Address : UNIREG
Telephone No. : 2419677/2419361
Fax : 0821-2419363/2419301

e-mail : registrar@uni-mysore.ac.in
www.uni-mysore.ac.in

UNIVERSITY OF MYSORE

Estd. 1916

VISHWAVIDYANILAYA KARYA SOUDHA
CRAWFORD HALL, POST BOX NO. 406
MYSORE-570 005

No.AC.2(S)/401/13-14

Dated: 24-05-2014

NOTIFICATION

Sub: Modification of B.Sc Physics Compulsory papers and lab experiments.

Ref: 1. Proceedings of Faculty of Science & Technology Meeting held on14-02-2014.
2. Proceedings of the Meeting of Academic Council held on 29-03-2014.

The Board of Studies in **Physics (UG)** at its meeting held on 28-11-2013 has resolved to modify B.Sc Physics Compulsory papers and all semesters lab experiments. from the academic year2014-15

The Faculty of Science and Technology and the Academic Council at their meetings held on 14-02-2014.and 29-03-2014 respectively approved the above proposals and the same is hereby notified.

The copy of the modify B.Sc Physics Compulsory papers is annexed herewith.

REGISTRAR.

University of Mysore
MYSORE.

To

1. The Registrar (Evaluation), University of Mysore, Mysore.
2. The Chairperson, BOS/DOS in Physics, MGM
3. The Dean, Faculty of Science & Technology, DOS in Zoology, MGM.
4. The Principals of the Affiliated Science Colleges.
5. The Deputy/Assistant Registrar (Evaluation), University of Mysore, Mysore.
6. Sri Narasimha Murthy, Statistician, E.B. UOM, Mysore.
7. The Supdt AC.1 & AC.2, A.B., Academic Section / PMEB, UOM., Mysore.
8. The P.A. to the Vice-Chancellor/Registrar/Registrar(Evaluation), UOM., Mysore.
9. The Case Worker, AC.7, Academic Section, University of Mysore, Mysore.
10. The Section Guard File(Supdt.AC.2), A.B., A.C., UOM.
11. The Schedule File.

UNIVERSITY OF MYSORE

Semester-scheme B.Sc. Degree

Syllabus for the optional subject PHYSICS

With Effect from

The Academic Year

2014-15

Following papers have been modified during Board of Studies (Under Graduate) meeting held on 28th November 2013.

Existing B.Sc Physics-practical Syllabus effective from 2008	Modified B.Sc. Physics-practical Syllabus effective from 2014-2015

FIRST SEMESTER BSc Physics-Theory

Title of Paper: Mechanics and properties of matter

(Course duration: 14 weeks with 3 Hours of instruction per week.)

Paper 1 Paper code:

PART -A

Motion of a point particle: The position vector **r**(t) of a moving point particle and its Cartesian components. Velocity and acceleration as the vector derivatives, Derivation of a planar vector of constant magnitude, radial and transverse component of velocity and acceleration for arbitrary planar motion, deduction of results for uniform circular motion – centripetal force

Frames of reference: Inertial reference frames with examples, uniform rectilinear motion in an inertial frame- Galilean transformation equation. The Galilean principle of relativity. Motion in a non-inertial reference frame- uniformly accelerated rectilinear motion concept of fictitious force-illustration -plumb line accelerometer and freely falling Lift. Qualitative discussion of centrifugal force, Coriolis force and earth as non –inertial frame.

Rigid body Dynamics: Moment of inertia and Radius of Gyration, Kinetic energy of a rigid body, the angular momentum, Statement of the theorems of Parallel and perpendicular axes, Calculation of the moment of inertia of rectangular and circular lamina. The theory of the compound pendulum.

Elasticity: Hooke's law. Modulii of elasticity. Relation between elastic constants. Poisson's ratio-limiting values, Elastic potential energy, Bending moment. Theory of the light cantilever. I-section girders. Torsion-calculation of couple per unit twist. The torsional pendulum. Static torsion, Searle's double bar experiment.

8Hrs.

First semester B Sc Physics

Paper-1

Title of the paper: Mechanics and properties of matter

(Course duration: 14 weeks with 3 Hours of instruction per week)

Part A:

Frames of reference:

Inertial reference frames with examples. Uniform rectilinear motion in an inertial frame-Galilean transformation equation. The Galilean principle of relativity. Motion in a non–inertial reference frame-uniformly accelerated rectilinear motion-concept of fictitious force-illustration; plumb line accelerometer and a freely falling elevator. Qualitative discussion of centrifugal force, Coriolis force and earth as a non-inertial frame.
-5Hrs

(S R Shankara Narayana, pp-87-91), (D S Mathur, **2001**, pp-67-86), (C L Arora, P S Hemne, "*Physics for degree students", B. Sc 1st year*, **2012,** pp-25-26) (J C Upadhyaya, "*Classical Mechanics*", **2013,** pp-322-325), [Berkeley Physics Course, Vol-1 "*Mechanics"*, 2nd edition, (SIE)-**2011,** pp-120-123, 124-128], (Halliday, Resnick, Jearl Walker, pp-1035), (Brij Lal, N Subrahmanyam, pp-367-375).

Motion of a point particle: Point mass. The position vector ***r(t)*** of a moving point particle and its Cartesian components. Velocity and acceleration as the vector derivatives. Derivation of planar vector of a constant magnitude. Radial and transverse components of velocity and acceleration for arbitrary planar motion, deduction of results for uniform circular motion-centripetal force. -3Hrs

(S R Shankara Narayana, pp-75-81), (D S Mathur, **2001**, pp-8, 33-35), (D S Mathur, **2007**, pp-22-24).

Rigid body dynamics:

Review of definitions, Moment of inertia and radius of gyration. Review of statements of the theorems of the parallel and perpendicular axes. Expression for kinetic energy of a rigid body. Calculation of moment of inertia of; thin uniform rod, rectangular lamina, circular lamina and solid cylinder. The Theory of Compound pendulum.
-5 Hrs

(Halliday, Resnick, Jearl Walker, pp-254-255), (S R Shankara Narayana, pp-334, 341-346, 358-360), (C L Arora, P S Hemne, pp-125-137), (D S Mathur, **2007**,

	pp-44-52, 56-57, 58-59, 148-149), (J C Upadhyaya, "*Classical Mechanics*", **2013,** pp-44-45). **Elasticity:** Review of concepts of modulii of elasticity, Hooke's Law and Poisson's ratio $\boldsymbol{\sigma}$. Relation between the elastic constants $\boldsymbol{q,k,n}$ and $\boldsymbol{\sigma}$, limiting values for $\boldsymbol{\sigma}$. Work done in stretching. Elastic potential energy. Bending moment. Theory of light single cantilever. I-section girders. Torsion-calculation of couple per unit twist. The Torsional pendulum, Static torsion, Searle's double bar experiment. -8Hrs (S R Shankara Narayana, pp-381-412), (D S Mathur, **2007,** pp-249-267, 275-276, 279-280, 286-290, 298-300), (D S Mathur, **2001**, pp-670-685, 690-692, 708-713, 729-731), (C L Arora, *"Refresher course in Physics*". Vol-1, 2008, pp-306-331).
PART -B	**Part B:**
Conservation Laws: Basic symmetries of nature, Conservation of linear momentum for a system of two particles, Rocket motion in a uniform gravitational field (single stage rocket equation -- with and without gravity), Multi stage rockets, Elastic and inelastic collisions, Elastic Head on collision, Elastic oblique collision in lab frame, Reduced mass. **6 Hrs**	**Conservation of Linear momentum:** Conservation of the linear momentum for a system of two particles. Rocket motion in a uniform gravitational field (single stage rocket equation with and without gravity). Multistage rocket. Review of definitions- Elastic and inelastic collisions. Elastic head-on collision and elastic oblique collision in a lab frame, Reduced mass. -6Hrs (Halliday, Resnick, Jearl Walker, pp-201-202, 210-217, 224-226), (S R Shankara Narayana, pp-172-174, 187-193, 201-206), (D S Mathur, **2007,** pp-353-354), (J C Upadhyaya, "*Classical Mechanics*", **2013,** pp-103-104), (C L Arora, *"Refresher course in Physics*". Vol-1, 2008, pp-182-186).
Conservation of energy: Conservative and non conservative forces with examples, conservation of energy in a conservative force field. Applications – 1.Vertical oscillations of loaded light spiral spring and 2.calculation of escape velocity in the gravitational field of the earth. Conditions for a geo-stationary satellite. Space programs in India. **4 Hrs**	**Conservation of energy:** Conservative force and non conservative forces with examples. Conservation of energy in a conservative force field. Applications- (i) vertical oscillations of a loaded light spiral spring and (ii) Calculation of escape velocity in the gravitational field of the earth. Conditions for a geo-stationary satellite. Space programs in India. -4 Hrs (Halliday, Resnick, Jearl Walker, pp-168, 183-184, 201-202), (S R Shankara Narayana, pp-412-413), (D S Mathur, **2001,** pp-329-330,360-361), (C L Arora, *"Refresher course in Physics*". Vol-1, 2008, pp-189-190).
Conservation of Angular momentum: Relation between torque and angular momentum, areal velocity –derivation $\frac{d\vec{A}}{dt}=\frac{1}{2}r^2\theta.\hat{n}$, Central forces- Physical insight into the nature of central forces , Two body central force problem- Kepler's laws of planetary motion –derivation using Newton's law of gravitation. **5 Hrs**.	
Fluid Dynamics: Stream line and Turbulent flows Expression for critical velocity, Reynolds number and its significance, coefficient of viscosity, terminal	

velocity, Stokes law (no derivation) Expression for terminal velocity of small ball falling through viscous fluid. **2 Hrs**.

Surface Tension: Surface energy and definition of surface tension. Pressure inside curved liquid surface, examples. The drop-weight method, Angle of contact and the Quincke's method –Theory

4Hrs

Books for reference :

1. J.C. Upadyaya : Mechanics 4.D.C. Mathur : Mechanics

2. Halliday and Resnick : Physics, Part -I
5.Brijlal and Subramanyam: Properties of Matter

3. Berkeley Physics -Vol. 1

Conservation of angular momentum:

Review of angular momentum and Torque. Relation between angular momentum and torque. Law of conservation of angular momentum. Areal velocity- derivation $\frac{dA}{dt} = \frac{1}{2} r^2 \overset{0}{\theta} \hat{n}$

Central force: Physical insight into the nature of central forces. Review of statement - Newton's Law of Gravitation. Kepler's laws of planetary motion- derivation using Newton's law of gravitation. -5Hrs

(Halliday, Resnick, Jearl Walker, pp-284-289,290-291, 342-344), (S R Shankara Narayana, pp-221-226, 268-271, 334), (D S Mathur, **2001,** pp-583, 622-624, 648-652), (J C Upadhyaya, pp-109-114), (D S Mathur, **2007,** pp-75-78), (Brij Lal, N Subrahmanyam, pp-455-458)

Fluid Mechanics: Viscosity;

Review of concepts of viscosity. Variation of viscosity of liquids with temperature and pressure. Theory of Rotation Viscometer.
-2Hrs

(C L Arora and P S Hemne, pp-361-362), (S R Shankara Narayana, pp-434-443, 489-490,501-502), (D S Mathur, **2007,** pp-406-408).

Surface Tension: Review of basic concepts. Pressure inside curved liquid surface, examples. Surface tension and Interfacial tension by drop-weight method. Surface tension of mercury by Quincke's method–Theory.
-4Hrs

(C L Arora and P S Hemne, pp-380-386). (Shankara Narayana, pp-434-437, 444,-448, 461-463).

Book of references:

1. Halliday, Resnick, Jearl Walker, "*Principles of Physics"* 9th edition, **2013**, Wiley.

2. J C Upadhyaya, "*Classical Mechanics*", Reprint-**2013**, Himalaya Publishing house.

3. C L Arora, P S Hemne, "*Physics for degree students",* B. Sc 1st year, Revised edition-**2012**, S Chand and company, New Delhi.

4. Berkeley Physics Course, Vol-1 "*Mechanics"*, 2nd edition, (SIE)-**2011,** Charles Kittle, Walter D Knight, Malvin A Ruderman, Carl A Helmholz, Burton J Moyer, Tata McGraw Hill Education Private Limited, New Delhi.

	5. C L Arora, *Refresher course in Physics*". Vol-1, Revised edition-**2008**, S Chand and company, New Delhi. 6. D S Mathur, *"Elements of properties of matter",* Reprint-**2007**, S Chand and company, New Delhi. 7. D S Mathur, "*Mechanics*", Reprint-**2001**, S Chand and company, New Delhi. 8. Brij Lal, N Subrahmanyam, "*Properties of matter*", 6th edition, Reprint-**1993,** Eurasia publishing house Ltd. New Delhi. 9. S R Shankara Narayana, *"Mechanics and properties of matter",* 2nd Revised edition-**1998**, Sultan chand and sons, New Delhi.
FIRST SEMESTER BSc Physics-PRACTICAL **PHYSICS PRACTICAL** **Practical 1** Paper code : **(Course duration: 14 weeks with 3 Hours of lab-work per week.)** **Any eight of the following experiments** 1. **Bar pendulum**: Determination of the acceleration due to gravity and the radius of gyration (by the graphical method). 2. **Spiral spring:** Determination of the acceleration due to gravity and the unknown mass by the graphical method. 3. **Fly wheel:** Determination of the moment of Inertia. 4. **Drop-weight method**: Determination of the surface tension of liquid and the interfacial tension between two liquids. 5. **Quincke's method**: Determination of surface tension and the angle of contact of mercury. 6. **Stokes' method**: Determination of coefficient of viscosity of viscous liquids. 7. **Young's modulus** by stretching. 8. **Young's modulus** by the single cantilever method. 9. Searle's double bar method of determining Young's modulus, the rigidity modulus and the Poisson ratio. 10. **Torsional pendulum**: Determination of the rigidity Modulus.	**First semester B Sc Physics-PRACTICAL** PHYSICS PRACTICAL-1 (Course duration: 14 weeks with 3 Hours of lab-work per week) Any EIGHT of the following experiments 1. Bar pendulum: Determination of the acceleration due to gravity and radius of gyration (graphical method). 2. Fly wheel: Determination of moment of inertia, mass and density. 3. Drop weight method: Determination of surface tension of liquid and the interfacial tension between two liquids. 4. Quincke's method: Determination of surface tension and angle of contact of mercury. 5. Young's modulus by the single cantilever method. 6. Searle's double bar: Determination of young's modulus, the rigidity modulus and poisson's ratio. 7. Torsional pendulum: Determination of the rigidity modulus 8. Determination of the Young's modulus by Dynamic method (using graph). 9. Spiral spring: Determination of the acceleration due to gravity (graphical method).

SECOND SEMESTER BSc Physics

Title of Paper: Heat and thermodynamics

Paper 2 Paper code :

(Course duration: 14 weeks with 3 Hours of instruction per week.)

PART -A

Kinetic theory: Maxwell's law of distribution of molecular velocity (no derivation)-its interpretation. Degrees of freedom. Principle of equipartition of energy based on kinetic theory of gases, U=3/2 RT-derivation. Mean free path-probability of a molecule having mean free path. Real gases, Andrews isothermals, Vanderwalls equations-expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity. **7 Hrs**.

Thermal conductivity: Equation of flow of heat through a solid bar. Determination of the thermal conductivity of bad conductor by Lee and Charlton method

3 Hrs

Radiation: Planck's quantum theory of radiation, Induced and spontaneous emission of radiation. Derivation of Planck's law of radiation using Einstein's A and B coefficients , Deduction of Rayleigh-Jeans' law. Stefan's law and Wien's displacement law from Planck's law.

4 Hrs

Low Temperature Physics : Ideal and real gases. Vanderwal's equation of state, Porous plug experiment and its theory Joule Thomson expansion-expression for the temperature of inversion, inversion curve. Relation between Boyle temperature, temperature of inversion and critical temperature of gas. Principle of regenerative cooling. Liquifaction of air by Linde's method. Adiabatic demagnetization.

7 hrs

PART –B

Thermodynamics : Thermodynamic coordinates ,concept of heat ,work and internal energy ,The Zeroeth law of Thermodynamics, Indicator and phase diagrams, Isothermals and Adiabatic

Second Semester B Sc Physics

Paper 2

Title of the paper: Heat and thermodynamics

(Course duration 14 weeks with 3 hours of instruction per week)

PART A

Kinetic theory: Maxwell's law of distribution of molecular velocity (no derivation)-its interpretation. Degrees of freedom. Principle of equipartition of energy based on Kinetic theory of gases. Derivation of $U=\frac{3}{2}RT$ Mean free path, Probability of a particle having mean free path. Real gases, Andrews isothermal, Van der Waals equations-expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity. -7hrs

(Brijlal Subramanyam pp 21-24,48, 50-51, 54-60, 83, 430, 432-434,: S.C Gupta pp 388-389)

Thermal conductivity: Equation for the flow of heat through a solid bar. Determination of thermal conductivity of a bad conductor by Lee and Charlton method. -3hrs (C. L. Arora pp 279-288)

Radiation: Planck's quantum theory of radiation..Induced and spontaneous emission of radiation. Derivation of Planck's law of radiation using Einstein's A and B coefficients. Deduction of Rayleigh-Jeans law, Stefan's law and Wien's displacement law from Planck's law. 4hrs

(Optics and Atomic Physics- Sathyaprakash pp 265-266: S R Shankaranarayana: pp 1027-1029)

Low temperature Physics: Ideal gas and real gas. Van der Waals equation of state. Porous-plug experiment and its theory. Joule-thomson expansion - expression for the temperature of inversion, inversion curve. Relation between Boyle temperature, temperature of inversion and critical temperature of a gas. Principle of regenerative cooling. Liquefaction of air by Linde's method. Adiabatic demagnetization. -7hrs (Brijlal, Subramanyam pp 51-59, 66-72, 274-276, 283-286)

PART B

Thermodynamics: Review of basic concepts, Carnot's theorem, thermodynamic scale of temperature and its identity with perfect gas scale. Clausius-Clapeyron first Latent heat equation, effect

changes –Expression for work done , First law of Thermodynamics-mathematical formulation.

Second law of thermodynamics – Kelvin Planck statement and Clausius statement and their equivalence. The Carnot engine –expression for efficiency, The Carnot's theorem-its proof. Reversible and irreversible process, reversibility of carnot's cycle, Refrigerators-principle of working and coefficient of performance. Thermodynamic scale of temperature and its identity with perfect gas scale, Clausius-Clapeyron first latent heat equation.

14 Hrs.

Entropy : The concept of Entropy, Change of entropy in reversible and irreversible cycles. Entropy and non-available energy. Principle of increase of entropy –Clausius inequality, Entropy and II law of Thermodynamics, Entropy of ideal gas, T-S diagram , Probability and Entropy - Boltzmann relation , Concept of absolute zero and the third law of thermodynamics

7 Hrs

References:

1. Brijal and Subramanyam : Heat and Thermodynamics
2. J.B. Rajam : Heat and Thermodynamics
3. D.S. Mathur :Heat
4. Halliday and Resnick : Physics Part-I

of pressure on melting point of a solid, effect of pressure on boiling point of a liquid. -5hrs (Halliday and Resnick - pp 488- 493: Brijlal, Subramanyam pp 140, 217-218: Dittaman and Zemansky pp 176-183)

Thermodynamic potentials: Internal Energy, Enthalpy, Helmholtz function, Gibbs function, relations among these functions, Gibbs-Helmholtz equations. -3hrs
(Blundell pp 164-168: Brijlal Subramanyam pp 219-221)

Maxwell's Thermodynamic Relations: Derivation of Maxwell's thermodynamic relations, Tds equations, Internal energy equations, Heat capacity equations. Change of temperature during Adiabatic process using Maxwell's relations.

-6hrs

(Dittaman and Zemansky pp 260-272: S. R. Shankara Narayana pp 943-944)

Entropy: The concept of entropy. Change of entropy in reversible and irreversible cycles. Entropy and non-available energy. Principle of increase of entropy - Clausius inequality. Second law of thermodynamics in terms of Entropy. Entropy of ideal gas, T-S diagram, Probability and entropy, Boltzmann relation, concept of absolute zero and the third law of thermodynamics. -7hrs

(Halliday and Resnick - pp 550-552: Dittaman and Zemansky pp 210-213: Brijlal Subramanyam pp 173-182, 187-191, 229-232: S. R. Shankara Narayana pp 931-932)

Books for reference

1. Halliday and Resnick: Fundamentals of Physics, 9th edition, Wiley India, 2011.
2. R. H. Dittaman and M. W. Zemansky: Heat and Thermodynamics, 7th edition, The McGraw-Hill companies, 2007.
3. S. J. Blundell and K. M. Blundell: Concepts in Thermal Physics, 2nd edition, Oxford University Press, 2006.
4. Brijlal ,N. Subramanyam P.S. Hemne: Heat Thermodynamics and Statistical Physics, 1st edition. S Chand Publishing, 2007.
5. S C Gupta: Thermodynamics, 1st edition, Pearson, 2005.
6. Satya Prakash: Optics and Atomic Physics, 11th, Ratan Prakashan Mandir, 1994.
7. C. L. Arora: Refresher Course in Physics Vol I, S Chand publishing, 2011.
8. S. R. Shankara Narayana: Heat and Thermodynamics, 2nd edition, Sulthan Chand and Sons, 1990.

SECOND SEMESTER BSc Physics PRACTICAL

PHYSICS PRACTICAL

Practical 2 Paper code :

(Course duration : 14 weeks with 3 Hours of Lab-work per week)

Any eight of the following experiments

1. Verification of Gaussian distribution and calculation of standard deviation Monte Carlo experiment.
2. Specific heat by cooling-graphical method.
3. Determination of thermal conductivity of a bad conductor by Lee-Charlton method.
4. Verification of Stefan-Boltzmann law using a meter bridge or a potentiometer.
5. Determination of boiling point of a liquid by using a platinum resistance thermometer.
6. Determination of Young's modulus by dynamic method (using graph).
7. Determination of moment of inertia of an irregular body using a torsional pendulum.
8. Determination of Young's modulus by Koenig's method.
9. Determination of rigidity modulus by the static-torsion method.
10. Determination of Young's modulus by the method of uniform bending

SECOND SEMESTER B Sc Physics

PHYSICS PRACTICAL

Practical 2

(Course duration: 14 weeks with 3 hours of Lab-work per week)

1. Verification of Gaussian distribution law and calculation of standard deviation –Monte Carlo experiment
2. Specific heat of a liquid by cooling – graphical method
3. Determination of thermal conductivity of a bad conductor by Lee-Charlton method
4. Verification of Stefan – Boltzmann law using meter bridge or a potentiometer
5. Determination of boiling point of a liquid using platinum resistance thermometer
6. Determination of moment of inertia of irregular body using Torsional pendulum
7. Determination of Young's modulus by Koenig's method.
8. Determination of rigidity modulus by the static torsion method
9. Determination of Young's modulus by uniform bending method

THIRD SEMESTER B.Sc. Physics

Paper 3 Paper code:

TITLE OF PAPER: Waves, Acoustics and Optics

(Course duration: 14 weeks with 3 Hours of instruction per week.)

PART -A

Analysis of complex waves: Fourier Series. Example of the square wave, Saw Tooth Wave 3Hrs

Super-position of simple harmonic motions: Lissajou's figures. Equation for damped vibrations. Forced vibration. Solution in exponential form. Resonance. Expression for amplitude and phase at resonance.
5 Hrs.

Progressive waves: Waves in one dimension. Differential equation of wave motion. Relation between amplitude and intensity. Expression for velocity of progressive waves in a medium. Newton's formula, Laplace's correction. Longitudinal vibrations in a rod. Expression for frequency of vibration of a stretched string-harmonics. Kundt's tube experiment
5Hrs

Transducers: Types of transducers, dynamic microphone and loudspeaker and their characteristics. **2 Hrs**

Theory of light: Huygen's principle. Explanation of the laws of reflection and refraction. Lens formula. Group and wave velocities and the relation between them

3 Hrs

Optical Instruments: Defects of lenses. Achromatic combinations of lenses. Huygen's and Ramsden's eye pieces. Resolving and magnifying power of the telescope and microscope (qualitative treatment only).
3 Hrs.

THIRD SEMESTER B.Sc.

PHYSICS – SYLLABUS (THEORY)

Paper 3: Waves, Acoustics and Optics

(Course duration: 14 weeks with 3 Hours of instruction per week.)

Part – A

Analysis of complex waves (3 hrs):
The Fourier series. Example of the square wave, saw tooth wave.
(S K Gupta, O P Varma: Waves and Oscillations, pp 61-68,). (N Subramanyam Brijlal: Waves and Oscillations, pp 297-304)

Superposition of simple harmonic motion (5 hrs):
Lissajous' figures. Equation for damped vibrations. Forced vibration, solution in exponential form, Resonance, Expression for amplitude and phase at resonance.
(Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, pp. 400 15-8, pp. 402, 15-9) (S K Gupta, O P Varma: Waves and Oscillations pp. 13-17, pp. 26-31, pp. 38-43)

Progressive waves (5 hrs):
Waves in one dimension. Differential equation of wave motion. Relation between amplitude and intensity. Expression for velocity of progressive waves in a medium, Newton's formula, Laplace's correction. Expression for frequency of vibration of a stretched string – harmonics, Longitudinal vibrations in a rod. Kundt's tube experiment.
(Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, pp. 425, 16-8) (N Subramanyam Brijlal: Waves and Oscillations, pp. 148-149, pp. 152-155, pp 214-216) (Khanna and Bedi: Sound, pp. 91-97,99, pp. 104-105, pp. 376-379) (*A.B.Bhattacharya R.Bhattacharya: Under Graduate Physics, Volume I pp 236-239, 259-266, 274-276)*

Transducers (3 hrs):
Types of transducers, dynamic microphone and loudspeaker and their characteristics, Piezo electrical transducer.
(Khanna and Bedi: Sound pp. 423,424) (N V Suryanarayana: Electrical Measurements and Measuring Instruments, pp. 232-233)(H S Kalsi: Electronic Instrumentation, pp. 418-419)

Interference: (5 hrs)

Review of basic concepts, Coherent sources. Interference by division of wave front – Theory of Fresnel's biprism, Interference by division of amplitude-Thin films of uniform thickness-antireflective coatings, Newton's rings. Interference at

PART –B

Velocity of light: Kerr effect. Determination of velocity of light by Kerr cell method.

2 Hrs

Interference: Theory of interference. Expression for fringe width. Coherent sources. Interference by division of wave front and division of amplitude. Fresnel's biprism. Lloyd's mirror. Thin films of uniform thickness. Newton's rings. Interference at a wedge. Michelson's interferometer - Measurement of λ and dλ.

5 Hrs.

Diffraction: Fresnel and Fraunhofer diffraction. Explanation of rectilinear propagation of light. Theory of the zone plate. Comparison with a convex lens. Fresnel diffraction at a straight edge. Fraunhofer diffraction at a single slit. Transmission grating-theory for the case of normal incidence.

7 Hrs.

Polarization: Double refraction in uniaxial crystals. Huygen's theory. Positive and negative crystal. Principal refractive indices. Huygen's constructions of O and E wave fronts in a uniaxial crystal. Retarding plates. Production and analysis of linearly. Circularly and elliptically polarized light. Optical activity, Fresnel's theory, Rotatory polarization. Use of biquartz. **7 hrs.**

Books for reference

1 Harnam Singh: Waves and sound

2. Khanna and Bedi : Sound

4. D.N. Vasudeva : Optics

5. B.K. Mathur : Optics

a wedge. Michelson's interferometer - Measurement of λ and dλ.

(Brijlal and Subrahmanyam: A Text Book of Optics, pp 310-314, 324-329, 339-356, 358-364, 377, 378, 385-390)

(Halliday and Resnick: Fundamentals of Physics, 6th edition, pp 874-888)

(Satya Prakash: Optics and atomic physics, pp 188-193, 221 – 226, 240 – 247, 257 - 263)

(Khanna and Gulathi: Fundamentals of optics, pp 242-247, 260-283, 284-292)

Part – B

Diffraction(7 hrs): Fresnel and Fraunhofer diffraction. Explanation of rectilinear propagation of light. Theory of the zone plate. Comparison with a convex lens. Fresnel diffraction at a straight edge. Fraunhofer diffraction at a single slit. Transmission grating-theory for the case of normal incidence , Resolving Power and dispersive power of Plane grating

(Brijlal and Subrahmanyam: A Text Book of Optics, pp 394-404, 408-410, 425-427, 429-433, 440-444, 446-449)

(Halliday and Resnick: Fundamentals of Physics - 6th edition, pp 903-906)

(Khanna and Gulathi: Fundamentals of optics, pp 316-335, 374-378)

(Satya Prakash: Optics and atomic physics pp 298-310, 326-331, 353-358, 377-384)

Polarization (9 hrs.): Double refraction in uniaxial crystals. Huygen's theory. Positive and negative crystal. Principal refractive indices. Huygen's constructions of O and E wave fronts in a uniaxial crystal – (i) optic axis in the plane of incidence and parallel to the crystal surface at normal incidence, (ii) **o**ptic axis in the plane of incidence and perpendicular to the crystal surface at normal incidence.

Retarding plates. Production and analysis of linearly, Circularly and elliptically polarized light. Optical activity, Fresnel's theory, Rotatory polarization. Use of Biquartz, Elementary idea of Babinet compensator, Interference of polarized light-Expression for resultant intensity, calculation of thickness of wedge shaped crystal plate(negative and positive), calculation of fringe width.

(Brijlal and Subrahmanyam: A Text Book of Optics, pp

3. Brijal and Subramanyam : Optics Jenkins and white. : Optics	6.	*480-500, 505-520, 523-525, 527)* *(Satya Prakash: Optics and atomic physics, pp 461-467, 478-489, 495, 496, 498 – 504, 511-515, 517, 520-521)* *(Khanna and Gulathi: Fundamentals of optics, pp 453-470, 481-491)* **Optical Instruments(3Hrs)**: Defects of lenses. Achromatic combinations of lenses. Huygen's and Ramsden's eye pieces. Resolving power of spectroscope (qualitative) *(Brijlal and Subrahmanyam: A Text Book of Optics, pp 187, 191-195, 219-224)* *(Satya Prakash: Optics and atomic physics, pp 383,393,424,428, 431)* *(Khanna and Gulathi: Fundamentals of optics, pp 133-143, 172-178)* **Velocity of light (2 hrs)**: Kerr cell, Kerr effect. Determination of velocity of light by Kerr cell method. *(Brijlal and Subrahmanyam: A Text Book of Optics, pp 243, 244)* *(Khanna and Gulathi: Fundamentals of optics, pp 191-193)* **References:** 1. Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, John Wiley & Sons(Asia) Pte. Ltd. 2. N Subramanyam Brijlal: Waves and Oscillations, 2nd edition, Vikas Publishing house Pvt. Ltd., New Delhi. 3. Khanna and Bedi: Sound 4. S K Gupta, O P Varma: Waves and Oscillations, 3rd edition, R.Chand & Co., New Delhi. 5. R.L. Saihgal, A Text Book of Sound, Reprint 1990, S.Chand & Company Ltd. New Delhi. 6. Dr.P.K.Mittal & Prof Jai Dev Anand, A Text Book of Sound, Har-Anand Publications, New Delhi. 7. N V Suryanarayana: Electrical Measurements and Measuring Instruments, 1st edition, S.Chand & Co. Ltd., New Delhi. 8. H S Kalsi: Electronic Instrumentation, 2nd edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi. 9. A.B.Bhattacharya R.Bhattacharya, Under Graduate Physics, Volume I, New Central Book Agency(P) Ltd., Kolkata.

	10. Dr. N. Subrahmanyam Brijlal and Dr. M.N. Avadhanulu: A text book of Optics, 24th revised edition-S.Chand & company Ltd, New Delhi 11. Satya prakash: Optics and Atomic physics, 8th revised edition-Educational and university Publishers, Agra. 12. D.R. Khanna and H.R. Gulati: Fundamentals of Optics, 15th edition- R. Cjand publishers, New Delhi. 13. R. Murugeshan Kiruthiga Sivaprasath: Optics and Spectroscopy , 17th revised edition-S.Chand & company Ltd, NewDelhi 14. F A Jenkins and H E White: Optics, McGraw-Hill, 3rd Edition, (1957)

THIRD SEMESTER B.Sc. Physics PRACTICAL **PHYSICS PRACTICAL** **Practical 3 Paper code :** **(Course duration: 14 weeks with 3 Hours of Lab-work per week)** Any **eight** of the following experiments 1. Kundt's tube experiment- velocity of sound in air at room temperature. 2. Newton's rings-determination of radius of curvature of a Plano convex lens. 3. Biprism-determination of the wavelength of a monochromatic light source. 4. Sonometer- determination of the frequency of AC. 5. Helmholtz resonator- determination of the frequency of a tuning fork. 6. Diffraction grating - determination of grating constant and wavelength. (Minimum deviation method) 7. Diffraction at a straight wire-determination of the diameter of a wire. 8. Cauchy's constants using a spectrometer. 9. Polarization-determination of unknown concentration of sugar solution by graphical method using a polarimeter. 10. de-Sauty bridge – Verification of laws of combination of capacitances 11. CRO –determination of voltage and Frequency. 12 Determination of refractive indices of Calcite and quartz crystal using spectrometer and Sodium light	**Third Semester BSc Physics Practicals** (Course duration 14 weeks with 3 hours of Lab work per week) *Any Eight of the Following Experiments* 1. Kundt's tube experiment – velocity of sound in air at room temperature 2. Study of stationary wave on a stretched string – Determination of speed of the transverse waves over the sonometer wire. 3. Characteristics of microphone – loudspeaker system – Determination of Velocity of sound at room temperature. 4. Newton's rings – Determination of radius of curvature of a plano convex lens 5. Air wedge – Determination of thickness of a thin paper/diameter of a thin wire. 6. Helmholtz resonator – Determination of frequency of a tuning fork 7. Diffraction grating – Determination of grating constant and wave length (minimum deviation method) 8. Diffraction at a straight wire – Determination of diameter of a wire 9. Cauchy's constants using spectrometer 10. Polarization – Determination of unknown concentration of sugar solution by graphical method using a polarimeter 11. Determination of refractive indices of calcite and quartz crystal using spectrometer and sodium light.
FOURTH SEMESTER BSc Physics **Paper 4 Paper code:** **TITLE OF PAPER: Electricity and magnetism** **(Course duration: 14 weeks with 3 Hours of instruction per week*).*** **PART –A** **Electrostatics**: Mechanical force and electric pressure on a charged surface. The path traced by a charged particle in electric field. The attracted disc electrometer-construction, theory and applications. **5 Hrs. Galvanometers**: Moving coil ballistic galvanometer-construction, theory, damping correction, current and charge sensitivity, Helmholtz	**FOURTH SEMESTER B.Sc.** **PHYSICS – SYLLABUS (THEORY)** **Paper 4: Electricity and Electromagnetism** **(Course duration: 14 weeks with 3 Hours of instruction per week.)** **Part – A** **Electrostatics (5 hrs):** Mechanical force and electric pressure on a charged surface. The path traced by a charged particle in an electric field.

galvanometer – Theory. **4 Hrs**. .**Electrical measurement** : C.R.O. –construction & working, Measurement of voltage and frequency using a C.R.O. **2 Hrs**. **Alternating current**: R.M.S. values. Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the 'j' symbol). Series and parallel resonance-half-power frequency, band-width and Q-factor. Power in electrical circuits-power factor. Power factor. The maximum power transfer theorem. **8 Hrs**. **Filters:** High-pass and low-pass filters with LR and CR combinations. Expression for cut-off frequency. Band pass filters. **2 hrs**. **PART –B** **Self-inductance and Mutual inductance:** Calculation of the self-inductance of a solenoid. Anderson's bridge. Mutual inductance. Calculation of the mutual inductance of a pair of coils **3Hrs Thermo-electricity:** The thermocouple. Seebeck, Peltier and Thomson effects. Thermodynamic theory of thermoelectric effect. The law of intermediate metals and the law of intermediate temperatures. **3 Hrs** **Electromagnetism :** Scalar and vector fields. The gradient of a scalar field. The divergence and curl of a vector field. The physical significance of gradient. The divergence and curl, Statement of theorems of Gauss and Stokes. **3 Hrs.**	The attracted disc electrometer – construction, theory and applications. *(K. K. Tewari :Electricity and magnetism, pp 109-112, pp 512-513, pp 248-250,)* **Galvanometers (4 hrs):** Moving coil galvanometer – construction, theory, damping correction, current sensitivity and charge sensitivity. Helmholtz galvanometer – Theory. *(K. K. Tewari :Electricity and magnetism, pp 325-328, pp 332-334, pp 361-365,)* **Alternating current (8 hrs):** R.M.S. values. Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the 'j' symbols). Series and parallel resonance-half-power frequencies, band-width and Q-factor. Power in electrical circuits-power factor. Maximum power transfer theorem for ac circuits. *(Brijlal and Subramanyam: Electricity and magnetism, pp 472 - 477, 486 – 492, 494 – 504)* *(D.N. Vasudeva: Fundamentals of electricity and magnetism pp 565 - 568, 551 – 556)* *(D.C. Tayal: Electricity and magnetism ,pp 537 – 553)* *(A.B.Bhattacharya R.Bhattacharya: Under Graduate Physics, Volume II, pp 266 – 274)* **Applications of ac circuits** (**4 Hrs)** - ac bridges – Anderson's bridge, Maxwell's bridge , desauty bridge, Robinson's bridge *(K.K.Tewari: Electricity and magnetism with electronics pp 746, 754 – 758, 760, 761)* **Part – B** **Filters (2 hrs):** High-pass and low-pass fliters with LR and CR combinations. Expression for cut-off frequency. Band pass filters. **Thermo-electricity (3 hrs):** The Thermocouple. Seebeck, Peltier and Thomson effects. Thermodynamic theory of thermoelectric effect. The law of intermediate metals and the law of intermediate temperatures. *(Brijlal and Subramanyam: Electricity and magnetism, p- p 374 – 394,)* *(D.N. Vasudeva: Fundamentals of electricity and magnetism, p – p 350 – 369)*

Electromagnetic theory: Concept of dipole. Ampere's circuital law. Current loop as a dipole. The torque on a dipole. Maxwell's field equations. Wave equation for the field vectors. Poynting vector (no derivation). Plane electromagnetic waves–Helmholtz equation, Transverse nature, intrinsic impedance, and wave equation for dielectric
10 Hrs.

Production of electromagnetic waves: Accelerated charges and oscillating dipole. Hertz experiment, radiation loss. Synchrotron radiation. **2 Hrs**.

Books for reference

1. D.J. Griffiths: Introduction to electrodynamics, third edition.

2. D.N. Vasudeva : Electricity and Magnetism

3. Brijlal and Subramanyam : Electricity and magnetism

4. Duggal and Chabbra : Electricity and magnetism-

5. D.C. Tayal; Electricity and magnetism

6. K.K. Tewari: Electricity and magnetism

7. B B Laud: Electromagnetics ,Wiley Eastern limited, New Delhi.

8. W H Hayt, J A Buck : Engineering Electromagnetics,6th Edition Tata McGraw Hill , New Delhi

(A.B.Bhattacharya R.Bhattacharya: Under Graduate Physics, Volume II, p- p 231 – 238)

Electrical measurement (2 hrs):

CRO – construction & working. Measurement of voltage, frequency and phase using a CRO.

(V.K.Mehta & Rohit Mehta: Principles of Electronics, Page 616-622)

Electromagnetism (3 hrs):

Scalar and Vector fields. The gradient of a scalar field. The divergence and curl of a vector field. The physical significance of gradient, divergence and curl. Statement and theorems of Gauss and Stokes. .

(Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, pp 581, 22-2)(K. K. Tewari :Electricity and magnetism, pp 38-43, 45-47, 51-56)

Electromagnetic theory (9 hrs):

Review of Basic concepts. Equation of continuity, Maxwell's modification of Ampere circuital law-Displacement current. Setting up of Maxwell's field equations. Maxwell's field equations in free space, Poynting vector
(definition). Wave equation for the field vectors in free space and in isotropic dielectric. Energy density of electromagnetic wave and Poynting Theorem(Proof). Plane monochromatic electromagnetic waves – Transverse nature. Helmholtz equation. Characteristic impedance of free space.

(Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, pp 864, 32-3, pp 866, 32-4 pp 868, 32-5, pp 894, 33-4, pp 897, 33-5)(K. K. Tewari :Electricity and magnetism Chapter 15) (A.B.Bhattacharya R.Bhattacharya: Under Graduate Physics, Volume II, pp 415-426)(Chopra Agrawal: Electromagnetic theory, pp 171-202, 230-239)

Production of electromagnetic waves (2 hrs):

Accelerated charges and oscillating dipole. Hertz's experiment. Radiation loss - Synchrotron radiation.

(A.B.Bhattacharya R.Bhattacharya: Under Graduate Physics, Volume II, pp 423)

Reference books:

1. Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, John Wiley & Sons(Asia) Pte. Ltd.
2. K. K. Tewari: Electricity and magnetism, Reprint 2007, S.Chand Co. Ltd., New Delhi.
3. B. B. Laud: Electrodynamics , Wiley Eastern Limited, New Delhi.
4. David. J. Griffiths: Introduction to

	Electrodynamics, 3rd edition, Prentice-Hall of India Private limited, New Delhi. 5. W.H. Hayt and J. A. Buck: Engineering Electromagnetism , 6th edition, Tata Mc Graw Hill, New Delhi. 6. V.K.Mehta & Rohit Mehta: Principles of Electronics, 11th edition, S.Chand & Co. Ltd., New Delhi. 7. BrijLal and N.Subrahmanyam : A text book of Electricity and Magnetism, 19th edition-Ratan Prakashan Mandir, Educational and University Publishers, Agra. 8. A.B.Bhattacharya R.Bhattacharya, Under Graduate Physics, Volume II, New Central Book Agency(P) Ltd., Kolkata. 9. D.N. Vasudeva: Fundamentals of Magnetism and Electricity, 12th edition-S.Chand and Co. Ltd., New Delhi.
.**FOURTH SEMESTER B.Sc. Physics PRACTICAL** **PHYSICS** PRACTICAL **Practical 4** Paper code : **(Course duration : 14 weeks with 3 Hours of Lab-work per week)** **Any eight of the following experiments** 1. Anderson's Bridge -determination of the self-inductance of the coil. 2. High resistance by leakage 3. B_H using Helmholtz double coil galvanometer and potentiometer 4. Capacity of a condenser using a B.G. 5. L C R series circuit -determination of L and Q-factor. 6. Voltage Triangle –measurement of phase difference between V_R and V_C 7. Low and high pass filters-determination of the cut-off frequency. 8. Mutual inductance by absolute method. 9. L C R parallel circuit -determination of L and Q-factor. 10. To study the variation of X_C with f and determination of 'C'. 11. Black Box –Identification of L, C and R.	**Fourth Semester BSc Physics Practical**s (Course duration 14 weeks with 3 hours of Lab work per week) Any Eight of the Following Experiments 1. Anderson's Bridge – Determination of the self-inductance of the coil 2. de-Sauty bridge – Verification of laws of combination of capacitances 3. High resistance by leakage 4. B_H using Helmholtz double coil galvanometer and potentiometer 5. Capacity of a condenser using a BG 6. LCR series circuit – Determination of L & Q factor 7. Voltage triangle – Measurement of phase difference 8. Low and High pass filters – Determination of the cut-off frequency 9. LCR parallel circuit – Determination of L & Q factor 10. To study the variation of X_C with f and determination of C 11. Black box – Identification of L,C & R 12. CRO – determination of voltage and frequency

FIFTH SEMESTER BSc Physics

COMPULSORY PAPER - Paper 5: Paper code:

TITLE OF PAPER : ATOMIC ,MOLECULAR AND NUCLEAR PHYSICS

(Course duration : 14 weeks with three hours of instructions per week)

PART -A

The electron : Determination of e/m of an electron by Thomson method. Determination of the charge of the electron by Millikan's oil-drop method.
2Hrs

Atomic spectra : A qualitative account of Sommerfeld relativistic atomic model. Excitation and ionization potentials-Frank-Hertz experiment. Vector model of an atom. Electron spin. Space quantisation. Magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment. Spin-orbit interaction and the fine structure of spectral lines. Quantum numbers and selection rules. Pauli's exclusion principle, Electronic configuration of atoms. Valence electron.Brief mention of LS and JS coupling for multi electron atoms. **8Hr**s

Zeeman effect : explanation of the normal Zeeman effect on the basis of the vector model of the atom. Expression for the Zeeman shift and experimental details. **2Hrs**

Molecular spectra : Rotation and vibration and electronic spectra of molecules. Associated quantum numbers and selection rules. Theory of pure rotation spectra.

The Raman effect : Experiment, Quantum theory intensity and polarization of Raman lines. Applications **2Hrs**

Lasers.: General principles. Three level laser, The He-Ne laser.

Laser Applications : Medical applications, Laser Communications, Industrial applications – cutting , drilling, welding, Scribing **4Hrs**.

Fifth Semester B Sc Physics

COMPULSORY PAPER - Paper 5: Paper code:

Title of the paper: Atomic molecular and Nuclear Physics

(Course duration 14 weeks with 3 hours of instruction per week)

PART A

The Electron: Determination of e/m of an electron by Thomson's method. Determination of charge of an electron by Millikan's oil drop method.
-2 hrs

(Halliday, Resnick pp 70-71: Duggal and Chhabra pp 17-24)

Atomic Spectra: A qualitative account of Sommerfeld relativistic atom model. Excitation and Ionization potentials - Franck-Hertz experiment. Vector model of atom. Electron spin. Space quantization. Magnetic moment of an electron due to its orbital motion..Stern-Gerlach experiment.. Spin-orbit interaction and the fine structure of spectral lines. Quantum number and selection rules. Pauli's exclusion principle.. Electronic configuration of atoms. Valance electron. Brief mention of LS and JJ coupling for multi-electron atoms. -8hrs

(Duggal and Chhabra pp 135-138,144-152: M C Jain pp 250-252: R Murugeshan pp 103-105: A K Saxena 35-38)

Zeeman Effect: Experimental details, explanation of normal Zeeman Effect on the basis of vector atom model, expression for the Zeeman shift. -2hrs

(Duggal and Chhabra pp 159-162: R Murugeshan pp 109-111)

Molecular Spectra: Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules. Theory of pure rotation spectra. -3hrs

(A.Beiser pp 282-293: Banwell pp 31-37)

The Raman Effect: Experimental setup. Quantum theory, intensity and polarization of Raman lines. Applications.
-2hrs

(A K Saxena pp 221, 226-231: R Murugeshan pp 296-299)

PART -B

Wave mechanics: Failure of classical mechanics in the microscopic domain. The concept of matter waves. The Davisson and Germer experiment. Heisenberg's uncertainty principle- the gamma ray microscope. Setting up the time-independent and time dependent Schröedinger equations. Born's interpretation of the wave function. Solution of the time-dependent Schröedinger equation for particle in one-dimensional box and its eigen-values. Mention of energy eigen-values for the one-dimensional simple harmonic oscillator, and The zero-point energy. **8Hrs**

The nucleus : Neutron – discovery and Properties . The proton-neutron hypothesis. Nuclear forces and their characteristics. Yukawa's theory (qualitative) **2 Hrs**.

Radioactive decay: Successive disintegration, Radioactive equilibrium radioactive series, Range and energy of alpha-particle and their measurement. Theory of alpha-decay(qualitative). Geiger-Nuttal law. Beta Decay - Pauli's neutrino hypothesis K-electron capture, Internal conversion, Nuclear isomerism. **6 Hrs**

Accelerators : Cockroft-Walton voltage multiplier. LINAC, Cyclotron **3Hrs**

Nuclear Detectors : G.M. counter, Bubble chamber. Principle of semiconductor detector **2 Hrs**

References.

1. A Beiser : concepts of modern physics. ,6th edition ,Tata Mcgraw Hill, New Delhi.

2 F.R. Richtmeyer. E.H. Kennard and T. Lauritsen : Introduction to modern Physics

3 Littleield and T.V. Thorley : Atomic and nuclear physics

Lasers: Meta stable state. Spontaneous emission, stimulated emission, population inversion. Three level laser. The He-Ne laser. Laser Applications : Nuclear fusion, Medical, communications, and industrial applications.
-4hrs

(SathyaPrakash pp 263-267,270-272: A K Saxena pp 302-304,337-341, 352-355, 376-381)

PART B

Wave mechanics: Failure of classical mechanics in the microscopic domain. The concept of matter waves. The Davisson and Germer experiment. Heisenberg uncertainty principle- the gamma ray microscope. Setting up of time independent and dependent Schrodinger equations. Born's interpretation of the wave function. Solution of the time dependent Schrodinger equation for a particle in a one dimensional box and it's Eigen values. Mention of energy Eigen values for the one dimensional simple harmonic oscillator and the zero point energy. -7hrs

(Gupta, Kumar, Sharma pp 1-4,40-43, 48-53, 88-93,79 - 81,83: M.C. Jain, pp 54-56, 61-6 3, 68-69, 77-82, 97-98, 111-113 : R Murugeshan pp 197-198,205-207:

A Beiser pp 177-179, 189-190)\\

The Nucleus: Neutron- discovery and properties. The proton-Neutron hypothesis. Nuclear forces and their characteristics, Yukawa's theory (qualitative).
-2hrs

(Ghoshal pp 613-615: Kaplan 191-192: Krane pp 100-108, 111-112)

Radioactive decay: Successive disintegration, radioactive equilibrium, radioactive series, range and energy of alpha particle and their measurement. Theory of alpha decay (qualitative), Geiger-Nuttall law. Beta decay, Pauli's neutrino hypothesis, K-electron capture, internal conversion, radioactive β and γ sources (Tl^{204}, RaDE, Cs^{137}, Co^{60}). Qualitative discussion of Inverse square law for beta radiations and Absorption of beta particles in matter. Nuclear isomerism
-7hrs

(Ghoshal pp 56-69, 92-102,141, 162-163, 166-170, 211-214): D C Tayal 669-670

Accelerators: Crockroft-Walton voltage multiplier, LINAC, Microtron. - 3hrs
(Ghoshal pp 549-551,554-560,579-581, 601-603)

Nuclear detectors: G. M. counter, Bubble chamber, principle of semiconductor detectors. -2hrs
(Ghoshal pp 248-254,277-281)

4 H. Semat and I.R. Albright : Introduction to atomic and nuclear physics 5 K.S. Kranes : Modern Physics 6. A.K. Ghatak : Lasers	**Book's for Reference:** 1. Halliday and Resnick: Fundamentals of Physics, 9th edition, Wiley India, 2011. 2. Duggal and Chabra: Fundamentals of modern physics, 8th edition, Shobnlal Nagin Chand and Co., 1997 3. M. C. Jain: Quantum Mechanics: A textbook for undergraduates, PHI India, 2007. 4. R. Murugeshan and K. Sivaprasath: Modern Physics, 12th edition, S. Chand and Co., 2005 5. A. K. Saxena: Atomic and Molecular Spectra and Lasers, 1st edition, CBS Publishers and Distributors, 2009 6. C. N. Banwell and E. M. McCash: Fundamentals of Molecular spectroscopy, 4th edition, TMH, 1994 (Reprint 2008). 7. Satya Prakash: Optics and Atomic Physics, 11th edition, Ratan Prakashan Mandir, 1994 8. Guptha, Kumar , Sharma: Quantum Mechanics, 28th edition, Jai Prakash Nath and Co.,2009. 9. A. Beiser: Concepts of mddern physics, 6th edition, TMH, New Delhi.2008. 10. Irving Kaplan: Nuclear Physics, 2nd edition, Narosa Publishing House, 1987 (Reprint 2002). 11. K. S. Kranes: Introductory Nuclear Physics, Wiley India, 2008. 12. S. N. Ghoshal: Nuclear Physics, 1st edition, S. Chand and Co, 1994(Reprint 2002) . 13. D.C.Tayal : Nuclear Physics, 5th edition, Himalaya Publishing House. 2008 (Reprint 2009)
FIFTH SEMESTER BSc Physics – PRACTICAL **(Course duration :14 weeks with 4 Hours of lab-work per week.)** **PRACTICAL 5 (COMPULSORY PAPER EXPERIMENTS) Paper code:** Any **eight** of the following experiments**.** 1.Ionization potential of xenon.. 2.The e/m of an electron using a bar magnet. 3. Rough Estimation of mass of an electron. 4.Determination of wavelength of laser light. 5.Verification of inverse square law for gamma-rays. 6.Absorption coefficient of gamma-rays 7.Cockroft-Walton Voltage multiplier. 8.Determination of Planck constant using a photo cell. 9.Characteristics of a GM-tube 10.Study of Spectra of Hydrogen Using Gas Discharge tube – Determination of Rydberg Constant	**FIFTH SEMESTER B Sc Physics-PRACTICAL** **(Course duration 14 weeks with 4 Hours of Lab-Work per week)** PRACTICAL 5 (COMPULSORY PAPER EXPERIMENTS) Any **EIGHT** of the following experiments 1. Ionization potential of Xenon 2. The e/m of an electron using a bar magnet 3. Estimation of mass of an electron 4. Determination of wavelength of Laser light 5. Verification of Inverse square law of gamma rays 6. Absorption coefficient of gamma rays 7. Cockcroft-Walton voltage multiplier 8. Determination of Planck's constant using Photo cell 9. Characteristics of a GM tube 10. Study of Hydrogen Spectra using Gas discharge tube – Determination of Rydberg constant

SIXTH SEMESTER BSc Physics	SIXTH SEMESTER BSc Physics(old)
COMPULSORY PAPER : Paper 7 : paper code	**COMPULSORY PAPER : Paper 7 : paper code**
TITLE OF PAPER : RELATIVITY ,SOLID STATE AND ELECTRONICS	**TITLE OF PAPER : RELATIVITY ,SOLID STATE AND ELECTRONICS**
(Course duration : 14 weeks with three hours of instructions per week)	**(Course duration : 14 weeks with three hours of instructions per week)**
PART -A	**PART-A**
Special theory of Relativity: The Michelson-Morley experiment. Basic postulates of theory of relativity. Lorentz transformation (no derivation). The Lorentz-Fitzgerald contraction. Time dilation, Velocity addition Theorem, The relativity of simultaneity. Einstein's Mass variation formula and the energy equation $E= mc^2$. The energy-momentum relation. The principle of equivalence. 10. Hrs. **Statistical ideas in physics :** The Maxwell-Boltzmann. Bose-Einstein and Fermi-Dirac energy distribution formulae (no derivation). A qualitative comparison of the three distribution formulae 2 hrs **Free electron theory of metals :** Classical theory. Expression for electrical conductivity-Ohm's law. Weidman –Franz law, Statement of number of the available energy states between E and E+dE. Expression for the Fermi-energy. 4 Hrs. **Band theory of solids** :Concept of bands in solids ,intrinsic and extrinsic semi-conductor. Derivation of the expression for electrical conductivity , Derivation of expression for carrier concentration and electrical conductivity of intrinsic semiconductors , Expression for the energy-gap. 5 Hrs	**Special theory of relativity:** Michelson-Morley Experiment and its outcome. Postulates of Special theory of Relativity. Lorentz Transformations (no derivation). Simultaneity and Order of Events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, Frequency and Wave number. Relativistic addition of velocities. Variation of mass with velocity. Rest mass. Massless particles. Mass energy equivalence $E=mc^2$. The energy-momentum relation. The principle of equivalence. **10 hrs** *1. University Physics 13th edition, by Hugh D. Young, Roger A Freedman and A. Lewis Ford, pp1223-1260* *2. Modren Physics by R Murugeshan Multicolor edition, pp 3-25 and 31-35* **Statistical Ideas in physics:** The Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac energy distribution formulae (no derivation). A qualitative comparison of the three distribution formulae. **2 hrs** *1.University Physics by G Venkatehs, B.S. Srikanta Subhas Publications pp. 248-268* *2. Heat and Thermodynamics and stastical physics by Brijlal Subramanyam P S Hemne pp. 450-477* **Free Electron Theory**: Classical theory, Expression for electrical conductivity-ohms law. Weidman-Franz law. Statement of number of available energy states between E and E+dE (density of states). Expression for the Fermi energy and average energy. Effect of temperature on Fermi-energy. **4 hrs** *1.Quantum Phyiscs of Atoms molecules , solids nulcie and particles second edition Robert Eisberg pp: 445-455* *2.University Physics by G Venkatehs, B.S. Srikanta Subhas Publications pp. 559-571*

PART –B

Semiconductor Devices : P-N Junction diode. Bridge rectifier. Expression for Ripple factor and efficiency. Filters. Zener diode and its use as a voltage regulator, LED-characteristics, Photo diode.
5 Hrs.

Transistors : Type and configuration: Transistor action & characteristics for the CE configuration. DC and AC current gain. Operating point. DC load line and self-biasing (potential divider type) in transistors.
4 HRS

Amplifiers: Single stage CE amplifier. Expressions for voltage gain. Current gain, powergain. Input resistance and output resistance (No derivation) , Mention of CB and CC amplifiers and their special properties in comparison with the CE amplifier
3 Hrs.

Oscillators : The feed back concept-positive and negative feed back. Mention the Barkhausen criteria. Types of oscillator - Hartley oscillator.
2 Hrs.

Logic circuits: Construction of AND, OR gates using diodes & NOT logic gates using Transistor. Symbols and truth table for NOR, NAND and XOR logic gates
2 Hrs

Radio communication.: Role of ionosphere in radio-communication. Need for modulation. Amplitude modulation. Modulation index, side bands, band width, and the power of an amplitude-modulated wave. The block diagram description of super heterodyne AM receiver.
5 Hrs

Band Theory of Solids: Concept of energy bands in solids, intrinsic and extrinsic semiconductor. Derivation of expression for electrical conductivity. Elements of quantum theory of free electron. Derivation of expression for carrier concentration and electrical conductivity of intrinsic semiconductors. Expression for the energy gap of semiconductor.

5 hrs

1. Modren Physics by R Murugeshan Multicolor edition pp.241-326
2.University Physics by G Venkatehs, B.S. Srikanta Subhas Publications pp. 537-557

PART-B

Semiconductor Devices: Diode current equation, I V characteristics, Static and dynamic resistance of a diode, testing of diode with an ohmmeter, Bridge rectifier, Expression for ripple factor and efficiency. Filters. Zener breakdown and Avalanche breakdown. Regulated power supplies- shunt regulator using zener diode. **4hrs**

1. A text book of applied electronics by R S Sedha, pp. 222-230, 248-255, 266-280,427-444, 465-472.
2. Principles of Electronics by VK Mehta pp. 133-173

Wave shaping: clipping and clamping circuits, Positive clipper, Negative clipper and biased clipper. **2hrs**

1.Principles of electronics by Albert malvino and Davic J bates pp. 120-127
2. A text book of applied electronics by R S Sedha, pp. 847-865

Transistors: Review of basic concept, Methods of transistor biasing- voltage divider bias, Fixing Operating point, drawing load line. Effect of temperature on operating point, Thermal runway. 3**hrs**

1. A text book of applied electronics by R S Sedha, pp. 524-550
2. Principles of Electronics by VK Mehta pp. 210-243

Transistors Amplifier: Multi stage transistor amplifiers, two stage transistor RC coupled amplifier, mathematical analysis, frequency response curve, half power frequencies bandwidth.

3hrs

References. 1. Resnick : Special theory of relativity 2. A.P French : Special relativity 3. Malvino : Electronic principles , Fifth edition 4. C. Kittel :Introduction to solid state physics 5. A. J. Dekkar : Solid Sate physics 6. J.B. Blackmore : Introduction to solid state physics 7 V.K. Mehta : Electronics	*1. A text book of applied electronics by R S Sedha, pp. 585-619* *2.Principles of electronic devices and circuits by B L Theraja and R S Sedha, pp.267-276* *2. Principles of Electronics by VK Mehta pp. 244-273* **Oscillator**: The feedback concept, positive and negative feedback. Mention the Barkhausen criteria, Hartley oscillator. **2hrs** *1. A text book of applied electronics by R S Sedha, pp. 788-792* *2.Principles of Electronics by VK Mehta pp. 344-365* **Logic gates**: Construction of AND, OR & NOT logic gates using Transistor only(two input). Symbols and discussion of truth table using Boolean expressions for NOR, NAND and XOR logic gates. **2hrs** **1.***Digital Principles and Applications by Donal P Leach, Albert Paul Malvino and Gautam saha, sixth edition: page numbers 40-60* **Radio communication:** Role of ionosphere in radio-communication. Mention need for modulation, Amplitude modulation, modulation factor, Mathematical analysis of a modulated carrier wave and power of an amplitude modulated wave. The block diagram description of super heterodyne AM receiver. **5hrs** *1. Principles of Electronics by VK Mehta page Numbers 384-406* *2.Principles of electronic devices and circuits by B L Theraja and R S Sedha, pp.380-387* **Reference Books** *1. University Physics 13th edition, by Hugh D. Young, Roger A Freedman and A. Lewis Ford* *2. Modern Physics by Paul A Tipler* *3. Concepts of Modern Physics by Arthur Beiser* *4.Quantum Phyiscs of Atoms molecules , solids nulcie and particles second edition Robert Eisberg* *5. Principles of Electronics by VK Mehta* *6. A text book of applied electronics by R S Sedha* *7. Digital Principles and Applications by Donal P Leach, Albert Paul Malvino and Gautam saha, sixth edition* *8. Principles of electronic devices and circuits by B L Theraja and R S Sedha, Revised edition(2011)*

SIXTH SEMESTER BSc Physics PRACTICAL PRACTICAL PHYSICS (Course duration: 14 Weeks with 4 Hours of lab-work per week.) **Practical-7 (COMPULSORY PAPER EXPERIMENTS) Paper code:** Any **eight** of the following experiments 1. Energy gap of a semiconductor. 2. Zener diode as a voltage regulator. 3. CE amplifier 4. The logic gates AND, OR and NOT using transistors. 5. Characteristics of Transistor in CE mode. 6. Characteristics of Transistor in CB mode. 7. Characteristics of LED. 8. Hartley oscillator. 9. Bridge Rectifier - Without & with C and pi section filters. 10. Photo-diode characteristics. 11. Verification of Richardson – Dushman equation.	SIXTH SEMESTER BSc Physics PRACTICAL PHYSICS (Course duration: 14 Weeks with 4 Hours of lab-work per week.) **Practical-7 (COMPULSORY PAPER EXPERIMENTS) Paper code:** Any **eight** of the following experiments 1. Determination of energy gap of a semiconductor using meter bridge. 2. Determination Fermi energy of metal(copper) 3. Determination of the value of Boltzmann Constant by studying diode Forward Characteristics 4. Construction and Implementation of Positive and negative clippers using diodes 5. Bridge Rectifier- Without and with C and PI section filters. 6. Zener diode as shunt voltage regulator 7. Two stage RC coupled transistor amplifier 8. Hartley oscillator 9. The logic gates AND, OR and NOT using transistors 10. Amplitude modulator.

FOLLOWING PAPERS AND PRACTICALS OF B.SC HAVE BEEN RETAINED AS IT IS.

FIFTH SEMESTER BSc Physics

ELECTIVE PAPER – 1 : Paper 6.1 : : Paper code :

TITLE OF PAPER : NUCLEAR AND CONDENSED MATTER PHYSICS

(Course duration : 14 weeks with three hours of instructions per week)

PART -A

X-rays: Brag's law and the Bragg spectrometer. A brief mention of the different types of crystals. Miller indices, structure of NaCl and KCl crystals. Continuous x-ray specta, Duane and Hunt limit. Characteristic x-ray spectra. Mosley law and its significance. Compton effect- expression for Compton shift **7Hrs**

Electrical properties: Quantum free electron theory of metals , Hall effect and magneto resistance. Expression for Hall coefficient.(metals and semiconductors).

3hrs

Dielectric properties: Dielectric materials and its properties, Methods of determining dielectric constant for solids and liquids. **2 hrs**

Specific heat of solids : Dulong and Petit's law and its limitations. Einstein's theory of specific heat. Debye's theory of specific heat **3 Hrs**

Superconductivity : Elementary ideas and experimental facts. Meissner effect. Critical magnetic field. Applications of superconductivity. A qualitative account of high temperature superconductors. BCS theory (qualitative) **4Hrs**

Liquid Crystals: Symmetry structure and classification of liquid crystals, polymorphism in thermotrophics, recent phenomena in liquid crystals.

2 Hrs

PART -B

Mass spectrographs : Theory of Dempster's and Aston's mass spectrograph **3 Hrs**

Nuclear Models: Liquid-drop model. Semi-empirical mass formula. Shell model and magic numbers **3 Hrs**

Accelerators :, Betatron, Proton synchrotron , Electron Synchrotron. **3 Hrs**

Nuclear reactions: Q-values. Threshold energy of an endoergic reaction. Reactions induced by proton, deuteron and □-particles. **2 hrs**

Nuclear Fission &Fusion : Estimation of the fission energy on the basis of the liquid-drop model. . The four-factor formula. Nuclear reactors - Pressurized Heavy water reactor. Thermo-nuclear reactions-sources of stellar energy. The C-N cycle , Electric and magnetic confinement of plasma- Tokamak **5 hrs**

Cosmic Rays : Discovery, Primary and secondary cosmic rays- their composition. Cosmic ray showers. Origin of cosmic rays **2 hrs**

Elementary particles : Particles and anti-particles. Classification of particles. Mention of the basic interactions in nature and conservation laws. A qualitative introduction to quarks (quark model), Big bang theory - qualitative **3hrs**

Books for reference *:*

1. J.B. Blackmore: Introduction to solid state physics
2. Kaplan Irving : Nuclear Physics
3. A. J. Dekkar : Solid Sate physics
4. Arthur Beiser : Perspectives of Modern Physics
5. B.L. Cohen : Concepts of Physics .
6. Arthur Beiser : Concepts of Modern Physics ,6th edition ,Tata Mcgraw Hill, New Delhi.
7. K.S. Kranes : Modern Physics.

FIFTH SEMESTER BSc Physics
ELECTIVE PAPER – 2 : Paper 6.2 : : Paper code :

TITLE OF PAPER : RENEWABLE ENERGY PHYSICS
(Course duration : 14 weeks with three hours of instructions per week

PART -A

Sources of Renewable Energy: Solar, wind, Biomass availability, merits and demerits. Hydrogen as a source. **3Hrs**

Energy storage :

Sensible heat storage – liquids and solids, latent heat storage, thermo chemical storage, storage through charged batteries. **4Hrs**.

SOLAR Energy & its utilization

Origin of Solar Energy, Spectral distribution of Solar radiation, Attenuation of beam radiation, Basic earth solar angle and derived solar angle, GMT, LCT, LST, Day length, Estimation of average solar radiation, sunshine recorder

Principle of conversion of solar energy into heat, classification of solar collectors, Flat plate and concentrating collectors, construction, Thermal efficiency and coating, Heat losses, Solar cell and its efficiency , P.V. Panels, **14Hrs**

PART -B

Photo thermal Devices: Solar cooker, solar dryer, solar hot water systems- Principles and Working. **3Hrs**

Photovoltaic Systems: Solar lantern, Water Pumps and Street lights- Principles and Working **3Hrs**

Wind Energy: Estimation of energy obtainable from wind, Velocity and power duration curves, energy pattern factors, Theory of power- Momentum transfer, power coefficients , Principle of Wind turbine, Types of wind driven Machine-Horizontal and vertical axis types. **10Hrs**

Ocean energy : Energy from Sea waves, Ocean Thermal energy- temperature gradient in sea and their use for power generation **5Hrs**

References:

1 J.T. MacMillan, R. Morgan & R.B.Murray: Enregy Resources, 2nd edition
2. S.P.Sukhatme: Solar Energy Principles&Thermal Collection &Storage, 2nd edition,Tata McGraw Hill ,New Delhi.
3.G.D.Rai: Solar Energy Utilization , 5th edition, Khanna Publishers, New Delhi.
4. G.D.Rai: Non-Conventional Energy sources, 4th edition, New Delhi.
5. Green: Solar Cells.
6.E.W.Golding: The Generation of Electricity(by wind)
7. L L Freris : Wind energy conversion systems, Prentice hall, NewYork.

FIFTH SEMESTER BSc Physics

ELECTIVE PAPER – 3 : Paper 6.3 : : Paper code :

***TITLE OF PAPER : COMPUTATIONAL PHYSICS AND PROGRAMMING IN C**

(Course duration : 14 weeks with three hours of instructions per week)

PART -A

Introduction

Computer Algorithms, Definition and properties of Algorithms, writing pseudocodes, logical modules and algorithm development, flow charts, need for structured programming.

2Hrs

C Programming

Variable names, data types and their declarations, operators - Arithmetic, logical, relational. conditional and assignment. **3Hrs**

Library functions: Input / Output statements – getchar, putchar, formatted output, file loading, errors handling. **4Hrs**

Control Statements: if – else, for, do, while loops, nested loops, break, switch, continue, go to, switch. **7Hrs.**

Functions & program structure: Definition, Accessing ,passing arguments ,recursion ,scope rules external, static and Register variables ,Block structure. **5Hrs**.

PART -B

Introduction to Arrays & introduction to pointers **5Hrs**

Graphics – Graphic commands and exercises to plot standard graphs and x – y plots **3 Hrs**

Numerical Methods and their applications in Physics

Iterative methods for finding roots of equation : Bisection method and Newton – Rapson method. **4Hrs**

Least square curve fitting – straight line fitting and non-linear curve fitting **2Hrs**

Numerical integration – Trapezoidal rule Simpson's $1/3^{rd}$ rule and Gaussian integration **2Hrs**

Applications : Writing programs to find solutions for simple problems in Physics **5Hrs**

References:

1 S S Sastry :Introductory methods of numerical analysis. 3Rd edition, Prentice hall of India ltd , NewDelhi

2. V Rajaraman :Computer programming in C , Prentice hall of India ltd , NewDelhi

3. V Rajaraman , Computer oriented Numerical Methods.

4. Yeshwanth Kanitkar : Let us C

5. Kereninngham and Ritchie : C programming Language.

6. Schaum series: programming with C.

FIFTH SEMESTER BSc Physics –PRACTICAL
(Course duration :14 weeks with 4 Hours of lab-work per week.)

PRACTICAL-6 (COMBINATION OF COMPULSORY AND ELECTIVE PAPERS**) Paper code :**
Any **seven** of the following experiments(**Four** expt from compulsory part and **Three** from elective Part)

Compulsory part

1. Triode Characteristics
2. Phase measurement in LCR circuit using CRO.
3. Verification Maximum power transfer theorem.
4. The logic gates- AND, OR, NOT and NAND using IC 7400

Elective part

Elective -1 (NUCLEAR AND CONDENSED MATTER PHYSICS)

1. Half-life of K 40.
2. Determination of Dielectric constant of liquid
3. Study of X-ray photograph –determination of interplanar distance
4. Study of Hall effect
5. Determination of range of electron in Al using GM counter.
6. Study of solar cell-I V Characteristics , F F & efficiency

Elective -2 (: **RENEWABLE ENERGY PHYSICS)**

1. Spectral response of a solar cell
2. Study of effect of intensity variation on efficiency of solar cell
3. Wind data analysis, velocity and power duration curves
4. Study of box type solar cooker
5. Study of solar dryer.(loss of moisture and drying efficiency)

Elective -3 (**COMPUTATIONAL PHYSICS AND PROGRAMMING IN** C)

1. Programming Excercises -Matrix multiplication
2. Programming Excercises to calculate Standard deviation, Transpose of a matrix
3. Programming Excercises-To write a program for least square fitting a function for given data points.
4. Programming Excercises – To write a function sub program to calculate Sin X or Cos X using series expansion.
5. Programming Excercises -
6. To find the roots of polynomial using Newton –Raphson method.
7. To integrate a given function using trapezoidal and Simpsons rule.

Project work equivalent to **two experiments** is compulsory. A report must be submitted for internal evaluation **IA marks(Max10).** The wok must emphasize significant ideas &concepts and should address the questions –why it is important, where it is applied, what are its key features &limitations. A list of Suggestive ideas for project work is appended at the end.

SIXTH SEMESTER BSc Physics

ELECTIVE PAPER -1 : Paper 8.1 : paper code

TITLE OF PAPER : ANALOG AND DIGITAL ELECTRONICS **

(Course duration : 14 weeks with three hours of instructions per week)

PART -A

Network Theorems : Thevenin's theorem, Norton's Theorem, application to the analysis of DC circuits 3Hrs

Transistor devices : FET ,UJT –working & its characteristics. 2Hrs

Amplifiers: h-parameters. A.C. equivalent circuit of a transistor in terms of the h-parameters. Derivation of the expressions for voltage gain. Current gain, powergain. Input resistance and output resistance for CE mode

3 Hrs

Operational amplifiers : Basic differential amplifier, Opamp and its characteristics, inverting ,non inverting amplifiers, concept of virtual ground, adder, integrator and differentiator with expressions for output.(derivations). 4hrs

Oscillators: Phase-shift and Wien-bridge oscillators,Crystal oscillator (qualitative). Expression for frequency and condition for oscillation (no derivation).

3 Hrs

Radio and TV Communication: Frequency Modulation, expression for frequency modulated wave for a single sinusoidal modulating signal, Band width of FM, Elements of TV transmission, scanning types, composite video signal and its components, Vidicon camera-working. TV standards. Elements of TV reception-Block diagram(Monochrome).

6 hrs

PART –B

Use of Binary number in logic circuits , EX OR gate. 1hrs

Combinational &sequential circuits – Half adder ,Full adder, using basic gates & ExOR gates ,RS and JK flip flop(clocked version). 3hrs

IC logic gates – TTL and CMOS gates: their characteristics, 3hrs

Intergrated Circuits –Types and Fabrication 4hrs

Analog to Digital Converters –counter comparator ADC, successive approximation type ADC

3hrs

Digital to Analog Converters – Weighted resistor DAC, Resistor ladder DAC

3hrs

Memory devices; Memory terminologies, Volatile and non volatile memory, static and dynamic RAM, magnetic, optical and ferroelectric memory.

4hrs

Books for reference

1. Malvino : Electronic principles , Fifth edition
2. Malvino and Leach : Digital principles and applications
3. Gulati RR : Monochrome and Colour Television ,Wiley eastern Ltd, New Delhi.
4. V.K. Mehta : Electronics
5. Bapat YN : Electronic circuits and Systems, TMH , New Delhi.
6. Alan Motttershead :Electronic devices and circuits , Prentice hall of India ltd , New Delhi .
7. R P Jain. : Modern Digital Electronics -
8. S V Subramanyam : Experiments in Electronics .

SIXTH SEMESTER BSc Physics

ELECTIVE PAPER -2 : Paper 8.2 : paper code

TITLE OF PAPER: PHOTONICS

(Course duration: 14 weeks with three hours of instructions per week)

PART –A

Lasers

Basic Principles, Properties of Laser light,coherence-spatial & temporal, Divergence, line shape broadening ,cavity laser modes, mode selection, single mode operation, Selection of Laser emission line **2Hrs**

Laser Oscillator: Pumping Schemes, Gain-threshold conditions, Optical feedback, Optical resonator. **4Hrs**

Types of Lasers: Nd – YAG., CO2 and Dye lasers – construction and principles of working . **3Hrs**

Laser Diodes: Lasing conditions and Gain in a semiconductor, selective amplification and coherence, Materials for laser diodes, quantum well lasers, surface emitting lasers, characterization and modulation of lasers. **5 hrs**

Optoelectronics :

Introduction: Optoelectronics in the information technology, Optoelectronic devices, Optoelectronic materials - liquid crystals, semiconductors, ceramics, polymers and optical fibers, Fabrication of Optoelectronic devices. **2Hrs**

Light Emitting Diodes: The electroluminescence process, Materials for light emitting diodes, LED Structures and efficiency, light output from LED, performance characteristics, manufacturing process. **5hrs**

PART –B

Photo Detectors : Specifications ,Types – Junction photodiodes , avalanche photodiodes, CCD Photo detectors, Comparison of different detectors , performance characteristics and Fabrication . **6hrs**

Photovoltaics – solar cell I -V characteristics , materials and device fabrication. **1Hrs**

Fiber Optics and Dielectric wave guides

Wave Guide:Slab wave guide , Modes ,V number, Modal , material and waveguide dispersions. **3hrs**

Optical Fiber- Types, Optical fiber functions. Light propagation, Optical power, Velocity of Propagation, critical angle, acceptance angle, numerical aperture, mode of propagation, Index profile. Single mode step-index optical fiber, multimode step- index fiber, graded index fibers advantages and disadvantages, energy losses in optical fiber, Bit rate, dispersion and optical bandwidth, Absorption and scattering, Block diagram of optical fiber communication. Construction of Optical cables. Optocoupler. **11Hrs**

References.

1.John Wilson and John Hawkes, Optoelectronics, an introduction - 3rd Edition, Prentice Hall 1998,
2.J Singh ,Optoelectronics : an introduction to materials and devices, McGraw Hill New York
3.P Bhattacharya ,Semiconductor optoelectronic devices, Prentice hall international ,1997.
4. KR Nambiar, Lasers –principles, Types and applications, New age international, New Delhi.
5. Wayne Tomaal, Electronic Communication Systems-Fundamentals through advanced- 5th edition Pearson education, New Delhi
6.Dennis Roddy and John Coolen , Electronic Communication ,4th edition, Pearson education, New Delhi

SIXTH SEMESTER BSc Physics

ELECTIVE PAPER – 3: Paper 8.3 : paper code

TITLE OF PAPER: COMMUNICATION SYSTEMS**

(Course duration: 14 weeks with three hours of instructions per week)

PART –A

Signal & Noise: Distinction between Signal and Noise. Signal to noise and its importance in communication. 2Hrs

Electro Acoustic transducers : Microphone types- Carbon, Moving coil, condenser and ribbon microphones, sensitivity, directivity, phasing and testing. 4Hrs

Loud Speakers : Direct radiator dynamic type, expression for efficiency, radiated output power, Horn Loudspeaker, cutoff frequency, measurement of acoustic power and pressure response of a speaker 5Hrs

Modulation : Types of Modulation, Frequency Modulation, expression for frequency modulated wave for a single sinusoidal modulating signal FET method to produce FM, Distinction between analog and digital methods of modulation, PAM, PWM, PCM and Delta modulation 6Hrs

Multiplexing: Types of multiplexing and methods of grouping 2Hrs

Demodulation: Detection and demodulation of FM signal using foster seely discrimination 2Hrs

PART –B

Amplifiers used in communication: Classes and types of amplifiers, AF, IF , RF and power amplifiers 6Hrs

Other Communication systems;

Principles of : Microwave and satellite communication, wire telephone, simplex and duplex systems, facsimile transmission, Mobile communication-cellular telephony. 8Hrs

Antennas

Types of antenna –elementary ideas of Resonant antenna,Hign frequency antenna,Yagi antenna, Microwave antenna-geometry and properties of parabolic antenna,wideband and special purpose antenna-Horn,Discone and helicaland Dielectric antenna,Current and voltage distribution in antenna, expression for energy radiated by a short doublet (dipole),Impedence matching 7Hrs

References.

1. Dennis Roddy and John Coolen , Electronic Communication ,4th edition, Pearson education, New Delhi
2. Wayne Tomaal, Electronic Communication Systems-Fundamentals through advanced- 5th edition Pearson education, New Delhi
3.Kennedy George :Electronic communication Systems,3rd edn, Tata Mcgraw Hill, New Delhi.
4. Deshpande Etal, Communication electronics,Tata Mcgraw Hill, New Delhi.
5.Fundamentals of Acoustics –Kinsler and Frey
6.Acoustics –Schaum series –(Seto)

Note: electronics students are not eligible to opt this papers**

SIXTH SEMESTER BSc Physics PRACTICAL

Practical-8 (COMBINATION OF COMPULSORY AND ELECTIVE PAPERS) Paper code:

Any **seven** of the following experiments (**Four** expt from compulsory part and **Three** from elective Part)

Compulsory part

1. Negative feed-back amplifier.
2. A study of Amplitude Modulation and Amplitude Demodulation
3. A study of Characteristics of FET
4. Thevenin Theorem-verification

Elective part

Elective -1 (ANALOG AND DIGITAL ELECTRONICS)

1. Phase shift Oscillator
2. Wein Bridge Oscillator
3. UJT characteristics
4. Full Adder
5. Study of opamp characteristics.

Elective -2 (PHOTONICS)

1. Measurement of efficiency and output power of LED
2. Characteristics of Diode Laser –Measurement of output power, LI curves
3. Verification of inverse square law for light intensity using a photo-diode.
4. Study of Optocoupler.
5. Study of Divergence of Diode laser.

Elective -3 (COMMUNICATION SYSTEMS)

1. Diode detector
2. Digital multiplexing using IC555 & IC 7400 (observe multiplexing on CRO)
3. PAM using IC 555
4. Study of demultiplexer using IC 555 & IC 7400.
5. A study of IF amplifier –Frequency response.

Project work equivalent to **two experiments** is compulsory. A report must be submitted for internal evaluation and **IA marks(Max10).** The wok must emphasize significant ideas &concepts and should address the questions –why it is important, where it is applied, what are its key features & limitations? A list of suggestive ideas for project work is appended at the end.

PRESENT PATTERN OF QUESTION PAPER.

B.Sc. 1ST TO 4TH SEMESTER
PHYSICS

Time 3 Hrs **Max Marks 60**

Answer any **three** questions out of **four** questions from parts A & B (two from each part) 3x12 =36
(Concept/understanding/application based questions to be set)

Answer any **three** questions out of **four** questions from part C (Two from each part) 3x4 =12
(Numerical problems /application oriented questions to be set)

Answer any **six** questions out of **eight** questions from part D(four from each part) 2x6 =12
(Short answer/long answer/derivations based questions to be set)

BSc Physics
Present PATTERN OF QUESTION PAPER.

BSc 5TH AND 6TH SEMESTER
PHYSICS

Time 3 Hrs **Max Marks 80**

Answer any **three** questions out of **four** questions from parts A & B (two from each part) 3x15=45
(Short answer/long answer/derivations based questions to be set)

Answer any **three** questions out of **four** questions from part C (Two from each part) 3x5 =15
(Numerical problems /application oriented questions to be set)

Answer any **ten** questions out of **twelve** questions from part D(six from each part) 10x2 =20
(Concept/understanding/application based questions to be set)

APPENDIX -I

SUGGESTED AREAS FOR PROJECT WORK

1. PREPARATION AND PRESENTATION OF SCIENTIFIC REPORTS. EXAMPLES TO BE TAKEN ON POPULAR, PURE & APPLIED SCIENCE AND OTHER TECHNICAL REPORTS.
2. COMPUTER SIMULATION OF DIFFERENT PHENOMENA/EXPERIMENTS IN PHYSICS
3. APPRECIATION COMPREHENSION OF ARTICLES WRITTEN BY RENOWNED SCIENTIST/PHILOSOPHERS.
4. REPORT ON PRESENT DAY SCIENTIFIC AND TECHNOLOGICAL SCENARIO IN THE WORLD WITH REFERENCE TO ENERGY, EVIRONMENT, COMMUNICATION AND OTHER RELATED AREAS.
5. Doing additional laboratory experiments and reporting on their results:
   a. Design, build and test a logarithmic amplifier.
   b. Studying the parameters of different lasers
   c. Study the aberrations of a thick lens.
   d. To trace the wave form of a sinusoidal input with / without series / shunt diode connected at the out put in series with a suitable resistance.
   e. Applications of rotating polarization in chemistry.
   f. studying flame spectra of some salts.
   g. Studying biological effects of radiation using the existing available data.
   h. Use of P-N junction for the measurement of temperature.
   i. Study of Faraday rotation in optically active crystals.
   j. Study of counting statistics in radioactive emissions.
   k. Studying the linear dispersion in a given prism or a grating spectrometer.
   l. Use of P-N junction for the measurement of temperature.

7. TO PREPARE MODELS OF DIFFERENT PHENOMEA OR CRYSTAL STRUCTURES/LATTICES.
8. TO PRPARE AREPORT ON DIFFERENT ASPECTS OF ASTRONONY AND COSMOLGY
9. USE OF SENSORS/TRANSDUCERS, GUAGES IN THE MEASUREMENT OF PRESSURE, TEMPERATURE, ETC.

IN ADDITON TO THE ABOVE AREAS, ANY OTHER RELEVENT AREA CAN BE CHOSEN.

A GROUP OF **3 OR 4** STUDENTS SHOULD BE MADE TO TAKE UP A SINGLE PROJECT SO THAT THEY LEARN THE TEAM SPIRIT IN DOING A JOB.

APPENDIX – 2

INTERNAL ASSESSMENT Distribution Table : From 2008 -09 onwards

Course: BSc PHYSICS

Marks Distribution Table: From 2008 -09 onwards

Semester	Paper	Examination marks	IA	REMARKS for IA
FIRST	**Paper -1** Mechanics and Properties of matter	60	10	05 marks for class tests and 05 marks for home assignments.
	Practical -1	20	10	Test / Record
SECOND	**Paper -2** ***Heat and thermodynamics***	60	10	05 marks for class tests and 05 marks for home assignments
	Practical-2	20	10	Test / Record
THIRD	*Paper –3* ***Waves, Acoustics and Optics***	60	10	05 marks for class tests and 05 marks for home assignments
	Practical-3	20	10	Test / Record
FOURTH	**Paper –4** Electricity and Electromagnetism	60	10	05 marks for class tests and 05 marks for home assignments
	Practical-4	20	10	Test / Record
FIFTH	**Compulsory paper** **PAPER 5** ATOMIC, MOLECULAR AND NUCLEAR PHYSICS	80	20	10 marks for class tests and 10 marks for home assignments.
	Practical-5	35	15	10 marks for practical test and05 marks for Test/record
	Practical-6	35	15	10 for **Project report** 05 for Test/record

	Elective papers (One to be selected) Paper 6.1 Nuclear and condensed matter physics PAPER 6.2 renewable energy PHYSICS *Paper 6.3 COMPUTATIONAL PHYSICS AND PROGRAMMING IN C	80	20	10 marks for class tests and 10 marks for home assignments.
		80	20	-------do----------
		80	20	-------do----------
SIXTH	**Compulsory paper** **Paper 7** RELATIVITY, SOLID STATE PHYSICS AND ELECTRONICS	80	20	10 marks for class tests and 10 marks for home assignments.
	Practical-7	35	15	10 marks for practical test and05 marks for Test/record
	Practical-8	35	15	10 for **Project report** 05 for Test/record
	Elective paper (One to be selected) ****PAPER 8.1** Analog and digital electronics **PAPER 8.2** PHOTONICS ****PAPER 8.3** COMMUNICATION SYSTEMS	80	20	10 marks for class tests and 10 marks for home assignment.
		80	20	--------do----------
		80	20	-------do----------

NOTE: 1) * COMPUTER SCIENCE STUDENTS ARE NOT ELIGIBLE TO OPT THIS PAPER.

** Electronics students are not eligible to opt these papers.

2) Home assignments to be based on the concept of learning topics not in the syllabus like –Biography of Scientists relevant to the syllabus or their contributions to science and or society.