RAJEEV GANDHI GOVT. POST GRADUATE COLLEGE,

AMBIKAPUR, SURGUJA (CG), INDIA

Learning Outcomes based Curriculum Framework

FOR

UNDERGRADUATE PROGRAMME

B.Sc. (PHYSICS)

SEMESTER SYSTEM

SESSION 2021-2022

DEPARTMENT OF PHYSICS

VISION

The vision of the Physics Department is to provide in proficiency both in depth understanding of principles and concept of Physics, theoretical and experimental Physics. The Department aims to enhance the students' knowledge in basic and applied physics. To inculcate aptitude for a research career in academia or industry by introducing advanced ideas and techniques that are applicable while emphasizing the underlying concepts of Physics.

MISSION

- To impart quality education in Physics such that they aim to become Scientists in reputed Research Organisations. To make the students effectively disseminate their knowledge in Physics to coming generations..
- Develop the capacity and know -how to apply principles/laws of Physics to solve the problems. The ability to do and interpret the data obtained in experiments. To become a center of excellence and extend research facilities.
- Apply the Physics knowledge for sustainable development useful for society. Assume responsibility and always practice ethical principles. To function effectively as individual as well as in a team.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Professional Skill Development To provide professional training and skill development to students in physical sciences, related disciplines and nurture them to become responsible persons in the society.
PEO 2	Core Competency Development To augment their core-competencies and knowledge levels in science, humanities and inter-disciplinary areas by imparting education of high standards and advanced technological tools.
PEO 3	Innovative Curriculum of Global Relevance To upgrade the curriculum periodically based on scientific advancements, innovations and societal relevance, so as to cater to the shifting global demands.
PEO 4	Environmental Sensitivity and Sustainability To infuse environmental sensitivity in students through academic activities and hence equip them with technical skills and scientific knowledge required to protect and safeguard the environment for a sustainable future.
PEO 5	Ethical Principles and Holistic Development To promote ethical values and focus on the holistic development of students to become proficient, skilled, competent and socially responsible people.
PEO 6	Accessibility and Academic Excellence To provide an accessible learning environment of excellence and equal opportunity to students, enabling them to develop their creativity, critical thinking, and leadership and employability skills.

PROGRAMME OUTCOMES (POs)

PO 1	Disciplinary and inter-disciplinary knowledge for capacity building Students will acquire improved knowledge of the laws governing nature through classroom teaching and experimenting in the laboratories. They will develop a sense of interdisciplinary approach to identify and resolve issues through project, seminars, field work, internships and industrialvisits.
PO 2	Skills for effective and efficient communication Students will be able to improve and enhance their communication skills such as reading, writing, listening and speaking. This will help them to express their ideas clearly and effectively and subsequently empower them to become agents of social change and hence pave the way for betterment of the society at large.
PO 3	Sense of inquiry and problem-solving skills Students will demonstrate the core competencies of their discipline through analytical reasoning, problem solving and research related skills, cooperation, team work, scientific reasoning and thinking that would make them emerge as entrepreneurs or administrative personnel.
PO 4	Skills to impact society Students will develop leadership, team spirit and other skills which will help them to identify, approach and analyze the existing societal problems with an eye to look beyond gender, age, caste, creed or nationality and work for the emancipation and empowerment of humanity.
PO 5	Energy, Ethics and Environment They will be able to involve themselves in framing policies and develop scientific temper to harness energy and work on alternate resources. They will be aware of the environmental issues and imbibe the spirit of ethical values in establishing a self-sustained environment for a healthy society.
PO 6	Self-directed and lifelong learning Through digital literacy, students will engage in self-paced and curious learning with limitless knowledge acquisition and hence develop motivation for a sustained lifelong learning capability. Students will accumulate knowledge by continuous learning and leverage the past knowledge seamlessly to solve the problems in the future.
PO 7	National and international-priorities preferences and perspectives Students will be able to prioritize national and global issues with an aim to build a nation and an integrated world through contributions that imbibe the spirit of multicultural competency, creative thinking, critical analysis, political awareness and the much-needed international policies.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	Acquire scientific temper leading to critical thinking and research motivation in Physics and its allied areas.
PSO 2	Gain knowledge and the skills to measure some of the properties of solid materials and understand the underlying principles governing the dynamics of rigid bodies.
PSO 3	Appreciate the principles of optics, electricity and magnetism and their applications in daily life.
PSO 4	Design and construct electronic circuits with computer interfacing for sophisticated analysis of material behavior and properties.
PSO 5	Comprehend algebraic concepts and advanced mathematical tools involved in the interpretation of various physical properties of materials.
PSO 6	Attain the required skills to interpret the Physics behind the phenomena occurring in nature and surroundings and hence apply them to enhance our life style.
PSO 7	Develop essential logical and analytical skills to approach a problem both quantitatively and qualitatively.

Graduate attributes in Physics

Some of the characteristic attributes of a graduate in Physics are

- **Disciplinary knowledge and skills:** Capable of demonstrating

  (i) good knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics and its different subfields like Astrophysics and Cosmology, Material science, Nuclear and Particle Physics, Condensed matter Physics, Atomic and Molecular Physics, Mathematical Physics, Analytical dynamics, Space science and other related fields of study, including broader interdisciplinary subfields like Chemistry, Mathematics, Life sciences, Environmental sciences, Atmospheric Physics, Computer science, Information Technology etc.

  (ii) ability to use modern instrumentation and laboratory techniques to design and perform experiments is highly desirable in almost all the fields of Physics listed above in (i).

- **Skilled communicator:** Ability to transmit complex technical information relating all areas in Physics in a clear and concise manner in writing and oral ability to present complex and technical concepts in a simple language for better understanding.
- **Critical thinker and problem solver:** Ability to employ critical thinking and efficient problem solving skills in all the basic areas of Physics.
- **Sense of inquiry:** Capability for asking relevant/appropriate questions relating to the issues and problems in the field of Physics, and planning, executing and reporting the results of a theoretical or experimental investigation.
- **Team player/worker**: Capable of working effectively in diverse teams in both classroom, laboratory, Physics workshop and in industry and field-based situations.
- **Skilled project manager:** Capable of identifying/mobilizing appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and laboratory hygiene regulations and practices.
- **Digitally Efficient*:*** Capable of using computers for simulation studies in Physics and computation and appropriate software for numerical and statistical analysis of data, and employing modern e-library search tools like Inflibnet, various websites of the renowned Physics labs in countries like the USA, Europe, Japan etc. to locate, retrieve, and evaluate Physics information.
- **Ethical awareness / reasoning*:*** The graduate should be capable of demonstrating ability to think and analyze rationally with modern and scientific outlook and identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, and adopting objectives, unbiased and truthful actions in all aspects of work.

- **National and international perspective*:*** The graduates should be able to develop a national as well as international perspective for their career in the chosen field of the academic activities. They should prepare themselves during their most formative years for their appropriate role in contributing towards the national development and projecting our national priorities at the international level pertaining to their field of interest and future expertise.
- **Lifelong learners:** Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.

Qualification descriptors for a UG programs in Physics

The qualification descriptors for a B.Sc. (CS), B.Sc. (PCM), B.Sc. (PEM), B.Sc. (PMC) program may include the following.

The graduates should be able to:

- Demonstrate

  (i) a fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas like Astrophysics, Material science, Nuclear and Particle Physics, Condensed matter Physics, Atomic and Molecular Physics, Mathematical Physics, Analytical dynamics, Space science and applications, and its linkages with related disciplinary areas/subjects like Chemistry, Mathematics, Life sciences, Environmental sciences, Atmospheric Physics, Computer science, Information Technology;

  (ii) procedural knowledge that creates different types of professionals related to different areas of study in Physics outlined above, including research and development, teaching and government and public service;

  (iii) skills in areas related to specialization area relating the subfields and current developments in the academic field of Physics.

- Use knowledge, understanding and skills required for identifying problems and issues relating to Physics, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources from various Physics laboratories of the world, and their application, analysis and evaluation using methodologies as appropriate to Physics for formulating new theories and concepts.
- Communicate the results of studies undertaken accurately in a range of different contexts using the main concepts, constructs and techniques of Physics. Develop communication abilities to present these results in technical as well as popular science meetings organized in various universities and other private organizations.
- Ability to meet one's own learning needs, drawing on a range of current research and development work and professional materials, and interaction with other physicists around the world.
- Apply one's knowledge of Physics and theoretical and laboratory skills to new/unfamiliar contexts to identify and analyse problems and issues and solve complex problems in Physics and related areas with well-defined solutions.
- Demonstrate Physics-related technological skills that are relevant to Physics-related job trades and employment opportunities.

The Programmelearning outcomes relating to B.Sc. Course in Physics:

The student graduating with the Degree B.Sc. (CS), B.Sc. (PCM), B.Sc. (PEM), B.Sc. (PMG) should be able to

- Acquire

  (i) a fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Astrophysics, Material science, Nuclear and Particle Physics, Condensed matter Physics, Atomic and Molecular Physics, Mathematical Physics, Analytical dynamics, Space science, and its linkages with related disciplinary areas / subjects like Chemistry, Mathematics, Life sciences, Environmental sciences, Atmospheric Physics, Computer science, Information Technology;

(ii)procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Physics, including professionals engaged in research and development, teaching and government/public service;

(iii)skills in areas related to one's specialization area within the disciplinary/subject area of Physics and current and emerging developments in the field of Physics.

- Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics-related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.
- Recognize the importance of mathematical modeling simulation and computing, and the role of approximation and mathematical approaches to describing the physical world.
- Plan and execute Physics-related experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose-written packages, and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of Physics.
- Demonstrate relevant generic skills and global competencies such as (i) problem-solving skills that are required to solve different types of Physics-related problems with well-defined solutions, and tackle open-ended problems that belong to the disciplinary-area boundaries; (ii) investigative skills, including skills of independent investigation of Physics-related issues and problems; (iii) communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature; (iv) analytical skills involving paying attention to detail and ability to construct logical arguments using correct technical language related to Physics and ability to translate them with popular language when needed; (v) ICT skills; (vi) personal skills such as the ability to work both independently and in a group.
- Demonstrate professional behavior such as (i) being objective, unbiased and truthful in all aspects

of work and avoiding unethical, irrational behavior such as fabricating, falsifying or misrepresenting data or committing plagiarism; (ii)the ability to identify the potential ethical issues in work-related situations; (iii) appreciation of intellectual property, environmental and sustainability issues; and

(iv) promoting safe learning and working environment.

The B.Sc.(Physics) programme is a three-year course divided into six semesters. The syllabus and schemes of examination are detailed herewith.

ACADEMIC PROGRAMMES & SCHEMES
B.Sc.(Physics)

FIRST SEMESTER:

Paper	Paper Code	Course (Paper/Subjects)	Semester Exam		Continuous Comprehensive Evaluation(CCE) (Internal Evaluation)					Grand Total
			Max. Marks	Min. Qualifying Marks	Test	Seminar	Assignment	Total	Min. Qualifying Marks	
I.	PHY 101	MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER	50	18	08	08	09	25	09	75

SECOND SEMESTER:

Paper	Paper Code	Course (Paper/Subjects)	Semester Exam		Continuous Comprehensive Evaluation(CCE) (Internal Evaluation)					Grand Total
			Max. Marks	Min. Qualifying Marks	Test	Seminar	Assignment	Total	Min. Qualifying Marks	
I	PHY 201	ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY	50	18	08	08	09	25	09	75
II	PHY 202	PHYSICS PRACTICAL LAB-I	50	18	-	-	-	-	-	50

THIRD SEMESTER:

Paper	Paper Code	Course (Paper/Subjects)	Semester Exam		Continuous Comprehensive Evaluation(CCE) (Internal Evaluation)					Grand Total
			Max. Marks	Min. Qualifying Marks	Test	Seminar	Assignment	Total	Min. Qualifying Marks	
	PHY 301	THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS	50	18	08	08	09	25	09	75

FOURTH SEMESTER:

Paper	Paper Code	Course (Paper/Subjects)	Semester Exam		Continuous Comprehensive Evaluation(CCE) (Internal Evaluation)					Grand Total
			Max. Marks	Min. Qualifying Marks	Test	Seminar	Assignment	Total	Min. Qualifying Marks	
I.	PHY 401	WAVES, ACOUSTICS AND OPTICS	50	18	08	08	09	25	09	75
II.	PHY 402	PHYSICS PRACTICAL LAB-II	50	18	-	-	-	-	-	50

FIFTH SEMESTER:

Paper	Paper Code	Course (Paper/Subjects)	Semester Exam		Continuous Comprehensive Evaluation(CCE) (Internal Evaluation)					Grand Total
			Max. Marks	Min. Qualifying Marks	Test	Seminar	Assignment	Total	Min. Qualifying Marks	
I	PHY 501	RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS	50	18	08	08	09	25	09	75

SIXTH SEMESTER:

Paper	Paper Code	Course (Paper/Subjects)	Semester Exam		Continuous Comprehensive Evaluation(CCE) (Internal Evaluation)					Grand Total
			Max. Marks	Min. Qualifying Marks	Test	Seminar	Assignment	Total	Min. Qualifying Marks	
I	PHY 601	SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS	50	18	08	08	09	25	09	75
II	PHY 602	PHYSICS PRACTICAL LAB-III	50	18	-	-	-	-	-	50

B.Sc. Semester-I

Paper-I: Mechanics, Oscillations and Properties of matters

Course Outcomes

After completing the course the students will able to : -

1. Understand laws of motion and their application to various dynamical situations, motion of inertial frames and concept of Galilean invariance. He / she will learn the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
2. Understand the analogy between translational and rotational dynamics, and application of both motions simultaneously in analyzing rolling with slipping.
3. Write the expression for the moment of inertia about the given axis of symmetry for different uniform mass distributions.
4. Understand the phenomena of collisions and idea about center of mass and laboratory frames and their correlation.
5. Understand the principles of elasticity through the study of Young Modulus and modulus of rigidity.
6. Understand simple principles of fluid flow and the equations governing fluid dynamics.
7. Apply Kepler's law to describe the motion of planets and satellite in circular orbit, through the study of law of Gravitation.
8. Explain the phenomena of simple harmonic motion and the properties of systems executing such motions.
9. In the laboratory course, the student shall perform experiments related to mechanics (compound pendulum), rotational dynamics (Flywheel), elastic properties (Young Modulus and Modulus of Rigidity) and fluid dynamics (verification of Stokes law, Searle method) etc.

B.Sc. (PHYSICS)	FIRST SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY101		
PAPER TITLE: MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER		
MARKS: 75 THEORY: 50	CCA : 30	PRACTICAL: 00

Scheme of marks:

i. Objective type questions: 08 questions carrying 1 marks each to be asked.
ii. Short answer type questions: 03 questions carrying 2 marks each to be asked. (Word limit 70-100 words).
iii. Middle answer type questions: 04 questions carrying 3 marks each to be asked. (Word limit 200-250 words).
iv. Long answer type questions: 03 questions carrying 08 marks each to be asked. (Word limit 500-600 words).

UNIT-1 15Hours	Cartesian, Cylindrical and Spherical coordinate system, Inertial and non-inertial frames of reference, uniformly rotating frame, Coriolis force and its applications. Motion under a central force, Kepler's laws. Effect of Centrifugal and Coriolis forces due to earth‟s rotation, Center of mass (C.M.), Lab and C.M. frame of reference, motion of C.M. of system of particles subject to external forces, elastic, and inelastic collisions in one and two dimensions, Scattering angle in the laboratory frame of reference, Conservation of linear and angular momentum, Conservation of energy..
UNIT-2 20Hours	Rigid body motion, rotational motion, moments of inertia and their products, principal moments & axes, introductory idea of Euler's equations. Potential well and Periodic Oscillations, case of harmonic small oscillations, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations: spring and mass system, simple and compound pendulum, torsional pendulum.
UNIT-3 20 Hours	Bifilar oscillations, Helmholtz resonator, LC circuit, vibrations of a magnet, oscillations of two masses connected by a spring. Superposition of two simple harmonic motions of the same frequency, Lissajous figures, damped harmonic oscillator, case of different frequencies. Power dissipation, quality factor, examples, driven (forced) harmonic oscillator, transient and steady states, power absorption, resonance.
UNIT-4 20Hrs	E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as deflecting field- CRO sensitivity, Transverse B field, 180o deflection, mass spectrograph, curvatures of tracks for energy determination, principle of a cyclotron. Mutually perpendicular E and B fields: velocity selector, its resolution. Parallel E and B fields, positive ray parabolas, discovery of isotopes, elements of mass spectrography, principle of magnetic focusing lens.
UNIT- 5 15Hrs	Elasticity: Strain and stress, elastic limit, Hooke‟s law, Modulus of rigidity, Poisson‟s ratio, Bulk modulus, relation connecting different elastic- constants, twisting couple of a cylinder (solid and hallow), Bending moment, Cantilever, Young modulus by bending of beam. Viscosity: Poiseulle‟s equation of liquid flow through a narrow tube, equations of continuity. Euler's equation, Bernoulli‟s theorem, viscous fluids, streamline and turbulent flow. Poiseulle's law, Coefficient of viscosity, Stoke‟s law, Surface tension and molecular interpretation of surface tension, Surface energy, Angle of contact, wetting.

SUGGESTED READINGS	E M Purcell, Ed Berkely physics course, vol. Mechanics (Mc. Gr. Hill) R P Feynman. R B Lighton and M Sands, the Feynman lectures in physics, vol I (B) publications,Bombay, Delhi, Calcutta, Madras. 2. D P Khandelwal, Oscillations and waves (Himalaya Publishing House Bombay). R. K. Ghosh, The Mathematics of waves and vibrations (Macmillan 1975). J.C. Upadhyaya- Mechanics (Hindi and English Edition.). D.S. Mathur- Mechanics and properties of matter. Brijlal and Subramanium- Oscillations and waves. Resnick and Halliday- Volume I. physics Part –1: Resnick and Halliday.

B.Sc. Semester-II

Paper-I: Electricity, Magnetism and Electromagnetic Theory

Course Outcomes

After completing the course the students will able to : -

1. Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.
2. Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.
3. Apply Gauss's law of electrostatics to solve a variety of problems.
4. Articulate knowledge of electric current, resistance and capacitance in terms of electric field and electric potential.
5. Demonstrate a working understanding of capacitors.
6. Describe the magnetic field produced by magnetic dipoles and electric currents.
7. Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.
8. Understand the dielectric properties, magnetic properties of materials and the phenomena of electromagnetic induction.
9. Describe how magnetism is produced and list examples where its effects are observed.
10. Apply Kirchhoff's rules to analyze AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.
11. Apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, Maximum Power Transfer, etc. and their applications in electronics, electrical circuit analysis, and electrical machines.
12. In the laboratory course the student will get an opportunity to verify various laws in electricity and magnetism such as Lenz's law, Faraday's law and learn about the construction, working of various measuring instruments.
13. Should be able to verify of various circuit laws, network theorems elaborated above, using simple electric circuits.

B.Sc. (PHYSICS)	SECOND SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY201		
PAPER TITLE: ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY		
MARKS: 75 THEORY: 50	CCA : 30	PRACTICAL: 00

Scheme of marks:

v. Objective type questions: 08 questions carrying 1 marks each to be asked.
vi. Short answer type questions: 03 questions carrying 2 marks each to be asked. (Word limit 70-100 words).
vii. Middle answer type questions: 04 questions carrying 3 marks each to be asked. (Word limit 200-250 words).
viii. Long answer type questions: 03 questions carrying 08 marks each to be asked. (Word limit 500-600 words).

UNIT-1 15Hours	Repeated integrals of a function of more than one variable, definition of a double and triple integral. Gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, and their geometrical interpretation, line, surface and volume integrals, flux of a vector field. Gauss's divergence theorem, Green's theorem and Stoke‟s theorem and their physical significance.Kirchoff's law, Ideal Constant-voltage and Constant-current Sources.Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem.
UNIT-2 20Hours	Coulomb‟s law in vacuum expressed in Vector forms, calculations of E for simple distributions of charges at rest, dipole and quadrupole fields. Work done on a charge in a electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Relation between Electric potential and Electric field, torque on a dipole in a uniform electric field and its energy, flux of the electric field. Gauss's law and its application: E due to (1) an Infinite Line of Charge, (2) a Charged Cylindrical Conductor, (3) an Infinite Sheet of Charge and Two Parallel Charged Sheets, capacitors, electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field.
UNIT-3 20 Hours	Dielectric constant, Polar and Non Polar dielectrics, Dielectrics and Gauss‟s Law, Dielectric Polarization, Electric Polarization vector P, Electric displacement vector D. Relation between three electric vectors, Dielectric susceptibility and permittivity, Polarizability and mechanism of Polarization, Lorentz local field, Clausius Mossotti equation, Debye equation, Ferroelectric and Paraelectric dielectrics, Steady current, current density J, non-steady currents and continuity equation, rise and decay of current in LR, CR and LCR circuits, decay constants, AC circuits, complex numbers and their applications in solving AC circuit problems, complex impedance and reactance, series and parallel resonance, Q factor, power consumed by an a AC circuit, power factor.
UNIT-4 20Hrs	Magnetization Current and magnetization vector M, three magnetic vectors and their relationship, Magnetic permeability and susceptibility, Diamagnetic, paramagnetic and ferromagnetic substances. B.H. Curve, cycle of magnetization and hysteresis, Hysteresis loss. Biot-Savart‟s Law and its applications: B due to (1) a Straight Current Carrying Conductor and (2) Current Loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole).Ampere‟s Circuital law (Integral and Differential Forms).

UNIT- 5 15Hrs	Electromagnetic induction, Faraday's law, electromotive force, integral and differential forms of Faraday's law Mutual and self inductance, Transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density. The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, Poynting's vector.
SUGGESTED READINGS	Berkeley Physics Course, Electricity and Magnetism, Ed. E.M. Purcell (Mc Graw-Hill). Halliday and Resnik, Physics, Vol. 2. D J Grifith, Introduction to Electrodynamics (Prentice-Hall of India). Raitz and Milford, Electricity and Magnetism (Addison-Wesley). A S Mahajan and A A Rangwala, Electricity and Magnetism (Tata Mc Graw-hill). A M Portis, Electromagnetic fields. Pugh & Pugh, Principles of Electricity and Magnetism (Addison-Wesley). Panofsky and Phillips, Classical Electricity and Magnetism, (India Book House). S S Atwood, Electricity and Magnetism (Dover).

B.Sc. (PHYSICS)	SECOND SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY202		
PAPER TITLE: PHYSICS PRACTICAL LAB-I		
MARKS: 50 THEORY: 00	PRACTICAL: 50	

GROUP-A

LIST OF EXPERIMENTS

1. Study of laws of parallel and perpendicular axes for moment of inertia.
2. Moment of inertia of Fly wheel.
3. Moment of inertia of irregular bodies by inertia table.
4. Study of conservation of momentum in two dimensional oscillations.
5. Study of a compound pendulum.
6. Study of damping of a bar pendulum under various mechanics.
7. Study of oscillations under a bifilar suspension.
8. Study of modulus of rigidity by Maxwell‟s needle.
9. Determination of Y, k, η by Searl‟s apparatus.
10. To study the oscillation of a rubber band and hence to draw a potential energy curve from it.
11. Study of oscillation of a mass under different combinations of springs.
12. Study of torsion of wire (static and dynamic method).
13. Poisson‟s ratio of rubber tube.
14. Study of bending of a cantilever or a beam.
15. Study of flow of liquids through capillaries.
16. Determination of surface tension of a liquid.
17. Study of viscosity of a fluid by different methods

GROUP-B

LIST OF EXPERIMENTS

1. Use of a vibration magnetometer to study a field.
2. Study of magnetic field B due to a current.
3. Measurement of low resistance by Carey-Foster bridge.
4. Measurement of inductance using impedance at different frequencies.
5. Study of decay of currents in LR and RC circuits.
6. Response curve for LCR circuit and response frequency and quality factor.
7. Study of waveforms using cathode-ray oscilloscope.
8. Characteristics of a choke and Measurement of inductance.
9. Study of Lorentz force.
10. Study of discrete and continuous LC transmission line.
11. Elementary FORTRAN programs, Flowcharts and their interpretation.
12. To find the product of two matrices.
13. Numerical solution of equation of motion.
14. To find the roots of quadratic equation.
15. To find the product of two matrices.
16. Numerical solution of equation of motion.
17. To find the roots of quadratic equation.

B.Sc. Semester-III

Paper-I: Thermodynamics, Kinetic Theory and Statistical Physics

Course Outcomes

After completing the course the students will able to : -

1. Comprehend the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.
2. Learn about Maxwell's thermodynamic relations.
3. Learn the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equitation of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.
4. Learn about the real gas equations, Van der Waal equation of state, the Joule-Thompson effect.
5. In the laboratory course, the students are expected to do some basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity, temperature coefficient of resistant, variation of thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.
6. Understand the concepts of microstate, macrostate, ensemble, phase space, thermodynamic probability and partition function.
7. Understand the combinatoric studies of particles with their distinguishably or indistinguishably nature and conditions which lead to the three different distribution laws e.g. Maxwell-Boltzmann distribution, Bose-Einstein distribution and Fermi-Dirac distribution laws of particles and their derivation.
8. Comprehend and articulate the connection as well as dichotomy between classical statistical mechanics and quantum statistical mechanics.
9. Learn to apply the classical statistical mechanics to derive the law of equipartition of energy and specific heat.
10. Understand the Gibbs paradox, equipartition of energy and concept of negative temperature in two level system.
11. Learn to derive classical radiation laws of black body radiation. Wiens law, Rayleigh

B.Sc. (PHYSICS)	THIRD SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY301		
PAPER TITLE:	THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS	
MARKS: 75		
THEORY: 50	CCA : 30	PRACTICAL: 00

Scheme of marks:

i. Objective type questions: 08 questions carrying 1 marks each to be asked.
ii. Short answer type questions: 03 questions carrying 2 marks each to be asked. (Word limit 70-100 words).
iii. Middle answer type questions: 04 questions carrying 3 marks each to be asked. (Word limit 200-250 words).
iv. Long answer type questions: 03 questions carrying 08 marks each to be asked. (Word limit 500-600 words).

UNIT-1 15Hours	The laws of thermodynamics: The Zeroth law, first law of thermodynamics, internalenergy as a state function, reversible and irreversible change, Carnot's cycle, carnottheorem, second law of thermodynamics. Claussius theorem inequality.Entropy, Changeof entropy in simple cases (i) Isothermal expansion of an ideal gas (ii) Reversibleisochoric process (iii) Free adiabatic expansion of an ideal gas.Concept of entropy,Entropy of the universe.Entropy change in reversible and irreversible processes, Entropyof Ideal gas, Entropy as a thermodynamic variable, S-T diagram, Principle of increase ofentropy.The thermodynamic scale of temperature, Third law of thermodynamics,Concept of negative temperature.
UNIT-2 20Hours	Thermodynamic functions, Internal energy, Enthalpy, Helmholtz function and Gibb'sfree energy, Maxwell's thermodynamical equations and their applications, TdS equations,Energy and heat capacity equations Application of Maxwell's equation in JouleThomson cooling, adiabatic cooling of a system, Van der Waals gas, Clausius- Clapeyronheat equation. Blackbody spectrum, Stefan-Boltzmann law, Wien's displacement law,Rayleigh-Jean's law, Planck's quantum theory of radiation.
UNIT-3 20 Hours	Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and velocities,experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Transport phenomena in gases: Molecularcollisions mean free path and collision cross sections. Estimates of molecular diameterand mean free path.Transport of mass, momentum and energy and interrelationship,dependence on temperature and pressure. Behaviour of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation.Andrew's Experiments on CO_2 Gas.Critical Constants.
UNIT-4 20Hrs	The statistical basis of thermodynamics: Probability and thermodynamic probability,principle of equal a priori probabilities, statistical postulates. Concept of Gibb'sensemble, accessible and inaccessible states.Concept of phase space, γ phase space and μ phase space.Equilibrium before two systems in thermal contact, probability and entropy,Boltzmann entropy relation. Boltzmann canonical distribution law and its applications,law of equipartition of energy.Transition to quantum statistics: ' h' as a natural constant and its implications, cases ofparticle in a one-dimensional box and one- dimensional harmonic oscillator.
UNIT- 5 15Hrs	Indistinguishability of particles and its consequences, Bose-Einstein & Fermi- Diracconditions, Concept of partition function, Derivation of Maxwell-Boltzmann, BoseEinstein and Fermi-Dirac Statistics, Limits of B-E and F-D statistics to M-B statistics.Application of B-E statistics to black body radiation, Application of F-D statistics to freeelectrons in a metal.

SUGGESTED READINGS	B.B. Laud, " Introduction to Statistical Mechanics" (Mcmillan 1981) F. Reif: " Statistical Physics" (Mcgraw-Hill, 1998). K, Haung: " Statatistical Physics" (Wiley Eastern, 1988). Thermal and statistical Physics: R.K. Singh, Y.M. Gupta and S. Sivraman. Statistical Physics: Berkeley Physics Course, Vol. 5 Physics (Part-2): Editor, Prof. B.P. Chandra, M.P. Hindi Granth Academy. Heat and Thermodynamics: K.W. Zeemansky. Thermal Physics: B.K. Agarwal. Heat and Thermodynamics: BrijLal and N. Subramanyam. Heat and Thermodynamics: Dayal, Verma and Pandey. A Treatise on Heat: M.N. Saha and B.N. Srivastava.

B.Sc. Semester-IV

Paper-I: Waves, Acoustics and Optics

Course Outcomes

After completing the course the students will able to : -

1. Recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems.
2. Apply basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.
3. Understand the principle of superposition of waves, so thus describe the formation of standing waves.
4. Explain several phenomena we can observe in everyday life that can be explained as wave phenomena.
5. Use the principles of wave motion and superposition to explain the Physics of polarisation, interference and diffraction.
6. Understand the working of selected optical instruments like biprism, interferometer, diffraction grating, and holograms.
7. In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. Resolving power of optical equipment can be learnt firsthand.
8. The motion of coupled oscillators, study of Lissajous figures and behaviour of transverse, longitudinal waves can be learnt in this laboratory course.

9. Understand the spontaneous and stimulated emission of radiation, optical pumping and population inversion. Three level and four level lasers. Ruby laser and He-Ne laser in details. Basic lasing.

B.Sc. (PHYSICS)	FOURTH SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY401		
PAPER TITLE: WAVES, ACOUSTICS AND OPTICS		
MARKS: 75 **THEORY: 50**	**CCA : 30**	**PRACTICAL: 00**

Scheme of marks:

v. Objective type questions: 08 questions carrying 1 marks each to be asked.
vi. Short answer type questions: 03 questions carrying 2 marks each to be asked. (Word limit 70-100 words).
vii. Middle answer type questions: 04 questions carrying 3 marks each to be asked. (Word limit 200-250 words).
viii. Long answer type questions: 03 questions carrying 08 marks each to be asked. (Word limit 500-600 words).

UNIT-1 15Hours	Waves in media: Speed of transverse waves on uniform string, speed of longitudinalwaves in a fluid, energy density and energy transmission in waves. Waves over liquidsurface: gravity waves and ripples. Group velocity and phase velocity and relationshipbetween them. Production and detection of ultrasonic and infrasonic waves andapplications. Reflection, refraction and diffraction of sound: Acoustic impedance of a medium,percentage reflection & refraction at a boundary, impedance matching for transducers,diffraction of sound, principle of a sonar system, sound ranging.
UNIT-2 20Hours	Fermat's Principle of extremum path, the aplanatic points of a sphere and otherapplications. Cardinal points of an optical system, thick lens and lens combinations.Lagrange equation of magnification, telescopic combinations, telephoto lenses.Monochromatic aberrations and their reductions; aspherical mirrors and Schmidtcorrector plates, aplanatic points, oil immersion objectives, meniscus lens.Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, commontypes of eyepieces. (Ramsdon and Hygen's eyepieces).
UNIT-3 20 Hours	Interference of light: The principle of superpositions, two slit interference, coherence requirement for the sources, optical path retardations, Conditions for sustainedinterference, Theory of interference, Thin films. Newton's rings and Michelsoninterferometer and their applications its application for precision determinations ofwavelength, wavelength difference and the width of spectral lines.Multiple beaminterference in parallel film and Fabry-Perot interferometer.Rayleigh refractometer,Twyman-Green interferometer and its uses.
UNIT-4 20Hrs	Diffraction, Types of Diffraction, Fresnel's diffraction, half-period zones, phasordiagramand integral calculus methods, the intensity distribution, Zone plates, diffraction due tostraight edge, Fraunhofer diffraction due to a single slit and double slit, Diffraction at NParallel slit, Plane Diffraction grating, Rayleigh criterion, resolving power of grating,Prism, telescope. Polarized light and its mathematical representation, Production of polarized light byreflection, refraction and scattering. Polarization by double refraction and Huygen‟stheory, Nicol prism, Retardation plates, Production and analysis of circularly andelliptically polarized light. Optical activity and Fresnel's theory, Biquartzpolarimeter.
UNIT- 5 15Hrs	Laser system: Basic properties of Lasers, coherence length and coherence time, spatialcoherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion, Types of Laser: Ruby and, He-Ne laser and. Applications of laser: Application in communication, Holography andBasics of non linear optics and Generation of Harmonic.

SUGGESTED READINGS	1. A.K. Ghatak, ' Physical Optics' 2. D.P. Khandelwal, Optical and Atomic Physics ' (Himalaya Publishing House, Bombay,1988). 3. K.D. Moltev;' Optics ' (Oxford University Press) 4. Sears:' Optics ' 5. Jenkins and White:' Fundamental of Optics ' (McGraw-Hill) 6. B.B. Laud: Lasers and Non-linear Optics (Wiley Eastern 1985) 7. Smith and Thomson:' Optics ' (John Wiley and Sons) 8. Berkely Physics Courses: Vol.-III,' Waves and Oscillations ' 9. I.G. Main,' Vibrations and Waves ' (Cambridge University Press) 10. H.J. Pain:' The Physics of Vibrations and Waves ' (MacMillan 1975) 11. Text Book of Optics: B.K. Mathur 12. B.Sc. (Part III) Physics: Editor: B.P. Chandra, M.P. Hindi Granth Academy. 13. F. Smith and J.H. Thomson, Manchester Physics series: optics (John Wiley, 1971) 14. Born and Wolf:' Optics '. 15. Physical Optics: B. K. Mathur and T. P. Pandya. 16. A textbook of Optics: N. Subrahmanyam, Brijlal and M. N. Avadhanulu. 17. Geometrical and Physical Optics: Longhurst. 18. Introduction to Modern Optics: G. R. Fowels. 19. Optics: P. K. Srivastav..

B.Sc. (PHYSICS)	FOURTH SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY402		
PAPER TITLE: PHYSICS PRACTICAL LAB-II		
MARKS: 50 THEORY: 00	PRACTICAL: 50	

LIST OF EXPERIMENTS

Minimum 16 (Sixteen) out of the following or similar experiments of equal standard:-

1. Study of Brownian motion.
2. Study of adiabatic expansion of a gas.
3. Study of conversion of mechanical energy into heat.
4. Heating efficiency of electrical kettle with varying voltage.
5. Study of temperature dependence of total radiation.
6. Study of temperature dependence of special density of radiation.
7. Resistance thermometry.
8. Thermo emf thermometry.
9. Conduction of heat through poor conductors of different geometries.
10. Experimental study of probability distribution for a two option system usinga coloured dice.
11. Study of statistical distribution on nuclear disintegration data (GM counter used as a black box).
12. Speed of waves on a stretched string.
13. Studies on torsional waves in a lumped system.
14. Study of interference with two coherent sources of sound.
15. Chlandi‟s figures with varying excitation and loading points.
16. Measurement of sound intensities with different situation.
17. Characteristics of a microphone –loudspeaker system.
18. Designing and an optical viewing system.
19. Study of monochromatic defects of images.
20. Determining the principle points of a combination of lenses.
21. Study of interference of light (biprism of wedge film).
22. Study of diffraction at a straight edge or a single slit.
23. Study of F – P etalon fringes.
24. Use of diffraction grating and its resolving limit.
25. Resolving limit of a telescope system.
26. Polarization of light by reflection; also cos – squared law.
27. Calculation of days between two dates of a year.
28. To check if triangle exists and the type of the triangle.
29. To find the sum of the since and cosine series and print out the curve.
30. To solve simultaneous equations by elimination method.
31. To prepare a mark list of polynomials.

32. Fitting a straight line or a simple curve to a given data.
33. Convert a given integer into binary and octal systems and vi versa.
34. Inverse of matrix.Spiral array.

B.Sc. Semester-V

Paper-I: Relativity, Quantum Mechanics, Atomic Molecular and Nuclear Physics

Course Outcomes

After completing the course the students will able to : -

1. Know main aspects of the inadequacies of classical mechanics and understand historical development of quantum mechanics and ability to discuss and interpret experiments that reveal the dual nature of matter.
2. Understand the theory of quantum measurements, wave packets and uncertainty principle.
3. Understand the central concepts of quantum mechanics: wave functions, momentum and energy operator, the Schrodinger equation, time dependent and time independent cases, probability density and the normalization techniques, skill development on problem solving e.g. one dimensional rigid box, tunneling through potential barrier, step potential, rectangular barrier.
4. Understanding the properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula.
5. Ability to calculate the decay rates and lifetime of radioactive decays like alpha, beta, gamma decay. Neutrinos and its properties and role in theory of beta decay.
6. Understand fission and fusion well as nuclear processes to produce nuclear energy in nuclear reactor and stellar energy in stars.
7. In the laboratory course, the students will get opportunity to perform the following experiments
8. Measurement of Planck's constant by more than one method.
9. Verification of the photoelectric effect and determination of the work Function of a metal.
10. Determination of the charge of electron and e/m of electron.
11. Determination of the ionization potential of atoms.
12. Determine the wavelength of the emission lines in the spectrum of Hydrogen atom.
13. Plan and Execute 2-3 group projects in the field of Atomic, Molecular and Nuclear Physics in collaboration with other institutions, if, possible where advanced facilities are available.

B.Sc. (PHYSICS)	FIFTH SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY501		
PAPER TITLE: WAVES, ACOUSTICS AND OPTICS		
MARKS: 75 THEORY: 50	CCA : 30	PRACTICAL: 00

Scheme of marks:

ix. Objective type questions: 08 questions carrying 1 marks each to be asked.
x. Short answer type questions: 03 questions carrying 2 marks each to be asked. (Word limit 70-100 words).
xi. Middle answer type questions: 04 questions carrying 3 marks each to be asked. (Word limit 200-250 words).
xii. Long answer type questions: 03 questions carrying 08 marks each to be asked. (Word limit 500-600 words).

UNIT-1 15Hours	Reference systems, inertial frames, Galilean invariance propagation of light, Michelson- Morley experiment, search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass..
UNIT-2 20Hours	Origin of the quantum theory : Failure of classical physics to explain the phenomena such as black-body‟ spectrum,‟ photoelectric effect, Compton effect, Wave-particle duality, uncertainty principle, de Broglie's hypothesis for matter waves, the concept of Phase and group velocities, experimental demonstration of matter waves. Davisson and Germer's experiment.Consequence of de Broglie's concepts, Bohr‟s complementary Principle, Bohr‟s correspondence principle, Bohr‟s atomic model, energies of a particle in a box, wave packets.Consequence of the uncertainty relation, gamma ray microscope, diffraction at a slit.
UNIT-3 20 Hours	Quantum Mechanics: Schrodinger's equation, Statistical interpretation of wave function, Orthogonality and normalization of wave function, Probability current density, Postulatory basis of quantum mechanics, operators, expectation values, Ehrenfest‟s theorem, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier.
UNIT-4 20Hrs	Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules. Discrete set of electronic energies of moleculers, quantisation of vibrational and rotational energies, determination of inter-nuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy.
UNIT- 5 15Hrs	Structure of nuclei:- Basic Properties of Nuclei: (1) Mass_(2) Radii, (3) Charge, (4) Angular Momentum, (5) Spin, (6) Magnetic Moment (μ). (6) Stability and) Binding Energy, Nuclear Models:~ Liquid Drop Model, Mass formula, Shell Model, Types of Nuclear reactions, laws of conservation, Q-value of reactions, Interaction of Energetic particles with matter, Ionization chamber, GM Counter, Cloud Chambers, Fundamental Interactions, Classification of Elementary Particles, Particles and Antiparticles, Baryons, Hyperons, Leptons, and Mesons, Elementary Particle Quantum Numbers: Baryon Number, Lepton Number, Strangeness, Electric Charge, Hypercharge and Isospin, introductory idea of discovery of Higg‟s Boson.

SUGGESTED READINGS	1. HLS. Mani and G.K. Metha: "Introduction to Modem Physics" (Affiliated East- West Press, 1989), 2. A Beiser, "Prospective of Modern Physics". 3. HE. White, Introduction to Atomic Physic" 4. Barrow, "Introduction to Molecular Physics". 5. RP. Feynman, R.B. Leighton and M Sands, "The Feynman Lectures on Physics", Vol.III (BLL Publications, Bombay, Delhi, Calcutta, Madras). 6. T.A. Littlefield and N Thorley, "Atomic and Nuclear Physics" (Engineering Language Book Society) 7. HLA. Enge, "Introduction to Nuclear Physics", (Addision-Wesly) 8. Bisenberg and Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles" (John Wiley) 9. D.P. Khandelwal, "Opties and Atomic Physics", (Himalaya Publishing House, Bombay, 1988). 10. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi, 1984. 11. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000). 12. Theoretical Nuclear Physics, J.M. Blatt & V-F.Weisskopf (Dover Pub.Inc., 1991).

B.Sc. Semester-VI

Paper-II: Solid State Physics, Solid State Devices and Electronics

Course Outcomes

After completing the course the students will able to : -

1. A brief idea about crystalline and amorphous substances, about lattice, unit cell, miller indices, reciprocal lattice, concept of Brillouin zones and diffraction of X-rays by crystalline materials.
2. Knowledge of lattice vibrations, phonons and in depth of knowledge of Einstein and Debye theory of specific heat of solids.
3. At knowledge of different types of magnetism from diamagnetism to ferromagnetism and hysteresis loops and energy loss.
4. Secured an understanding about the dielectric and ferroelectric properties of materials.
5. Understanding above the band theory of solids and must be able to differentiate insulators, conductors and semiconductors.
6. Understand the basic idea about superconductors and their classifications.
7. N- and P- type semiconductors, mobility, drift velocity, fabrication of P-N junctions; forward and reverse biased junctions.
8. Application of PN junction for different type of rectifiers and voltage regulators.
9. NPN and PNP transistors and basic configurations namely common base, common emitter and common collector, and also about current and voltage gain.
10. Biasing and equivalent circuits, coupled amplifiers and feedback in amplifiers and oscillators.
11. To characterize various devices namely PN junction diodes, LEDs, Zener diode, solar cells, PNP and NPN transistors. Also construct amplifiers and oscillators using discrete components.
12. Basic working of an oscilloscope including its different components and to employ the same to study different wave forms and to measure voltage, current, frequency and phase.
13. Secure first-hand idea of different components including both active and passive components to gain a insight into circuits using discrete components and also to learn about integrated circuits.
14. About analog systems and digital systems and their differences, fundamental logic gates, combinational as well as sequential and number systems.
15. Synthesis of Boolean functions, simplification and construction of digital circuits by employing Boolean algebra.
16. In the laboratory he is expected to construct both combinational circuits and sequential circuits by employing NAND as building blocks and demonstrate Adders, Subtractors, Shift Registers, and multivibrators using 555 ICs.

B.Sc. (PHYSICS)	SIXTH SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY601		
PAPER TITLE: WAVES, ACOUSTICS AND OPTICS		
MARKS: 75 **THEORY: 50**	**CCA : 30**	**PRACTICAL: 00**

Scheme of marks:

xiii. Objective type questions: 08 questions carrying 1 marks each to be asked.
xiv. Short answer type questions: 03 questions carrying 2 marks each to be asked. (Word limit 70-100 words).
xv. Middle answer type questions: 04 questions carrying 3 marks each to be asked. (Word limit 200-250 words).
xvi. Long answer type questions: 03 questions carrying 08 marks each to be asked. (Word limit 500-600 words).

UNIT-1 15Hours	Amorphous and crystalline solids, Elements of symmetry, Seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Brage‟s Law, Bonding in solids, classification. Cohesive energy of solid, Madelung constant, evaluation of Parameters, Specific heat of solids, classical theory (Dulong-Petit‟s law), Einstein and Debye theories, Vibrational modes of one dimensional monoatomic lattice, Dispersion relation, Brillouin Zone.
UNIT-2 20Hours	Free electron model of a metal, Solution of one dimensional Schrodinger equation in a constant potential, Density of states, Fermi Energy, Energy bands in a solid (Kronig- Penny model without mathematical details), Difference „between Metals, Insulator and Semiconductors, Hall effect, Dia, Para and Ferromagnetism, Langevin's theory of dia and para-magnetism, Curie- Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss.
UNIT-3 20 Hours	Intrinsic and_ extrinsic semi conductors, Concept of Fermi level, Generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, p-n junction diode, depletion width and potential barrier, junction capacitance, I-V characteristics, „Tunnel diode, Zener diode, Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET and MOSFET Characteristics.
UNIT-4 20Hrs	Half and fall wave rectifier, rectifier efficiency ripple Factor, Bridge rectifier, Filters, Inductor filter, L and 1 section filters, Zener diode, regulated power supply using zener diode, Applications of transistors, Bipolar Transistor as amplifier, h-parameter, h- parameter equivalent circuit, Transistor as power amplifier, Transistor as oscillator, principle of an oscillator and Bark Hausen‟s condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator
UNIT- 5 15Hrs	Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter.

SUGGESTED READINGS	1. Introduction to solid state physics, C. Kittel. 2. Solid State Physics: A.J. Dekkar. 3. Electronic Circuits: Mottershead. 4. Electronic Circuits: Millman and Halkias. 5. Semiconductor Devices: SM. Sze. 6. Electronic devices: T.L. Floyd 7. Device and Circuits: J. Millman and C. Halkias. 8. Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit, 9. Electricity and Magnetism: K.K. Tiwari.

B.Sc. (PHYSICS)	SIXTH SEMESTER	COURSE CODE: UD1
PAPER CODE: PHY602		
PAPER TITLE: PHYSICS PRACTICAL LAB-III		
MARKS: 50		
THEORY: 00	PRACTICAL: 50	

LIST OF EXPERIMENTS

MINIMUM 16(Sixteen) out of following or similar experiment of equal standard:

1. Determination of Planck‟s constant.
2. Determination of e/m by using Thomson‟s tube.
3. Determination of e by Millikan‟s methods.
4. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron proton)
5. Absorption spectrum of iodine vapour.
6. Study of alkali or alkali or earth spectra using a concave gra‟s.
7. Study of Zeeman effect for determination of Lande g-factor.
8. Analysis of given band spectrum.
9. Study of Raman spectrum using laser as an excitation source.
10. Study of absorption of alpha and beta rays.
11. Study of statistics in radioactive measurement
12. Coniometric study of crystal faces.
13. Determination of dielectric constant.
14. Hysteresis curve of transformer core.
15. Hall-probe method for measurement of magnetic field.
16. Specific resistance and energy gap of a semiconductor.
17. Characteristics of transistor.
18. Characteristics of tunnel diode.
19. Study of voltage regulation system.
20. Study of a regulated power supply.
21. Study of lissajous figures using CRO.
22. Study of VTVM.
23. Study of RC and TC coupled amplifiers.
24. Study of AF and RF oscillators.
25. Find roots of F (X)=0 by using Network-Raphson method.
26. Find roots of F (X)=0 by using secant method.
27. Integration by Simpson rule.
28. Towers of Hanoi (Nonrecursive).
29. Finding first four perfect numbers.
30. Quaddratic interpolation using Network‟s forward-difference formula of degree two.

C.Programming

31. To write a program for simple interest.
32. To write a program to print two numbers.
33. To write a program to print numbers in ascending order.

34. To write a program to print numbers in Descending order.
35. To write a program to insert three numbers and find out the largest one.
36. To write a program to insert an integer numbers and find out even or odd numbers.
37. To write a program for finding simple interest for three set of Capital rate, rate of percentage and years