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.

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.

Sd/-
DEPUTY REGISTRAR(Academic)

Draft approved by the Registrar

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.
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 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 75% 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**

<table>
<thead>
<tr>
<th>Semesters</th>
<th>Total Credits</th>
<th>Programme</th>
<th>Credits (Theory) (L)</th>
<th>Teaching hours per week (L)</th>
<th>Credits: Practicum/al (Lab/Field) (T/P)</th>
<th>Practicum/al Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>24</td>
<td>B.Sc.</td>
<td>13</td>
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<td>II</td>
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<td>2</td>
<td>4</td>
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<td>50</td>
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<td>III</td>
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<td>11</td>
<td>4</td>
<td>8</td>
<td>19</td>
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<td>IV</td>
<td>23</td>
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<td>4</td>
<td>4</td>
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<td>12</td>
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<td>V</td>
<td>24</td>
<td>B.Sc.</td>
<td>9</td>
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<td>6</td>
<td>15</td>
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<td>VI</td>
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<td>7</td>
<td>5</td>
<td>10</td>
<td>17</td>
<td>50</td>
<td>50</td>
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<tr>
<td>VII</td>
<td>17*</td>
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<td>3</td>
<td>6</td>
<td>12</td>
<td>18</td>
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<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B.Ed.</td>
<td>4</td>
<td>4</td>
<td>16**</td>
<td>8</td>
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<td>VIII</td>
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<td>5</td>
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<td>12</td>
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<tr>
<td></td>
<td></td>
<td>B.Ed.</td>
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<td>6</td>
<td>4</td>
<td>8</td>
<td>14</td>
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<td></td>
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<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
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<td>23</td>
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<td>16</td>
<td>16</td>
<td>4</td>
<td>8</td>
<td>24</td>
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<td>50</td>
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<td></td>
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<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50</td>
<td>50</td>
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<tr>
<td>XI</td>
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<td>16</td>
<td>4</td>
<td>8</td>
<td>24</td>
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<td></td>
<td></td>
<td>PE</td>
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<td></td>
</tr>
<tr>
<td>XII</td>
<td>23</td>
<td>M.Sc.</td>
<td>16</td>
<td>16</td>
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<td>8</td>
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<td>1</td>
<td>2</td>
<td>4</td>
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</tr>
</tbody>
</table>

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

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)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits</th>
<th>Theory</th>
<th>Teaching Hours per week</th>
<th>Practicum/Field (TP)</th>
<th>Periodic Assessment</th>
<th>Terminal Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Core Course 1B Physics</td>
<td>3</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Core Course 2B Chemistry</td>
<td>3</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3B Mathematics</td>
<td>3</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>AEC 1B Language</td>
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<td>12</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>AEC 2B English</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>Contemporary Indian</td>
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<td>3</td>
<td>12</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Yoga Edu., self-</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>3</td>
<td>50%</td>
<td>50%</td>
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</tbody>
</table>

Total 24

17 17 7 14 31

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

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

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits</th>
<th>Theory</th>
<th>Teaching Hours per week</th>
<th>Practicum/Field (TP)</th>
<th>Periodic Assessment</th>
<th>Terminal Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Core Course 1C Physics</td>
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<td>12</td>
<td>5</td>
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<td>3</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3C Mathematics</td>
<td>3</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
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<td>3</td>
<td>Skill Enhancement Course 1</td>
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<td>50%</td>
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<tr>
<td>5</td>
<td>4</td>
<td>Childhood &amp; Growing up</td>
<td>3</td>
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<td>5</td>
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<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Gender School &amp; Society</td>
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<td>1</td>
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<tr>
<td>7</td>
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<td>24</td>
<td>3 weeks</td>
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</table>

Total 23

15 15 8 16 31

### TABLE 5: Semester IV (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)
### Table 6: Semester V (Credits: B.Sc. 12; B.Ed. 12; Total 24)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits: Practicum/Field (T/P)</th>
<th>Practicum/Field Hours per week (T/P)</th>
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<th>Periodic Assessment C1+C2</th>
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<tbody>
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<td>Core Course 1D Physics</td>
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<td>5</td>
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<td>50%</td>
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<td>3 weeks</td>
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*SEC 2 - Skill Enhancement Course 2 – Each student will select any one from among the courses offered.

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

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<th>Terminal Assessment C3</th>
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TABLE 8: Semester VII*(Credits: DSE 9; B.Ed. 20; Total 29**)

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

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TABLE 9: Semester VIII (Credits: DSE 9; GE 2; B.Ed. 10; Total 21)
### TABLE 10: Semester IX (Credits: M.Sc. 20; Prof. Edu.3; Total 23)

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

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*+= courses which do not have C3 Theory examination
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 Committee constituted for the purpose.

TABLE 16 : SUBJECTS AND TITLES OF COURSES IN THE PROGRAMME

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<td></td>
<td></td>
<td>MSE(C)-X.6</td>
<td>Inorganic Practical – I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Education</td>
<td>MSE(C)-X.7</td>
<td>Teaching of Chemistry</td>
<td></td>
</tr>
<tr>
<td>ELEVENTH</td>
<td>Core Chemistry</td>
<td>MSE(C)-XI.1</td>
<td>Solid State Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XI.2</td>
<td>Organometallics, Catalysis &amp; Frontiers in Inorganic Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XI.3</td>
<td>Spectroscopy</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>MSE(C)-XI.4</td>
<td>Electrochemistry and Surface Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XI.5</td>
<td>Organic Practical – II</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>MSE(C)-XI.6</td>
<td>Analytical Practical – II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Education</td>
<td>MSE(C)-XI.7</td>
<td>Internship Programme 2 (Senior Secondary Level)</td>
<td></td>
</tr>
<tr>
<td>Twelfth</td>
<td>Core Chemistry</td>
<td>MSE(C)-XII.1</td>
<td>Instrumental Methods of Chemical Analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XII.2</td>
<td>Bio-inorganic Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XII.3</td>
<td>Heterocyclics, Molecular Rearrangements, Green Chemistry, Synthetic Drugs and Antibiotics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XII.4</td>
<td>Chemical Kinetics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XII.5</td>
<td>Inorganic Practical – II</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSE(C)-XII.6</td>
<td>Physical Chemistry Practical – II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Education</td>
<td>MSE(C)-XII.7</td>
<td>Research in Chemistry Education</td>
<td></td>
</tr>
</tbody>
</table>
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 C3 in Theory
  Y is the marks scored out of 50 in C3 in Practical
  Z is the marks scored out of 50 in C3 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 C3.
(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 C1, C2 and C3.
The evaluation of the first component C1 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 8th week of the semester.
The evaluation of the second component C2 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 16th week of the semester.
In general C1, and C2 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:

<table>
<thead>
<tr>
<th>Probable Credit Distribution patterns</th>
<th>Formula for calculating $M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $L : T : P$</td>
<td>$M = ((L+T)\times X + (P\times Y)) / (L+T+P)$</td>
</tr>
<tr>
<td>2. $L : T : P = 0$</td>
<td>$X$</td>
</tr>
<tr>
<td>3. $L : T = 0 : P$</td>
<td>$(L \times X + P \times Y) / (L+P)$</td>
</tr>
<tr>
<td>4. $L = 0 : T : P$</td>
<td>$Y$</td>
</tr>
<tr>
<td>5. $L : T = 0 : P = 0$</td>
<td>$X$</td>
</tr>
<tr>
<td>6. $L = 0 : T = 0 : P$</td>
<td>$Y$</td>
</tr>
<tr>
<td>7. $L = 0 : T : P = 0$</td>
<td>$Z$</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>$P$</th>
<th>$G$</th>
<th>$GP = V \times G$</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 – 100</td>
<td>10</td>
<td>$V \times 10$</td>
</tr>
<tr>
<td>80 – 89</td>
<td>9</td>
<td>$V \times 9$</td>
</tr>
<tr>
<td>70 – 79</td>
<td>8</td>
<td>$V \times 8$</td>
</tr>
<tr>
<td>60 – 69</td>
<td>7</td>
<td>$V \times 7$</td>
</tr>
<tr>
<td>50 – 59</td>
<td>6</td>
<td>$V \times 6$</td>
</tr>
<tr>
<td>40 – 49</td>
<td>5</td>
<td>$V \times 5$</td>
</tr>
<tr>
<td>30 – 39</td>
<td>4</td>
<td>$V \times 4$</td>
</tr>
<tr>
<td>0 - 29</td>
<td>0</td>
<td>$V \times 0$</td>
</tr>
</tbody>
</table>

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 $CGPA = \Sigma GP / \text{Total number of credits}$ and the class is declared as follows:
<table>
<thead>
<tr>
<th>CGPA</th>
<th>Numerical Index</th>
<th>Qualitative Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ≤ CGPA &lt; 5</td>
<td>5</td>
<td>Second Class</td>
</tr>
<tr>
<td>5 ≤ CGPA &lt; 6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6 ≤ CGPA &lt; 7</td>
<td>7</td>
<td>First Class</td>
</tr>
<tr>
<td>7 ≤ CGPA &lt; 8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>8 ≤ CGPA &lt; 9</td>
<td>9</td>
<td>Distinction</td>
</tr>
<tr>
<td>9 ≤ CGPA ≤ 10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

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 up to 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 an 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.

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


Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II


Unit III


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:
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.
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
9. H C Verma, Concepts of Physics, Bharati Bhawan; Revised Reprint 2015 edition

PRACTICAL

Exam Duration : 3 hrs

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)
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.
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:
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

Core Course 2A- Chemistry

MSE1.2: 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


Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of $\psi$ and $\psi^2$, 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: Slater’s 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 trends. Comparison of the ionic size of atoms with the corresponding anion and cation. Variation of ionic radii in isoelectronic ions. Additive nature of covalent radii. Ionic radii: 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.


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 $\text{NH}_3$, $\text{H}_2\text{O}^+$, $\text{SF}_4$, $\text{ClIF}_3$, $\text{ICl}_2$, and $\text{H}_2\text{O}$.

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 $\sigma$, $\sigma^*$, $\pi$, $\pi^*$ 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
3. An Introduction to Inorganic chemistry Mackay and Mackay

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 pure crystals 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.

References:
1. A Text Book of Quantitative Inorganic Analysis, A I Vogel

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:
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**

**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.
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.
Ability Enhancement Course 1 A : Language

MSE1A :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
Prayojanmoolk Hindi: Zaroorat, Swaroop, Visheshayen, Prayukti ke Madhyam, Mukhya tatwa-Paribhashik Shabadavali aur Anuvad, Simayen aur Smabhavnayen,

Unit II: Communication skills

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
Sumitranand Pand- Drut Jharo Jagat Ke Jim Patra
Mahadevi Verma-Mai Neer Bhari Dhukh Ki Badli,
Sacchidanand Heenanad Vatsayan Aggy-Kalgi Bajre Ki
Gajanan Madhav Muktibodh- Bhoon 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
Aggy-Gaingreen (Rooj)
Phanishwar Nath Renu- Teesari Kasam
Bhism Sahani- Cheef ki Dawat
Krisha Sobti- Dadi Amma
Sudha Aroda- Annapurna Mandal Ki Aakhiri Chitthi
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
5. Naee Kavita aur Astitvawad: Ramvilas Sharma, Rajkamal Prakashan, Delhi
6. Chhayavad: Namvar Singh, Rajkamal 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 Gadyath- Kathaloochan ke Aayam: Suvas Kumar, Vani 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. Aadhhoonik Hindi Kahani: Laxminarayan Laal, Vani Prakashan, Delhi
19. Kahani Sanakaleen Chunautiyan: Dr Sambhoo Gupt, Vani Prakashan, Delhi
20. Prayojamoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
21. Prayojamoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
22. Prayojamoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
23. Sarkari Karyalayon mein Hindi ki Prayog- Gopi Nath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
24. Hindi Prayog: Ramchandra Verma, Rajkamal Prakashan Samooh, Delhi
25. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
27. Effective Communication Skills, by Omkar N Kour
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

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 Gopalkrishna 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- Devanuru 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.

MSEI4C: 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

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: Definition-styles of conversation-formats of conversation-telephonic conversation, etc-Exercises

Unit III: Poetry: Modern Poetry

Ikkalak Kavithaikal, Kannan En Sevegan, Thirus 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
3. Naatru, Vaanathi Pathippagam, 13 Deenadayalu Street, T. Nagar, Chennai 600 017

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

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:
2. The perfect Interview by Max Eaggert, Random House, UK.,
3. Interview Secrets by Heather Salter, Publications: Collins, London,
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:

GENERAL ELECTIVE 1
MSEL.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 oMSEerved 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 environmental 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:
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.
7. Web Resources Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT

**PROFESSIONAL EDUCATION COURSES**

**MSEI.7 :Language Across Curriculum**

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

**Web Resources**
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
13. Courses on Communication Skills, http://nptel.ac.in/courses/109104030/
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

Unit II: Waves

Unit III: Thermodynamics-I
Unit IV: Thermodynamics-II

References:
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S Chand (G/L) & Company Ltd., 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 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°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.
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.
16. Specific heat of a solid by the method of mixtures.

References:
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

Core Course 2 B : Chemistry

MSEIL2 : 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 observations 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. Liquefaction 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.


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

**Unit III : Acids and bases**


**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
PRACTICAL

Exam Duration : 3 hrs

C3 : 50

Objectives:

- To evolve a scheme of qualitatively analyzing an inorganic mixture classification 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 basic 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:

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

References:
1. Calculus by Anton, Wiley.
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.
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

ABILITY ENHANCEMENT COURSE  AEC 1B : LANGUAGE

MSEIL4A: 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 :Dramaand 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
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-Vinayak aur Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
6. Aadhunik Hindi Ka Gadya Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
7. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Manager 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- Gopi Nath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
17. Alankar Mimansah: Murlimanohar Prasad 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

MSEIL4B: 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

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
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
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
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:
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
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)
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

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

Unit IV Genre 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:
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.
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-11

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:


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:
3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
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 Astaṅga yoga.
- State the different types of yoga.
- Derive how Hatha yoga and Astaṅga 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
Pranayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Sheetali Pranayama; Meditation, Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs  C₃: 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 prānāyāma
  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. Prānāyāmas

* 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:

2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
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
DC Circuits: Kirchhoff’s laws, Voltage and Current dividers, Mesh analysis and Loop analysis, RC circuits, Maximum power transfer theorem.

Unit III: Magnetism

Unit IV: Electromagnetic Induction and AC Circuits


Reference Books:
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.

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.
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 &Bh.
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.
17. Variation of phase angle with capacitance for a RC circuit.
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:
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.

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.


Unit II: Aliphatic Hydrocarbons

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.


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**


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

**PRACTICALS**

Exam Duration: 3 hrs

**Objective:**
To develop basic skills in organic synthesis and purification of organic compounds

**COURSE CONTENT:**
1. Calibration of Thermometer using naphthalene / acetonilide / 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. Crystallization: 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:
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.
7. Introduction to Real Analysis by Bartle R G & Sherbert, Wiley India
8. Kumar Ajit & Kumaresan S, Real Analysis, CRC Press
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International Ltd.

Skill Enhancement Course- 1 Physics
MSEIIII.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 of 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 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:

PRACTICALS
Exam Duration: 3 hrs

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)

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.

References:

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 common pesticides

COURSE CONTENT:

Unit I:
Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid 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:

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.


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:
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 industrial 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.
   (AgNO₃ and potassium chromate)
6. Estimation of total alkalinity of water samples (CO₃, HCO₃) 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
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

References:
5. R. Cremllyn: Pesticides, John Wiley. 7. William O. Foye, Thomas L., Lemke , David A. William:
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, Histograms, 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:
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


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 Familiarised with Individual Psychological Tests.

References:


Web Resources

- Animated Videos from Study.com, [http://study.com/academy/course/educational-psychology-course.html](http://study.com/academy/course/educational-psychology-course.html)
- [www.aeparc.org](http://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  
Unit II: Policy framework for public Education in India and its implementation

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
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
- Govt. of India (1992). Programme of Action (NPE). Min of HRD.
- Dr. Veda Mitra. Education in Ancient India, Arya book Depot, New Delhi – 1967
- Reports of SSA and RMSA


MSEIII.7 : School Attachment Programme

Credits : 2
Duration: 3 Weeks
Marks: 100
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.
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

Unit II: Interference

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, Polaroids, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity, Fresnel’s theory, Rotatory polarization, use of biquartz.

Reference Books:

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.
7. Spectrometer- i₁- i₂ 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.
13. p– n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers

References:
2. E Armitage, Practical Physics, John Murray.
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


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, CO2 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– H2O), (FeCl3–H2O) and (CuSO4–H2O) system. Freezing mixtures, acetone dry ice.


**References:**

2. Physical Chemistry: Atkins
Exam Duration : 3 hrs  

C3 : 50

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

COURSE CONTENT:
2. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
3. pH titration of acid versus base (oMSEvation 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 toluene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.

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:
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
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 (unformattedformatted), 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:

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:

Skill Enhancement Course - SEC2 Chemistry

MSE IV.4B : INORGANIC MATERIALS

Credits : 3 (1L + 0T +1P) \hspace{1cm} \text{Marks: 100}
Contact hrs per week: 3 \hspace{1cm} C_1 + C_2: 50
Exam Duration : 2 hrs \hspace{1cm} C_3 : 50

Objectives :
- To understand the production, handling and storage of industrial 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 industry
- To acquire the knowledge of simple fertilizers, surface coatings, alloys, and chemical explosives

COURSE CONTENT

UNIT I : 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.

UNIT II : 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 setting process, 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.


**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.
8. Preparation of pigment (zinc oxide).
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 methyl orange.

**References:**

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
Measures of Relationships: 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, oMSErvalational 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 skilful 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:
• 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

**Web Resources**

• Courses on Communication Skills, [http://nptel.ac.in/courses/109104030/](http://nptel.ac.in/courses/109104030/)
• Jane Ciumwari Gatumu, Reflective Teaching, [http://oer.avu.org/bitstream/handle/123456789/155/REFLECTIVE-TEACHING.pdf?sequence=1](http://oer.avu.org/bitstream/handle/123456789/155/REFLECTIVE-TEACHING.pdf?sequence=1)
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
4. Theory of Drama by A. Nicoll

**Web Resources**

Position Paper National Focus Group on Arts, Music & Dance, NCERT  
Online courses on Arts, http://www.dsource.in/course/index.php  
Learning Indicators and Learning Outcomes at the Elementary Stage, (2014), NCERT  
MSE IV.7 : School Attachment Programme 2

Credits : 2  
Duration : 3 weeks  
Marks: 100  
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 programmes 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


Unit III : Molecular Spectra

Molecular formation, the \( \text{H}_2^+ \) molecular ion, \( \text{H}_2 \) – 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

Reference Books:

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.
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
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.
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:
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

Core Course 2E Chemistry
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 electronic configuration 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 adsorption of 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 heterogeneous 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

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 the kinetics 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.
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 calculus, 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, Paraboloid, 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
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 interrelationships.
(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 Standardized tests: 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, Techniques and 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 outcomes: 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, Techniques and 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 stakeholders (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 made and various 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:
6. NCERT (2015) CCE Packages, New Delhi
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi
**Web Resources**

1. Assessment in school education, (2013)
2. Compendium of Tools, (2013), CMSE
   http://cmse.nic.in/ePub/webcMSE/webcMSE/Revised%20Compendium%20of%20Tools/Revised%20Compendium%20of%20Tools/docs/Revised%20Compendium%20of%20Tools.pdf
4. www.ncert.nic.in
5. http://nroer.in/home/
MSE V.5 : Pedagogy of Physical Science 1

Credits: 4 (2L+ 2T +0P)  
Marks: 100  
Contact hrs per week: 6  
Exam Duration: 2 hrs  
C1 + C2: 50  
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, oMSEervation, 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 mindedness, 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 misconceptions 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:

7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
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

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; matematization 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, Pythagagorous; 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:**

3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewicz, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
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
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
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

Unit II: Special Theory of Relativity

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:
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).
7. Laser-wavelength using transmission grating.
8. Photo conductivity using LDR.
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.

Reference Books:
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.

Core Course 2F Chemistry

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
Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols-oxidative cleavage [$\text{Pb(OAc)}_4$ and $\text{HIO}_4$] 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).
Unit II: Carbonyl Compounds
Aldehydes and Ketones

Carboxylic Acids and their Derivatives
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, alklylation 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


References:
1. Advanced organic chemistry Arun Bahl and B.S. Bhal

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, NaHCO₃, 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 Rf 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

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**Core Course 3F Mathematics**

**MSE VI.3 :GROUPS AND RINGS**

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

**C1 + C2:** 50  
**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’s Criterion of irreducibility.
References:
1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
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, WAN and 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, fair 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
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:

**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 oMSEvation, 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.
- 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 museum, 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:
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.


15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.


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 (8th, 9th, 10th, 11th, and 12th 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:
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
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
10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
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

Unit IV:
Particle Accelerators and Detectors: Cockcroft–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.
4. Subramanymam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.

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.
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.
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.

References:
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

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

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.

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.

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
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 electrical 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 electrolyte 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:

DSE 3A Mathematics
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:

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:
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
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.
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
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, Competencies 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, lesson 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 oMSEerve 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:


19. Ramaa S : Website: s-ramaa.net ( for various publications)


**Web Resources**

- Inclusive Education: Learners and Teachers (2008), by UNESCO, produced by International Bureau of education, 14 minutes,
- Preparing Teachers in Asia-Pacific for Inclusive Education, (2012), by UNESCO, 3 minutes,
- Preparing teachers for inclusive education: Part 3 & 4, by UNESCO, produced by Lesotho, Ministry of Education, 21 minutes,
- Toward Inclusive schools - Special needs in the classroom, by UNESCO, directed by Mike Fowler, 6 minutes,
- Training Video: Special Needs in the Classroom, (1992), by UNESCO, directed by Mel Ainscow, 46 minutes,
- Including Children with Special Needs Upper Primary Stage, (2015), NCERT,
- Position Paper National Focus Group on Education of Children with Special Needs, NCERT,
- Learning Curves, Inclusive education (2014), Azim Premji Foundation,

**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


Unit II: Tech-related Health Risks


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.


Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhabitation.


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 observations 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

Physical Education

Yoga
Web Resources

Position Paper National Focus Group on Health and Physical Education, NCERT

www.FalunDafa.org

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:

16. My experiments with the truth – *Autobiography of Mahatma Gandhi*
17. The Little Prince – Antoin de Saint – Exupery
18. Cultural Heritage – Dr. S. Radhakrishnan
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
Duration : 10 Weeks

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 observation 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 reflections

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

Unit II:

Unit III:

Unit IV: Superconductivity

Reference Books:
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.
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°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 CaCl₂.
17. Frequency resonance of LR circuit.
References:
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

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


**Alkaloids:** Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine

**Terepinoindos:** Introduction, isoprene rule, structural elucidation of Citral and Menthol

**Amino acids, Peptides, Proteins and Nucleic acids**


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.

Unit IV: Heterocyclic Compounds

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
- Synthesis of p-bromoaniline from acetonilide
- Preparation of o-iodobenzoic acid from anthranilic acid
- Preparation of m-nitrobenzoic acid from methyl benzoate
- Preparation of Paracetamol
- Synthesis of Quinoline

2. Quantitative organic analysis
- Estimation of aniline/ phenol by bromate-bromide method
- Estimation of glucose by Fehlings method/ Spectrophotometry using 3,5 dinitro salicylic acid
- Determination of iodine value of an oil by Wij’s method/ Chloramine-T method
- Determination of saponification value of an ester / oil
- Estimation of amino acid by formal titration method
- Estimation of ascorbic acid in Vitamin C tablets by Volumetry
- Estimation of Paracetamol by titrimetric and spectro photo metric methods.
- Colorimetric Estimation of proteins by Biuret method

References:
2. Organic Synthesis A.I. Vogel
DSE 3B Mathematics

MSE VIII.3: COMPLEX ANALYSIS & NUMERICAL ANALYSIS

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

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:

Unit II:

Unit III:

Unit IV:

References:
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, Oxford University Press.
11. Numerical Analysis by Gupttha, S. Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
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

Unit III: Union, State and Local Self Governments

Unit IV: Human Rights

References:
1. M.V.Pylee, Indian Constitution, OUP, New Delhi
2. Granville Austin, Indian Constitution, OUP, New Delhi
3. Rajani Kotari, Politics in India, OUP, New Delhi
5. S R Maheswari, Local Governments in India (Latest Edition)
9. Subash C Kashyap, Our Parliament, NBT, New Delhi
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 knowledge and 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:
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
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

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:
11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication

Web resources

- Introduction to Guidance and Counseling African Virtual university
  http://oer.avu.org/bitstream/handle/123456789/153/GUIDANCE%20AND%20COUNSELLING.pdf?sequence=1
- Ethical Principles of Psychologists and Code of Conduct by APA,
- Guidance and Counselling,
- http://www.egyankosh.ac.in/
MSE VIII.7 : VALUE AND PEACE EDUCATION

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


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
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

References:
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 MX₂ (fluorite, rutile, β-cristobalite 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, AB₃E and AB₆ molecules. M.O. treatment for homonuclear and heteronuclear diatomic molecules. M.O. treatment involving delocalized π-bonding (CO₃²⁻, NO₃⁻, NO₂⁻, CO₂ 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 SO₂, BrF₃ and N₂O₄. 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 network 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 pseudohalogenes.
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.

References:

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
Stereoselectivity: Stereoselective reactions, diastereoselective 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 equilibria 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, nitriles, 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: SN1, SN2 and benzene 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:**
3. Organic Chemistry-Morrison & Boyd
10. A Guide book to mechanism in Organic Chemistry-Petersykes
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:

Unit II:

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.

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.
15. Titrations of amino acids with HClO4 in CH3COOH medium.

References:

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.
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.
17. Determination of the molecular weight of a polymer material by viscosity
measurements (cellulose acetate/methyl acrylate).

References:
2. Experimental Physical Chemistry – F. Daniels et al.
(1994).
MSE(C)-IX.7 FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits : 3(2L + 1T+0P)  
Contact Hrs per week : 4  
Exam. Duration: 2 Hrs

Max.Marks :100  
C_1 + C_2 : 50  
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, Multilingual 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

References:
7. Peters, R.S: The concept of Education
8. Peters, R.S: Education and Education of Teachers
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
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
   Krishnamurthy Foundations of India, Ptd by Chennai
   and Perspectives. Needham Heights, Mass.: Allyn & Bacon
   University Press of America
   Macmillan
   Wesley
   Free Press
   Wadsworth.
   National Focus Group. New Delhi: NCERT.
   Delhi : NCERT.
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.

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
6. Electron Absorption Spectroscopy and Selected Techniques-D. N. Satyanarayana, University Press. India Ltd. Hyderabad
COURSE CONTENT:

Unit-I:
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
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:

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:
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 reaction, Knovenagel, benzoin, Darzens Glysidic ester condensation, 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
Steroids: Introduction, Structural elucidation and synthesis of Cholesterol and Ergosterol. Biological importance of bile acids, estrone, progesterone, testosterone, androsterone and corticosterones.

References
2. Organic Chemistry-Morrison & Boyd
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. Sziraldd-Chalmers reaction. Nuclear power reactors-basic features and components of power reactors. An introduction to breeder reactor.

Unit III: Radiation Chemistry

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
References

7. Quantum Chemistry – D.A. McQuarrie.
19. Advances in Photochemistry-Rohatgi Mukherjee.
MSE(C)-X.5 : LAB III - ORGANIC PRACTICAL –I

Credits : 2(0L+0T + 2P) Contact Hrs per week : 4 Exam. Duration: 4 Hrs
Max.Marks :100 C1 + C2:50 C3:50

COURSE CONTENT:

1. Preparation of o-chlorobenzoic acid from phthalic anhydride
2. Preparation of p-nitriodobenzene 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:
5. Semimicro qualitative organic Analysis by Cheronis, Entrikin and Hodnet.

MSE(C)-X.6 : LAB IV - INORGANIC PRACTICAL – I
(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P) Contact Hrs per week : 4 Exam. Duration: 4 Hrs
Max.Marks :100 C1 + C2:50 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
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-dichlorobis(triphenyl) phosphine nickel(II).
7. Determination of the composition of iron-phenanthroline complex by:
   (a) Job’s method and
   (b) Mole ratio 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.
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
4. Vogel’s Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.

MSE(C)-X.7 : TEACHING OF CHEMISTRY

Credits: 3 (2L+1T+0P)  Max.Marks :100
Contact Hrs per week : 4  C₁ + C₂ : 50
Exam. Duration: 2 Hrs  C₃ : 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.
COURSE CONTENT:

Unit I:


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:


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

References:

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.

Unit-II:
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.
Artificially layered materials: Quantum wells and multiple quantum wells. Solid state superlattices. Artificially layered crystal structures.
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:

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:


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:

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, BC13, 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

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:**

8. NMR spectroscopy-Powai
COURSE CONTENT:

Unit I:

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:


Unit IV

References
1. Elements of Physical Chemistry – Lewis and Glasstone.
5. Introduction to electrochemistry by S. Glasstone.
7. Electrochemistry – Principles and applications by E.G. Potter.

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
4. Estimation of Glycine by Sorensen’s method.
References:
3. An introduction to practical Organic Chemistry-Robert, Wingrove etc.
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.

MSE(C)-XI.6 : LAB VI - ANALYTICAL PRACTICAL – II
(Any ten out of the following suggested experiments)

Credits : 2(Ol+OT + 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.
10. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
12. Spectrophotometric determination of iron using thiocyanate/1,10-phenanthroline.
13. Spectrophotometric determination of nickel in steel using DMG.

References

**MSE(C)-XI.7 : INTERNSHIP PROGRAMME 2 (Senior Secondary Level)**

**Credits : 4**

**Duration: 4 Weeks**

Max. Marks: 100

\[ C_1 + C_2 : 50 \]

\[ C_3 : 50 \]

**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 electrophoretic 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.
Stripping analysis: Stripping voltammetry-basic principles, electrodes used for stripping analysis, apparatus for stripping analysis, applications.

**Unit III:**
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.

**References:**

**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.
A brief overview of molecular biology- Replication and Transcription, Translation.
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:
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 Hemoceyanin.
Chlorophyll and its role in photosynthesis

**Unit III:**

Unit IV:

References:

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:

Unit-II

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:

References
2. Advances in Photochemistry-Rohatgi Mukherjee.
7. Organic Chemistry-Marrison & Boyd
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:

Unit I:

Unit II:

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:

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).
16. Analysis of blood for
a) cholesterol by spectrophotometry
b) bicarbonate by acid-base titration

References:
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.
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.
15. Coulometric titrations - NaOH vs HCl.

References:
3. Experimental Physical Chemistry –F. Daniels et al.

MSE(C)-XII.7 : RESEARCH IN CHEMISTRY EDUCATION

Credits: 3 (2L+1T+0P) Max.Marks :100
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:


5. School Science Review

6. Journal of Chemical Education

7. Chemistry Education

8. Home Pages on Web: NCERT, NCTS, ERIC, NSTA

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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 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:
From semesters IX to XII, courses of study are classified 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.

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 75% 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**

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

*internship  ** includes internship credits

L : Lectures; 1 credit = 1 hr/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 2:  Semester I (Credits: B.Sc.12; AEC 6; B.Ed. 6; Total 24)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits</th>
<th>Theory (L)</th>
<th>Teaching Hours per week (T)</th>
<th>Theory (L)</th>
<th>Practicinal (T/P)</th>
<th>Practicinal Hours per week (T/P)</th>
<th>Total Hours (L+T+P)</th>
<th>Periodic Assessment</th>
<th>Terminal Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Core Course 1A Physics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Core Course 2A Chemistry</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3A Mathematics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>AEC 1A Language H/K/M/Tam/Tel</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>AEC 2A English</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>Language across the curriculum</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Environmental Education</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>7</strong></td>
<td><strong>14</strong></td>
<td><strong>31</strong></td>
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<td><strong>50%</strong></td>
<td><strong>50%</strong></td>
<td><strong>50%</strong></td>
</tr>
</tbody>
</table>

**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)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits Theory (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits Practicum (T/P)</th>
<th>Practicum Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment</th>
<th>Terminal Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Core Course 1B Physics</td>
<td>3</td>
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<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Core Course 2B Chemistry</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3B Mathematics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>AEC 1B Language H/K/M/Tam/Tel</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>AEC 2B English</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>Contemporary Indian Education</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Yoga Edu., self-understanding &amp; development</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>7</strong></td>
<td><strong>14</strong></td>
<td><strong>31</strong></td>
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</table>

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

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<th>Total Credits</th>
<th>Courses</th>
<th>Credits Theory (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits Practicum (T/P)</th>
<th>Practicum Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment</th>
<th>Terminal Assessment</th>
</tr>
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<tbody>
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<td>Core Course 1C Physics</td>
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<td>5</td>
<td>50%</td>
<td>50%</td>
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<tr>
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<td>4</td>
<td>Core Course 2C Chemistry</td>
<td>3</td>
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<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3C Mathematics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>Skill Enhancement Course 1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
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<tr>
<td>5</td>
<td>4</td>
<td>Childhood &amp; Growing up</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Gender School &amp; Society</td>
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<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>School Attachment Programme 1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>3 weeks</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td></td>
<td><strong>15</strong></td>
<td><strong>15</strong></td>
<td><strong>8</strong></td>
<td><strong>16</strong></td>
<td><strong>31</strong></td>
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<td></td>
</tr>
</tbody>
</table>

*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)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits Theory (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits Pract/ Lab/ Field (TP)</th>
<th>Pract/ Lab/ Field per week (TP)</th>
<th>Total Hours per week (L+TP)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Core Course1D Physics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Core Course 2D Chemistry</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3D Mathematics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>*Skill Enhancement Course 2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Learning &amp; Teaching</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Drama &amp; Art Education</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>School Attachment Programme 2</td>
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<td>0</td>
<td>2</td>
<td>4</td>
<td>3 weeks</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td><strong>15</strong></td>
<td><strong>8</strong></td>
<td><strong>16</strong></td>
<td><strong>31</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

* 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)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits Theory (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits Pract/ Lab/ Field (TP)</th>
<th>Pract/ Lab/ Field per week (TP)</th>
<th>Total Hours per week (L+TP)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Core Course 1E Physics</td>
<td>3</td>
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<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Core Course 2E Chemistry</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3E Mathematics</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
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<tr>
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<td>4</td>
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<td>2</td>
<td>2</td>
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<tr>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<td><strong>Total</strong></td>
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<td><strong>16</strong></td>
<td><strong>8</strong></td>
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<td><strong>Total</strong></td>
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### TABLE 7: Semester VI (Credits: B.Sc. 12; B.Ed. 12; Total 24)

<table>
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<th>Course No.</th>
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<th>Teaching Hours per week (L)</th>
<th>Credits: Practicum/LabField (TP)</th>
<th>Practicum/LabField (FP)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
</tr>
</thead>
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</tr>
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<td>4</td>
<td>Core Course 2F Chemistry</td>
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<td>2</td>
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<tr>
<td>3</td>
<td>4</td>
<td>Core Course 3F Mathematics</td>
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<td>50%</td>
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<td>Critical Understanding Of ICT</td>
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<td>2</td>
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<td>4</td>
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<td><strong>15</strong></td>
<td><strong>9</strong></td>
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### TABLE 8: Semester VII*(Credits: DSE 9; B.Ed. 20; Total 29**)

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<th>Courses</th>
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<th>Credits: Practicum/LabField (TP)</th>
<th>Practicum/LabField (FP)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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<tr>
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<td>1</td>
<td>1+1</td>
<td>2+2</td>
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<td>50%</td>
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</tr>
<tr>
<td>2</td>
<td>3</td>
<td>DSE 2 A Chemistry</td>
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<td>1</td>
<td>1+1</td>
<td>2+2</td>
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<td>50%</td>
<td>50%</td>
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</tr>
<tr>
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<td>3</td>
<td>DSE 3 A Mathematics</td>
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<td>1</td>
<td>2</td>
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<td>5</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Creating an Inclusive School</td>
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<td>2</td>
<td>2</td>
<td>4</td>
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<td>50%</td>
<td>50%</td>
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</tr>
<tr>
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<td>Health &amp; Physical Education</td>
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<td>1</td>
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<td>2</td>
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<td>50%</td>
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<tr>
<td>6</td>
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<td>Reading &amp; Reflections On Text</td>
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<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>7*</td>
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<td>10 weeks</td>
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<td>Internship in School Subject 2 : Mathematics</td>
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<td><strong>20</strong></td>
<td><strong>27</strong></td>
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*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)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits Theory (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits Practicum/Field Study (TP)</th>
<th>Practicum Hours per week (L+T)</th>
<th>Total Hours per week (L+T+F)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>DSE 1 B Physics</td>
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<td>3</td>
<td>DSE 2 B Chemistry</td>
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<td>2+2</td>
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<td>GE 2 Indian Const. &amp; Human Rights</td>
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<td>5</td>
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<td>50%</td>
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<tr>
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<td>4</td>
<td>Knowledge &amp; Curriculum</td>
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<td>4</td>
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<td>Guidance &amp; Counseling</td>
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<td>5</td>
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<td>Value &amp; Peace Education</td>
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### TABLE 10: Semester IX (Credits: M.Sc. 20; Prof. Edu.3; Total 23)

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<th>Credits Theory (L)</th>
<th>Teaching Hours per week (L)</th>
<th>Credits Practicum/Field Study (TP)</th>
<th>Practicum Hours per week (L+T)</th>
<th>Total Hours per week (L+T+F)</th>
<th>Periodic Assessment C1+C2</th>
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<td>Core Maths 2</td>
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<tr>
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Total: 31
TABLE 11: Semester X (Credits: M.Sc. 20  Prof. Edu. 3; Total 23)

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<th>Credits: Practicum/al (Lab/Field) (T/P)</th>
<th>Practicum/al Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
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<td>2</td>
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<tr>
<td>5</td>
<td>3</td>
<td>Professional Education</td>
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<td>2</td>
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TABLE 12: Semester XI (Credits: M.Sc. 20  Prof. Edu. 4; Total 24)

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

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<th>Total Credits</th>
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<th>Teaching Hours per week (L)</th>
<th>Credits: Practicum/Fieldwork (T/P)</th>
<th>Practicum/Fieldwork Hours per week (T/P)</th>
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<th>Periodic Assessment C1+C2</th>
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<tr>
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<td><strong>Total</strong></td>
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### TABLE 14: PANORAMA OF COURSES IN THE EIGHT-SEMESTERS

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<th>SLNo</th>
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<th>CORE COURSES</th>
<th>ABILITY ENHANCEMENT COURSES</th>
<th>SKILL ENHANCEMENT COURSES</th>
<th>DISCIPLINE SPECIFIC ELECTIVE</th>
<th>GENERIC ELECTIVE</th>
<th>PROFESSIONAL EDUCATION COURSES</th>
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<tr>
<td></td>
<td></td>
<td>I   II  III IV  V  VI  VII  VIII</td>
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<td>Total Credits in Prog.</td>
<td>Total Contact Hours per week (*16)</td>
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<td>XI</td>
<td>XII</td>
<td>TOTAL NO. OF CREDITS</td>
<td>TOTAL NO. OF CONTACT HOURS</td>
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<tr>
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<tr>
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</tr>
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<td>20*</td>
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<td></td>
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</table>

**= courses which do not have C3 Theory examination

**TABLE 15: Semesters IX to XII**
### TABLE 16 : SUBJECTS AND TITLES OF COURSES IN THE PROGRAMME

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>COURSE</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>TITLE</th>
</tr>
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<tbody>
<tr>
<td><strong>FIRST</strong></td>
<td><strong>Core course 1A</strong></td>
<td>MSE I.1</td>
<td>Physics</td>
<td>Mechanics</td>
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<tr>
<td></td>
<td><strong>Core Course 2A</strong></td>
<td>MSE I.2</td>
<td>Chemistry</td>
<td>Atomic Structure and Bonding</td>
</tr>
<tr>
<td></td>
<td><strong>Core Course 3A</strong></td>
<td>MSE I.3</td>
<td>Mathematics</td>
<td>Calculus – I and Matrices</td>
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<tr>
<td></td>
<td><strong>AEC 1A</strong></td>
<td>MSE I.4A</td>
<td>Language</td>
<td>Hindi/ Kannada/ Malayalam / Tamil/ Telugu</td>
</tr>
<tr>
<td></td>
<td>MSE I.4B</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE I.4C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE I.4D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE I.4E</td>
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<td><strong>AEC 2A</strong></td>
<td>MSE I.5</td>
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<td><strong>GE 1</strong></td>
<td>MSE I.6</td>
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<td></td>
<td><strong>Professional Education</strong></td>
<td>MSE I.7</td>
<td>Language Across Curriculum</td>
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</tr>
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<td><strong>SECOND</strong></td>
<td><strong>Core course 1B</strong></td>
<td>MSE II.1</td>
<td>Physics</td>
<td>Elasticity, Waves, Heat and Thermodynamics</td>
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<tr>
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<td><strong>Core Course 2B</strong></td>
<td>MSE II.2</td>
<td>Chemistry</td>
<td>States of Matter and Nuclear Chemistry</td>
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<tr>
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<td><strong>Core Course 3B</strong></td>
<td>MSE II.3</td>
<td>Mathematics</td>
<td>Calculus – II , Analytical Geometry and Number Theory</td>
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<tr>
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<td><strong>AEC 1B</strong></td>
<td>MSE II.4A</td>
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<tr>
<td></td>
<td>MSE II.4B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE II.4C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE II.4D</td>
<td></td>
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</tr>
<tr>
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<td>MSE II.4E</td>
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<td>AEC 2B</td>
<td>MSE II.5</td>
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</tr>
<tr>
<td>Professional Education</td>
<td>MSE II.6</td>
<td>Contemporary Indian Education</td>
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<td></td>
<td>MSE II.7</td>
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### THIRD

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<tr>
<th>Core course 1C</th>
<th>MSE III.1</th>
<th>Physics</th>
<th>Electricity and Electromagnetism</th>
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<tbody>
<tr>
<td>Core Course 2C</td>
<td>MSE III.2</td>
<td>Chemistry</td>
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<tr>
<td>Core Course 3C</td>
<td>MSE III.3</td>
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#### SEC 1

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<th>Professional Education</th>
<th>MSE III.4A</th>
<th>MSE III.4B</th>
<th>MSE III.4C</th>
<th>Physics</th>
<th>Chemistry</th>
<th>Mathematics</th>
<th>Basic Instrumentation Skills</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Industrial Chemicals and Environment</td>
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<td></td>
<td></td>
<td>Combinatorics, Statistics &amp; Basic Probability</td>
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### FOURTH

<table>
<thead>
<tr>
<th>Core course 1D</th>
<th>MSE IV.1A</th>
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<th>Optics</th>
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<tr>
<td>Core Course 2D</td>
<td>MSE IV.2</td>
<td>Chemistry</td>
<td>Thermodynamics, Equilibrium and Solutions</td>
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<tr>
<td>Core Course 3D</td>
<td>MSE IV.3</td>
<td>Mathematics</td>
<td>Differential Equations</td>
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#### SEC 2

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<th>MSE IV.4</th>
<th>MSE IV.4C</th>
<th>MSE IV.4D</th>
<th>MSE IV.4E</th>
<th>Physics</th>
<th>Chemistry</th>
<th>Mathematics</th>
<th>Computational Physics</th>
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<td></td>
<td></td>
<td></td>
<td>Industrial Inorganic Materials</td>
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### FIFTH

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<tr>
<th>Core course 1E</th>
<th>MSE V.1</th>
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<th>Atomic and Molecular Physics</th>
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<td>Core Course 2E</td>
<td>MSE V.2</td>
<td>Chemistry</td>
<td>Transition Elements, Coordination Compounds and Chemical Kinetics</td>
</tr>
<tr>
<td>Core Course 3E</td>
<td>MSE V.3</td>
<td>Mathematics</td>
<td>Multivariate Calculus and Vector Calculus</td>
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#### Professional Education

<table>
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<tr>
<th>MSE V.4</th>
<th>Assessment For Learning</th>
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<tr>
<td>MSE V.5</td>
<td>Pedagogy Of Physical Sciences</td>
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<tr>
<td>MSE V.6</td>
<td>Pedagogy of Mathematics</td>
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### SIXTH

<table>
<thead>
<tr>
<th>Core course 1F</th>
<th>MSE VI.1</th>
<th>Physics</th>
<th>Classical and Quantum Mechanics and Special Theory of Relativity</th>
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<tbody>
<tr>
<td>Core Course 2F</td>
<td>MSE VI.2</td>
<td>Chemistry</td>
<td>Organic Chemistry II</td>
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<tr>
<td>Core Course 3F</td>
<td>MSE VI.3</td>
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<td>Groups and Rings</td>
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#### Professional Education

<table>
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<th>MSE VI.4</th>
<th>Critical Understanding of ICT</th>
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<td>MSE VI.5</td>
<td>Pedagogy of Physical Science</td>
</tr>
<tr>
<td>MSE VI.6</td>
<td>Pedagogy of Mathematics</td>
</tr>
</tbody>
</table>
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 Committee 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 C3 in Theory
  Y is the marks scored out of 50 in C3 in Practical
  Z is the marks scored out of 50 in C3 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 C3.

(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 C1, C2 and C3.

The evaluation of the first component C1 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 8th week of the semester.
The evaluation of the second component C2 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 16th week of the semester. In general C1, and C2 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 C3 with weightage of 50%.

If a candidate has not scored at-least 30% in C1 and C2 put together, he/she is not allowed to appear for C3.

It should be noted that evaluated papers/assignments of C1 and C2 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 C3, both theory and practical examinations shall be conducted for 50 marks each.

The final marks of a course, M of C3, will be computed as per the following table:

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<thead>
<tr>
<th>Probable Credit Distribution patterns</th>
<th>Formula for calculating M</th>
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</thead>
<tbody>
<tr>
<td>1. L : T : P</td>
<td>( M = ((L+T)<em>X+ (P</em>Y)) / (L+T+P) )</td>
</tr>
<tr>
<td>2. L : T : P = 0</td>
<td>X</td>
</tr>
<tr>
<td>3. L : T = 0 : P</td>
<td>( (L<em>X + P</em>Y) / (L+P) )</td>
</tr>
<tr>
<td>4. L = 0 : T : P</td>
<td>Y</td>
</tr>
<tr>
<td>5. L : T = 0 : P = 0</td>
<td>X</td>
</tr>
<tr>
<td>6. L = 0 : T = 0 : P</td>
<td>Y</td>
</tr>
<tr>
<td>7. L = 0 : T : P = 0</td>
<td>Z</td>
</tr>
</tbody>
</table>

Where,
X is the marks scored out of 50 in C3 in Theory
Y is the marks scored out of 50 in C3 in Practical
Z is the marks scored out of 50 in C3 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.

<table>
<thead>
<tr>
<th>P</th>
<th>G</th>
<th>GP = V × G</th>
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</thead>
<tbody>
<tr>
<td>90 – 100</td>
<td>10</td>
<td>V × 10</td>
</tr>
<tr>
<td>80 – 89</td>
<td>9</td>
<td>V × 9</td>
</tr>
<tr>
<td>70 – 79</td>
<td>8</td>
<td>V × 8</td>
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<tr>
<td>60 – 69</td>
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<td>50 – 59</td>
<td>6</td>
<td>V × 6</td>
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<td>40 – 49</td>
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<td>V × 5</td>
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<tr>
<td>30 – 39</td>
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<td>V ×4</td>
</tr>
<tr>
<td>0 -29</td>
<td>0</td>
<td>V × 0</td>
</tr>
</tbody>
</table>
If a candidate scores in $C_1 + C_2 \geq 30\%$, $M \geq 30\%$ 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 $CGPA = \Sigma GP / \text{Total number of credits}$ and the class is declared as follows:

<table>
<thead>
<tr>
<th>CGPA</th>
<th>Numerical Index</th>
<th>Qualitative Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4 \leq CGPA &lt; 5$</td>
<td>5</td>
<td>Second Class</td>
</tr>
<tr>
<td>$5 \leq CGPA &lt; 6$</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>$6 \leq CGPA &lt; 7$</td>
<td>7</td>
<td>First Class</td>
</tr>
<tr>
<td>$7 \leq CGPA &lt; 8$</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>$8 \leq CGPA &lt; 9$</td>
<td>9</td>
<td>Distinction</td>
</tr>
<tr>
<td>$9 \leq CGPA \leq 10$</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Overall percentage = $10 \times CGPA$ 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 up to 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) $C_1 + C_2 \geq 30\%$ and $M < 30\%$ or
   ii) $C_1 + C_2 \geq 30\%$, $M \geq 30\%$ 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)

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
Core course 1A: Physics

MSE 1.1: 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

Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II


Unit III

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:
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.
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
9. HC 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)

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.
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:
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

Core Course 2A- Chemistry

MSE1.2 : 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


Schroedinger wave equation and its importance, physical interpretation of the wave function, significance of $\psi$ and $\psi^2$, 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 trends. Comparison of the ionic size of atoms with the corresponding anion and cation. Variation 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.


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 NH₃, H₃O⁺, SF₄, CIF₃, ICl₂, and H₂O.
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 $\sigma$, $\sigma^*$, $\pi$, $\pi^*$ 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
3. An Introduction to Inorganic chemistry Mackay and Mackay

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 strenthen 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 and estimation 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 pure crystals 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 Iodimetry.
12. Estimation of Copper in the given Copper salt by Iodimetry.

References:
1. A Text Book of Quantitative Inorganic Analysis, A I Vogel

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

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.
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.
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

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
Sumiranandan Pant- Drut Jhoro Jagat Ke Jim Patra
Mahadevi Verma-Mai Neer Bhari Dhukh Ki Badli,
Sacchidanand Heenanad Vatsayan Aggey-Kalgi Bajre Ki
Gajanand 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
Bhim 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 Kavya ka Itihas: Ramswaroop Chaturvedi, Lokbharti 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: Manager 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
19. Kahani Samkaleen Chunautiyen: 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- Gopi Nath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
24. Hindi Prayog: Ramchandra Verma, Rajkamal Prakashan Samooh, Delhi
25. Anuprayukt Rajbhasha: Manik Mrigesh, Vani Prakashan, Delhi
27. Effective Communication Skills, by Omkar N Kour
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

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- Devanuurru 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.
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
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
3. Naatru, Vaanathi Pathippagam, 13 Deenadayalu Street, T. Nagar, Chennai 600 017

MSE I.4:E: 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):

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

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:
2. The perfect Interview by Max Eaggert, Random House, UK.,
3. Interview Secrets by Heather Salter, Publications: Collins, London,
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:

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 observed 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 environmental 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 Swachh 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:

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.
7. Web Resources Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT

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 III Language 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 III Strategies 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 IV Developing 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:

Web Resources
7. Similarities and Differences between First and Second Language Acquisition
8. Activities for Developing Speaking Skill
Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm
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
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

Unit II: Waves

Unit III: Thermodynamics-I
Unit IV: Thermodynamics-II

References:
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S Chand (G/L) & Company Ltd., 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 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°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.
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.
16. Specific heat of a solid by the method of mixtures.

References:
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

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 observations 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. Liquefaction 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.


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 cholesteric 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 NH₃ and liquid SO₂.

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

PRACTICAL

Exam Duration : 3 hrs C3 : 50

Objectives:
- To evolve a scheme of qualitatively analyzing an inorganic mixture classification 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 basic 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:
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

References:
1. Calculus by Anton,Wiley.
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.
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

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 Sathakta
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- Dharma Aur Dharma Nirpechhata

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
6. Aadhunik Hindi Ka Gadhyaa Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
7. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Manager 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- Gopi Nath, Shrivastav, Rajkamal Prakashan Samooh, Delhi
17. Alankar Mimansh: Murlimanohar Prasad 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

Unit III: Medieval Poetry
i) Enna Devange Jagavela 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
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
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
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:
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
3. The perfect Interview by Max Eggert, Random House, UK.

MSEIL4E: 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)
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
Unit III: Ancient Poetry and medieval poetry
1. Damayanthee Swayamvaram by Nannaya (First 18 Poems)
2. Sathyabahama Santhwanam by Nandi Timmana (Poems 82 to 104)
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

Unit IV: Genre 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:
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.
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-11

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:

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 Vivekananda, 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:
3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
7. JJ Rousseau, (1956) Emile
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 Astaŋga yoga.
- State the different types of yoga.
- Derive how Hatha yoga and Astaŋga 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, Bhamari Pranayama, Sheetali Pranayama; Meditation, Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs C₃ : 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 prānāyāma
  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. Prānāyāmas

* 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:

2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
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

Unit III: Magnetism
Unit IV: Electromagnetic Induction and AC Circuits


Reference Books:
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.

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.
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 &Bbh.
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.
17. Variation of phase angle with capacitance for a RC circuit.
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:
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

Core Course 2 CChemistry
MSEEIII.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.


Unit II: Aliphatic Hydrocarbons

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.


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.

Unit III: Aromatic Hydrocarbons

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

Unit IV: Alkyl and Aryl Halides

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

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 nitrations
3. Preparation of \( p \)-bromoacetanilide from acetonilide 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 subMSEts, 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, SumMSequences.

**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:**
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.
7. Introduction to Real Analysisby Bartle R G & Sherbert, Wiley India
8. Kumar Ajit & Kumaresan S, Real Analysis, CRC Press
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International 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. 

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 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:

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)

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 observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
7. To observe 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.

References:
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 common 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:

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 industrial products
- To analyse food adulterants

**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.
   (AgNO3 and potassium chromate)
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
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

References:

5. R. Cremlyn: Pesticides, John Wiley. 7. William O. Foye, Thomas L., Lemke, David A. William:

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:

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

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 Familiarised with Individual Psychological Tests.

References:

**Web Resources**

- Animated Videos from Study.com, [http://study.com/academy/course/educational-psychology-course.html](http://study.com/academy/course/educational-psychology-course.html)
- [www.aeparc.org](http://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

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
- 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

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

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

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, Polaroids, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity, Fresnel’s theory, Rotatory polarization, use of biquartz.

Reference Books:

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.
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.
13. p– n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers
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


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 Chateliers 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, CO₂ 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– H₂O), (FeCl₃–H₂O) and (CuSO₄–H₂O) system. Freezing mixtures, acetone dry ice.
Partially miscible liquids– Phenol-water, trimethylamine– water, nicotine– water systems.
Lower and upper consolute temperature. Effect of impurity on consolute temperature.

References:
2. Physical Chemistry : Atkins

PRACTICAL

Exam Duration : 3 hrs       C3 : 50

Objectives:
• To study the energetics of chemical reactions
• To find out the equilibrium constants of selected systems
• To study the behaviour of immiscible liquid systems
• To appreciate the physical properties of liquids and liquid mixtures

COURSE CONTENT:
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 toluene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.

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:
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
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 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:

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:

Skill Enhancement Course – SEC 2 Chemistry

MSEIV.4B : INORGANIC MATERIALS

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

Objectives:
• To understand the production, handling and storage of industrial 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 industry
• To acquire the knowledge of simple fertilizers, surface coatings, alloys, and chemical explosives

COURSE CONTENT

UNIT I: 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.

UNIT II: 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 setting process, 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.


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.

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**PRACTICAL**

**Exam Duration : 3 hrs**

**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.
8. Preparation of pigment (zinc oxide).
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 methyl orange.

References:

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.

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
Measures of Relationships: 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, Observational 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 Teacher: Communication: Meaning, mode: input/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:
- Encyclopaedia of Modern Methods of Teaching and Learning (Vol. 1-5).
- Gage N.L. Scientific Basis of art of Teaching

Web Resources
- Courses on Communication Skills, [http://nptel.ac.in/courses/109104030/](http://nptel.ac.in/courses/109104030/)
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 observation, 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
4. Theory of Drama by A. Nicoll

Web Resources
Position Paper National Focus Group on Arts, Music & Dance, NCERT
Online courses on Arts, http://www.dsource.in/course/index.php
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 programmes 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


UnitIII : Molecular Spectra

Molecular formation, the $\text{H}_2^+$ molecular ion, $\text{H}_2$ – 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


Reference Books:

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.
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
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.
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:
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.

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 electronic configuration 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 adsorption of 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 heterogeneous 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
   S.Chand and company pvt. Ltd.

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 the kinetics 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.
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 calculus, 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, Hyperboloid, Paraboloid, 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
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 Standardized tests: 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, Techniques and Strategies - I

(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 outcomes: 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) Interdependence of validity, reliability and objectivity

Unit III: Developing Assessment Tools, Techniques and 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; oMSEervation 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 stakeholders (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 made and various 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:**

6. NCERT (2015) CCE Packages, New Delhi
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi

Web Resources

1. Assessment in school education, (2013)
2. Compendium of Tools, (2013), CMSE
5. www.ncert.nic.in

MSEV.5: Pedagogy of Physical Science

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 1: Nature of Science
Nature of science - Scientific method, how science works, science as a process and product. Science as a way of thinking: inquiry, observation, 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, role 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 mindedness, 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:
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.

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- observation, 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, Ramanujam, Guass, Euclid, Descarte, Cantor, Pythagorous; 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:
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
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
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
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

Unit II: Special Theory of Relativity

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:
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).
7. Laser-wavelength using transmission grating.
8. Photo conductivity using LDR.
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.

Reference Books:
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

Core Course 2FChemistry

MSEVI.2 : ORGANIC CHEMISTRY – II

Credits: 4 (3L+ 0T +1P) \hspace{1cm} Marks: 100
Contact hrs per week: 5 \hspace{1cm} C1 + C2: 50
Exam Duration: 2 hrs \hspace{1cm} 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
Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols-oxidative cleavage [\(\text{Pb(OA}_2\text{)}_4\) and \(\text{HIO}_4\)] 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).


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, Li\(\text{AlH}_4\) and Na\(\text{BH}_4\) reductions. Halogenation of enolizable ketones. An introduction to \(\sigma\), \(\beta\) unsaturated aldehydes and ketones.

Carboxylic Acids and their Derivatives

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 \(\alpha\) – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; \(\alpha,\beta\) – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.

Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; \(\alpha,\beta\) – 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


References:
1. Advanced organic chemistry Arun Bahl and B.S. Bhal

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, NaHCO₃, 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 R₇ 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 Rf 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

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’s Criterion of irreducibility.

References:
1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
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
Role of technology in emerging pedagogical practices. Visual literacy, media literacy, and new media literacy.
Computer hardware fundamentals, computer network-LAN, WAN and 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.
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
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:

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 observe 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 MSERivation, 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.
- 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, observation 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 museum, 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 observation 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:

7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
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 (8th, 9th, 10th, 11th, and 12th 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 (FA1 or FA2) and analysing its causes and suggesting various remedial measures for it

References:

3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewize, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
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
10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
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
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.
4. Subramanyam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.

**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.
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.
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.

References:
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

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**


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.


**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 


**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
3. Elements of Electrochemistry by Samuel Glasstone and Lewis
4. Principles of Physical chemistry -Marron and prutton
PRACTICAL

Exam Duration : 3 hrs

Objectives:
• To study the electrical 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 electrolyte 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:

DSE 3A Mathematics

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:

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:
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
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.
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, Competencies 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, lesson 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:

   Manual: New Delhi, Krishana Publication.
   University Press.
   New Delhi: NCERT.
19. Ramaa S : Website: s-ramaa.net ( for various publications)
   Community Health Workers, Rehabilitation Workers, and Families.
   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 Attrakchi, 20 
• Children with Disabilities (2012), by UNESCO, 23 
8
• Inclusive Education: Approaches, scope and Content (2008), by UNESCO, produced by 
  International Bureau of education, 11 
4
• Inclusive Education: Learners and Teachers (2008), by UNESCO, produced by International Bureau 
  of education, 14 
6
• Preparing Teachers in Asia-Pacific for Inclusive Education, (2012), by UNESCO, 3 
0
• Preparing teachers for inclusive education: Part 3 & 4, by UNESCO, produced by Lesotho, Ministry 
  of Education, 21 
• Toward Inclusive schools - Special needs in the classroom, by UNESCO, directed by Mike Fowler, 6 
8
• Training Video: Special Needs in the Classroom, (1992), by UNESCO, directed by Mel Ainscow, 46 
5
• Including Children with Special Needs Primary Stage (2014), 
• Including Children with Special Needs Upper Primary Stage, (2015), 
• Position Paper National Focus Group on Education of Children with Special Needs, 
  nal1.pdf

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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

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,

**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.


Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhabitation.


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 observations 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

Physical Education

Yoga

**Web Resources**

Position Paper National Focus Group on Health and Physical Education, NCERT  

www.FalunDafa.org  

**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:
16. My experiments with the truth – *Autobiography of Mahatma Gandhi*
17. The Little Prince – *Antain de Saint* – Exupery
18. Cultural Heritage – Dr. S. Radhakrishnan
20. Recognizing Different Types of Text

**Web Resources**


**Models of Reading Process**

- [http://people.ucalgary.ca/~mpeglar/models.html](http://people.ucalgary.ca/~mpeglar/models.html)
- [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/)
- [http://www.tarleton.edu/Faculty/gentry/reading%20models.html](http://www.tarleton.edu/Faculty/gentry/reading%20models.html)

**Reflective Skills**

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 observation 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 reflections

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

Unit II:

Unit III:

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:

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`z 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.
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°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 CaCl₂.
17. Frequency resonance of LR circuit.

References:
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

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


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


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

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.


Unit IV: Heterocyclic Compounds

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:
2. Organic Synthesis A.I. Vogel

DSE 3B Mathematics

MSE VIII.3: COMPLEX ANALYSIS & NUMERICAL ANALYSIS

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

Unit II:

Unit III:

Unit IV:
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:
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, OxfordUniversity Press.
11. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
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

Unit III: Union, State and Local Self Governments

Unit IV: Human Rights

References:
1. M.V. Pylee, Indian Constitution, OUP, New Delhi
2. Granville Austin, Indian Constitution, OUP, New Delhi
3. Rajani Kotari, Politics in India, OUP, New Delhi
5. S R Maheswari, Local Governments in India (Latest Edition)
9. Subash C Kashyap, Our Parliament, NBT, New Delhi
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 knowledge and 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.


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:
0205412599.
2. Curriculum planning for better teaching and learning by J.G. Saylor and W Alexander
(Holt, Rinehart and Winston).
educational Planning, France and Longman Inc.
Cutchan Public Corp, Printed in USA.
7. Dewey, John (1959): The Child and the Curriculum, Chicago, the University of Chicago
Press.
World, Inc.
framework.
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
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
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

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 Observation. 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:
11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication

Web resources
- Introduction to Guidance and Counseling African Virtual university http://oer.avu.org/bitstream/handle/123456789/153/GUIDANCE%20AND%20COUNSELING.pdf?sequence=1
- http://www.egyankosh.ac.in/
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. Krishnamurthi)
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:**

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
NINTH SEMESTER

MSE(M)-IX.1 : ABSTRACT ALGEBRA

Credits :5 (4L + 1T +0P)       Marks: 100
Contact hrs per week: 6        C1+ C2: 50
Exam Duration : 2 hrs           C3 : 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, Cayley’s theorem, Sylow’s theorems, p-Sylow subgroups, structure of abelian 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 :
6. Fraleigh J B, *A First course in Abstract Algebra*, Addison-Wesley,

MSE(M)-IX.2 : LINEAR ALGEBRA

Credits :5 (4L + 1T +0P)       Marks: 100
Contact hrs per week: 6        C1+ C2: 50
Exam Duration : 2 hrs           C3 : 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:**

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**MSE(M)-IX.3 : ANALYSIS I**

Credit : 5 (4L + 1T + 0P)  
Marks: 100  
Contact hrs per week: 6  
Exam Duration: 2 hrs  
C1 + C2: 50  
C3: 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.
MSE(M)-IX.4: DISCRETE MATHEMATICS

Credits :5 (4L + 1T +0P)  Marks: 100
Contact hrs per week: 6  C1+C2: 50
Exam Duration : 2 hrs  C3 : 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:
4. Deo Narsingh (1987), Graph Theory With Applications to Engineering and Computer Science, Prentice Hall of India.
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.
DISCRETE MATHEMATICS

Credits : 5 (4L + 1T +0P)  
Contact hrs per week: 6  
Exam Duration : 2 hrs

Marks: 100  
C1+ C2: 50  
C3 : 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:
4. Deo Narsinah (1987), Graph Theory With Applications to Engineering and Computer Science, Prentice Hall of India.
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.

MSE(M)-IX.5 : FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits : 3(2L + 1T +0P)  
Contact Hrs per week : 4  
Exam. Duration: 2 Hrs

Max. Marks : 100  
C1 + C2 : 50  
C3 : 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, Multilingual 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

References:
7. Peters, R. S.: The concept of Education.
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.
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.
TENTH SEMESTER

MSE(M)-X.1 : ANALYSIS II

Credits : 5 (4L + 1T + 0P)  
Marks: 100
Contact hrs per week: 6  
C1 + C2: 50
Exam Duration : 2 hrs  
C3 : 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:

MSE(M)-X.2 : COMPLEX ANALYSIS I

Credits :5 (4L + 1T +0P)  Marks: 100  
Contact hrs per week: 6  C₁+ C₂: 50  
Exam Duration : 2 hrs  C₃ : 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 IV: Cauchy’s theorem for a rectangle. Cauchy’s theorem in a Circular disk, Cauchy’s integral formula. Local properties of analytic functions.

References:
2. Conway J B, Functions of one complex variable, Narosa, New Delhi.

MSE(M)-X.3 : THEORY OF NUMBERS

Credits :5 (4L + 1T +0P)  Marks: 100  
Contact hrs per week: 6  C₁+ C₂: 50  
Exam Duration : 2 hrs  C₃ : 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 \( \pi \).

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:

MSE(M)-X.4 : TOPOLOGY I

Credits :5 (4L + 1T +0P)
Contact hrs per week: 6
Exam Duration : 2 hrs

Marks: 100
C1+ C2: 50
C3 : 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:

MSE(M)-X.5: TEACHING OF MATHEMATICS

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

References:
4. Learning Mathematics by Robert B. Davis
ELEVENTH SEMESTER

MSE(M)-XI.1 ELEMENTS OF FUNCTIONAL ANALYSIS

Credits :5 (4L + 1T +0P)        Marks: 100
Contact hrs per week: 6        C₁+ C₂: 50
Exam Duration : 2 hrs        C₃ : 50

COURSE CONTENT:


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 :
MSE(M)-XI.2 : THEORY OF ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Credits :5 (4L + 1T +0P)  
Marks: 100
Contact hrs per week: 6  
C1+ C2: 50
Exam Duration : 2 hrs  
C3 : 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 - Liouville system, eigen values and eigen functions, simple properties, expansion in eigen functions, Parseval's identity, Green’s function method.

References:

MSE(M)-XI.3 : COMPLEX ANALYSIS II

Credits :5 (4L + 1T +0P)  
Marks: 100
Contact hrs per week: 6  
C1+ C2: 50
Exam Duration : 2 hrs  
C3 : 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.


References:
2. Conway J B, Functions of one complex variable, Narosa, New Delhi.

MSE(M)-XI.4: TOPOLOGY II

Credits : 5 (4L + 1T + 0P) Marks: 100
Contact hrs per week: 6 C1 + C2: 50
Exam Duration : 2 hrs C3 : 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.


References:
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          C1+ C2: 50
Exam Duration : 2 hrs            C3 : 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, Artinian rings, Noetherian rings, Hilbert basis theorem.

References :
3. Reid Miles, Under-graduate Commutative Algebra, Cambridge University Press.

MSE(M)-XII.2 : MEASURE THEORY

Credits :5 (4L + 1T +0P)        Marks: 100
Contact hrs per week: 6          C1+ C2: 50
Exam Duration : 2 hrs            C3 : 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.

MSE(M)-XII.3 : ALGORITHMS AND COMPUTATION

Credits :5 (4L + 1T +0P) Marks: 100
Contact hrs per week: 6 C₁+ C₂: 50
Exam Duration : 2 hrs C₃ : 50

COURSE CONTENT:


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.


References:
2. Deo Narsingh (1987), Graph Theory With Applications to Engineering and Computer Science, 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-area Maps and a theorem of
Archimedes.

Unit III: Curvature of surfaces – The Second Fundamental form, Normal and Principal
Curvatures. Gaussian and 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.

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:

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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:
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 75% 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

<p>| TABLE 1: CREDIT BREAK-UP INTO B.SC., M.Sc. AND B.ED. COMPONENTS AND MODE OF EVALUATION |
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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)**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Total Credits</th>
<th>Courses</th>
<th>Credits</th>
<th>Theory Teaching Hours per week</th>
<th>Practical Teaching Hours per week</th>
<th>Total Hours (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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<td>AEC 2A English</td>
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<tr>
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<td>Language across the curriculum</td>
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<td><strong>17</strong></td>
<td><strong>17</strong></td>
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<td><strong>14</strong></td>
<td><strong>31</strong></td>
<td><strong>50%</strong></td>
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</tbody>
</table>

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)

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<th>Credits</th>
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<th>Teaching Hours per week (L)</th>
<th>Credits: Practicum (Lab/Field) (T/P)</th>
<th>Pencumulative 1 Hours per week (TP)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment</th>
<th>Terminal Assessment</th>
<th>C1+C2</th>
<th>C3</th>
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<td>7</td>
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### TABLE 4: Semester III (Credits: B.Sc.12; SEC 3; B.Ed. 8; Total 23)

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<th>Credits: Practicum (Lab/Field) (T/P)</th>
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<th>C3</th>
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* 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)

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<th>Credits Practicum/ Lab/Field (T/P)</th>
<th>Practicum Hours per week (T/P)</th>
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* 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)

<table>
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<th>Practicum Hours per week (T/P)</th>
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<td>2</td>
<td>5</td>
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<td>4</td>
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<td>5</td>
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<td>50%</td>
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<th>Credits: Practical/Lab (TP)</th>
<th>Practicum/al Hours per week (P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
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<td>Core Course 2F Chemistry</td>
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<td>2</td>
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<td>4</td>
<td>Core Course 3F Mathematics</td>
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<td>Pedagogy of Maths</td>
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TABLE 8: Semester VII* (Credits: DSE 9; B.Ed. 20; Total 29**)

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<th>Credits: Practical/Lab (TP)</th>
<th>Practicum/al Hours per week (P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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<td>1</td>
<td>1</td>
<td>1</td>
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<td>5</td>
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<td>50%</td>
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<tr>
<td>2</td>
<td>3</td>
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<td>2</td>
<td>5</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>DSE 3 A Mathematics</td>
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<td>1</td>
<td>2</td>
<td>4</td>
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<td>50%</td>
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<tr>
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<td>50%</td>
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<td>6</td>
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<td>Reading &amp; Reflections On Text</td>
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<td>1</td>
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<tr>
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*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)

<table>
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<th>Teaching Hours per week (L)</th>
<th>Credits Practicum/al Lab/Field (T/P)</th>
<th>Practicum/al Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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<tr>
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<td>1+1</td>
<td>2+2</td>
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<td>50%</td>
<td>50%</td>
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<td>DSE 2 B Chemistry</td>
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<td>1</td>
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<td>5</td>
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<td>Guidance &amp; Counseling</td>
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<td><strong>11</strong></td>
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TABLE 10: Semester IX (Credits: M.Sc. 20; Prof. Edu.3; Total 23)

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<th>Courses</th>
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<th>Credits Practicum/al Lab/Field (T/P)</th>
<th>Practicum/al Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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<th>Practicum Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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#### TABLE 12: Semester XI (Credits: M.Sc. 20 Prof. Edu. 4; Total 24)

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<th>Courses</th>
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<th>Teaching Hours per week (L)</th>
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<th>Practicum Hours per week (T/P)</th>
<th>Total Hours per week (L+T+P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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### TABLE 13: Semester XII (Credits: M.Sc. 20 ; Prof. Edu.3; Total 23)

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<th>Practicum/al Hours per week (T/P)</th>
<th>Total Hours per week (L+T+F-P)</th>
<th>Periodic Assessment C1+C2</th>
<th>Terminal Assessment C3</th>
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<tr>
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**TABLE 15: Semesters IX to XII**

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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 10 weeks 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**

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</tr>
<tr>
<td></td>
<td>Professional Education</td>
<td>MSE I.7</td>
<td>Language Across Curriculum</td>
<td></td>
</tr>
<tr>
<td>SECOND</td>
<td>Core course 1B</td>
<td>MSE II.1</td>
<td>Physics</td>
<td>Elasticity, Waves, Heat and Thermodynamics</td>
</tr>
<tr>
<td></td>
<td>Core Course 2B</td>
<td>MSE II.2</td>
<td>Chemistry</td>
<td>States of Matter and Nuclear Chemistry</td>
</tr>
<tr>
<td></td>
<td>Core Course 3B</td>
<td>MSE II.3</td>
<td>Mathematics</td>
<td>Calculus – II, Analytical Geometry and Number Theory</td>
</tr>
<tr>
<td></td>
<td>AEC 1B</td>
<td>MSE II.4A</td>
<td>Language</td>
<td>Hindi/Kannada/Malayalam/Tamil/Telugu</td>
</tr>
<tr>
<td></td>
<td>AEC 1B</td>
<td>MSE II.4B</td>
<td>Language</td>
<td>Hindi/Kannada/Malayalam/Tamil/Telugu</td>
</tr>
<tr>
<td></td>
<td>AEC 1B</td>
<td>MSE II.4C</td>
<td>Language</td>
<td>Hindi/Kannada/Malayalam/Tamil/Telugu</td>
</tr>
<tr>
<td></td>
<td>AEC 1B</td>
<td>MSE II.4D</td>
<td>Language</td>
<td>Hindi/Kannada/Malayalam/Tamil/Telugu</td>
</tr>
<tr>
<td></td>
<td>AEC 1B</td>
<td>MSE II.4E</td>
<td>Language</td>
<td>Hindi/Kannada/Malayalam/Tamil/Telugu</td>
</tr>
<tr>
<td></td>
<td>AEC 2B</td>
<td>MSE II.5</td>
<td>English</td>
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</tr>
<tr>
<td></td>
<td>Professional Education</td>
<td>MSE II.6</td>
<td>Contemporary Indian Education</td>
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</tr>
<tr>
<td></td>
<td>Professional Education</td>
<td>MSE II.7</td>
<td>Yoga Edu., self-understanding &amp;</td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td>Description</td>
<td></td>
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<tr>
<td><strong>THIRD</strong></td>
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</tr>
<tr>
<td>Core course 1C</td>
<td>MSE III.1 Physics</td>
<td>Electricity and Electromagnetism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 2C</td>
<td>MSE III.2 Chemistry</td>
<td>Organic Chemistry – I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 3C</td>
<td>MSE III.3 Mathematics</td>
<td>Real Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEC 1</td>
<td>MSE III.4A Physics</td>
<td>Basic Instrumentation Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE III.4B Chemistry</td>
<td>Industrial Chemicals and Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE III.4C Mathematics</td>
<td>Combinatorics, Statistics &amp; Basic Probability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Education</td>
<td>MSE III.5</td>
<td>Childhood &amp; Growing up</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE III.6</td>
<td>Gender School &amp; Society</td>
<td></td>
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<tr>
<td></td>
<td>MSE III.7</td>
<td>School Attachment Programme 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FOURTH</strong></td>
<td></td>
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</tr>
<tr>
<td>Core course 1D</td>
<td>MSE IV.1A Physics</td>
<td>Optics</td>
<td></td>
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</tr>
<tr>
<td>Core Course 2D</td>
<td>MSE IV.2 Chemistry</td>
<td>Thermodynamics, Equilibrium and Solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 3D</td>
<td>MSE IV.3 Mathematics</td>
<td>Differential Equations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEC 2</td>
<td>MSE IV.4 Physics</td>
<td>Computational Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE IV.4C Chemistry</td>
<td>Industrial Inorganic Materials</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>MSE IV.4D Mathematics</td>
<td>Data Handling</td>
<td></td>
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<td></td>
<td>MSE IV.4E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Education</td>
<td>MSE IV.5</td>
<td>Learning &amp; Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE IV.6</td>
<td>Drama &amp; Art Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE IV.7</td>
<td>School Attachment Programme 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FIFTH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core course 1E</td>
<td>MSE V.1 Physics</td>
<td>Atomic and Molecular Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 2E</td>
<td>MSE V.2 Chemistry</td>
<td>Transition Elements, Coordination Compounds and Chemical Kinetics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 3E</td>
<td>MSE V.3 Mathematics</td>
<td>Multivariate Calculus and Vector Calculus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Education</td>
<td>MSE V.4</td>
<td>Assessment For Learning</td>
<td></td>
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<td></td>
<td>MSE V.5</td>
<td>Pedagogy Of Physical Sciences</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>MSE V.6</td>
<td>Pedagogy Of Mathematics</td>
<td></td>
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<tr>
<td><strong>SIXTH</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Core course 1F</td>
<td>MSE VI.1 Physics</td>
<td>Classical and Quantum Mechanics and Special Theory of Relativity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 2F</td>
<td>MSE VI.2 Chemistry</td>
<td>Organic Chemistry II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Course 3F</td>
<td>MSE VI.3 Mathematics</td>
<td>Groups and Rings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Education</td>
<td>MSE VI.4</td>
<td>Critical Understanding of ICT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE VI.5</td>
<td>Pedagogy Of Physical Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE VI.6</td>
<td>Pedagogy Of Mathematics</td>
<td></td>
<td></td>
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<tr>
<td><strong>SEVENTH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective 1</td>
<td>MSE VII.1 Physics</td>
<td>Nuclear and Particle Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE VII.2 Chemistry</td>
<td>Electrochemistry and Photochemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE VII.3 Mathematics</td>
<td>Linear Algebra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Education</td>
<td>MSE VII.4</td>
<td>Creating an inclusive school</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSE VII.5</td>
<td>Health &amp; Physical Education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 Committee 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 C3 in Theory
  - Y is the marks scored out of 50 in C3 in Practical
  - Z is the marks scored out of 50 in C3 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 C3.
   (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 C1, C2 and C3.
The evaluation of the first component C1 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 8th week of the semester.
The evaluation of the second component C2 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 16th week of the semester. In
general C1, and C2 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 C1 and C2 put together, he/she is not allowed to appear for C3.

It should be noted that evaluated papers/assignments of C1 and C2 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 C3, both theory and practical examinations shall be conducted for 50 marks each.

The final marks of a course, M of C3, will be computed as per the following table:

<table>
<thead>
<tr>
<th>Probable Credit Distribution patterns</th>
<th>Formula for calculating M</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. L : T : P</td>
<td>M = ((L+T)<em>X+ (P</em>Y)) / (L+T+P)</td>
</tr>
<tr>
<td>2. L : T : P = 0</td>
<td>X</td>
</tr>
<tr>
<td>3. L : T = 0 : P</td>
<td>(L<em>X + P</em>Y) / (L+P)</td>
</tr>
<tr>
<td>4. L = 0 : T : P</td>
<td>Y</td>
</tr>
<tr>
<td>5. L : T = 0 : P = 0</td>
<td>X</td>
</tr>
<tr>
<td>6. L = 0 : T = 0 : P</td>
<td>Y</td>
</tr>
<tr>
<td>7. L = 0 : T = 0 : P</td>
<td>Z</td>
</tr>
</tbody>
</table>

Where,
X is the marks scored out of 50 in C3 in Theory
Y is the marks scored out of 50 in C3 in Practical
Z is the marks scored out of 50 in C3 in Tutorial

The total marks in a course is P = C1 + C2 + 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.

<table>
<thead>
<tr>
<th>P</th>
<th>G</th>
<th>GP = V × G</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 – 100</td>
<td>10</td>
<td>V × 10</td>
</tr>
<tr>
<td>80 – 89</td>
<td>9</td>
<td>V × 9</td>
</tr>
<tr>
<td>70 – 79</td>
<td>8</td>
<td>V × 8</td>
</tr>
<tr>
<td>60 – 69</td>
<td>7</td>
<td>V × 7</td>
</tr>
<tr>
<td>50 – 59</td>
<td>6</td>
<td>V × 6</td>
</tr>
<tr>
<td>40 – 49</td>
<td>5</td>
<td>V × 5</td>
</tr>
<tr>
<td>30 – 39</td>
<td>4</td>
<td>V ×4</td>
</tr>
<tr>
<td>0 -29</td>
<td>0</td>
<td>V ×0</td>
</tr>
</tbody>
</table>

If a candidate scores in C1 + C2 ≥ 30%, M ≥ 30% M and G ≥ 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:
<table>
<thead>
<tr>
<th>CGPA</th>
<th>Numerical Index</th>
<th>Qualitative Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ≤ CGPA &lt; 5</td>
<td>5</td>
<td>Second Class</td>
</tr>
<tr>
<td>5 ≤ CGPA &lt; 6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6 ≤ CGPA &lt; 7</td>
<td>7</td>
<td>First Class</td>
</tr>
<tr>
<td>7 ≤ CGPA &lt; 8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>8 ≤ CGPA &lt; 9</td>
<td>9</td>
<td>Distinction</td>
</tr>
<tr>
<td>9 ≤ CGPA ≤ 10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

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

However, if $C_1 + C_2 ≥ 30\%, M ≥ 30\%$ 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 $C_1 + C_2 ≥ 30\%, M ≥ 30\%$ 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 $≥ 30\%$ in $C_1 + C_2$ and $M < 30\%$
2. scores $≥ 30\%$ in $C_1 + C_2$; $M ≥ 30\%$ 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 $≥ 30\%$ and $M < 30\%$ or
   ii) $C_1 + C_2$ is $≥ 30\%$, $M ≥ 30\%$ 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


Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II


Unit III


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

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:
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.
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
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)
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.

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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:
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

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


Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of \( \psi \) and \( \psi^2 \), 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: Slater’s 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 trends. Comparison of the ionic size of atoms with the corresponding anion and cation. Variations in 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.


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 \( \text{NH}_3 \), \( \text{H}_3\text{O}^+ \), \( \text{SF}_4 \), CIF3, ICl2, and \( \text{H}_2\text{O} \).
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\textsubscript{2}\textsuperscript{+} ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of \(\sigma, \sigma^*, \pi, \pi^*\) orbitals and their characteristics. Hybrid orbitals – sp, sp\textsuperscript{2}, sp\textsuperscript{3}; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H\textsubscript{2}, comparison of M.O. and V.B. Models.

Discussion about homonuclear (He\textsubscript{2}, N\textsubscript{2}, O\textsubscript{2}, F\textsubscript{2}, C\textsubscript{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
3. An Introduction to Inorganic chemistry Mackay and Mackay

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 and estimation 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.
7. Estimation of oxalic acid present in the given solution using sodium hydroxide solution and pure crystals 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.

References:
1. A Text Book of Quantitative Inorganic Analysis, A I Vogel

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:
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

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.
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.
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, Visheshhtayen, 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 Gupta- Nar Ho Na Nirash Karo Man ko
Jayshankar Prasad- Himadri Tung Sring Se Prabudh Sudhha Bharti
Suryakant Tripathi Nirala- Joohi ki Kali
Sumitranaand Pant- Drut Jhara Jagat Ke Jim 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 Parmeshwvar
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
Omprikash 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 Kavya ka Itihas: Ramswaroop Chaturvedi, Lokbharti 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: Manager 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
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
27. Effective Communication Skills, by Omkar N Kour
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

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.
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
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: Definition-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
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):

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

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:
2. The perfect Interview by Max Eaggert, Random House, UK.,
3. Interview Secrets by Heather Salter, Publications: Collins, London,
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:

GENERIC ELECTIVE 1

MSEL6 :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 environmental 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 Swachh 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:


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.


7. Web Resources Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT


**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 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 II Language 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 III: Strategies 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 IV: Developing 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:**


**Web Resources**

6. First and Second Language Acquisition – A Brief Comparison. Retrieved from [https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf](https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf)
7. Similarities and Differences between First and Second Language Acquisition
8. Activities for Developing Speaking Skill
Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm


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

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 - \( q, \eta \) and \( \sigma \) by Searle’s method.

Unit II: Waves

Unit III: Thermodynamics-I
Unit IV: Thermodynamics-II

References:
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S Chand (G/L) & Company Ltd., 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 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°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.
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.
16. Specific heat of a solid by the method of mixtures.

References:
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

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 observations 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. Liquefaction 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.


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 cholesteric phases. Thermography and seven segment cell.

Definition of colloids, classification of colloids.


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 NH₃ and liquid SO₂.

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

PRACTICAL

Exam Duration: 3 hrs  C3 : 50

Objectives:
• To evolve a scheme of qualitatively analyzing an inorganic mixture classification 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 basic 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 J. 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

References:
1. Calculus by Anton, Wiley.
3. Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.
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-Karyalaye 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- Dharma 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 Addhyay: Dr Baburam, Vani Prakashan, Delhi
6. Aadhunik Hindi Ka Gadhyaa Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
7. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Manager 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 Prasad Singh, Swaraj Prakashan, Delhi
18. Saral Hindi Vyakaran: Swaraj Prakashan, Delhi
19. Upayanas aur Lokjeevan: Railph Fox, Vani Prakashan, Delhi
20. Upayanas 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

Unit III: Medieval Poetry
i) Enna Devange Jagavella Hennu Noada - Akkamahadevi
ii) Kaayutirdanirulu Hagalennade-Raghavanka
iii) Parahimseyam Madi Manavam Balapane – 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) Samaanaavaakaasha – 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
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
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 Prakash, Kozhikode
1. Yudhathinte parinaamam
2. Amba
3. Karnante arangettram
4. Markandeyante chiri

References:
1. Bhashaa bhushanam and Kerala Paanineeyam, NBS, Kottayam
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:
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)
   (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
   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. Sathyabhamha Santhwanam by Nandi Timmana (Poems 82 to 104)
   (From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

Unit IV: Genre 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:
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:

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:
3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
7. JJ Rousseau, (1956) Emile
20. Scheffler, Israel (1966). Philosophy and Education: Modern Readings, Allyn and Bacon, Boston, US.
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 Astaṅga yoga.
- State the different types of yoga.
- Derive how Hatha yoga and Astaṅga 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: Astaṅga 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, Pranayama, 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, Vyawahara, Yogic Practices for Stress Management; Asanas, Hastottanasana, Padahastasana, Trikonasana, Shashankasana, Ushtrasana, Ardhamatsyendrasana, Bhujangasana, Makarasana, Sarvangasana, Matsyasana, Shavasana; Pranayama, Anuloma-Viloma Pranayama, Bhastrrika Pranayama, Bhramari Pranayama, Sheetali Pranayama; Meditation, Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs C₃ : 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 prānāyāma
  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. Prānāyāmas

* 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:

2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
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

Unit III: Magnetism
Unit IV: Electromagnetic Induction and AC Circuits


Reference Books:
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.

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.
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
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.
17. Variation of phase angle with capacitance for a RC circuit.
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:
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

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.


**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.

Unit III: Aromatic Hydrocarbons


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

Unit IV: Alkyl and Aryl Halides


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

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 acetonilide 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

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**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:**
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.
7. Introduction to Real Analysis by Bartle R G & Sherbert, Wiley India
8. Kumar Ajit & Kumaresan S, Real Analysis, CRC Press
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International 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 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:

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)

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 observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
7. To observe 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.

References:

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 common pesticides

COURSE CONTENT:
Unit I:
Chemical Technology:  Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid 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:

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.


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 industrial 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.
   - (AgNO₃ and potassium chromate)
6. Estimation of total alkalinity of water samples (CO₃, HCO₃) 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
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

**References:**
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:

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


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 Familiarised with Individual Psychological Tests.

References:


**Web Resources**

- Animated Videos from Study.com, [http://study.com/academy/course/educational-psychology-course.html](http://study.com/academy/course/educational-psychology-course.html)
- [www.aeparc.org](http://www.aeparc.org)

**MSEIII.6 : Gender, School and Society**

Credits: 2 (1L+ 1T +0P)  
Marks: 100  
C1 + C2: 50  
C3: 50  

**Contact hrs per week: 3**  
Exam Duration: 2 hrs  

**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

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 learning 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


• 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.


• UNESCO; (1997). Learning the Treasure Within.
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.
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

Unit II: Interference

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:

PRACTICALS

Exam Duration : 3 hrs

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.
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.
13. p– n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers
References:
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

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

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.


**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$_2$O), (FeCl$_3$–H$_2$O) and (CuSO$_4$–H$_2$O) system. Freezing mixtures, acetone dry ice.


References:

2. Physical Chemistry: Atkins
3. Phase rule: Gurdeep Raj, Goel publicing house.

PRACTICAL

Exam Duration: 3 hrs

Objectives:

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

COURSE CONTENT:

2. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
3. pH titration of acid versus base (oMSEvation 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 toluene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.

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 :
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
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:

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:

Skill Enhancement Course - SEC2 Chemistry

MSE IV.4B : INORGANIC MATERIALS

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

C1 + C2: 50  
C3 : 50

Objectives:
- To understand the production, handling and storage of industrial 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 industry
- 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 setting process, 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.


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.

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**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.
8. Preparation of pigment (zinc oxide).
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 methyl orange.
References:


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
Measures of Relationships: 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, Snowball 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, observational 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 Teacher Communication: 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:
- Encyclopaedia of Modern Methods of Teaching and Learning (Vol. 1-5).
- Gage N.L. Scientific Basis of art of Teaching

Web Resources
- Courses on Communication Skills, http://nptel.ac.in/courses/109104030/
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 observation, 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
4. Theory of Drama by A. Nicoll

Web Resources

Position Paper National Focus Group on Arts, Music & Dance, NCERT
Online courses on Arts, http://www.dsource.in/course/index.php
Learning Indicators and Learning Outcomes at the Elementary Stage, (2014), NCERT
MSE IV.7 : School Attachment Programme 2

Credits : 2
Duration : 3 weeks

Marks: 100
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 observe the integrated skills of teaching given by their peers and submit the observation 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 programmes 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

Unit III : Molecular Spectra
Molecular formation, the H⁺₂ molecular ion, H₂ – 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

Reference Books:

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.
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
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.
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:
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\textsuperscript{th} Edition, Kitab Mahal, New Delhi, 2011.

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

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

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 the kinetics 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.
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 calculus, 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, Paraboloid, 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
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, Techniques and Strategies - I

(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, Techniques and 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 made and various 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:

6. NCERT (2015) CCE Packages, New Delhi
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi

Web Resources

1. Assessment in school education, (2013) 
2. Compendium of Tools, (2013), CMSE
   http://cMSE.nic.in/ePub/webcMSE/webcMSE/Revised%20Compendium%20of%20Tools/Revised%20Compendium%20of%20Tools/docs/Revised%20Compendium%20of%20Tools.pdf
4. www.ncert.nic.in
5. 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, observation, 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, role 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 mindedness, 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 Glaserfeld’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:

7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
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

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:**

3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewicz, Boris and Stoyl, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
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
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
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


Unit II: Special Theory of Relativity


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:

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).
7. Laser-wavelength using transmission grating.
8. Photo conductivity using LDR.
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.

Reference Books:
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

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
Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides),
chemical reactions of vicinal glycols-oxidative cleavage [Pb(OAc)₄ and HIO₄] 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 phenoxy
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, LiAlH₄ and NaBH₄ 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. KI–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

**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 , NaHCO₃, 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 Rf 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

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’s Criterion of irreducibility.

References:
1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
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
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, WAN and 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
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:

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.
- 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 museum, 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:

7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
MSE VI.6 : PEDAGOGY OF MATHEMATICS 2

Credits: 4 (2L + 2T +0P) 
Contact hrs per week: 6 
Exam Duration: 2 hrs

Marks: 100 
C1 + C2: 50 
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 (8th, 9th, 10th, 11th, and 12th 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:**

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
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
10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
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
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.
4. Subramanyam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.

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.
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.
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.
References:
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.

DSE 2AC

Chemistry

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**
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.

**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
   Vishal Publishing Co.
3. Elements of Electrochemistry by Samuel Glasstone and Lewis
4. Principles of Physical chemistry -Marron and prutton

**PRACTICAL**

Exam Duration : 3 hrs  C3 : 50
Objectives:
- To study the electrical 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 electrolyte 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:

DSE 3A Mathematics

MSE VII.3 : LINEAR ALGERBRA

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:

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:
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
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.
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, lesson 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:

19. Ramaa S : Website: s-ramaa.net ( for various publications)

Web Resources


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**MSEVII.5 : HEALTH AND PHYSICAL EDUCATION**

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

Unit II: Tech-related Health Risks


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.
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 Observation 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 observations 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

Physical Education

Yoga

Web Resources
Position Paper National Focus Group on Health and Physical Education, NCERT
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:

16. My experiments with the truth – *Autobiography of Mahatma Gandhi*
17. The Little Prince – *Antain de Saint – Exupery*
18. Cultural Heritage – Dr. S. Radhakrishnan
20. Recognizing Different Types of Text

Web Resources

- Models of Reading Process
  - [http://people.ucalgary.ca/~mpeglar/models.html](http://people.ucalgary.ca/~mpeglar/models.html)
  - [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/)
  - [http://www.tarleton.edu/Faculty/gentry/reading%20models.html](http://www.tarleton.edu/Faculty/gentry/reading%20models.html)
- Reflective Skills
MSE VII.7A INTERNSHIP IN SCHOOL SUBJECT 1 – PHYSICAL SCIENCE
&
MSE VII.7B : INTERNSHIP IN SCHOOL SUBJECT 2 – MATHEMATICS

Credits : 6+6
Duration : 10 Weeks
Marks: 100
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 observation 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 reflections

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

Unit II:

Unit III:

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:

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.
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° 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 CaCl₂.

17. Frequency resonance of LR circuit.

References:
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

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


**Alkaloids:** Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine

**Terpenoids:** Introduction, isoprene rule, structural elucidation of Citral and Menthol

**Amino acids, Peptides, Proteins and Nucleic acids**


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

**Unit IV: Heterocyclic Compounds**


**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

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**PRACTICAL**

**Exam Duration : 3 hrs**

**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:
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                    C₁ + C₂: 50
Exam Duration : 2 hrs                        C₃ : 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:

Unit II:

Unit III:

Unit IV:
References:
3. Complex Analysis by Serge Lang, Springer Verlag.
4. Theory of Functions of a Complex Variable by Shanthinarayanan, S. Chand and Co. Ltd.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, Oxford University Press.
11. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
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

Unit III: Union, State and Local Self Governments

Unit IV: Human Rights

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
5. S R Maheswari, Local Governments in India (Latest Edition)
9. Subash C Kashyap, Our Parliament, NBT, New Delhi
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.
- Analyze 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 knowledge and 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 frameworks 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:**
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
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

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:
11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication

Web resources

- [http://www.egyankosh.ac.in/](http://www.egyankosh.ac.in/)
MSE VIII.7 : VALUE AND PEACE EDUCATION

Credits: 2 (1L+ 1T +0P)  
Contact hrs per week: 3  
Exam Duration: 2 hrs

Marks: 100  
C1 + C2: 50  
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. Krishnamurthi)
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:**

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
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

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 Poisson 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 an 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:**

**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**

**Unit II: Special functions- I**

**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**

**Reference Books:**

**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:**

**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.


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.

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:
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:

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:

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 G\textsc{nuplot}: 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 \textsc{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  \hspace{1cm} C_1 + C_2 : 50
Exam. Duration: 2 Hrs  \hspace{1cm} 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, Multilingual 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

References:
7. Peters, R. S: The concept of Education
8. Peters, R. S: Education and Education of Teachers
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
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
Krishnamurthy Foundations of India, Ptd by Chennai
and Perspectives. Needham Heights, Mass.: Allyn & Bacon
University Press of America
Macmillan
Wesley
Free Press
& K. Paul
Publications.
Wadsworth.
National Focus Group. New Delhi: NCERT.
Delhi : NCERT.
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.

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:
10. B. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.

MSE(P) X.2 : MATHEMATICAL PHYSICS – II

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

COURSE CONTENT:

Unit I: Functions of Complex Variables

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} and D^{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 differential equation, generating function for J (x), integrals for J_{0}(x) and J_{1}(x), recurrence 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

Reference Books:

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

Unit III: Applications of Fermi-Dirac Statistics

Unit IV: Non-ideal systems and Fluctuations

Reference Books:
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:
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:

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).
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 amplifier.
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.
16. Second order Low pass, High Pass and Band Pass filters using OPAMP (study the frequency response )

Reference books:

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.
4. Check whether the input number is prime or not.
5. Compute the roots of a quadratic equation.
MSE(P) X.7 : TEACHING OF PHYSICS

Credits: 3 (2L+1T+0P) \hspace{1cm} \text{Max.Marks :100}
Contact Hrs per week : 4 \hspace{1cm} C_1 + C_2 : 50
Exam. Duration: 2 Hrs \hspace{1cm} 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 collection and experimental skills, recording, analyzing and reporting skills. Problem solving and 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 projects 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 participation. 

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:**

7. NCERT Textbook in Physics for XI and XII students.
12. School Science Review : The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
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 → B + C, A + B → C, P + P¯ → P + 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:
10. B. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.

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

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 CH₃Cl, 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 $\text{H}_2\text{O}$ and $\text{CO}_2$. Instrumentation for IR spectroscopy.

Raman Effect—classical and quantum theories, Pure rotational Raman spectra, Examples of $\text{O}_2$ and $\text{CO}_2$, Rotational Raman Spectrum of Symmetric top molecules, Examples of $\text{CHCl}_3$, vibration Raman spectrum of a symmetric top molecule, Example of $\text{CHCl}_3$, combined use of Raman and Infrared Spectroscopy in structure determination, Examples of $\text{CO}_2$ and $\text{NO}_3$, Instrumentation for Raman spectroscopy.

**Unit IV: Spin Resonance Spectroscopy**


**Reference Books:**


**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 polarizabilities 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 properties 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

Unit IV: Elastic Constants of crystals
Definition of elastic strains and stresses in a solid. Elastic compliance and stiffness constants. Applications to cubic crystals and isotropic solids. Elastic waves and experimental determination of elastic constants. (as given in C. Kittel)

Reference Books:

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**

**Unit IV: Terrestrial and Satellite Communication**

**Reference Books:**

**MSE(P) XI.5 : CORE LAB – V**

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<td>Exam Duration: 4 hrs</td>
<td>C3: 50</td>
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**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’s constant.
9. Determination of the polarisabilities of the molecules of an uniaxial crystal using spectrometer.
11. Thermal expansion coefficient in solids.
12. Optical rotatory dispersion of an uniaxial crystal.
14. Fermi energy of copper.
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.
20. Frank Hertz experiment.
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-Dushmann 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:
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.
17. Fermi energy of copper.
18. Cell parameter(s) from an X-ray powder diffractogram.
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
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 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:
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

Unit IV: Smectics

Reference Books:

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 $J$ and $\mu$ - 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.

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.
Gamma Decay : Internal conversion – Mossbauer effect.

Unit IV: Nuclear Fission, Fusion and Reactors
Nuclear reactions, Q values, threshold energy, Reactions induced by protons, deuterons and particles, photo disintegration.

Reference Books:

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

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 refinement,

**Unit III: Imperfections in Solids**

**Unit IV: Magnetic properties**

**Reference Books:**
MSE(P) XII.5 : CORE LAB – VII

Credits: 2 (0L + 0T +2P)  
Marks: 100

Contact hrs per week: 6  
Exam Duration: 4 hrs

C1 + C2: 50  
C3: 50

COURSE CONTENT:
(Any TEN experiments)

1. Randomocity of radioactive decay.
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
7. Coincidence circuit.
8. Linear pulse amplifier.
11. Linear Gate.
12. Transistorised binary circuit.
14. Variable delay line.
15. Pulse recorder.
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  
Exam Duration: 4 hrs

C1 + C2: 50  
C3: 50

COURSE CONTENT:
(Any EIGHT of the following experiments to be done)

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.
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.
15. Astable multivibrator using timer IC 555.
16. Dead time of the G.M. counter.

Reference books:

MSE(P) XII.7: RESEARCH IN PHYSICS EDUCATION

Credits: 3 (2L+1T+0P)  Max. Marks : 100
Contact Hrs per week : 4
Exam. Duration: 2 Hrs
C1 + C2 : 50
C3 : 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
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:
2. Journal of Research in Science Education
3. School Science Review
4. Physical Review
5. Home pages on web : NCERT, ERIC, NSTA, IAPT, etc.

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