crisis among Higher secondary learners and teacher's role in helping to resolve value conflicts
- Analyses various perspectives and thoughts on Peace and Peace Education
- Analyses the role of Education in a Pluralistic society like India and a need for culture-specific pedagogy in School Education
- Reflects on the social discriminations, inequalities and the oppressed groups ,as a teacher, as well as a member of the society and develops responsible attitude and commitment.
- Understands the school as a sub system of society and its responsibilities in reflecting the cultural and social ethos in its aims and functions
- Examines the concerns and issues of contemporary Indian Society and their bearing upon Education

Transaction Mode:

Lectures followed by Discussions; Group Discussions; Seminars; Collaborative Presentations; Assignments

COURSE CONTENT:

Unit I:

Education as a critical concept and criteria of educative process; Knowledge and disciplines; Logical distinction between Scientific and Mathematical Knowledge; Education as a discipline; Multidisciplinary nature of education; Concept and nature of value and value education; Factors contributing to value development; Value shifts; Need for education for peace; Value crises in adolescent learners; Methods of resolving value conflicts; Human rights; Role of education in promoting peace; Use of curricular and co-curricular areas in promoting peace as a value; Rationality as a value to be developed in learners.

Unit II:

Styles of learning and thinking – implications for understanding the adolescent learner; Sociocultural factors influencing learning.

The process of adult learning – cognitive changes (Praget and Elkind); role of feedback and incentives; learner's experience in the construction of knowledge.

Personality and development of self; The intra and interpersonal realm – self perception, self-defeating behaviour, self presentation, impression and management, self-monitoring; search for identity (Erikson), time of turmoil.

Mental health and management – Issues and concerns; adjustment and adjustment mechanisms; role of teacher in management.

Unit III:

Characteristic of Indian society : Multicultural, Multilinguistic and Multireligion system and role of senior Secondary Teacher

Socialization and acculturation, etc. influence on personality development in education.

Modernisation, its attributes and effect on present system of education.

Democratic values, equality and social justice, its importance in classroom teaching at higher secondary level.

Unit IV: Issues and Concerns of Senior Secondary Education

Gender equality, Inclusive Education for Children with Diverse Needs. Environmental Concerns, Sustainable Education, Quality Teacher Education, Globalization and its Effect over Education System.

References:

1. Dewey,John(1956): The School and the Society, The University of Chicago,ptd in USA,1990.
2. Carnoy, Martin (1974): education as Cultural Imperialism, Longman Inc. London
3. Bruner,S,J(1972): the Relevance of Education,Pub by Redwood press Ltd, ptd in Great Britain.
4. Gross,R,B(1970): Analytical Philosophy- An Historical Introduction, Western Publishing company, Inc. USA
5. O'Connor.D.J(1956): Philosophy Of Education
6. Dewey, J(1916): Democracy and Education: An Introduction to Education, New York
7. Peters, R.S: The concept of Education
8. Peters, R.S: Education and Education of Teachers
9. Pathak, Avijit (2002), Social Implications of Schooling, Rainbow Publishers, Delhi
10. Introduction: Life at School, need for critical enquiry Ch. 2 Sociology of School Knowledge Ch 3. Looking Beyond Texts, culture of school and formation of consciousness
11. Kumar Krishna (2004), What is Worth Teaching? 3rd edition, Orient Longman Ch 3. Implications of a Divisive School System Ch. 6 Growing Up Male
12. Saraswathi, T.S. (1999), Culture, Socialization and Human Development, Sage Publications
13. Bhattacharjee, Nandini, Through the Looking Glass: Gender Socialization in a Primary School (Ch14)
14. Krishnamurti, J., Education and the Significance of Life, KFI Publications (Ch. 6)
15. Readings from 'The Social Character of Learning' by Krishna Kumar and from 'Inner World' by Sudhir Kakar could also be considered

16. Krishnamurthi.J (2002): Why are you being educated? Talks at Indian Universities Krishnamurthy Foundations of India, Ptd by Chennai
17. Banks, James A. and C. A. McGee Banks, eds(1989): Multicultural Education: Issues and Perspectives. Needham Heights, Mass.: Allyn & Bacon
18. Boocock, S. S(1980): Sociology of Education: An Introduction. Lanham, MD: University Press of America
19. Chesler, Mark A. and W. M. Cave(1981): A Sociology of Education. New York: Macmillan
20. Dreeben, Robert(1968): On What is Learned in School. Reading, Mass.: Addison-Wesley
21. Durkheim, Emile(1956): Education and Sociology. Tr. Sherwood D. Fox. New York: Free Press
22. Eggleston, John(1977): The Sociology of the School Curriculum. Boston: Routledge & K. Paul
23. Jackson, P.W.(1968):Life in Classrooms. New York: Holt.
24. Rayner Steve (2007): Managing Special and Inclusive Education. New Delhi : Sage Publications.
25. Woodfolk Anitha (2004) : Educational Psychology. Boston : Pearson.
26. Snowman, S and Bidher, R. (2004): Psychology Applied to Teaching. California : Wadsworth.
27. NCERT (2005) : Education of Children with Special Needs – Position Paper by National Focus Group. New Delhi: NCERT.
28. NCERT (2005): Education for Peace- Position Paper by National Focus Group. New Delhi : NCERT.
29. Byrne, D. and Baron, R. (2008): Social Psychology. Boston : Allyn and Bacon.
30. Palmer, Joy, A. (2003) : Environmental Education in the 21st Century – Theory, Practice, Progress and Promise. New York : Routledge.

TENTH SEMESTER

MSE(P) X.1 : QUANTUM MECHANICS -I

Credits: 4 (4L + 0T +0P) | **Marks: 100**
Contact hrs per week: 4 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

COURSE CONTENTS:

Unit I: Fundamental Concepts

The Stern– Gerlach Experiment, Kets, bras, and operators, base kets and matrix representations, postulates of quantum mechanics observables. Measurements, eigen values and expectation values, the uncertainty relations, compatible and incompatible observables, change of basis, position, momentum and translation, Momentum as generator of translations. The canonical commutation relations, wave functions in position and momentum space, momentum operator in position eigen basis, Gaussian wave packets.

Unit II: Quantum Dynamics

Schrodinger wave equation, Heisenberg's formulation of Quantum mechanics, potential well and barrier problems, reflection, transmission and tunneling, simple harmonic oscillator – solution by operator method, spherically symmetric potentials, hydrogen atom, two body problem, equations for center of mass and reduced mass, separation of variables, orbital angular momentum, commutation relations, radial and angular parts, energy eigen states and eigen values, degeneracy of energy eigen states.

Theory of Angular Momentum : Angular momentum operators, Matrix representation of angular momentum operators, spin ½, Pauli spin matrices, Eigen values and eigen- states of angular momentum, Addition of angular momenta, Clebsch-Gordon coefficients, simple examples.

Unit III: Symmetry and Conservation laws

Space-time symmetrics, conservation of linear momentum, conservation of energy, conservation of angular momentum, space inversion and time reversal, identical particles, construction of symmetric and antisymmetric wave functions, Slater determinant, Pauli's exclusion principle, Bosons and Fermions, spin wave functions for two electrons, ground state of the He atom, scattering of identical particles.

Unit IV: Scattering

Classical definition of scattering cross-section, quantum theory of scattering, low energy scattering by a central potential, method of partial waves, phase shifts, scattering by a square well potential, scattering by Coulomb potential, High energy scattering, Born approximation, Validity of Born approximations, Yukawa potential, Rutherford scattering.

Reference Books:

1. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Plenum Press, New York, 1984.
2. L. I. Schiff, Quantum Mechanics, 3rd Edition, McGraw Hill, Koyakusha Ltd., New Delhi, 1968.

3. N. Zettili, Quantum Mechanics– Concepts and applications, John Wiley & Sons, 2004.
4. V. K. Thankappan, Quantum Mechanics, New Academic Science Ltd, 4th revised edition, 2014.
5. A. K. Ghatak and S. Lokanathan, Quantum Mechanics : Theory and Applications, 3rd Edition, Macmillan India Limited, Madras, 1994.
6. David J Grififth, Introduction to Quantum Mechanics, Addison Wesley; 2nd edition, 2004.
7. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
8. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
9. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
10. B. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.
11. Stephen Gasiorowicz, Quantum Physics, John Wiley & Sons; 3rd edition, 2003.
12. E. Merzhacher, Quantum Mechanics, John Wiley & Sons; 3rd edition, 1998.

MSE(P) X.2 : MATHEMATICAL PHYSICS – II

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I: Functions of Complex Variables

Function of a complex variable, Analytic functions, Cauchy- Riemann conditions, Contour Integral, Cauchy’s integral theorem, Cauchy’s integral formula. Taylors Expansion, Laurent expansion, Zero of analytic functions, Singularities- regular and singular points, poles of a function, Residues, Cauchy's Residue theorem, Calculus of residues and applications, Evaluation of definite integrals, Jordan's lemma, Cauchy's principal value.

UNIT II: Groups

Linear representations of groups. Groups of regular matrices; the general linear groups GL(n;C) and GL(n;R). The special linear groups SL(n;C) and SL(n;R) .The unitary groups U(n) and SU(n) .The orthogonal groups O(n;C), O(n;R), SO(n;C) and SO(n;R).Rotation group The matrix exponential function. Definition and properties. Rotation matrix in terms of axis and angle. Eigen values of a rotation matrix. Euler resolution.of a rotation. Definition of a representation. Equivalence. Reducible and irreducible representations. Schur's lemma. The groups O(3) and SO(3). Construction of the $D^{1/2}$andD^{1} representation of SO(3)by exponentiation. Mention of the DJ irreps SO(3)

UNIT III: Special functions

Special functions:Sturm Liouville theory, Bessel functions, Legendre functions and Spherical harmonics. Self adjoint ODE's, Hermitian operators, completeness of eigenfunctions, Green's function eigenfunction expansion. Bessel functions: Bessel functions of the first kind J (x). Bessel diffeerential equation, generating function for J (x), integrals for $J_0(x)$ and $J_1(x)$, reccurence formulae for J(x), orthogonal properties of Bessels polynomials. Legendre functions: Legendre differential equation, Legendre polynomials, generating functions, recurrence formulae, Rodrigues representation, orthogonality. Associated Legendre polynomials. The differential equation, orthogonality relation. Spherical harmonics: Definition and orthogonality.

UNIT IV: Fourier transforms and integral equations
Integral transforms, Development of the Fourier integral. Fourier transforms-inversion theorem. Fourier transform of derivatives. Convolution theorem. Momentum representation, Integral equations: Types of linear integral equations. definitions. Transformation of a differential equation into an integral equation. Abel's equation, Neumann series, separable kernels.

Reference Books:

1. G. B. Arfken and H. J. Weber., Mathematical methods for physicists, 7th Edn., Academic Press, New York (Prism Books, Bangalore, India), 2012.
2. E. G. Harris, Introduction to modern theoretical physics, Vol. 1, John Wiley, New York, 1975.
3. K. N. Srinivasa Rao., The rotation and Lorentz groups and their representations for physicists, Wiley Eastern, New Delhi, 2003.
4. D Guptha., Mathematical physics, Vikas Publishing House, 4th edition, 2009.
5. A.W.Joshi, Elements of Group Theory for Physicists, New Age International (P) Ltd., 1997.
6. J. Mathews and R. L. Walker, Mathematical Methods for Physics, Benjamin, Pearson Addison-Wesley; 2nd edition, 1971.
7. M. Tinkham, Group Theory and Quantum Mechanics, Dover Publications Inc., 2004.
8. L. I. Pipes and L. R. Harvill : “Applied Mathematics for Engineers and Physicists (3rd Edition)" (McGraw Hill).
9. Wu- Ki Tung, Group theory for Physicists, World Scientific Publishing Co Pte Ltd., 1985.
10. E. Kreyzig, Advanced Engineering Mathematics 8th edition, Wiley, 2010.
11. M. Greenberg, Advanced Engineering Mathematics 2nd edition, Pearson India, 2002.

MSE(P) X.3 : STATISTICAL PHYSICS

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:
Unit I: Basic concepts of classical statistical Mechanics
Specification of states of a system, contact between statistics and Thermodynamics, classical Ideal gas, entropy of mixing and Gibbs paradox. Macroscopic and microscopic description of a system, Kinetic calculation of Pressure and interpretation of Temperature, Maxwell-Boltman distribution law, energy and velocity distribution laws for an ideal gas. Ensembles-microcanonical, canonical, and grand canonical ensembles, phase space, thermodynamic probability, fundamental postulates of statistical mechanics, probabilistic interpretation of entropy, statistical equilibrium. ergodic hypothesis, stationary state and Liouville’s theorem,

Postulate of equal apriori probability, Partition function, density of states, Translational, Vibrational, Rotational and Electronic partition function and contributions to thermodynamic properties, Equipartition theorem and Virial theorem, Partition function in a system and for particles, Harmonic oscillator, particle in a box, Derivation of thermodynamic equation of state for ideal and real gases, Gibb's paradox, Sackur- Tetrode equation.

Unit II: Quantum statistical Mechanics

Limitations of classical statistics, phase space, phase cells, postulates of quantum statistics, indistinguishability, Bose-Einstein statistics – derivation of distribution function, Application to Photon concept, derivation of Planck's radiation formula. Elementary idea of Bose-Einstein condensation. Fermi Dirac statistics – derivation of distribution function, Application of FD statistics to free electrons in metals – Fermi energy. Comparison of classical and quantum statistics. Symmetric and anti-symmetric wave functions, ensembles in quantum statistics, Degeneracy and non-degeneracy, condition for degeneracy, comparison of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein Distribution functions, Density of States.

Unit III: Applications of Fermi-Dirac Statistics

Ideal Fermi gas, equation of State, Application to electron gas, Diamagnetism and paramagnetism of free electrons, Pauli paramagnetism, Specific heat of solids, Limitations of Dulong, Petit's law (classical), phonons and electrons, Einstein model of the theory of solids, Debye model of the theory of solids, Electron degeneracy pressure and its application in Astrophysics. Ideal Bose gas, Planck's radiation law, Wien's law, Stefan – Boltzmann law, Black body as a thermodynamic system, Radiation pressure. Bose – Einstein condensation.

Unit IV: Non-ideal systems and Fluctuations

Cluster expansion for a classical gas, Virial equation of state, Ising model, mean-field theories of the Ising model in three, two and one dimensions, exact solutions in one dimension. Correlation of space-time dependent fluctuations and transport phenomena, Brownian motion, Langevin theory, fluctuation-dissipation theorem, The Fokker-Planck equation.

Reference Books:

1. K. Huang, Statistical Mechanics, John Wiley & Sons, 2008.
2. R. K. Pathria and Paul D. Beale, Statistical Mechanics, Academic Press Inc; 3rd revised edition, 2011.
3. F. Reif, Fundamentals of Statistical and Thermal Physics, Waveland Press, 2010.
4. E. S. R. Gopal, Statistical Mechanics and properties of Matter, Ellis Horwood, 1976.
5. Gupta and Kumar, Statistical Mechanics, 24th edition, Pragati Prakashan, 2011.
6. N. S. Brijlal and P. S. Hemne, Heat, Thermodynamics and statistical physics, S.Chand Publishing, 2008.
7. R. P. Feynman, Statistical Mechanics: a set of Lectures, Perseus Books, 2nd edition, 1998.
8. L. D. Landau, E.M. Lifshitz, Course of Theoretical Physics, Vol.5, Statistical Physics, Part 1 and 2, Butterworth-Heinemann, 3rd edition, 1980.

MSE(P) X.4 : ELECTRONICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I:

Intrinsic and extrinsic semiconductors, Carrier concentrations, Fermi level, donor and acceptor levels in extrinsic semiconductors. Half wave and full wave rectifiers, circuits, wave forms, Rectifiers with L-sections and π-section filters, *Peak Inverse Voltage*, ripple factor, efficiency, Breakdown in diodes, Zener breakdown, voltage regulation, zener regulation against load and line variations. Clippers and Clampers.

Unit II:

Bipolar junction transistor-PNP and NPN transistors, different configurations and characteristics, current components in CE configuration, large signal and small signal dc current gains, transistor biasing – self bias circuit, Load line and operating point. Transistor as an amplifier, transistor as a two port device, frequency response of CE amplifier, Emitter follower, Comparison of transistor configurations, multi stage amplifiers, RC coupling, Transistor as Power amplifier.

MESFET and MOSFET, enhancement and depletion MOSFETS volt-ampere characteristics, MOSFET circuit symbols, DC analysis of FETs, the FET as a switch, the FET as an amplifier, MOSFET as a resistance.

Unit III:

Kirchhoff's Laws, Maximum Power Transfer theorem. Impedance matching Principle of superposition, Thevenin's and Norton's theorems, analysis of networks using Thevenin's and Norton's theorems.

Concept of feedbacks in amplifiers and advantages of negative feedback. Requirements for oscillation, Barkhausen criterion, Hartley and Colpitts oscillators, Wien Bridge oscillator, Phase Shift oscillator.

Unit IV:

Elementary considerations of low pass, high pass, band pass, and band stop filters and their characteristics. Differential amplifiers, principle of OP-AMP, OP-AMP parameters, Applications – Addition, Subtraction, differentiation and integration. Filters with OP- AMP as active device (basic ideas only).

Basic ideas of differentiating and integrating circuits, bistable multivibrators, comparators, square wave generation from a sinusoid, Schmitt trigger, Astable and monostable multivibrators, discrete circuits of astable and monostable multivibrators and wave forms.

Reference Books:

1. Jacob Millman and Arvin Grabel, Microelectronics, McGraw Hill International Editions, 1987.
2. Jacob Millman and Halkias, Integrated Electronics – Analog and Digital Circuits and Systems.
3. Taub and Schilling, Principles of Communication systems, Tata McGraw-Hill Education,2008.
4. V. K. Mehta & Rohit Mehta, Principles of Electronics, S. Chand & Company, 2010.

5. B. L. Theraja,Basics Electronics- solid state, S. Chand & Company, 2012.
6. Millman, Halkias, and Satyabrata Jit, Millman's Electronic devices and circuits, McGraw Hill India, III edition, 2015.
7. Malvino, Leach, and Saha, Digital Principles and Applications, McGraw Hill India, 2015.
8. Malvino and Bates, Electronic Principles, McGraw Hill India, 2013.
9. R. A. Gaekwad, OPAMPS and Linear Integrated Circuits, Prentice Hall, 2000.
10. D. C. Roy, Linear Integrated circuits, New Age International Publishers, 2003.
11. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, John Wiley & Sons,2008.

MSE(P) X.5 : CORE LAB – III

Credits: 2 (0L + 0T +2P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 4 hrs	**C3: 50**

COURSE CONTENT:

(Any TEN of the following experiments)

1. Regulated power supply.
2. Active fillters: low pass (single pole) and Active filters: high pass (double pole).
3. Voltage follower.
4. Colpitts' oscillator.
5. Sawtooth generator using transistors and Miller sweep circuit using OPAMPS (for different frequencies).
6. Op-amp as an integrator and differentiator, summing and log amplifier.
7. Use of IC 741 - Determination of input offset voltage, current, CMRR, slew rate, and use as Inverting and non-inverting amplifier and difference amplifier, summing amplifier and comparator.
8. Op-amp as an inverting and non-inverting amplier.
9. Coder and encoder.
10. IC 555 Timer - Astable and Monostable and Bistable multi vibrators, VCO missing pulse detector and Sawtooth generator.
11. Half adder and full adder.
12. Schmidt trigger using transistors and OPAMPS - Trace hysteresis curve , determine LTP and UTP.
13. Boolean algebra-Logic gates.
14. Bootstrap Amplifier (frequency response, input & output resistance).
15. Op- amp astable multivibrator.
16. Second order Low pass, High Pass and Band Pass filters using OPAMP (study the frequency response)

Reference books:

1. Paul B. Zhar and A.P. Malvino, Basic Electronics - A Text Book Manual, JMH publishing, 1983.
2. A. P. Malvino, Basic Electronics - A textlab manual, Tata McGraw Hill, 1992.

3. R. Bogart and J. Brown, Experiments for electronic devices and circuits, Merrill International series, 1985.
4. Buchla, Digital Experiments, Merrill International series, 1984.
5. B. L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methusen & Co. 1950.
6. E.V. Smith, Manual of experiments in applied Physics, Butterworth, 1970.
7. R. A. Dunlap, Experimental Physics, Modern methods, Oxford University Press, 1988.
8. D. Malacara (ed), Methods of experimental Physic- series of volumes, Academic Press Inc., 1988.
9. S.P. Singh, Advanced Practical Physics – Vol I & II, Pragati Prakasan, Meerut, 2003.

MSE(P) X.6 : CORE LAB IV: COMPUTER LAB – II

Credits: 2 (0L + 0T +2P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 4 hrs	**C3: 50**

COURSE CONTENT:

(Any EIGHT of the following experiments)

Programming in C:

1. Check whether given number is odd or even.
2. Find the largest and smallest number in the input set.
3. Compute the Fibonacci sequence.
4. Check whether the input number is prime or not.
5. Compute the roots of a quadratic equation.
6. Generate Pascal's triangle.
7. To add two m x n matrices.
8. To find the sum and average of a data stored in a file.
9. Linear least-squares fitting to data in a file.
10. To find the trajectory of a projectile shot with an initial velocity at an angle. Also, find the maximum height travelled and distance travelled. Write the trajectory data to a file specified and plot using Gnuplot.

Programming in Perl:

1. Searching for a pattern in a string.
2. Counting the number of characters, words and lines in a given file.
3. Sorting strings.
4. Check whether the input number is prime or not.
5. Compute the roots of a quadratic equation.
6. Linear least squares fitting to data in a file.

MSE(P) X.7 : TEACHING OF PHYSICS

Credits: 3 (2L+1T+0P) — **Max.Marks :100**
Contact Hrs per week : 4 — **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs — **C_3 : 50**

Objectives:
The student teacher will be able to

- understand the nature and scope of Physics
- understand the different pedagogical approaches to teaching of Physics
- plan learning designs based on problem situations, inquiry and projects,
- explore the use and relevance of different learning resources and materials in teaching of Physics
- study the facilities and materials available in Physics labs for teaching Physics at higher secondary level,
- Familiarize with different types of curricular projects in Physics, their purpose and themes.
- analyse the textbooks and other instructional materials with reference to the content, its organization, learning experiences and other characteristics
- prepare tools for assessing learning of Physics

COURSE CONTENT:

Unit I: Aims, Objectives and Approaches to Teaching/ Learning Physics
Objectives of teaching Physics at +2 level in India (State CBSE and the ICSE)Boards), Objectives/ Standards of teaching Physics in senior secondary schools in other countries; Approaches to teaching/learning Physics; Investigatory and Group investigatory methods; data collectionand experimental skills, recording, analyzing and reporting skills.
Problem solvingand Problem based learning; Demonstration and Discussion strategies, methods of independent study, experimental and field projects, experiential learning method; ICT integrated approaches to teaching; e-learning; on-line learning of science; Task based learning; designing of group tasks; seminar presentations: Planning, organizing and presentation skills.
(The above may be taught with illustrations of topics at senior secondary level; certain curricular projets of the Western countries may be referred to identify the topics suitable)

Unit II: Planning for Preparation for Teaching / Learning of Physics
Planning of Physics lessons with required components; Planning of different types of lessons: Problem based – Task based – STS oriented – Content and Skill based Experiential learning lessons; planning for practical work in physics; understanding of lab. Techniques, skills in conducting experiments.

Suggested topics for pedagogic analysis

1. Motion: Description of Motion (uniform, accelerated and retarded), equations of motion, Relation between force and acceleration, projectile motion, work and energy, momentum, conservation of momentum and energy.
2. Current Electricity: Definition of electric current, cells as sources of electromotive force (emf), emf and voltage, resistance and resistivity, Ohm's law, resistances in series and parallel with numerical examples.

(The above topics are only illustrative and other topics can be chosen by the teacher depending on resources).

Unit III: Instructional and Curricular Resources

Physics Textbooks, Lab. manuals, Journals on Physics Education, Teacher Manuals, Worksheets, Teaching Learning Aids, Laboratory work, Multimedia and web based resources.

Lab as a Resource : Evolution of practical work in Physics and its purpose; Demonstration of content specific experiments on topics related to +2 content; set of experiments in the lab to illustrate process skills related to learning of Physics; Planning, designing and demonstrations of experiments, recent trends and issues in practical work.

Curricular Resources : Study of curricular projects at the State/ National / International Levels in physics; Critical analysis of CBSE syllabus and textbooks in Physics based on the validities enumerated in NCF 2005.

Unit IV: Assessment in Learning Physics

Tools and techniques of assessment in Physics learning: Tools used for assessing factual and conceptual knowledge in physics; assessment of practical work: rubrics for assessing practical work (performance abilities and skills); assessment of practical/ lab records; assessment of attitude towards practical work; course work; assignments; group discussions.

Assessment of project work, investigatory projects; group discussions; seminar presentations and participation.

Need for periodic assessment of the above and the strategies used for periodic assessment.

Using assessment feedback to improve teaching of and learning in physics. Analysis of question papers in Physics prepared by State / CBSE Boards; setting of question papers following the patterns in State/CBSE.

Scoring of physics answer papers.

References:

1. National Curriculum Framework, 2005, NCERT, New Delhi.
2. Steve Alsop, Keith Hicks (2007), Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
3. John I. Lewis (1972), Teaching School Physics : A UNESCO Sourcebook – Penguin Education, UK.
4. McIntosh Techniques and Problems of Assessment: A Practical Handbook for teachers.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its publications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. NCERT Textbook in Physics for XI and XII students.
8. State Textbook in Physics for XI and XII students.
9. Nathan S Washton (1967) Teaching Science Creatively, Saunders Company, London.
10. History of Physics in the 20th Century, Internet Browsing.
11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All: Methods for Constructing Understanding, Allyn and Bacon, London.
12. School Science Review : The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
13. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.

14. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.

ELEVENTH SEMESTER

MSE(P) XI.1 : QUANTUM MECHANICS - II

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I:

Approximation Methods for time-independent problems: The WKB approximation, connection formulae, barrier tunneling, application to decay – bound states, penetration of a potential barrier, Time independent perturbation theory, non-degenerate and degenerate cases, anharmonic oscillator, Stark and Zeeman effects in hydrogen. Variational Method, Expectation value of energy, ground state and excited states, application to ground state of Hydrogen and Helium atoms, Van der Waals interaction.

Unit II:

Approximation Methods for time-independent problems (contd.):Time dependent Perturbation theory, Transition probability, constant and harmonic perturbations, Application to interactions of an atom with the electromagnetic field, emission and absorption of radiation, selection rules, the dipole approximation, the Born approximation and scattering amplitude. *Relativistic kinematics*: Relativistic kinematics of scattering and reactions. Elastic, Inelastic reactions, Decay of a particle $A \rightarrow B + C$, $A + B \rightarrow C$, $P + \bar{P} \rightarrow P + \bar{P} + P + P$.

Unit III: Relativistic Quantum Mechanics

Klein Gordon equation, plane-wave solutions, negative energy. Equation of continuity. The difficulties of the Klein-Gordon equation. The Dirac equation: The free-particle Dirac equation in the Hamiltonian form. The algebra of Dirac γ matrices, Plane wave solutions of the free-particle equation, the two-component form of the solution in the Dirac-Pauli representation, standard normalisation of the solutions. Non-relativistic reduction and g factor.

Unit IV: Quantisation of fields

Principles of canonical quantisation of fields, The Lagrangian formulation for a field, Classical Hamiltonian equations, quantisation of bosonic and fermionic fields, creation and annihilation operators, Fock states, Number representation.

Reference Books:

1. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Plenum Press, New York, 1984.

2. L. I. Schiff, Quantum Mechanics, 3rd Edition, McGraw Hill, Koyakusha Ltd., New Delhi, 1968.
3. N. Zettili, Quantum Mechanics– Concepts and applications, John Wiley & Sons, 2004.
4. V. K. Thankappan, Quantum Mechanics, New Academic Science Ltd, 4th revised edition, 2014.
5. A. K. Ghatak and S. Lokanathan, Quantum Mechanics : Theory and Applications, 3rd Edition, Macmillan India Limited, Madras, 1994.
6. David J Grififth, Introduction to Quantum Mechanics, Addison Wesley; 2nd edition, 2004.
7. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
8. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
9. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
10. B. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.
11. Stephen Gasiorowicz, Quantum Physics, John Wiley & Sons; 3rd edition, 2003.
12. E. Merzhacher, Quantum Mechanics, John Wiley & Sons; 3rd edition, 1998.

MSE(P) XI.2 : SPECTROSCOPY

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I: Atomic spectroscopy

Spectroscopic terms and their notations. Spin-orbit interaction, quantum mechanical relativity correction; Lamb shift. Zeeman effect, Normal and anomalous Zeeman effect, Paschen-Back effect. Stark effect, Weak field and strong field effects, quantum mechanical treatment of stark effect. Hyperfine structure of spectral lines: Nuclear spin and hyperfine splitting, intensity ratio and determination of nuclear spin. Breadth of spectral lines, natural breadth, Doppler effect and external effect.

Unit II: Vibrational and Rotational Spectroscopy of Molecules

Vibrational coarse structure of electronic spectra, Vibrational analysis of band systems, Deslander's table, Progressions and sequences, Information derived from vibrational analysis, Franck-Condon principle, rotational fine structure and the R, P and Q branches, Fortrat diagrams, dissociation energy, examples of iodine molecule.

Classification of molecules, interaction of radiation with vibrating molecules, Rotational spectrum of a rigid, diatomic molecule, example of CO, selection rule, intensities, the spectrum of a non-rigid rotator, example of HF, spectrum of a symmetric top molecule. Example of CH_3Cl, Instrumentation of Microwave Spectroscopy– information derived from rotational spectra.

Unit III: Infra red and Raman Spectroscopy

Vibrational energy of an anharmonic oscillator– diatomic molecule (Morse curve), IR spectra – spectral transitions and selection rules, example of HCl, the vibration – rotation spectra of diatomic molecule, Example of CO, Born-Oppenheimer Approximations, Effect of

Breakdown of Born-Oppenheimer approximation, normal modes of vibrational of H_2O and CO_2. Instrumentation for IR spectroscopy.
Raman Effect– classical and quantum theories, Pure rotational Raman spectra, Examples of O_2 and CO_2, Rotational Raman Spectrum of Symmetric top molecules, Examples of $CHCl_3$, vibration Raman spectrum of a symmetric top molecule, Example of $CHCl_3$, combined use of Raman and Infrared Spectroscopy in structure determination, Examples of CO_2 and NO_3, Instrumentation for Raman spectroscopy.

Unit IV: Spin Resonance Spectroscopy
Interaction between nuclear spin and magnetic field, Level population, Larmor precession, resonance condition, Block equations, Relaxation times, spin-spin and spin-lattice relaxation, The Chemical Shift, spin-spin interaction. Example of ethyl alcohol.. Instrumentation for NMR spectroscopy, FTNMR. A brief account of NMR in medicine Electron spin spectroscopy, Total Hamiltonian Fine structure, Electron-Nucleus coupling and hyperfine structure ESR spectrometer.

Reference Books:

1. C. N. Banwell and E M McCash, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill (1994).
2. G. M. Barrow, Introduction to Molecular Spectroscopy, McGraw Hill.
3. N. Tralli and P. R. Pomilla, Atomic theory, McGraw-Hill, New York, 1999.
4. G. Aruldas, Molecular Structure and Spectroscopy, Prentice Hall India Learning Private Limited, 2nd edition, 2007.
5. B. H. Mahan, University chemistry, 3rd edition , (Chapters 3, 10, 11 and 12), Narosa, New Delhi, 1975.
6. E. Hecht, Optics, Addison-Wesley, 2002.
7. S. G. Lipson, H. Lipson and D. S. Tannhauser, Optical physics, Cambridge University Press, USA, 1995.
8. B. P. Straughan, Stanley D. Walker, Spectroscopy Vol. I and II, Chapman and Hall 1976.
9. G. Herzberg, Spectra of Diatomic Molecules, Krieger Pub Co., 2nd edition, 1989.

MSE(P) XI.3 : SOLID STATE PHYSICS – I

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:
Unit I: Dielectric properties of solids
Macroscopic description of static dielectric constant, the static electronic and ionic pollarizabilities of molecules, orientation polarization, the static dielectric constant of gases, Local electric field at an atom. Lorentz field, of dipoles inside cavity. The static dielectric constant of solids, Clausius- Mossotti relation, the complex dielectric constant and dielectric losses. Polarization catastrophe.Dielectric losses and Debye relaxation time. Classical theory of electronic polarization and optical absorption

Unit II: Ferroelectricity

Basic properties of ferroelectric materials. Classification and prop-erties of ferroelectrics. Dipole theory of ferroelectricity, objections against the dipole theory, ionic displacements and behavior of Barium titanate above the curie temperature, theory of spontaneous polarization of Barium titanate. Thermodynamics of ferroelectric transitions. Landau theory of phase transitions, Dielectric constant near the curie point.Ferroelectric domains

Unit III: Band Theory of Solids

Statement and proof of Bloch theorem. Explanation of periodic potentials in solids. Reciprocal lattice, periodic boundary conditions, density of states. Construction of Brillouin zones for a square lattice. Nearly free electron model and solution at the boundary. Discussion of energy gap using nearly free electron model.Tightly bound electron approximation, application to simple cubic , BCC and FCC lattices. Constant energy surfaces, Fermisurfaces.square lattice. Overlapping of bands.(asgiven in A J Dekker)Superconductivity:Elementary ideas of BCS theory. Formation of Cooperpairs and explanation based on theory (as given inIbach and Luth). Energy gap, Meissner effect fluxquantisation, Josephson tunnelling,Josephsonjunction.Theory for DC and AC bias.HighT csuperconductors.(as given in Ibach and Luth).

Unit IV: Elastic Constants of crystals

Definition of elastic strains and stresses in a solid. Elastic compliance and sti ness constants,Applications to cubic crystals and isotropic solids. Elastic waves and experimental determination of elastic constants.(as given in C Kittel)

Reference Books:

1. A. J. Dekker, Solid state physics, Prentice Hall, 1985.
2. C. Kittel, Introduction to solid state physics, 7th Edn., John Wiley, New York, 8^{th} edition, 2012.
3. N. W. Ashcroft and N. D. Mermin, Solid State Physics, Saunders College Publishing, Cengage Learning India Private Ltd., Twelfth Indian Reprint 2011.
4. H. Iback and H. Luth., Solid State Physics, Narosa, New Delhi, 1996.
5. S. O. Pillai, Solid state physics, New Age International Publications, Sixth Revised Edition,2012.
6. M. A, Wahab, Solid state physics, Narosa Publishing House, New Delhi, Seventh Reprint, 2011.

MSE(P) XI.4 : DIGITAL AND COMMUNICATION ELECTRONICS (SYSTEMS)

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I: Digital logic gates

Binary to decimal and decimal to binary conversion, Binary addition and subtraction,
Octal number system, Hexadecimal system and conversions. Construction and working of AND and OR logic gates using diodes. Construction of NOT gate using transistor. Symbols

and truth table for AND, OR, NOT, NAND NOR and Ex-OR logic gates. Boolean algebra, Boolean laws, De Morgan's theorem. NAND and NOR as universal gates. Logic gate characteristics, The NMOS inverter, NMOS logic gates, The CMOS inverter, CMOS logic gates, The BJT inverter, the TTL NAND gate, emitter coupled logic (ECL) circuits, comparison of logic families.

Unit II: Communication Systems

Basic block diagram of communication system – Transmitter, channel and Receiver.

Amplitude Modulation– Expression for AM Wave, frequency spectrum, power, single side band transmission. Amplitude modulated class C amplifier, SSB balanced modulator, detection of AM signals, diode envelope detector– basic circuit and input-output waveforms, detection of SSB signals, comparison of signal to noise ratio, Frequency modulation, Expression for FM carrier, frequency spectrum, modulation index, average power, Phase modulation, The Varactor diode circuit for frequency modulation, detection of FM signals – Foster – Seeley discriminator and ratio detector (only basic circuits and principles).

Unit III: Pulse Modulation and Digital Communication

Pulse transmission, inter-symbol cross-talk, pulse-amplitude modulation, pulse-width modulation, pulse-position modulation, pulse-code modulation, effect of noise, advantages and applications of Pulse-Code Modulation (PCM).

Digital Communication: The microprocessor, Fundamentals of data communication, coding, digital codes, error detection and correction codes.

Unit IV: Terrestrial and Satellite Communication

Electromagnetic spectrum – communication channels – Ground wave propagation, sky wave propagation – ionosphere and its functions, space wave, tropospheric scattering.

Satellite communication : Orbits, station keeping, satellite altitude, transmission path, path loss, noise consideration, effective isotropic radiated power.

Fibre-optic Communication : Principles of light transmission in a fibre, losses in fibres, dispersion, light sources for fibre optics, photodetectors, fibre-optic communication systems (Block diagram).

Reference Books:

1. Jacob Millman and Arvin Grabel, Microelectronics, 2nd Edition, McGraw Hill International Edition, 1987.
2. Dennis Roddy and John Coolen, Electronic Communications, 3rd Edition, Prentice Hall, India, 1991.
3. George Kennedy and Bernard Davis, Electronic Communication Systems, Tata McGraw Hill, 1993.

MSE(P) XI.5 : CORE LAB – V

Credits: 2 (0L + 0T +2P)	**Marks: 100**
Contact hrs per week: 6	**C1 + C2: 50**
Exam Duration: 4 hrs	**C3: 50**

COURSE CONTENT:

(Any TEN of the following experiments)

1. Determination of the paramagnetic susceptibility of salt by Gauy's method.
2. Determination of the paramagnetic susceptibility of the given salt by Quincke's method.
3. Study of mercury spectrum by superimposing it on brass spectrum.
4. Sodium spectrum analysis by using Edser-Butler fringes.
5. Temperature coefficient of resistance of a thermistor.
6. Analysis of the powder X-ray photograph of a simple cubic crystal.
7. Thermionic work function of a metal (Richardson-Dushmann formula).
8. Determination of Stefan'constant.
9. Determination of the polarisabilities of themolecules of an uniaxial crystal using spectrometer.
10. Photoelasticity in crystalline solids.
11. Thermal expansion coefficient in solids.
12. Optical rotatory dispersion of an uniaxial crystal.
13. Birefringence of quartz using spectrometer.
14. Fermi energy of copper.
15. Verication of Langmuir-Child's law.
16. Thermoluminescence(plotting Glow curve)
17. Curie temperature of a ferroelectric material.
18. Determination of the polarisabilities of the molecules of an uniaxial crystal using spectrometer.
19. Thermal expansion coefficient in solids.
20. Frank Hertz experiment.
21. Magnetic hysterisis.
22. Measurement of magneto resistance of semiconductors.
23. Variation of depletion capacitance with bias voltage in pn diode.
24. Variation of junction voltage with temperature in pn diode and hence determine the energy gap of a p-n diode.
25. Determine the energy gap of given semiconductor using four probe method.
26. Analysis of the powder X-ray photograph of a cubic crystal (KCL;NaCl:CaCl03).
27. Thermionic work function of a metal (Richardson Dushman Equation).
28. B H curve of a ferromagnetic material.
29. Schottky correction of workfunction using thermionic emission apparatus.
30. Velocity of sound using a signal generator and an oscillator.

Reference books:

1. B. L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methusen & Co. 1950.
2. E.V. Smith, Manual of experiments in applied Physics, Butterworth, 1970.
3. R. A. Dunlap, Experimental Physics, Modern methods, Oxford University Press, 1988.
4. D. Malacara (ed), Methods of experimental Physic- series of volumes, Academic Press Inc., 1988.
5. S.P. Singh, Advanced Practical Physics – Vol I & II, Pragati Prakasan, Meerut, 2003.

MSE(P) XI.6 : CORE LAB VI: SOLID STATE PHYSICS LAB

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any EIGHT of the following experiments to be done)

1. Dispersion relation and cut off frequency in the case of a monatomic lattice using lattice dynamics kit.
2. Photovoltaic cell.
3. Photoconductive cell.
4. Determination of the energy gap of semiconductors by four-probe method.
5. Temperature variation of the junction voltage of a p-n diode.
6. Temperature variation of the reverse saturation current in a p-n diode.
7. Depletion capacitance of a junction diode.
8. Determination of material constant of an intrinsic semiconductor.
9. Schottky effect.
10. Ionic conductivity of an alkali halide crystal.
11. Dielectric constant and its temperature variation.
12. Ultrasonic velocity and elastic constants of a solid.
13. Determination of Curie temperature of a magnetic material.
14. Optical rotatory dispersion of an uniaxial crystal.
15. Birefringence of quartz using spectrometer.
16. Paramagnetic susceptibility by Gouy balance method.
17. Fermi energy of copper.
18. Cell parameter(s) from an X-ray powder diffractogram.
19. Verification of Langmuir-Child's law.
20. Thermoluminescence.
21. Curie temperature of a ferroelectric material.
22. Dielectric constant and its temperature variation.

MSE(C)-XI.7 : INTERNSHIP PROGRAMME 2 (Senior Secondary Level)

Credits : 4 **Max. Marks: 100**
Duration: 4 Weeks **$C_1 + C_2$: 50**
C_3 : 50

Objectives:
To provide field experience to the students to develop competencies and skills required for effective classroom teaching at the senior secondary level; class management; evaluation of student learning; organization of cocurricular activities; to enable students to develop proper professional attitudes, values and interests; to establish a closer professional link between RIE Mysore and schools in the region.

COURSE CONTENT:
The course is organized into activities distributed over two phases.

Phase 1 : Internship (3 weeks)

Phase 2 : Post-Internship and Critical Reflection of Internship Experience

Activities:

- Student teachers will teach 12 lessons (including 2 practicals) at Senior Secondary level
- Student teachers will observe a minimum of 5 lessons of their peers
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records
- The student teachers will carry out action research project, analyse and write the report

(C1 : Observation, Evaluation and Activity Records; C2 : Action Research Report & Post-Internship Activities; C3 : Teaching)

TWELFTH SEMESTER

MSE(P) XII.1 : LASER PHYSICS

Credits: 4 (4L + 0T +0P) | **Marks: 100**
Contact hrs per week: 4 | **C1 + C2: 50**
Exam Duration: 2 hrs | **C3: 50**

COURSE CONTENT:

Unit I:

Radiative transitions and emission, line widths, Radiative decay of excited states, homogeneous and inhomogeneous broadenings, Absorption, Spontaneous and Stimulated emissions, Einstein's A and B coefficients, Absorption and gain of homogeneously broadened radiative transitions, gain coefficient and stimulated emission cross-section for homogeneous and inhomogeneous broadening.

Unit II:

Necessary and sufficient conditions for laser action (population inversion and saturation intensity), exponential growth factor, threshold requirements for laser with and without cavity, laser gain saturation, laser amplifiers, rate equations for three and four level systems, pumping mechanisms.

Unit III:

Laser cavity modes – longitudinal and transverse modes in rectangular cavity, TE and TM modes, FP cavity modes, spectral and spatial hole burning, stability of laser resonator and stability diagram, unstable and ring resonators, semiconductor diode lasers.

Unit IV:

Q-switching and Mode locking, active and passive techniques, generation of giant pulses and pico second and femto second optical pulses, properties of laser beam and techniques to characterize laser beam. He- Ne laser: excitation mechanism and applications, Ti- sapphire laser: excitation mechanism and applications.

Reference Books:

1. W. T. Silfaust, Laser Fundamentals, Cambridge University Press, 2008.
2. J. T. Verdeyen, Laser Electronics, III Ed., Prentice Hall of India, 1994.
3. A. Ghatak and K. K. Thyagarajan, Lasers Theory and Applications, McMillan India Limited, 2000.
4. W. Koechner, Solid State Laser Engineering, Springer, 2013.
5. L. V. Tarasou, Laser Age in Physics, Mir Publications, 1981.
6. Semiconductor Laser Fundamentals, T. Suhara, CRC Press,2004.

MSE(P) XII.2 : MATERIALS PHYSICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Nano Materials

Introduction to Nanotechnology, Nanoparticles, definition of structural features, properties of nanoparticles in comparison with the bulk material, Zero dimensional nanostructures-nanoparticles, one-dimensional nanostructures– nanowires and nanorods, two dimensional nano structures: films, special nanomaterials.

Unit II: Preparation and Properties of Nanomaterials

'Top Down' and 'Bottom Up' methods: cluster beam evaporation, ion beam deposition, pulsed laser methods, carbon nanotubes and nanofibres, nanostructured polymers (only qualitative),some of the applications such as in fuel cells, chemical sensors, and catalysis. Quantum dots, synthesis and applications.

Unit III: Liquid Crystals

Main types and properties: Introduction. The building blocks, small organic molecules, Long helical rods, associated structures, Nematics and Cholesterics. Nematics proper. The Cholesterics: A distorted form of the nematic phase. Smectic: Smectics A, Smectic B, Smectic C. Other mesomorphic phases, exotic smectics, long range order in a system of long rods. Remarkable features of liquid crystals and their applications.

Unit IV: Smectics

Symmetry of the main smectic phases. Liquid layers, solid layers, continuum description of smectics A and C. Statics of smectic A. Remarks of phase transitions and pre-critical phenomena, The C-A, A-N, C-N transitions.

Reference Books:

1. Guozhong Cao, Ying Wang, Nanostructures and Nanomaterials: Synthesis Properties and Applications, World Scientific, 2011.
2. Gan-Moog Chow,Kenneth E. Gonsalves, Nanotechnology – Molecularly designed materials- Vol-622, American Chemical Society, 1996.
3. B. C. Crandall, Nanotechnology Molecular speculations on Global Abundance, MIT Press, 1996.
4. D. Bimerg, M. Grundmann and N. N. Ledentsov, Quantum Dot Heterostructures, John Wiley & Sons, 1999.
5. L. Banyai and S. W. Koch, Semiconductor Quantum Dots, World Scientific, 1993.
6. J. H. Fender, Nanoparticles and Nanostructured Films – preparation, characterization and application, John Wiley & Sons, 2008.
7. H. C. Hoch, H. G. Craighead and L. W. Jelinski, Nanofabrication and Bio-system , Cambridge University Press, 1996.
8. K P Jain, Physics of semiconductor Nanostructures, Narosa, 1997.
9. Charles P Poole Jr., Frank J. Owens, Introduction to Nanotechnology, Wiley-Interscience publication, 2003.
10. T. Pradeep, Nano:The Essentials, McGraw Hill Professional, 2008.

11. J. H. Davies, Physics of Low – dimension semiconductors, Cambridge University Press, 1998.
12. B. Kramer (Ed.), Advances in Solid State Physics- Vol.41, Springer, 2004.
13. P. G. De Gennes and J. Prist, The Physics of Liquid Crystals, 2nd Edition, Clarendar Press, Oxford, 1998.
14. S. Chandrashekhar, Liquid Crystals III Ed., Cambridge University Press, 1992.
15. G. Verlogen and W. H. de Jen, Thermotropic Liquid crystals: Fundamentals, Springer Science & Business Media,2012.
16. E. Priestly, Introduction to Liquid crystals, Springer Science & Business Media, 2012.

MSE(P) XII.3 : NUCLEAR PHYSICS

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I: Nuclear Properties

Nuclear radius – determination by mirror nuclei – mesonic X-rays, nuclear masses – Bainbridge and Jordon mass-spectrograph – Nier's mass spectrometer – Nuclear stability – Odd-even rules – Nuclear quantum numbers (Principal, orbital and spin) – Nuclear angular momentum, Nuclear moments – Spin, magnetic dipole moment – Relation between $\vec{J}$ and $\vec{\mu}$ - Determination of nuclear magnetic moment by molecular beam experiment – Experimental determination of electron and proton magnetic moments.

Unit II: Nuclear Models

Liquid drop model – Formula for binding energy of a nucleus – Application to (i) stability of isobars, (ii) fission process (mechanism and energy released) – Bohr – Wheeler condition for spontaneous fission.

Shell model – Evidences for magic numbers – stability of magic nuclei – single particle potential – spin-orbit coupling and level scheme. Explanation of nuclear magnetic moments and spins.

Unit III: Nuclear Decay Modes

Potential barrier around a nucleus – V ~ r diagram – Nuclear potential well height of the barrier – Failure of classical theory to explain Alpha – decay.

Alpha-Decay : Wave mechanical explanation – tunneling – Geiger – Nuttal law (no derivation) – Experimental evidences and verification.

Beta decay : Beta ray spectrum – Classification of Beta decay – neutrino hypothesis – [Life times in Beta decay – allowed and forbidden transitions – Sargent diagram – comparative half periods – ft values – Fermi selection rules – Kurie plots – (as in Chapter 6 of Nuclear Physics – R D Evang).

Gamma Decay : Internal conversion – Mossbauer effect.

Nuclear excited states – meta stable states – nuclear isomerism – independent and genetically related isomeric transitions – islands of isomers – Auger effect – characteristic X-rays.

Unit IV: Nuclear Fission, Fusion and Reactors

Nuclear reactions, Q values, threshold energy, Reactions induced by protons, deuterons and particles, photo disintegration.

Nuclear fission – Neutrons released- cross sections – thermalization of neutrons – moderators – Neutral energy spectrum – conditions for controlled chain reaction in a homogeneous spherical reactor – critical size – Brief description of a nuclear reactor.
Nuclear fusion – C – N and H – H cycle – Plasma – condition for maintained fusion reaction – Pinch effect – Plasma containment – Tokomac.

Reference Books:

1. E. Segre, Nuclei and Particles : An Introduction to Nuclear and Subnuclear Physics, Benjamin/Cummings, 1980.
2. I. Kaplan, Nuclear Physics, Narosa Publishing House, 1997.
3. A. Beiser, Perspectives of Modern Physics, McGraw-Hill Inc., 1969.
4. D. Halliday, Introductory Nuclear Physics, Wiley, 1951.
5. C. M. H. Smith, A Textbook of Nuclear Physics, Pergamon Press, 1965.
6. R. D. Evans, Atomic Nucleus, McGraw-Hill, 1955.
7. H. A. Bethe and P. Morrisson, Elementary Nuclear theory, Courier Corporation, 2006.
8. S. Glasstone, Source Book on Atomic Energy, Krieger Publishing Company, 1979.
9. Marimer and Sheldon- Vol.I and II, Physics of Particles and Nuclei, American Institute of Physics, 1994.
10. H. A. Enge, Introduction to Nuclear Physics, Addison-Wesley Pub. Co., 1966.
11. Littlefield and Thorley, Atomic and Nuclear Physics: An introduction, Springer Science & Business Media,2012.

MSE(P) XII.4 : SOLID STATE PHYSICS II

Credits: 4 (4L + 0T +0P)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

COURSE CONTENT:

Unit I: Elements of Crystallography

X-ray diffraction by crystals: The reciprocal lattice. Ewald sphere and construction. Scattering by an electron and atom. Atomic scattering factor. Anomalous scattering. Fourier analysis and inversion of Fourier series. Physical significance. Geometrical structure factor of the unit cell. Absent re ections and space groups [Sherwood, p290{302, p320{332, p342{358]. Experimental techniques: Weissenberg and precession methods. Cell parameter and space group determination. Molecular weight determination. Low angle scattering.Reduction of intensities to structure amplitudes. Various corrections. Absolute scale factor and temperature factor from statistical methods. Statistical method for nding the presence of center of symmetry [Stout and Jensen, p90,91, 94,106, 117,120, 122,128,148,156, 195,211]

Unit II: Structure analysis

Fourier analysis of electron density. Patterson synthesis. Harker sections and lines. Heavy atom methods. Direct methods for phase determination.The inequality relations. Difference Patterson synthesis and error Fourier synthesis.Figure of merit. Cyclic Fourier renement, Dierence Fourier synthesis Refinement of structures: The least squares method. Accuracy of the parameters. Bond lengths and angles SAXS:Particle size. Study of fibre structures.

Unit III: Imperfections in Solids

Different types of imperfections.Schottky and Frenkel de-fects. Expression for energy for the formation of Frenkel and Schottky defects. Diffusion in metals. Kirkendall e ect. Ionic conductivity in pure and doped halides. Photocon-ductivity. (as in C Kittel). Dislocations: Buerger's Vector. Expression for strain in the case of edge and screw dislocations. Low-angle grain boundaries.(As in Wahab and C Kittel)

Unit IV: Magnetic properties

Definition of Magnetisation and susceptibility. Hunds rule. Calculation of L,S and J for 3d and 4f shells. Setting up of Hamiltonian for an atom in an external magnetic field. Based on this , explanation of diamagnetism, Van Vleck Paramagnetism and quantum theory of paramagnetism using the above hamiltonian,in solids(see Ashcroft and Mermin). Interpretation of the Weiss field interms of exchange integral(Page 473-474, A J Dekker). Calculation of the singlet-triplet splitting, Spin Hamiltonian and Heisenberg model.(as given in Ashcroft N.W. and Mermin N.D) Magnetic resonance: Phenomenological description, Relaxation mecha-nisms,Derivation of Casimir-Durpe relation. Nuclear Magnetic moments, condition for resonance absorption, Setting up of Bloch's equations, obtaining solutions for the steady state case and that of the weak RF field, expression for power absorption, change of inductance near resonance. Dipolar line width in a rigid lattice. (as given 498-512 of AJ Dekker).

Reference Books:

1. A. J. Dekker, Solid state physics, Prentice Hall, 1985.
2. C. Kittel, Introduction to solid state physics, 7th Edn., John Wiley, New York, 8^{th} edition, 2012.
3. N. W. Ashcroft and N. D. Mermin, Solid State Physics, Saunders College Publishing, Cengage Learning India Private Ltd., Twelfth Indian Reprint 2011.
4. H. Iback and H. Luth., Solid State Physics, Narosa, New Delhi, 1996.
5. S. O. Pillai, Solid state physics, New Age International Publications, Sixth Revised Edition,2012.
6. M. A, Wahab, Solid state physics, Narosa Publishing House, New Delhi, Seventh Reprint, 2011.
7. G. H. Stout and L. H. Jensen, X-ray structure determination, MacMillan, USA, 1989.
8. M. F. C. Ladd and R. A. Palmer, Structure determination by X-ray crystallography, Plenum Press, USA, 2003.
9. D. Sherwood, Crystals, X-rays and proteins, Longman, London, 1976.
10. L. V. Azaro, Introduction to solids, McGraw-Hill Inc, USA, 1960.
11. J. Weertman and J. R. Weertmann, Elementary dislocation theory, McMillan, USA, 1964.
12. T. Egami and S. J. L. Billinge, Underneath the Bragg Peaks Structural Analysis of Complex materials, Pergamon materials Series, Series Editor R W Cahn, volume 7, Elsevier Ltd, 2003.

MSE(P) XII.5 : CORE LAB – VII

Credits: 2 (0L + 0T +2P) | **Marks: 100**
Contact hrs per week: 6 | **C1 + C2: 50**
Exam Duration: 4 hrs | **C3: 50**

COURSE CONTENT:

(Any TEN experiments)

1. Randomocity of radioactive decay.
2. Nomogram method: Measurement of endpoint energy of beta rays.
3. Study of linearity of the NaI(Tl) gamma ray spectrometer with SCA and hence determination of energy of unknown gamma source.
4. Determination of the rest mass energy of the electron using MCA.
5. Study of the variation of resolution of NaI(Tl) spectrometer as a function of energy
6. Cockroft-Walton voltage multiplier.
7. Coincidence circuit.
8. Linear pulse amplier.
9. Transistorised binary circuit.
10. Pulse shaping circuits.
11. Linear Gate.
12. Transistorised binary circuit.
13. Schmitt trigger.
14. Variable delay line.
15. Pulse recorder.
16. Display devices.
17. Feather analysis: End-point energy of beta rays measurement.

MSE(P) XII.6 : CORE LAB VIII: NUCLEAR PHYSICS LAB

Credits: 2 (0L + 0T +2P) | **Marks: 100**
Contact hrs per week: 4 | **C1 + C2: 50**
Exam Duration: 4 hrs | **C3: 50**

COURSE CONTENT:

(Any EIGHT of the following experiments to be done)

1. Z dependence of external Bremsstrahlung radiation.
2. Fermi-Kurie plot: Determination of the end-point energy of beta rays using a plastic scintillation detector.
3. Determination of the resolving time of a coincidence circuit.
4. Determination of source strength by gamma-gamma coincidence.
5. Determination of source strength by beta-gamma coincidence.
6. Multichannel analyser : Study of the variation of energy resolution as a function of gamma ray Energies.
7. Half-life of Indium-116 measurement.
8. Energy Resolution of a NaI (TI) scintillation spectrometer.
9. Compton scattering determination of the rest energy of an electron.
10. Beta absorption coefficient measurement.
11. Dekatron as a counter of signals.
12. Gamma-ray absorption coefficient measurement.

13. End-point energy of beta particles by half thickness measurement.
14. Common source amplifier.
15. Astable multivibrator using timer IC 555.
16. Dead time of the G.M. counter.

Reference books:

1. L. Gerward,H. S. Sahota, Experiments in Nuclear Physics:(Lab Manual), Department of Physics, Guru Nanak Dev University, 2012.
2. H. S. Hans, Nuclear Physics: Experimental And Theoretical, New Age International,2008.

MSE(P) XII.7 : RESEARCH IN PHYSICS EDUCATION

Credits: 3 (2L+1T+0P)	**Max.Marks :100**
Contact Hrs per week : 4	**$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs	**C_3 : 50**

Course Objectives:

The student teacher will be able to

- understand the current reform movements in Physics Education,
- critically examine the areas of research in Physics Education,
- familiarize with the concept and methods in Action Research,
- encourage teachers to take up research as a measure of Professional Development.

COURSE CONTENT:

Unit I: Trends in Research in Physics Education

Diversity in Research, areas of research, transition from behaviourist to Constructivist model, Developmental, experimental and correlational studies with examples. A comparison of studies in India and other countries, Implications to classrooms, vision of Science Education Research – Policy Perspectives in India.

Unit II: Action Research and Investigatory Projects in Physics

Meaning, scope, some typical Action Research studies, steps involved and role of the teacher, as an indicator of professional growth.
Planning investigatory projects and studying its effectiveness in learning, Teacher as a reflective practitioner.

Unit III: Professional Development in Physics Education

Physics Abstracts and current contents : Physics Education journals relating to School Education : (School Science Review, Journal of Physics Education, Journal of Research in Science Teaching, Bulletin of Indian Association of Physics Teachers, NCERT Journals, etc).
Format of reporting, writing abstracts, papers, graphical and numerical data and conclusion, acknowledging the references.
Other Resources : Online surfing, Internet Browsing, Web resources, Online journals, virtual laboratories, Wikipedia, Patenting and copy right rule.

Unit IV: Supporting Agencies for Researching Teachers

Role of National and State agencies like NCERT, RIEs, SCERT, EIC, IASE in conducting inservice programmes, conferences, monitoring capacity building and evaluating functions of them. Academic staff colleges and Universities in conducting orientation and refresher courses for inservice teachers. Financing agencies for research.

Seminar, conferences, workshops, paper presentations by NSTA, Indian Physics Association, Indian Science Congress, NSTC, NCERT and others. Teacher autonomy as a researcher.

References:

1. Costa, L. Marques and R. Kempa (2000). Science Teachers' Awareness of findings from Education Research. – Research in Science and Technology Education.
2. Journal of Research in Science Education
3. School Science Review
4. Physical Review
5. Home pages on web : NCERT, ERIC, NSTA, IAPT, etc.

******