ST. PHILOMENA'S COLLEGE (AUTONOMOUS), MYSURU-570 015

Subject: PHYSICS
SYLLABUS FOR B.Sc., UNDER SEMESTER SCHEME
from the Academic Year 2016-17

The Scheme of Teaching & Examination

Semester	Title of the paper	Paper code	Teaching Scheme (hours per week)			Examination scheme			
			Theory	Practical	Credits	Duration	Theory/ Practical max. marks	IA max. marks	Total marks
I	**PAPER 1 MECHANICS AND PROPERTIES OF MATTER**	16MA590	03	-	3	03	60	10	100
	PRACTICAL PAPER 1 MECHANICS AND PROPERTIES OF MATTER	16MA592	-	03	1.5	03	20	10	
II	**PAPER 2 HEAT AND THERMODYNAMICS**	16MB590	03	-	3	03	60	10	100
	PRACTICAL PAPER 2 HEAT AND PROPERTIES OF MATTER	16MB592	-	03	1.5	03	20	10	
III	**PAPER 3 WAVES, ACOUSTICS AND OPTICS**	16MC590	03	-	3	03	60	10	100
	PRACTICAL PAPER 3 ACOUSTICS AND OPTICS	16MC592	-	03	1.5	03	20	10	
IV	**PAPER 4 ELECTRICITY AND ELECTROMAGNETISM**	16MD590	03	-	3	03	60	10	100
	PRACTICAL PAPER 4 ELECTRICITY	16MD592	-	03	1.5	03	20	10	
V	**PAPER 5 (COMPULSORY) MODERN PHYSICS-I**	16ME606	03	-	3	03	80	20	150
	PRACTICAL PAPER 5 (COMPULSORY) MODERN PHYSICS-I	16ME608	-	03	1.5	03	35	15	
	PAPER 6.1 <u>Elective -1</u> CONDENSED MATTER AND NUCLEAR PHYSICS PAPER 6.2 <u>Elective -2</u> RENEWABLE ENERGY PHYSICS PAPER 6.3 <u>Elective -3</u> *COMPUTATIONAL PHYSICS AND PROGRAMMING IN C NOTE : ONE ELECTIVE TO BE OPTED * COMPUTER SCIENCE STUDENTS ARE NOT ELIGIBLE TO OPT FOR THIS PAPER.	16ME610 16ME598	03	-	3	03	80	20	150
	PRACTICAL PAPER 6.1 <u>Elective -1</u> CONDENSED MATTER AND NUCLEAR PHYSICS + PROJECT/ FIELD VISIT PRACTICALPAPER 6.2 <u>Elective -2</u>	16ME612	-	03	1.5	03	35	15	

	RENEWABLE ENERGY PHYSICS + PROJECT/ FIELD VISIT **PRACTICAL (PAPER 6.3** **Elective -3** *** COMPUTATIONAL PHYSICS AND PROGRAMMING IN C + PROJECT/ FIELD VIS** **NOTE : ONE ELECTIVE TO BE OPTED** ***COMPUTER SCIENCE STUDENTS ARE NOT ELIGIBLE TO OPT FOR THIS PAPER.**	16ME600							
VI	**PAPER 7 (COMPULSORY)** **MODERN PHYSICS-I1**	16MF606	03	-	3	03	80	20	150
	PRACTICAL PAPER 7 (COMPULSORY) **MODERN PHYSICS-I1**	16MF608	-	03	1.5	03	35	15	
	PAPER 8.1 **Elective -1** **ANALOG AND DIGITAL ELECTRONICS **** **PAPER 8.2** **Elective -2** **PHOTONICS** **PAPER 8.3** **Elective -3** **COMMUNICATION SYSTEMS **** **NOTE : ONE ELECTIVE TO BE OPTED** **ELECTRONICS STUDENTS ARE NOT ELIGIBLE TO OPT FOR THIS PAPER**	16MF592 16MF594 16MF596	03	-	3	03	80	20	150
	PRACTICAL PAPER 8.1 **Elective -1** **ANALOG AND DIGITAL ELECTRONICS **** **PRACTICAL PAPER 8.2** **Elective -2** **PHOTONICS** **PRACTICAL PAPER 8.3** **Elective -3** **COMMUNICATION SYSTEMS **** **NOTE : ONE ELECTIVE TO BE OPTED** **** ELECTRONICS STUDENTS ARE NOT ELIGIBLE TO OPT FOR THIS PAPER**	16MF600 16MF602 16MF604	-	03	1.5	03	35	15	

- Minimum **Eight** experiments should be completed in all labs.
- Project /Field Visit is compulsory.
- IA marks for practical includes evaluation of practical record.

Objective:

In this course, we aim to provide a solid foundation in all aspects of physics and to show a broad spectrum of modern trends in physics and to develop experimental, computational and mathematical Skills of students. The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of physics by providing a more complete and logical framework in almost All areas of basic physics.

By the end of the first year, the students should have

- Attained a common understanding in basic mechanics, properties of matter, heat and thermodynamics.
- Developed their experimental and data analysis skills through a wide range of experiments in the practical laboratories.

By the end of the second year, the students should have

- Been introduced to powerful tools for tackling a wide range of topics in Waves, Acoustics, optics, Electricity and Electromagnetism.
- Become familiar with additional relevant mathematical techniques like Fourier series.
- Further developed their experimental skills through a series of experiments which also illustrate major themes of the lecture courses.

By the end of the sixth semester, the students should have

- Covered a range of topics in almost all areas of physics like Atomic and molecular spectra, Wave mechanics, Nuclear physics, Astrophysics, Nuclear and condensed matter physics.
- Been introduced to Special theory of relativity, Solid state physics, Analog and Digital electronics so that they are exposed to all most all branches of Physics.

Had experience of independent work such as Presentations, project work, seminars etc.

FIRST SEMESTER - Theory

Paper –I

Title of paper: MECHANICS AND PROPERTIES OF MATTER
Course duration – 14 Weeks with 03 hours of instruction per week

Marks-Theory - 60 + Internal assessment - 10= 70

42 hrs.

PART –A

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 Derivative 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. **3 hrs.**

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 - plumbline accelerometer and freely falling lift. Qualitative discussion of centrifugal force, Coriolis force and earth as non-inertial frame. **5 hrs**.

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, circular lamina and solid cylinder. Theory of the compound pendulum-derivation of period, interchangeability of centres of oscillation and suspension. **5 hrs.**

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-derivation of couple per unit twist. The torsional pendulum,static torsion - derivations **8 hrs.**

PART – B

Conservation of Linear Momentum: Conservation of linear momentum for a system of two particles, rocket motion in a uniform gravitational field – expression for the instantaneous velocity of a single stage rocket (with and without gravity), multi-stage rockets (qualitative), elastic and inelastic collisions, elastic head on collision, elastic oblique collision in laboratory frame. Illustrations. **6 hrs.**

Conservation of Angular momentum: Motion of particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant-derivation), Newton's law of gravitation- Kepler's laws of planetary motion –derivation using Newton's law of gravitation. **4 hrs**.

Conservation of energy: Conservative and non-conservative forces with examples, conservation of energy in a conservative force field - applications -(i) vertical oscillations of loaded light spiral spring and (ii) calculation of escape velocity in the gravitational field of the earth. Conditions for a geo-stationary satellite. Basic idea of Global positioning system (GPS). **4 hrs.**

Fluid Dynamics: **3 hrs.**
Viscosity: Stream line and turbulent flows, Expression for critical velocity, Reynolds number and its significance, coefficient of viscosity, terminal velocity, Stokes law (no derivation) – derivation for terminal velocity of small ball falling through viscous fluid. Variation of viscosity of liquid with temperature and pressure.

Surface tension: Surface energy and definition of surface tension. Pressure inside curved liquid surface, examples. The drop-weight method – derivation, factors affecting surface tension, applications of surface tension. Surface tension of mercury by Quincke's method – Theory. **4 hrs.**

Books for reference:

Brijlal and Subramanyam: Properties of Matter

C.L Arora: Refresher course in Physics Vol. 1 S. Chand Publications.

S.R Shankar Narayan: Mechanocs & Properties of matter

Books for further reference:

1. J.C. Upadyaya : Mechanics
2. Halliday and Resnick : Physics, Part -I
3. Berkeley Physics -Vol. 1- Mechanics
4. D.C. Mathur : Mechanics/Elements of properties of matter
5. K. N.Srinivasa Rao : Classical Mechanics 2003 University Press India (P) Ltd.
6. Vernon D Barger and Martin G Olsson – Classical Mechanics – Tata McGraw Hill
7. C.L Arora, P.S Hemne, S Chand & Co: Physics for degree students B.Sc First year

Practical - 1 Mechanics and properties of matter Paper code:
(Three hours of lab-work per week.)
Marks -End semester examination - 20 + IA - 10 [Record - 5 + Class Test - 5] =30

Any eight of the following experiments:

1. **Bar pendulum**: Determination of the acceleration due to gravity and the radius of gyration by graphical method.
2. **Spiral spring:** Determination of the acceleration due to gravity and the unknown mass by graphical method.
3. **Fly wheel:** Determination of the moment of Inertia.
4. **Drop-weight method**: Determination of the surface tension of a liquid.
5. **Drop-weight method:** Interfacial tension between two liquids.
6. **kes' method**: Determination of coefficient of viscosity of a viscous liquid.
7. **Single cantilever:** Determination of young's modulus of the given material.
8. **Searle's double bar** :Determination of young's modulus, the rigidity modulus and the Poisson ratio.
9. **Torsional pendulum**: Determination of moment of inertia of an irregular body.
10. **Elastic Collision:** Verification of law of conservation of linear momentum and the law of conservation of kinetic energy.

SECOND SEMESTER - Theory

Paper - 2

Title of paper: HEAT AND THERMODYNAMICS

Course duration – 14 Weeks with 03 hours of instruction per week

Marks-Theory - 60 + Internal Assessment - 10= 70 **42 hrs.**

PART –A

Kinetic theory: Maxwell's law of distribution of molecular velocity (no derivation)-its interpretation. Calculation of mean velocity, most probable velocity and RMS velocity. Degrees of freedom. Principle of equipartition of energy based on kinetic theory of gases, Expression for internal energy of gas (U=3/2 RT-derivation using pressure equation). Mean free path-definition and expression (no derivation). Real gases. Andrews's isothermals for carbon di oxide -graph, its explanation and interpretation- critical isothermal – definition of critical constants. Derivation of critical constants using Vanderwaal's equation of state. **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. Joule Thomson effect-Porous plug experiment and its theory (explain why heating and cooling of gases takes place). Joule Thomson expansion-expression for the temperature of inversion, inversion curve. Relation between Boyle temperature, temperature of inversion and critical temperature of gas (mention of relations only). Principle of regenerative cooling. Liquifaction of air by Linde's method. Adiabatic demagnetization. Application of low temperature Physics. **7 hrs.**

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 (derivation) - effect of change of pressure on melting point of a solid and boiling point of a liquid **5 hrs.**

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Thermodynamic potentials: Internal energy, enthalpy, Helmholtz function, Gibbs function, relations among these functions, Gibbs- Helmholtz equations. **3 hrs.**

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. **6 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.**

Books for reference:

Brijal, Subramanyam, P.S Hemne-S Chand : Heat and Thermodynamics and Statistical Physics

S.R Shankaranarayan-Heat and thermodynamics. S. Chand Publications.

C.L Arora: Refresher course in Physics Vol. 1 S. Chand Publications.

Books for further reference:

1.Brijlal and Subramanyam : Heat and Thermodynamics
2.J.B. Rajam : Heat and Thermodynamics
3.D.S. Mathur :Heat
4.Halliday and Resnick : Physics Part-I
5.B B Laud :Introduction to statistical Mechanics 1981, McGraw Hill
6. R.H Dittaman and M.W Zemansky : Heat and Thermodynamics . 7Th Edition Mc.Graw Hill
7.K Huang – Statistical Physics 1988 Wiley Eastern
8. S.J Blundell,K.M Blundell .Oxford university-Concepts in thermal physics
9. S.C Guptha: Thermodynamics

Practical - 2 Heat and Properties of matter
(Three Hours of Lab-work per week)
Marks -End semester examination - 20 + IA - 10 [Record - 5 + Class Test - 5] =30

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 rigidity modulus 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

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THIRD SEMESTER - Theory

Paper –3

Title of paper: WAVES, ACOUSTICS AND OPTICS

Course duration – 14 Weeks with 03 hours of instruction per week

Marks-Theory - 60 + Internal Assessment -10= 70

42 hrs.

PART -A

Analysis of complex waves: Fourier series- Examples of square wave and saw tooth wave. **3 hrs.**

Superposition of simple harmonic motions: Lissajou's figures - Graphical and analytical method (1:1 and 1:2 ratio) and their uses. Equations for damped vibration and 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. Velocity of sound in a rod - Kundt's tube experiment. **5 hrs.**

Transducers: Types of transducers, dynamic microphone and loudspeaker - construction, working and their characteristics, Piezo electrical transducer. **3 hrs.**

Interference: Theory of interference – Young's double slit experiment -expression for fringe width (no derivation). Coherent sources. Interference by division of wave front and division of amplitude. Fresnel's biprism. Lloyd's mirror (theory,construction and action). Thin films of uniform thickness-reflected light only. Newton's rings-determination of λ and R. Interference at a wedge- expression for fringe width for normal incidence. Michelson's interferometer - Measurement of λ and $d\lambda$. **5 hrs.**

PART –B

Velocity of light: Kerr effect. Determination of velocity of light by Kerr cell method **2 hrs.**

Optical Instruments: Defects of lenses-mention of monochromatic and chromatic types, explanation of spherical and chromatic types-condition for minimum spherical aberration-statement. Achromatic combinations of lenses. Huygen's and Ramsden's eye pieces. Resolving power of spectroscope. **3 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. Resolving power and dispersive power of plane grating. **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-for normal incidence and optic axis in the plane of incidence and a) parallel to the refracting surface b) perpendicular to the refracting surface c) inclined to the refracting surface. Retarding plates- **9 hrs.**

quarter wave plate and half wave plate- derivation of expression. Production and analysis of linearly, circularly and elliptically polarized light. Optical activity-Fresnel's theory, Rotatory polarization. Application of polarized light. Elementary idea of Babinet compensator.

Books for reference:

Optics -Brijal and Subramanyam
Optics – Satyaprakash
Text book of sound: N. Subramanyam and Brijal
Electrical measurements & measuring instruments: N.V Surya Narayana

Books for further reference:

1. Sound - Khanna and Bedi
2. Optics -D.N. Vasudeva
3. Optics - B.K. Mathur
4. Optics - Jenkins and white.
5. Fundamentals of Physics: Halliday Resnik Walker 8th Edition
6. Waves and oscillations: Brijlal and Subramanyam
7. Waves and oscillations: S.K Guptha and S.P Verma 3rd Edition
8. Electronic instrumentation: H.S Kalsi Tata Mc Graw Hill

Practical -3 Acoustics and optics

(Three hours of Lab-work per week)
Marks -End semester examination - 20 + IA - 10 [Record - 5 + Class Test - 5] =30

Any **eight** of the following experiments

1. **Newton's rings**-determination of radius of curvature of a Plano convex lens.
2. **Biprism**-determination of the wavelength of a monochromatic light source.
3. **Sonometer**- determination of speed of transverse waves.
4. **Helmholtz resonator**- determination of the frequency of a tuning fork.
5. **Diffraction grating** - determination of grating constant and wavelength. (Minimum deviation method)
6. **Diffraction at a straight wire**-determination of the diameter of a wire.
7. **Cauchy's constants -** determination of Cauchy's constants using a spectrometer.
8. **Polarization**-determination of unknown concentration of sugar solution by graphical method using a polarimeter.
9. D**etermination of velocity of sound at room temperature using microphone, loudspeaker system**
10. **CRO** –determination of voltage and Frequency.
11. **Air wedge** – determination of thickness of a thin paper.

FOURTH SEMESTER - Theory

Paper –4

Title of Paper: ELECTRICITY AND ELECTROMAGNITISM

Course duration – 14 Weeks with 03 hours of instruction per week

Marks-Theory - 60 + Internal Assessment - 10= 70

42 hrs.

PART –A

Electrostatics: Mechanical force and electric pressure on a charged surface. The path traced by a charged particle in an electric field. The attracted disc electrometer-construction, theory Applications **4 hrs.**

Electrical measurement: C.R.O. –construction and working, Measurement of voltage and frequency using a C.R.O. **2 hrs**.

Alternating current: Response of LR and CR circuits to sinusoidal voltages (discussion using the 'j' symbol). LCR circuits-Series and parallel resonance- halfpower frequency, band width,sharpness of resonance and Q factor. Power in electrical circuits-power factor. Wattless current, wattmeter. Maximum power transfer theorem with proof (discussion using the 'j' symbol) **8 hrs.**

Applications of ac circuits: Anderson's bridge, Maxwell's bridge, de sauty bridge, Robinson's bridge. **4 hrs.**

Filters: High-pass and low-pass filters with LR and CR combinations. Expression for cut-off frequency-derivation. Band pass filters (qualitative). **3 hrs.**

PART –B

Galvanometers: Moving coil ballistic galvanometer-construction, theory, damping correction, current and charge sensitivity. Helmholtz double coil galvanometer – Theory. **4 hrs.**

Thermo-electricity: The thermocouple- thermoelectric series. Variation of thermo emf with temperature of hot junction- neutral, inversion temperature, thermoelectric power-definition. Seebeck, Peltier and Thomson effects and their coefficients. Thermodynamic theory of thermo electric 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.**

Electromagnetic theory: Equation of continuity, Maxwell's modification of Ampere's circuital law, Displacement current. Setting up of Maxwell's field equations-free space and in isotropic dielectric medium, Electromagnetic wave propagation through vacuum and isotropic dielectric medium. Energy density, Poynting theorem (proof), Poynting vector (definition) . Plane monochromatic electromagnetic wave -Helmholtz equation, Transverse nature, intrinsic impedance (free space and dielectric) **9 hrs.**

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

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Books for reference:

1. **Duggal and Chabbra: Electricity and magnetism**
2. **Brijlal and Subramanyam: Electricity and magnetism**
3. **D.C. Tayal: Electricity and magnetism**
4. **A.B. Bhattacharya , R Bhattacharya : Under Graduate Physics , Volume 11**

Books for further reference:

1. D.J. Griffiths: Introduction to electrodynamics, third edition.
2. D.N. Vasudeva : Electricity and Magnetism
3. K.K. Tewari: Electricity and magnetism
4. B B Laud: Electromagnetics, Wiley Eastern limited, New Delhi.
5. W H Hayt, J A Buck : Engineering Electromagnetics,6th Edition Tata Mcgraw Hill , New Delhi
6. Fundamentals of Phyics: Halliday Resnik Walker 8th Edition
7. Introductory circuit analysis : Robert Boylestad

Practical-4 :Electricity
(Three Hours of Lab-work per week)
Marks -End semester examination - 20 + IA - 10 [Record - 5 + Class Test - 5] =30

Any eight of the following experiments

1. **Anderson's Bridge** -determination of the self-inductance of the coil.
2. **BG -**high resistance by leakage using BG.
3. **B_H** using Helmholtz double coil galvanometer and potentiometer
4. **L C R series circuit** -determination of L and Q-factor.
5. **Low and high pass filters**-determination of the cut-off frequency.
6. **Mutual inductance** by absolute method.
7. **L C R parallel circuit** -determination of L and Q-factor.
8. To study the variation of X_C with frequency and determination of 'C'.
9. **Phase measurement** using CRO
10. Maximum Power transfer theorem (dc analysis only)
11. **de-Sauty bridge** – determination and verification of law of capacitance.

FIFTH SEMESTER - Theory

Compulsory paper- Paper- 5

Title of paper: MODERN PHYSICS - I

Course duration: 14 weeks with 03 hours per week

Marks-Theory - 80 + Internal Assessment - 20= 100 **42 hrs.**

PART –A

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

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. Brief mention of LS and JJ coupling for multielectron atoms. **8 hrs.**

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. **2 hrs.**

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

The Raman effect: Experiment, Quantum theory-intensity and polarization of Raman lines, applications **2hrs.**

Lasers. Induced absorption, Spontaneous emission and Stimulated emission, metastable state-population inversion. Three level laser, The He-Ne laser. Properties of laser light. **4 hrs.**

PART -B

Wave mechanics: Failure of classical mechanics in the microscopic domain. de Broglie's concept of matter waves. The Davisson and Germer experiment. Heisenberg's uncertainty principle- the gamma ray microscope, application of uncertainty principle. Setting up of 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. **7 hrs.**

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 its measurement. Theory of alphadecay (qualitative). Geiger-Nuttal law. Beta Decay - Pauli’s neutrino hypothesis, K-electron capture, Internal conversion, Nuclear isomerism. **6 hrs.**

Astrophysics: The Harward classification of stars.Luminosity of star-stellar distances, stellar **6 hrs.**

magnitudes.H-R diagrams.Mass-luminosity relation (qualitative). Structure of Sun. Stellar evolution, Red giants, white dwarfs, neutron stars, black holes, Chandrashekar limit, quasars. Expanding Universe- Hubble's law , Big bang theory (qualitative)

Books for reference:

1. R. Murugeshan and K. Sivaprasath- Modern Physics, 12th ed S. Chand & Co.
2. A.B.Gupta, New Central Book Agency Pvt.Ltd.: Atomic and Nuclear Physics
3. Introduction to Astrophysics – Baidyanath Basu

Books for further reference:

1.Duggal and Chabra : Fundamentals of modern Physics , 8th ed
2. A Beiser : concepts of modern physics. , 6th edition, Tata Mcgraw Hill, New Delhi.
3. D .C Tayal – Nuclear Physics , 5th ed, Himalaya Publishing House
4. S.N. Ghoshal- Nuclear Physics, S. Chand & Co.
5. Irving Kaplan: Nuclear Physics, Narosa Publishing House.
6. A.K. Ghatak : Lasers
7. B B Laud 1995 Wiley Eastern : Lasers and non linear Optics
8.A.K. Saxena : Atomic and Molecular Spectra and Lasers
9.M. C Jain – Quantum Mechanics- A text book for UG

FIFTH SEMESTER -Theory

Elective paper - 1 paper 6.1

Title of paper: CONDENSED MATTER AND NUCLEAR PHYSICS

Course duration – 14 Weeks with 03 hours of instruction per week

42 hrs.

Marks-Theory -80 + Internal Assessment - 20= 100

PART –A

X-rays: Bragg'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 spectra, Duane and Hunt limit. Characteristic x-ray spectra. Moseley's law and its significance. Compton effect- expression for Compton shift. **7hrs.**

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) **4 hrs.**

Liquid Crystals: Symmetry structure and classification of liquid crystals, polymorphism in thermotrophics. Applications. **2 hrs.**

Nano particles: Introduction, Carbon nanotubes, properties, application to medicine, basic principles of drug delivery, toxic effects of nano particles. **3 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 **3hrs.**

Accelerators: Cockcroft-Walton voltage multiplier. LINAC, Cyclotron, Betatron, Proton synchrotron, Electron Synchrotron. **5hrs.**

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

Nuclear reactions: Q-value. Threshold energy of an endoergic reaction. Reactions induced by proton, deuteron and α-particles. Application of nuclear energy in medicine and industry (qualitative) **3 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) **3 hrs.**

Books for reference *:*

1. **R. Murugeshan and K. Sivaprasath - Modern Physics, 12th ed S. Chand & Co.**

2. ***A.B.Gupta, New Central Book Agency Pvt.Ltd.: Atomic and Nuclear Physics***

3. ***S.O. Pillai : Solid State Physics***

Books for further reference :

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

FIFTH SEMESTER - Theory

Elective paper -2 paper 6.2

Title of paper: RENEWABLE ENERGY PHYSICS

Course duration – 14 Weeks with 03 hours of instruction per week **42 hrs.**

Marks-Theory - 80 + Internal Assessment - 20= 100

PART -A

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

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

Solar Energy & its utilization **14 hrs.**

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,

PART –B

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

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

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. **10 hrs.**

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

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, New York.

FIFTH SEMESTER - Theory

Elective paper -3 paper 6.3

***Title of Paper: COMPUTATIONAL PHYSICS AND PROGRAMMING IN C**

Course duration – 14 Weeks with 03 hours of instruction per week **42 hrs.**

Marks-Theory - 80 + Internal Assessment - 20= 100

PART -A

Introduction **2 hrs**.
Computer Algorithms, Definition and properties of Algorithms, writing pseudocodes, logical modules and algorithm development, flow charts, need for structured programming.

C Programming **3 hrs.**
Variable names, data types and their declarations, operators - Arithmetic, logical, relational. Conditional and assignment.

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

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

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

PART -B

Introduction to Arrays & introduction to pointers **5 hrs.**

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

Numerical Methods and their applications in Physics **4 hrs.**
Iterative methods for finding roots of equation: Bisection method and Newton – Rapson method.

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

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

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

References:

1. S S Sastry: Introductory methods of numerical analysis. 3Rd edition, Prentice hall of India Ltd , New Delhi
2. V Rajaraman :Computer programming in C , Prentice hall of India ltd , New Delhi
3. V Rajaraman , Computer oriented Numerical Methods.
4. Yeshwanth Kanitkar : Let us C
5. Kerenininghamand Ritchie: C programming Language.
6. Schaum series: programming with C.

Note: * Computer science students are not eligible to opt for this paper.

FIFTH SEMESTER

Practical -5 Modern Physics - 1

(Course duration: 14 weeks with 2 Hours of lab-work per week.)

Marks -End semester examination -35+ IA - 15 [Record - 5 + Class Test - 10] = 50

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 by Millikan's oil drop method
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 fine structure constant
9. Analysis of rotational spectrum of N_2
10. Study of Spectra of Hydrogen Using Gas Discharge tube – Determination of Rydberg Constant
11. Plank's constant using photo cell
12. Characterstics of GM tube

Practical-6 (combination of compulsory and elective papers)

(Course duration: 14 weeks with 2 Hours of lab-work per week.)

Marks -End semester examination - 35+ IA - 15 [Record -5+Project/Field trip report -10] = 50

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

Compulsory part

1. Determination of range of electron in Al using GM counter
2. Triode Characteristics
3. LDR characteristic
4. Laser - Interference
5. Study of Hall effect
6. Universal logic gates using IC 7400
7. Energy gap of a semi conductor

Elective part

Elective -1

(CONDENSED MATTER AND NUCLEAR PHYSICS)

1. Half-life of K 40.
2. Determination of Dielectric constant of liquid / solid
3. Study of X-ray photograph –determination of interplanar distance
4. Hubble constant
5. Analysis of sunspot photograph
6. Gaussian distribution using radioactive source
7. Dead time of the GM counter by two source method
8. VI Characteristics of LED and determination of Planck's constant
9. VI Characteristics of Solar cell

Elective -2

(RENEWABLE ENERGY PHYSICS)

1. Spectral response of a solar cell.

2. Planck's constant using solar cell.
3. Wind data analysis, velocity and power duration curves.
4. Study of box type solar cooker.
5. Series and parallel connection of PV modules.
6. Study of solar cell – IV characteristics, FF & efficiency.
7. Study of solar dryer.(loss of moisture and drying efficiency)

Elective -3

(**COMPUTATIONAL PHYSICS AND PROGRAMMING IN** C)

1. Programming Exercises -Matrix multiplication
2. Programming Exercises to calculate Standard deviation, Transpose of a matrix
3. Programming Exercises-To write a program for least square fitting a function for given data points.
4. Programming Exercises – To write a function sub program to calculate Sin X or Cos X using series expansion.
5. Programming Exercises -
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 work must emphasize significant ideas &concepts and should address the questions –why it is important, where it is applied, what are its key features &limitations.

SIXTH SEMESTER - Theory

Compulsory paper - Paper 7

Title of paper: MODERN PHYSICS - II

(Course duration : 14 weeks with three hours of instructions per week) **42 hrs.**

Marks-Theory - 80 + Internal Assessment - 20= 100

PART –A

Special theory of Relativity: Michelson-Morley experiment and its outcome. Basic postulates of theory of relativity. Lorentz transformation (no derivation). The Lorentz-Fitzgerald contraction. Time dilation, Relativistic transformation of velocity, frequency and wave number, 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 **8 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, Quantum theory of free electrons in metals, Statement of number of the available energy states between E and E+dE. Expression for the Fermi-energy and average energy. Effect of temperature on Fermi energy. **4 hrs.**

Electrical properties: Hall effect and magneto resistance. Expression for Hall coefficient.(metals and semiconductors). **2 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 of semi-conductor. **5 hrs**.

PART –B

Semiconductor Devices: Review of basic concepts-PN junction diode. Bridge rectifier using diodes. Expression for ripple factor and efficiency. Filters. Special purpose diodes - varactor, Zenor diode and its use as a shunt voltage regulator. **4 hrs.**

Diode applications : Positive, negative and biased clippers and clampers **2 hrs.**

Transistor: Review of basic concepts, Load line analysis of transistor in CE mode, DC load line and Q point .Voltage divider biasing for CE mode-stabilization and stability factor(qualitative) **4 hrs.**

Amplifiers: h parameters, AC equivalent circuit of a transistor in terms of the h parameters.Derivation of the expressions for voltage gain, current gain, power gain, input resistance and output resistance of a single stage CE amplifier **3 hrs.**

Multivibrators-Transistor astable multivibrator, transistor monostable multivibrator. **2 hrs.**

Oscillators: The feedback concept-positive and negative feedback. Effect of negative feedback on gain stability, bandwidth, noise, input and output impedance (no derivation). Barkhausen criteria for oscillation. Types of oscillators - Hartley oscillator**,** phase shift oscillator-Expression for frequency **4 hrs.**

and condition for oscillation (no derivation), crystal oscillator (qualitative)

Logic circuits: Construction of AND, OR & NOT logic gates using Transistors. Symbols, truth table using neither Boolean expression for NOR, NAND and XOR logic gates. **2 hrs**.

Books for reference *:*

R. Murugeshan and K. Sivaprasath- Modern Physics, 12th ed S. Chand & Co.
A.B.Gupta, New Central Book Agency Pvt.Ltd.: Atomic and Nuclear Physics
S.O. Pillai : Solid State Physics
V.K. Mehta : Principles of Electronics

Books for further reference *:*

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.Floyd 2000 III Edition UBS : Digital Fundamentals
8.Digital principles and application – Donal P. Leach, Albert Paul Malvino and Gautam Saha 6th
9.Principles of electronic devices and circuits – B. L theraja and R. S Sedha
10. Fundamentals of Digital Circuits – A. Anand Kumar

SIXTH SEMESTER - Theory

Elective paper -1 Paper 8.1

Title of paper: ANALOG AND DIGITAL ELECTRONICS **

(Course duration : 14 weeks with three hours of instructions per week) **42 hrs.**

PART -A

Network Theorems : Thevenin's theorem, Norton's Theorem, application to the analysis of DC **3 hrs.**

Transistor devices: FET, UJT –working & their characteristics. **2 hrs**.

Transistor Amplifiers: Multistage transistor amplifier - Two stage transistors RC coupled amplifier- Mathematical analysis, frequency response curve, half power frequencies and bandwidth. **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). **4 hrs.**

Radio and TV Communication: Review of basic concepts of amplitude modulation, 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). Basics of colour television. **6 hrs.**

Other Communication System: Principle of microwave and satellite communication, mobile communication- cellular telephony. **3 hrs.**

PART –B

Number system and Boolean Algebra: Binary and Hexadecimal number systems. Conversion between decimal, binary and hexadecimal. Binary addition, binary subtraction using one's and two's complements. DeMorgan's theorem, Boolean equation and realization using basic gates **3 hrs.**

Combinational &sequential circuits: NAND and NOR as universal gates, Half adder, Full adder using basic gates & XOR gates. RS and JK flip flop (clocked version). **3 hrs.**

IC logic gates: TTL and CMOS gates -their characteristics. **3 hrs.**

Integrated circuits : Types, fabrication of components on monolithic IC **3hrs.**

Analog to Digital Converters: counter comparator ADC, successive approximation type ADC. **3 hrs.**

Digital to Analog Converters: Weighted resistor DAC, Resistor ladder DAC. **3 hrs.**

Memory devices: Memory terminologies, volatile and non volatile memory, static and dynamic RAM magnetic, optical and ferroelectric memory. **3 hrs.**

Books for reference

1. Introductory circuit analysis : Robert Boylestad

2. V.K. Mehta : Electronics

3. A. Anand Kumar : Fundamentals of Digital Circuits

4. Malvino and Leach : Digital principles and applications

5. Gulati RR: Monochrome and Colour Television, Wiley eastern Ltd, New Delhi.

Books for further reference

1. Alan Motttershead: Electronic devices and circuits, Prentice hall of India ltd , New Delhi .
2. Malvino : Electronic principles , Fifth edition
3. Kennedy George , Tata Mcgraw Hill: Electronic Communication Systems
4. Deshpande Etal : Communication Electronics
5. Modern Digital Electronics: R P Jain

Note:** **Electronics students are not eligible to opt for this paper**

SIXTH SEMESTER - Theory

Elective paper - 2 Paper 8.2

Title of paper: PHOTONICS

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

Marks-Theory - 80 + Internal Assessment - 20= 100 **42 hrs.**

PART –A

LASERS: **2 hrs.**
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.

Laser oscillator: Pumping schemes, Gain-threshold conditions, Optical feedback and Optical resonator. **4 hrs.**

Types of Lasers: Nd -YAG, CO_2 and Dye lasers – construction and principles of working **3 hrs.**

5 hrs.

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.

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

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

PART –B

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

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

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

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. **11 hrs.**

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 I

SIXTH SEMESTER - Theory

Elective paper – 3: Paper 8.3

Title of paper: COMMUNICATION SYSTEMS**

(Course duration: 14 weeks with three hours of instructions per week) **42 hrs.**

Marks-Theory - 80 + Internal Assessment -20= 100

PART –A

Signal & Noise: Distinction between Signal and Noise. Signal to noise and its importance in Communication**.** **2 hrs.**

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

Loud Speakers: Direct radiator dynamic type, expression for efficiency, radiated output power, Horn Loudspeaker, cut-off frequency, measurement of acoustic power and pressure response of a speaker **5 hrs.**

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 **6 hrs.**

Multiplexing: Types of multiplexing and methods of grouping **2 hrs.**

Demodulation: Detection and demodulation of FM signal using foster seely discrimination **2 hrs.**

PART –B

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

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

Antennas: **7 hrs.**
Types of antenna –elementary ideas of Resonant antenna, High 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.

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 paper**

SIXTH SEMESTER

Practical -7 MODERN PHYSICS - II

(Course duration: 14 Weeks with 2 Hours of lab-work per week.)

Marks - End semester examination - 35+ IA - 15 [Record - 5 + Class Test - 10] =50

Practical -7 (Compulsory paper experiments)

Any **eight** of the following experiments

1. Positive and Negative clippers using diodes
2. Zener diode as a shunt voltage regulator.
3. Negative feedback CE amplifier
4. The logic gates AND, OR and NOT using transistors.
5. Astable multivibrator
6. Modulation and Demodulation
7. Monostable multivibrator
8. Hartley oscillator.
9. Bridge Rectifier - Without & with C and pi section filters.
10. Fermi energy of copper.

Practical-8 (Combination of compulsory and elective papers)

(Course duration: 14 Weeks with 2 Hours of lab-work per week.)

Marks -End semester examination - 35+ IA - 15 [Record -5+Project/Field trip report - 10] =50

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

Compulsory part

1. Verification of Thevenin's Theorem
2. A study of Characteristics of FET
3. Universal gate using IC 7402
4. Phase shift Oscillator
5. Characteristics of Photodiode
6. Diode as a Sensor

Elective part

Elective -1 (ANALOG AND DIGITAL ELECTRONICS)

1. UJT characteristics
2. Full Adder
3. Study of opamp inverting and non inverting dc amplifier
4. 3 bit DAC using R-2R ladder network
5. Frequency response of opamp inverting amplifier
6. RS and JK Flip Flop (clocked version)

Elective -2 (PHOTONICS)

1. Measurement of efficiency and output power of LED
2. Characteristics of Diode Laser –Measurement of output power, LI curves
3. Study of optical fibre.

4. Study of Optocoupler.
5. Study of Divergence of Diode laser.
6. Determination of Planck's constant using LED

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 work must emphasize significant ideas &concepts and should address the questions –why it is important, where it is applied, what are its key features & limitations.