Integral University
Faculty of Science, Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17

Year: I, Semester: I
Subject: Mechanics and Wave Motion **Code: PY106**

L	T	P
3	1	0

UNIT I: CONSERVATION LAWS

Inertial reference frame, Newton's laws of motion, Dynamics of particle in rectilinear and circular motion, Conservative and Non -conservative forces, Conservation of energy, liner momentum and angular momentum, Collision in one and two dimensions, cross section. (8)

UNITII: ROTATIONAL MOTION

Rotational energy and rotational inertia for simple bodies, the combined translation and rotational and motion of a rigid body on horizontal and inclined planes, Simple treatment of the motions of a top, Relations between elastic constants, bending of Beams and Torsion of Cylinder. (8)

UNIT III: GRAVITATION

Law of gravitation, gravitational field and potential, gravitational potential energy, gravitational field intensity, central forces, two particle central force problem, reduced mass, relative and centre of mass motion, Law of gravitation, Kepler's laws, motions of planets and satellites, geo-stationary satellites. (8)

UNIT IV: OSCILLATIONS

Simple harmonic motion, differential equation of S. H. M. and its solution, some examples (mass-spring, simple pendulum, and compound pendulum), Damped Oscillator: Equation of motion and its solution, Forced oscillations and resonance: Solution of differential equation of a forced oscillator and variation of amplitude with frequency and damping. (8)

UNIT V: WAVE MOTION

Classification of waves, expression for a plane progressive and transverse harmonic wave, particle velocity and acceleration, path difference and phase difference, velocity of transverse waves in a string, differential equation of wave motion, plane progressive waves in fluid media, reflection of waves, phase change on reflection, superposition, stationary waves, pressure and energy distribution, phase and group velocity. (8)

Recommended Books

1. EM Purcell, Ed: "Berkeley Physics Course, Vol. 1, Mechanics" (McGraw- Hill).
2. RP Feymman, RB Lighton and M Sands; "The Feymman Lectures in Physics", Vol. 1 (BI Publications, Bombay, Delhi, Calcutta, Madras).
3. J. C. Upadhyay: 'Mechanics'.
4. D.S, Mathur "Mechanics",
5. P. K. Srivastava: "Mechanics" (New Age International).

Integral University
Faculty of Science, Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17

Year: I , Semester I
Subject: Mechanics Lab **Code: PY107**

L	T	P
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(1) Determination of Modulus of Rigidity of the material by Statistical method.
(2) Determination of Young's Modulus of the Material by Flexure Method.
(3) Determination of Coefficient of Viscosity of Water.
(4) Determination of Surface Tension of Water.
(5) Determination of Acceleration due to gravity by Compound Pendulum
(6) Determination of frequency of A. C. Mains with the help of sonometer.
(7) Measurement of height of a tower with a sextant.
(8) Study of oscillations of mass under different combination of springs.
(9) To find the capacity of a condenser with electrical vibrator using A. C. supply of 50 Hertz.
(10) To study of moment of inertia of a body with the help of inertia table.

Integral University
Faculty of Science, Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17

Year: I, Semester: II
Subject: Physical Optics and Lasers **Code: PY108**

L	T	P
3	1	0

UNIT-I Geometrical Optics and Nature of Light

Fermat's principle and its application to obtain laws of reflection and refraction , Cardinal points of an optical system, Chromatic and spherical aberrations , Coma, astigmatism.

Idea of wave, Electromagnetic and quantum theory of light, Definition and Properties of wave front. Huygens Principle. (8)

Unit II: Interference of a light

The principle of superposition, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringe, thin films, applications for precision measurements for displacements, Haidinger fringes: Fringes of equal inclination,Michelson interferometer, its application for precisional determination of wavelength, wavelength difference, Newton's rings, Fabry-Perrot interferometer and etalon.

(8)

UNIT -III Diffraction:

Fresnel half-period zones, plates, straight edge, rectilinear propagation , Fraunhoffer diffraction: Diffraction at a slit, half-period zones, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems, Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating, reflection grating, Resolving power of a grating and comparison with resolving powers of prism. (8)

UNIT – IV Polarization

Double refraction in uniaxial crystals, Nicol prism, polaroids and retardation plates, Babinet's compensator, Analysis of polarised light, Optical activity and Fresnel's explanation, Half shade and Biquartz polarirneters, Matrix representation of plane polarized waves, matrices for polarizers, retardation plates and rotators. (8)

UNIT- V Lasers

Purity of a special line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, spontaneous and induced emissions, conditions for laser action, population inversion, 3 and 4 Level Systems (Ruby, Nd: YAG, CO_2, liquid dye and He-Ne laser), Properties and applications of laser. (8)

Recommended Books

1. A K Ghatak, "Physical Optics" (Tata McGrew Hill).
2. D P Khandelwal; "Optics and Atomic Physics" (Himalaya, Publishing House, Bombay, 1988).
3. F Smith and JH Thomson; "Manchester Physics sries; Optics" (English Language Book Society and Joh Wiley, 1977).
4. Born and Wolf; "Optics"
5. K D Moltey; "Optics" (Oxford University Press).
6. Jonkins and White; "Fundamental of Optics" (McGraw-Hill).
7. Smith and Thomson; "Optics" (John Wiley and Sons).
8. B.B. Laud; "Lasers" (New Age).

Integral University
Faculty of Science, Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17

Year: I, Semester II
Subject: Optics Lab **Code: PY109**

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(1) Determination of wavelength of sodium light by Newton's Rings.
(2) Determination of Specific Rotation of Sugar solution by half shade Polari meter.
(3) Determination of refractive index of a material of a prism by spectrometer.
(4) Verification of Brewster's law.
(5) Determination of wavelength of Sodium light of by using Fresnel's Biprism.
(6) Determination of wavelength of mercury light by using Plane diffraction grating.
(7) To determine the dispersive power of a plane transmission diffraction grating.
(8) To determine the resolving power of a telescope.
(9) Determination of refractive index of water using laser.
(10) To determine the focal length of combination of two lenses separated by a distance d with the help of a nodal slide and to verify the formula: $\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{d}{F_1 F_2}$.

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: II, Semester: III
Subject: Circuit Fundamentals and Basic Electronics **code: PY201**

L	T	P
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UNIT-I Circuit Fundamentals

Growth and decay of currents through inductive resistances, charging and discharging in R.C. and R.L.C. circuits, Time constant, Measurement of high resistance , A.C. Bridges, Maxwell's and Scherings Bridges, Wien Bridge. THEVENIN, NORTON and Superposition theorems and their applications. (8)

UNIT –II Theory of Semiconductor

Semiconductors, intrinsic and extrinsic semiconductors, n-type and p-type semiconductors, unbiased diode forward bias and reverse bias diodes, diode as a rectifier, diode characteristics, zener diode, avalanche and zener breakdown, power supplies, rectifier, bridge rectifier, capacitor input filter, voltage regulation, zener regulator. (8)

UNIT – III Transistor Basics

Bipolar transistors, three doped regions, forward and reverse bias, DC alpha, DC beta transistor curves. Transistor biasing circuits: base bias, emitter bias and voltage divider bias, DC load line , Basic AC equivalent circuits, low frequency model, small signal amplifiers, common collector amplifiers and common base amplifiers, current and voltage gain, R.C. coupled amplifier, gain, frequency response, equivalent circuit at low, medium and high frequencies, feedback principles. (8)

UNIT-IV Oscillators and OPAMP

Input and output impedance, transistor as an oscillator, general discussion and theory of Hartley oscillator only.

Operational amplifier (black box approach) and its ideal characteristics, virtual ground, inverting and non-inverting amplifiers, adder, integrator and differentiator. (8)

Unit -V Modulation and Instrumentation

Elements of transmission and reception, basic principles of amplitude and frequency modulation and demodulation.

Principle and design of linear multimeters and their application, cathode ray oscillograph and its simple applications. (8)

Recommended Books

1. B. G. Streetman; "Solid State Electronic Devices", IInd Edition (Prentice Hall of India, New Delhi, 1986).
2. W.D. Stanley: "Electronic Devices, Circuits and Applications" (Prentice-Hall, New TTC'A 1flOO\ JL4y, JJI. 1OO).
3. J.D. Ryder, "Electronics Fundamentals and Applications", lI'' Edition (Prentice-Hall of India, New Delhi, 1986).
4. Millman and A Grabel, "Microelectronics", International Edition (McGraw Hill Book Company, New York, 1988).
5. Bollested, R. and Nashelksky, L. (Electronic Devices and Circuit Theory, Prentice Hall)

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: II, Semester: III
Subject: Kinetic Theory and Thermodynamics **Code: PY202**

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UNIT-I

Ideal Gas: Kinetic model, Deduction of Boyle's law, interpretation of temperature, estimation of r.m.s. speeds of molecules. Brownian motion, estimate of the Avogadro number, Equipartition of energy, specific heat of monatomic gas, extension to di- and triatomic gases, adiabatic expansion of an ideal gas.

Real Gas: Vander Waals gas, equation of state, nature of Van der Waals forces, comparison with experimental P-V curves ,Joule expansion of ideal gas and of a Vander Waals gas, Joule coefficient. (8)

UNIT -II

Liquefaction of gases: Boyle temperature and inversion temperature, Principle of regenerative cooling and of cascade cooling, liquefaction of hydrogen and helium gas, Refrigeration cycles, meaning of efficiency.

Transport phenomena in gases: Molecular collisions mean free path and collision cross sections. Transport of mass, momentum and energy and interrelationship. (8)

UNIT - III The laws of thermodynamics

The Zeroth law, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function and other applications , Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics, Different versions of the second law, Entropy, principle of increase of entropy, third law of thermodynamics, impossibility of attaining the absolute zero, Seebeck, Peltier and Thomson effect. (8)

Unit IV: Thermodynamic Potentials

Thermodynamic variables: extensive and intensive, Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's thermodynamical relations & applications - Joule-Thompson Effect, Clausius-Clapeyron heat Equation, Expression for (CP – CV), CP/CV, TdS equations. (8)

Unit V: Theory of Radiation

Blackbody radiation, Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, spectral distribution of Black body radiation. Wien's displacement law, Rayleigh-Jean's law, Plank's law the ultraviolet catastrophy. (8)

Text and Reference Books

1. G.G. Agarwal and H.P. Sinha "Thermal Physics."
2. S.K. Agarwal and B.K. Agarwal "Thermal Physics."
3. Zemansky, M.W. "Heat and thermodynamics (6^{th} Edition Mcgraw Hill)."

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: II, Semester III
Subject: Electronics and Thermal Physics Lab **Code: PY203**

L	T	P
0	0	4

(1) To study the frequency response of RC coupled amplifier.
(2) To draw the charactersic of PN junction diode.
(3) To study the Characteristics of a transistor in CE, CB and CC configurations.
(4) To study of Regulated Power Supply.
(5) To calibrate an oscillator (Hartley/ Phase shift) using CRO.
(6) To draw the characteristic of a Zener diode.
(7) Determination of Stefan's constant.
(8) To study the characteristics of a thermocouple.
(9) To determine the mechanical equivalent of heat by Callender and Barne's constant flow method.
(10) To find the mechanical equivalent of heat using Joules calorimeter.

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: II, Semester: IV
Subject: Electricity and Magnetism **Code: PY204**

L	T	P
3	1	0

UNIT -I Vector Analysis & Electrostatics I

Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their physical significance, Vector Integration, electrostatics field, electric flux, Coulomb's law, electric field and potentials, Field due to a uniform charged sphere, derivations of Poission and Laplace equations with applications, Uniqueness theorem. (8)

UNIT II Electrostatics II

Gauss Law and its application: The Field of a conductor, electric dipole, field and potential due to an electric dipole, dipole approximation for an arbitrary charge distribution, method of electrical images, electric quadruple, field due to a quadruple , electrostatic energy of a charged uniform sphere, energy of a condenser. (8)

UNIT III Magnetostatics & Magnetic Properties of Materials

Magnetic field, Magnetic force of a current, Magnetic Induction and Biot- Savart Law, Lorentz Force, Vector and Scalar Magnetic potentials, Magnetic Dipole, Magnetomotive force and Ampere's Circuital theorem and its applications to calculate magnetic field due to wire carrying current and solenoid.

Intensity of magnetization and magnetic susceptibility, Properties of Dia, Para and Ferromagnetic materials, Curie temperature, Hysteresis and its experimental determination. (8)

UNIT IV Electromagnetic Induction

Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, self inductance (L) of single coil, mutual inductance (M) of two coils, Energy stored in magnetic field. Motion of electron in changing magnetic field , Betatron , Magnetic energy in field, Induced magnetic field (Time varying electric field), theory and working of moving coil ballistic galvanometer. (8)

UNIT V Maxwell's Equations and Electromagnetic Waves

Idea of displacement current and Maxwell's modification of Ampere's law, Integral and differential forms of Maxwell's equations and their physical significances, skin effect.

The wave: (equation satisfied by E and B, plane electromagnetic waves in vacuum), Poynting's vector, reflection at a plane boundary of dielectrics, e.m. waves in a conducting medium, reflection and refraction by the ionosphere. (8)

Text and Reference Books

1. Berkeley Physics Course; Electricity and Magnetism, Ed. E.M. Purcell (Mc GrawHill). Halliday and Resnik; "Physics", Vol 2.
2. D. J. Griffith; "Introduction to Electrodynamics" (Prentice-Hall of India).
3. Reitz and Milford; "Electricity and Magnetism (Addison-Wesley).
4. A S Mahajan and A A Rangwala; "Electricity and Magnetism" (Tata McGraw- Hill).
5. A M Portis; "Electromagnetic Fields".
6. Pugh and Pugh; "Principles of Electricity and Magnetism" (Addison-Welsley).
7. Panofsky and Phillips; "Classical Electricity and Magnetism" (India Book House).
8. S S Atwood; "Electricity and Magnetism" (Dover).

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: II, Semester IV
Subject: Electricity and Magnetism Lab **Code: PY205**

L	T	P
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(1) Study of characteristics of a ballistic Galvanometer.
(2) Measurement of low resistance by Carey-Foster Bridge.
(3) Measurement of inductance using impedances at different frequencies.
(4) Determination of energy band gap of a semiconductor using p-n junction diode.
(5) To measure high Resistance by the method of Leakage of a condenser.
(6) To determine the coefficient of Mutual Inductance between two coils.
(7) To determine the coefficient of Self Inductance of a single coil.
(8) To determine the capacity of condenser by absolute method.
(9) To study of characteristic of a choke.
(10) Measurement of inductance by Anderson's bridge.

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: V
Subject: Elements of Quantum Mechanics, Atomic and Molecular Spectra **Code: PY 301**

L	T	P
3	1	0

UNIT-I Matter Waves
Inadequacies of classical mechanics, Black body radiation, theoretical law's of black body radiation, Photoelectric phenomenon, Compton effect, Planck's quantum hypothesis, development of quantum mechanics, Bohr's quantization condition, wave particle duality, de- Broglie hypothesis, velocity of de-Broglie waves, Phase and Group Velocities and their relationship for a non-relativistic particle. (8)

UNIT -II Schrodinger Equation I
Heisenberg's uncertainty principle with deviation and its application, ground state energy of hydrogen atom & linear harmonic oscillator Basic postulate of quantum mechanics, Schrodinger Equation :Time dependent and time independent form, Physical interpretation of the wave function, orthogonality and normalization of wave function, basic problem related to wave function, probability current dencity, Ehrenfest theorem. (8)

UNIT -III Schrodinger Equation II
Applications of Schrodinger wave equation: (free particle, a particle in 1-D infinitely deep potential well, a particle in 3-D infinitely deep potential well, 1-D linear harmonic oscillator, one dimensional motion in step potential, rectangular potential barrier, square well potential), expectation values of dynamical quantities, momentum space wave function. (8)

UNIT – IV Atomic spectra
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. Singlet and triplet fine structure in alkaline earth spectra, L-S and J-J couplings. Weak spectra: continuous X-ray spectrum and its dependence on voltage, Duane and Haunt's law. Characteristics X-rays, Moseley's law, doublet structure and screening parameters in X-ray spectra, X-ray absorption spectra. (8)

UNIT -V Molecular spectra
Discrete set of electronic energies of molecules, quantisation of vibrational and rotational energies, determination of internuclear distance, pure rotation and rotation- vibration spectra, Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. (8)

Text and Reference Books

1. H S Mani and G K Mehta; "Introduction to Modern Physics" (Affiliated East- West Press 1989).
2. A Beiser, "Perspectives of Modern Physics".
3. H E White; "Introduction to Atomic Physics".
4. Barrow; "Introduction to Molecular Physics".
5. R P Feymann, R B Leighton and M Sands; "The Feyrnann Lectures on Physics, Vol. III (B I Publications. Bombay. Delhi, Calcutta, Madras).
6. T A Littlefield and N Thorley; "Atomic and Nuclear Physics" (Engineering Language Book Society).
7. Eisenberg and Resnik; "Quantum Physics of Atoms, 'Molecules, Solids, Nuclei and Particles" (John Wiley).

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: V
Subject: Classical Mechanics, Relativity and Statistical Physics **Code: PY 302**

L	T	P
2	1	0

UNIT I: Lagrangian and Hamiltonian Dynamics

Constraints: holonomic and non-holonomic, time independent and time dependent. Generalized coordinates, Lagrange equations from D'Alembert's principle, velocity dependent potentials, Variational Principle: Technique of the calculus of variation, Hamilton's variational principle, Lagrange equations using Hamilton's principle, Generalized momenta, Cyclic coordinates.

Definition of Hamiltonian and its physical significance, Hamilton's equations of motion from variational principle. (8)

UNIT II: Special Theory of Relativity

Reference systems, inertial frames, Galilean invariance and conservation laws, propagation of light, Michelson-Morley experiment; search for ether, Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with a zero rest mass. (8)

UNIT III

The Statistical Basis of Thermodynamics: Probability and thermodynamic probability, principle of equal a prior probabilities, probability distribution and its narrowing with increase in number of particles. (8)

UNIT IV

Some universal laws: The μ (mu)- space representation, division of μ (mu)- space into energy sheets and into phase cells of arbitrary size, applications to one-dimensional harmonic oscillator and free particles. Equilibrium before two systems in thermal contact, Probability and entropy, Boltzmann entropy relation. Statistical interpretation of second law of thermodynamics. (8)

UNIT V

Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and of velocities, experimental verification, distinction between mean, r.m.s. and most probable speed values.

Transition to quantum statistics: 'h' as a natural constant and' its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator, Indistinguishability of particles and its consequences, Bose-Einstein and Fermi-Dirac distributions, photons in black body chamber, free electrons in a metal, Fermi level and Fermi energy. (8)

Text and Reference Books

1. A. Beiser, "Concepts of Modern Physics" (McGraw-Hill).
2. B B Laud, "Introduction to Statistical Mechanics" (Macmillan 1981).
3. F Reif, "Statistical Physics" (McGraw-Hill 1988).
4. K Haung, "Statistical Physics" (Wiley Eastern, 1988).
5. Goldstein, H. "Classical Mechanics, 2nd Edition (Narosa)

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: V
Subject: Solid State, Nuclear and Particle Physics **Code: PY 303**

L T P
2 1 0

UNIT-I

Crystal Structure

Lattice translation vectors and lattice, Symmetry operations, Basis and Crystal structure, Primitive Lattice cell, Two-dimensional lattice types, systems, Number of lattices. Index system for crystal planes, Miller indices, Simple crystal structures, NaCl, hcp, diamond.

Crystal Diffraction and Reciprocal Lattice

Bragg's law, Experimental diffraction method, Laue method, Rotating crystal method, Powder method. (8)

UNIT -II

Crystal Bondings

Crystal of inert gases, Van der Walls-London interaction, repulsive interaction, Equilibrium lattice constants, Cohesive energy, compressibility and bulk modulus, ionic crystal, Madelung energy, evaluation of Madelung constant, Covalent crystals, Hydrogen-bonded crystals, Atomic radii.

Lattice Vibrations

Lattice Heat capacity, Einstein model, Vibrations of monatomic lattice, derivation of dispersion relation, Force constants, Lattice with two atoms per primitive cell. (8)

UNIT -III

Hall effect (metals and semiconductors), Origin of band theory, Kronig-Penney model, Number of orbitals in a band, conductor, Semi- conductor and insulators, Effective mass, Concept of holes. (8)

UNIT IV

General Properties of Nucleus: Brief survey of general Properties of the Nucleus, Mass defect and binding energy, charges, Size, Spin and Magnetic moment.

Nuclear Forces: Saturation phenomena and Exchange forces, Deutron ground state properties.

Nuclear Reactions: Nuclear reactions and their conservation laws, Cross section of nuclear reactions, Theory of fission (Qualitative), Nuclear reactors and Nuclear fusion. (8)

Unit V: Particle Physics

Basic particle interactions (gravitational, Electromagnetic, week and strong Interactions), Basic classification based on rest mass, Spin and half life, particles and antiparticles, idea of resonances, conservation rules in fundamental interactions, determination of spin and parity of pions, strange particles. (8)

Text and Reference Books

1. Puri and Babbar, "Solid State Physics" (S. Chand).
2. C. Kittel, "Introduction to Solid State Physics"- Vth Edition (John Wiley & Sons).
3. H. S. Mani and G. K. Mehta, "Introduction to Modern Physics" (Affiliated East-West Press— 1989).
4. A. Beiser, "Perspectives of Modern Physics".
5. Martin, B.R. & Shaw, Particle Physics (John Wiley)

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: V
Subject: Advance Electricity and Magnetism Lab **Code: PY 304**

L	T	P
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(1) To study the charging and discharging of RC and LCR circuits.
(2) To Study of Lissajous figures using a CRO.
(3) To study the spectral response of a solar cell.
(4) To calibrate a ballistic galvanometer with a standard solenoid and then to find out ballistic constant.
(5) Hall Probe Method for measurement of Magnetic Field.
(6) Study of decay of currents in LR and RC circuits.
(7) To study the response curve for LCR circuit and hence estimate the resonance frequency and quality factor.
(8) To determine the capacitance of a condenser by Wien's bridge.
(9) To draw the characteristic of a photoelectric cell.
(10) To study time constant in a LR circuit.

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: VI
Subject: Applied Electronics **Code: PY 305**

L	T	P
3	1	0

UNIT I: Semiconductor and p-n junction diode

Diffusion of minority carriers in semiconductor, work function in metals and semiconductors Junctions between metal and semiconductors, Semiconductor and p.n. Junction, Depletion layer, Junction Potential Width of depletion layer, Field and Capacitance of depletion layer, Forward A.C. and D.C. resistance of junction, Reverse Breakdown. Zener and Avalanche diodes, Tunnel diodes, Point contact diode, their importance at High frequencies, LED photodiodes, Effect of temperature on Junction diode Thermistors. (8)

UNIT II: Transistor I

Transistor parameters, base width modulation, transit time and life-time of minority carriers, Base-Emitter resistance Collector conductance, Base spreading resistance, Diffusion capacitance, Reverse feedback ratio, Equivalent circuit for transistors, Basic model, hybrid model and Y parameter equivalent circuit, Input and output impedances. (8)

UNIT III: Transistor II

Current and Voltage gain, Biasing formulae for transistors, Base bias, emitter bias and mixed type bias and mixed type biasing for small and large signal operation, Transistor circuit application at law frequencies, their AC and DC equivalent for three different modes of operation, Large signal operation of transistors, Transistor Power amplifiers, Class A and B operation, Maximum power output Effect of temperature, heat sinks, thermal resistance Distortion in amplifiers, cascading of stages, Frequency response, Negative and positive feedback in transistor amplifiers. (8)

UNIT IV

Field effect transistors

Field effect transistors and their characteristics, biasing of FET, use in preamplifiers, MOSFET and their simple uses.

Power Supplies:

Electronically regulated low and high voltage power supplies, Inverters for battery operated equipments.

Miscellaneous:

Phototransistors, Silicon, Controlled rectifiers. (8)

UNIT V: Power Electronics and Integrated Circuits:

Triac Construction, Operation and Characterstics, Unijunction Transistors (UJT), its charaterstics, IC-classification, Making monolithic ICs, IC-fabrication of components on monolithic IC, IC packings, IC symbols. (8)

Text and Reference Books

1. B G Streetman; Solid State Electronic Devices, UK Edition (Prentice-Hall of India. New Delhi, 1986).
2. W D Stanley; “Electronic Devices, Circuits and Applications” (Prentice-Hall, New Jersey, USA. 1988).
3. J D Ryder; “Electronics Fundamentals and Applications” 1jnd Edition\ (Prentice-Hall of India. New Delhi, 1986).
4. I Miliman and A Grabel; “Microelectronics”, International. Edition (McGraw-Hill Book Company, New York, 1988).

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: VI
Subject: Physics of Materials **Code: PY 306**

L	T	P
3	1	0

UNIT I: Introduction: Atomic basis of structure – ionic bonding, Covalent bonding, Metallic bonding, Secondary bonding. Crystalline and non-crystalline states, Crystal symmetry, silica and silicates, Polymers, Fullerenes.
Fracture: Ductile fracture, Brittle fracture, Fracture toughness, Ductile-brittle transition, Protection against fracture, Fatigue fracture. (8)

UNIT II: Crystal Imperfections: Point, line, surface and volume imperfections, dislocations and their geometry, Disorder in polymers and non-crystalline materials.
Elastic Properties: Elastic behaviour and its atomic model, Rubber like elasticity, Anelastic behaviour, Relaxation processes, Viscoelastic behaviour, Plastic deformation. (8)

UNIT III: Structure and Processing of Materials
Structure of Metals and Alloys , Structure of Ceramics and Glasses , Structure of Polymers , Structure of Composites (qualitative).
Brief introduction of processing of metals, alloys, ceramic and glasses. (8)

UNIT IV: Introduction to Nanomaterials
Brief introduction of nanomaterials, properties of nanomaterials. Methods to produce nanomaterials: Sol-Gel synthesis method, Applications of nanomaterials.
Carbon Nanomaterials: Classification and Properties, Nanowires: Classification, properties and applications, Nanocomputers. (8)

UNIT V: Tools and Techniques
Crystallography: Particle size determination, Electron Microscopy: Scanning Electron Microscopy (SEM), Tunneling Electron Microscopy (TEM) (qualitative), sample preparation for an electron microscope, Difference between TEM and SEM, Disadvantages of electron microscope, Atomic force microscope (AFM) (qualitative). (8)

Text and Reference Books:

1. Introduction to Solid State Physics : C. Kittel (Wiley, VII ed.)
2. Introduction to Solids : L.V. Azaroff (Tata McGraw Hill)
3. Solid State Physics: A.J. Dekker (Prentice-Hall)
4. Essentials of Materials Science: A.G. Guy (McGraw Hill)
5. Materials Science and Engineering: V. Raghvan (Prentice Hall)
6. Elements of Materials Science and Engineering: L.H. Van Vlack (Addison-Wesley).
7. Introduction to Nanotechnology: Charles P. Poole Jr, Frank J. Owens

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: VI
Subject: Mathematical Methods in Physics (Elective 1) **Code: PY 307**

L	T	P
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UNIT I: Vector Calculus and Curvilinear Coordinates
Vector Calculus and Curvilinear Coordinates Differential vector operators: Gradient, divergence and curl, Gauss's theorem, Green's theorem, Stoke's theorem, Some simple examples based on these theorems, orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates, divergence, gradient, curl and Laplacian in these coordinates. (8)

UNIT II: Vector Spaces and Linear Algebra
Determinants for linear algebraic equations, Laplace development, Cramer's rule, antisymmetry, Gauss elimination. Matrices – basic definition, classification and operations, orthogonal matrices, Hermitian matrices, unitary matrices, Rank of matrices, eigenvalues and eigenvectors. (8)

UNIT III
Infinite Series: Fundamental concepts, convergence tests, alternating series, algebra of series, power series, Taylor series.
Multiple Integrals: Double and triple integrals, application of multiple integrals, change of variables in integrals, general properties of Jacobians, surface and volume integrals. (8)

UNIT IV: Statistics and Probability
Statistics and Probability: Statistical distributions, second moments and standard deviations, definition of probability, fundamental laws of probability, discrete probability distributions, combinations and permutations, continuous distributions : expectation, moments and standard deviation, Binomial, Poisson and Gaussian distributions. (8)

UNIT V: Special Functions
Beta and gamma functions : problems, relation between beta and gamma functions, Bessel's differential equations, Legendre's differential equations, Hermite's differential equations, Laguerre's differential equations (Qualitative), series solutions, Dirac delta functions and its properties. (8)

Text and Reference Books:
1. Mathematical Methods for Physicists: G. Arfken and H.J. Weber (Academic Press, San Diego) 7th edition, 2012.
2. Mathematical Methods in the Physical Sciences, M.L. Boas (Wiley) 2002.
3. Applied Mathematics for Engineers and Physicists, L.A. Pipes & L.R.Harvill (McGraw- Hill), 1971.
4. Mathematical Methods for Physics and Engineering, K.F. Riley, M.P. Hobson and S.J. Bence (Cambridge University Press), 1998.

Integral University
Department of Physics
Course: B.Sc. (PMC/PME)
w.e.f. July 2016-17
Syllabus

Year: III, Semester: VI
Subject: Advanced Solid State Physics (Elective 2) **Code: PY-308**

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UNIT- I Elementary Lattice Dynamics

Elementary Lattice Dynamics: Lattice vibrations and Phonons, Linear monoatomic and diatomic chains, Acoustical and optical phonons, Qualitative description of the phonons ,spectrum solids, Dulong and Petit's law, Einstein and Debye theories of specific heat of solids, T^3 law. (08)

UNIT-II Semiconductor Physics

Classifying materials as semiconductors, Chemical bonds in semiconductors, Mechanism of current flow, Forbidden, valence and conduction bands, Intrinsic and extrinsic semiconductors, Carrier concentration and Fermi level for intrinsic semiconductor, Carrier concentration, Fermi level and conductivity of extrinsic semiconductor. (08)

UNIT-III Dielectric Properties of Materials

Polarization, Depolarization field, Electric susceptibility, Polarizability, Sources of Polarizability (electronic, ionic, dipolar & orientational), Classical theory of electric polarizability, Frequency dependence of ionic polarizability, Local electric field at an atom, Clausius-Mosotti equation, Langevin-Debye equation, Complex dielectric constant and loss. (08)

UNIT- IV Magnetic Properties of Materials

Magnetic properties of matter: dia , para, ferri and ferromagnetic materials, Classical Langevin theory of dia and paramagnetic materials, Quantum mechanical treatment of paramagnetism , Curie law, Weiss's theory of ferromagnetic domains, Discussion of B-H Curve, hysteresis and energy loss. (08)

UNIT -V Optical Properties of Materials

Classical Model-Drude model, ionic conduction, Optical refractive index and relative dielectric constant, Optical absorption in metals, semiconductors and insulators, Colour centres, Excitons, Luminescence, LED, Photo detector, Photomultiplier. (08)

Recommended Books

1. Introduction to Solid State Physics by Charles Kittel (Willey Publication).
2. Elements of Solid State Physics by Puri and Babbar (S. Chand).
3. Solid State Physics by S. O. Pillai (New Age International).