Department of Physics
Teaching Plans for under graduate classes

Sr. No.	Title of course	Paper code
1	Mechanics	PHYS101
2	Electricity, Magnetism and EMT	PHYS102
3	Statistical and Thermal Physics	PHYS201
4	Waves and Optics	PHYS202
5	Workshop Skills	PHYS203
6	Electrical Circuits and Network Skills	PHYS205
7	Nuclear and Particle Physics	PHYS304
8	Quantum Mechanics	PHYS305
9	Radiation Safety	PHYS307
10	Renewable Energy and Energy Harvesting	PHYS310

Department of Physics
Teaching Plan
Class: B.Sc-Ist Year
Title: Mechanics
Course Code: PHYS101TH
Lecture Allotted: 3 per week
Total Lectures: 60

S.No.	Topics	Week	Months
1.	**Unit-I:** Ordinary Differential Equations: 1 st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.	3rd	July
2.	Coordinate systems and motion of a particle: Volume, velocity and acceleration in Cartesian and plane polar coordinates.	4th	July
3.	Volume, velocity and acceleration in Spherical co-ordinate systems, Solid angle.	Ist	August
4.	Space Time Symmetry and Conservation Laws: Relationship of conservation laws and symmetries of space and time.	2nd	August
5.	Frames of Reference: Inertial frames of reference, Galilean transformation and Galilean invariance. Non-inertial frames, Coriolis force and its applications; Foucault's pendulum	3rd	August
6.	**Unit II:** Gravitation and Inverse Square Force Law: Newton's Law of Gravitation, Various forces in nature (qualitative). Central and non-central forces.	4th	August
7.	Inverse square force, Centre of mass. Equivalent one body problem. Reduced mass, angular momentum in central force field	Ist	September
8.	Equation of motion under a force law. Equation of orbit and turning points.	2nd	September
9.	Relationship between eccentricity and energy, Kepler's laws.,	3rd	September
10.	Basic idea of global positioning system (GPS).	4th	September
11.	**Unit-III:** Rotational Motion and Kinematics of Elastic and Inelastic Collisions : Angular velocity, angular momentum, Torque, Conservation of angular momentum,	Ist	October
12.	Elastic and inelastic collisions, coefficient of restitution,	2nd	October
13.	Elastic collisions in laboratory and C.M. systems, Velocities, angle and energies in elastic collisions in C.M.	3rd	October
14.	Velocities, angle and energies in elastic collisions in lab. Systems	4th	October
15.	Classical Scattering: Cross section for elastic scattering, Rutherford scattering (with derivation)	Ist	November
16.	House Exams	2nd and 3rd	November

17.	**Unit IV:** Special Theory of Relativity: Concept of stationary universal frame of reference and search for ether.	4th	November
18.	Michelson Morley experiment, postulates of special theory of relativity. Lorentz transformations. Observer in relativity. Relativity of simultaneity.	I st -2nd	December
19.	Effects of Relativity: Length contraction. Time dilation. Relativistic addition of velocities. Relativistic Doppler effect. Variation of mass with velocity and mass energy equivalence.	3th -4th	December
20.	Increase of mass in an inelastic collision, Relativistic momentum and energies.	2nd	February
21.	Transformation of momentum, energy. Minkowsky space.	3rd	February
22.	Revision and Class Tests	4th	February
23.	End Term Practicals		March
24.	End Term Exams		April

Department of Physics
Teaching Plan
Class: B.Sc-I[st] Year
Title: Electricity, Magnetism and EMT
Course Code: PHY102TH
Lecture Allotted: 3 per week
Total Lectures: 60

S.No.	Topics	Week	Months
1.	**Unit-I:** Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vectorfields, Gauss-divergence theorem, Stokes"s theorem, Green's theorem .	3rd week	July
2.	Electrostatics: Significance of electrostatic force, Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor, electrostatic potential, electrostatic potential energy.	4th	July
3.	Electric potential due to a dipole and quadrupole, long uniformly changed wire, charged disc. Electric potential energy	1st	August
4.	Electric field as a gradient of a scalar potential. Calculation of electric field due to a point charge and a dipole from potential. Method of Electrical Images. Poisson and Laplace equations.	2nd	August
5.	Electric Current and Fields of Moving charges: Current and current density. Continuity equation; $\nabla J + \partial\rho/\partial t = 0$. Microscopic form of Ohm"s law ($J \alpha E$) and conductivity. Failure of Ohms law and its explanation. Invariance of charge.	3rd	August
6.	**Unit II:** Magnetism: Ampere circuital law and its applications. Hall Effect, Expression for Hall constant and its significance. Divergence and curl of magnetic field B. Vector potential: Definition of vector potential A and derivation. (4 Lectures)	4th	August
7.	Field of Moving Charges: E in different frames of reference. Field of a point charge moving with constant velocity. Field of charge that starts or stops (qualitative). Interaction between moving charge and force between parallel currents.	I[st]	September
8.	Surface current density: Definition. and its use in calculation of change in magnetic field at a current sheet. Transformation equations of E and B from one frame of reference to another.	2nd	September

9.	Dielectrics, parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, displacement vector D,	3rd	September
10.	molecular interpretation of Claussius - Mossotti equation, boundary conditions satisfied by E and D at the interface between two homogenous dielectrics, illustration through a simple example.	4th	September
11.	**Unit-III:** Electrostatic Fields in Dielectrics: Polarization of matter. Atomic and molecular dipoles, induced. Dipole moment and atomic polarizability. Electric susceptibility and polarization vector . (7 Lectures)	Ist	October
12.	Capacity of a capacitor filled with Dielectrics. Dielectrics and Gauss"s law Displacement vectorEstablishment of relation ∇.D = ρ free . Energy stored in a dielectric medium	2nd	October
13.	Magnetic Fields in Matter: Behavior of various substances in magnetic fields. Definition of M and H and their relation to free and bound currents.	3rd	October
14.	Magnetic permeability and susceptibility and their interrelation.	4th	October
15.	Orbital motion of electrons and diamagnetism. Electron spin and paramagnetic.	Ist	November
16.	Ferromagnetism. Domain theory of ferromagnetism, magnetization curve, hysterics loss, ferrites.	2nd and 3rd	November
17.	**Unit IV:** Maxwell`s equations and Electromagnetic wave propagation: Displacement current, Maxwell's equations and its physical interpretation,	4th	November
18.	EM waves and wave equation in a medium having finite permeability and permittivity but with conductivity σ = 0. Poynting vector	Ist -2nd	December
19.	Poynting theorem, Impedence of a dielectric to EM waves, EM waves in conducting medium and skin depth.	3th -4th	December
20.	EM waves velocity in a conductor and anomalous dispersion..	2nd	February
21.	Reflection and Transmission of EM waves at a boundary of two dielectric media for normal and oblique incidence of reflection of EM waves from the surface of a conductor at normal incidence	3rd	February
22.	Revision and Class Tests	4th	February
23.	End Term Practicals		March
24.	End Term Exams		April

Department of Physics
Teaching Plan
Class: B.Sc-IInd Year
Title: Statistical and Thermal Physics
Course Code: PHYS201TH
Lecture Allotted: 3 per week
Total Lectures: 60

S.No.	Topics	Week	Months
1.	**Unit-I:** Basic Ideas of Statistical Physics: Scope of statistical physics, basic ideas about probability	3rd	July
2.	Distribution of four distinguishable particles in two compartments of equal sizes. Concept of macro-states, micro-states	4th	July
3.	Thermodynamic probability, effect of constraints on the system.	I^st	August
4.	Distribution of Particles in Compartments: Distribution of n particles in two compartments, Deviation from the state of maximum probability.	2nd	August
5.	Equilibrium state of a dynamic system, distribution of n distinguishable particles in k compartments of unequal sizes.	3rd	August
6.	**Unit II:** Types of Statistics in Physics: Phase space and division into elementary cells. Three kinds of statistics. The basic approach in the three statistics.	4th	August
7.	M-B. Statistics applied to an ideal gas in equilibrium, experimental verification of the Maxwell Boltzmann's law of distribution of molecular speeds. Need for quantum statistics,	I^st	September
8.	h as a natural constant and its implications, indistinguishability of particles and its implications. B-E statistics,	2nd	September
9.	Bose Einstein and Fermi Dirac Statistics: Derivation of Planck's law of radiation, deduction of Wien's distribution law and Stefan's law from plank's law	3rd	September
10.	Fermi-Dirac statistics. Applications to liquid helium, free electrons gas (Fermi level and Fermi Energy), Comparison of M-B, B-E, F-D statistics.	4th	September

11.	**Unit-III:** Entropy and Laws of Thermodynamics: Application of thermodynamics to the thermoelectric effect, change of entropy along a reversible path in a p-v diagram,	I st	October
12.	Entropy of a perfect gas, equation of state of ideal gas from simple statistical considerations, heat death of the universe.	2nd	October
13.	Statistical Interpretation of entropy: Statistical definition of entropy, change of entropy of system, additive nature of entropy	3rd	October
14.	Law of increase of entropy. Reversible and irreversible processes, example of reversible and irreversible processes.	4 th	October
15.	Work done in a reversible process, example of entropy in natural process, entropy and disorder	I st	November
16.	House Exams	2 nd and 3 rd	November
17.	**Unit IV:** Maxwell's Thermodynamic Relations and Their Applications: Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions	4th	November
18.	Derivation of Maxwell's thermodynamic relations	I st -2nd	December
19.	Applications of thermodynamics relations. Cooling produced by adiabatic stretching, adiabatic compression	3th -4th	December
20.	Adiabatic Stretching of a wire, stretching of thin films, change of internal energy with volume. Clausius-Clapeyron Equation,	2nd	February
21.	Thermo dynamical treatment of Joule-Thomson effect for liquification of Helium. Production of very low temperatures by adiabatic demagnetization, TdS equations	3rd	February
22.	Revision and Class Tests	4th	February
23.	End Term Practicals		March
24.	End Term Exams		April

Department of Physics
Teaching Plan
Class: B.Sc-2nd Year
Title: waves and optics
Course Code: PHYS202TH
Lecture Allotted: 3 per week
Total Lectures: 60

	Unit	Topic	Week	Month
1.	**Unit 1:Simple Harmonic Motion (SHM)**	Introduction to SHM (Characteristics, Graphical Representation) [2 lectures]	3rd	July
2.		Phase Relations (Displacement, Velocity, Acceleration) [2 lectures]	3rd -4th	
		Energy of SHM (Kinetic, Potential, Total) SHM oscillator (mass attached to a spring placed on horizontal frictionless surface). [2 lectures]	4th	
		Solution of Differential Equation of SHM, avg. K.E., Pot. E., Total Energy Numerical problems related to SHM	1st	Aug.
3.		Class test/quiz/presentations etc.	1st	
4.		Assignment		
5.	**Damped SHM**	Introduction to Damped Oscillations [1 lecture] Differential Equation of Damped Oscillator, Types of Damping [2 lectures]	2nd	Aug.
		Damped Harmonic Electric Oscillator [1 lecture] Determination of Damping Constants, Logarithmic Decrement, relaxation time [2 lectures]	3rd	Aug.
		Quality Factor, Power Dissipation, Relation between power dissipation energy and relaxation time of damped harmonic oscillator. [2 lecture]	4th	Aug.
		Problems on Damped SHM		
		Class test/presentation		

6.	**Unit-II: Forced Oscillator and Coupled Oscillators**	Transient and Steady Behaviour of Forced Oscillator, Displacement and Velocity vs. Driving Force Frequency [3 lectures]	1st	Sept.
7.		, Power Supplied, Q-Value, Bandwidth (Phasor Treatment) [1 lecture]	2nd	Sept.
		Numerical problems on Forced Oscillator		
8.		Assignment/class test	3rd	Sept
9.				
10.	**Coupled Oscillators**	Stiffness Coupled Pendulums, Normal Modes [2 lectures]	3rd	Sept
11.		Inductance Coupling of Electrical Oscillators [1 lecture] Problems on Coupled Oscillators Class test/quiz /seminar etc.	4th	Sept.
Unit 3				
12.	**Unit-III: Wave Motion and Wave Optics**	Types of Waves, Wave Equation, Impedance [3 lectures]	1st	Oct.
13.		Reflection and Transmission, Standing Waves [3 lecture]	2nd	
14.		Energy of Vibrating String, Wave Velocity [2 lectures]	3rd	
15.		Group Velocity [1lecture]	4th	
16.		Problems on Wave Motion	4th	
17.		Class test/ assignment/ quiz etc.		
18.	**Wave optics**	Electromagnetic Nature of Light, Wavefront Huygens Principle, Interference (Young's Double Slit, Lloyd's Mirror) [3 lectures]	1st	Nov.
		House exam	**2nd-3rd**	**Nov.**
19		Fresnel biprism, Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes) Newton's Rings [4 lectures]	4th	Nov.
20.		Problems on Wave Optics	1st	Dec.
21.		Class test/ assignment/ quiz etc.		
Unit 4				
22.	**Unit-IV: Diffraction and Polarization**	Fraunhofer Diffraction (Single Slit, Double Slit, Grating) [3 lectures]	2nd	Dec.
23.		Fresnel Diffraction (Half-Period Zones, Zone Plate), Fresnel Diffraction Patterns [3 lectures]	3rd	Dec.
24.		Problems on Diffraction	4th	Dec.
25.		Class test/quiz/seminar etc.		

26.	Polarization	Transverse Nature of Light Waves, Polarized Light, Production of Polarized Light, Polaroid, Malus' Law [3 lectures]	1st	Feb.
27.		Double Refraction, Birefringence, Polarization by Reflection, ordinary ray and extraordinary ray, positive and negative crystals. [3 lectures]	2nd	Feb.
28.		Nicol Prism, quarter wave plate and half wave plate, Polarization by reflection (Brewster law), polarization by scattering, Circular and elliptical polarization, production of elliptically polarized and circularly polarized light	3rd – 4th	
29.		Assignment/ Problems on Polarization	4th	Feb.
30.		Submission of final assignment	1st	March
31.		Revision of full syllabus		

Department of Physics
Teaching Plan
Class: B.Sc-IInd Year
Title: Physics Workshop Skill
Course Code: PHYS203TH
Lecture Allotted: 2 per week
Total Lectures: 30

S.No.	Topics	Week	Months
1.	**Unit-I:** Introduction: Measuring units. Conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility.	3rd	July
2.	Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.	4th	July
3.	**Unit-II:** Mechanical Skill: Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding.	Ist	August
4.	Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood.	2nd	August
5.	Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines.	3rd	August
6.	Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file	4th	August
7.	Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.	Ist	September
8.	**Unit-III:** Electrical and Electronic Skill: Use of Multimeter.	2nd	September
9.	Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB.	3rd	September
10.	Operation of oscilloscope.	4th	September

11.	Making regulated power supply. Timer circuit,	I st	October
12.	Electronic switch using transistor and relay.	2 nd	October
13.	**Unit-IV:** Introduction to prime movers: Mechanism, gear system, wheels.	3 rd	October
14.	Fixing of gears with motor axel. Lever mechanism, lifting of heavy weight using lever.	4 th	October
15.	Braking systems, pulleys,	I st	November
16.	House Exams	2 nd and 3 rd	November
17.	Working principle of power generation systems. Demonstration of pulley experiment.	4 th	November
18.	Revision	I st -2 nd	December
19.	Class tests	3 th -4 th	December
20.	Lab Demostration	2 nd -4 th	February
21.	End Term Practicals		March
22.	End Term Exams		April

Department of Physics
Teaching Plan
Class: B.Sc-IInd Year
Title: Electrical Circuits and Network Skill
Course Code: PHYS205TH
Lecture Allotted: 2 per week
Total Lectures: 30

Sr. no.	General topic	Topics	Week	Month
1	**Basic Electricity Principles:**	Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations.	3rd	July
		AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.	4th	July
2	**Understanding Electrical Circuits:**	Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements.	1st	Aug.
		Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source.	2nd	Aug.
		Power factor. Saving energy and money. Assignment/class test/quiz/ seminar etc.	3rd	Aug.
3	**Electrical Drawing and Symbols:**	Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics	4th	Aug.
		Power circuits. Control circuits. Reading of circuit schematics.	1st	Sept.
		Tracking the connections of elements and identify current flow and voltage drop.	2nd	Sept.
		Assignment/class test/quiz/ seminar etc.	3rd	Sept.
4	**Generators and Transformers:**	DC Power sources.	4th	Sept.
		AC/DC generators.	1st -2nd	Oct.
		Inductance, capacitance, and impedance. Operation of transformers.	3rd	Oct.
5	**Electric Motors:**	Single-phase, three-phase & DC motors. Basic design	4th	Oct.
		Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor. Assignment/class test/quiz/ seminar etc.	3rd	Nov.

6	Solid-State Devices:	Resistors, inductors and capacitors. Diode and rectifiers.	4th	Nov.
		Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources Assignment/class test/quiz/ seminar etc.	1st 1st	Dec. Dec.
7	Electrical Protection	Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating	2nd	Dec.
		Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device) Assignment/class test/quiz/ seminar etc.	3rd	Dec.
8	Electrical Wiring:	Different types of conductors and cables.	4th	Dec.
		Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors.	1st	Feb.
		Instruments to measure current, voltage, power in DC and AC circuits. Insulation	2nd	Feb.
		Solid and stranded cable. Conduit. Cable trays. Splices: wire nuts, crimps, terminal blocks, split bolts, and solder.	3rd	Feb.
Project		Preparation of extension board.	4th	Feb.
		Submission of project	1st	March
		Submission of final assignment	1st	March

Department of Physics
Teaching Plan
Class: B.Sc-3rd Year
Title: nuclear and particle physics
Course Code: PHYS304TH
Lecture Allotted: 3 per week
Total Lectures: 60

Sr. no.	unit	topic	week	month
Unit 1				
1	**General Properties of Nuclei**	Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), 2 lectures binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, (2 lectures)	3rd	July
2		N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states. (1 lecture)	4th	July
3		Liquid drop model approach, semi empirical mass formula and significance of various terms (2 lectures) condition of nuclear stability. Two nucleon separation energies (1 lecture)	1st	Aug.
4		Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas) (2 lectures)) evidence for nuclear shell structure, nuclear magic numbers (1 lecture))	2nd	Aug.
5		basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force. (3 Lectures) Assignment 1 (gen. properties) Assignment 2 (nuclear models) Class test unit 1	3rd	Aug.
Unit 2				
6	**Radioactivity decay:**	Alphaα decay: basics of -decay processes, theory of α-emission, Gamowα factor, Geiger Nuttall law, -decay spectroscopy. (3 lectures)	4th	Aug.

7		decay: energy kinematics for βdecay, positron emission, electron capture, neutrino hypothesis. (3 lectures)	1st	Sept.
8		Gamma decay: Gamma rays' emission & kinematics, internal conversion. (3 lectures) Assignment 3, (radioactive decay)	2nd	Sept.
9	**Nuclear Reactions:**	Types of Reactions, Conservation Laws, kinematics of reactions. (2 lectures) Q-value, reaction rate, reaction cross section. (2 lectures)	3rd	Sept.
10		Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering). (3 lectures) Assignment 4, (nuclear reactions) Class test/ quiz/seminar etc.	4th	Sept.
Unit 3				
11	**Nuclear Detectors and Accelerators:**	Interaction of nuclear radiation with matter: Energy loss due to ionization (Bethe-Block formula) (2 lectures) energy loss of electrons, Cerenkov radiation (1 lectures)	3rd	Nov.
12		Detector for Nuclear Radiations: Gas detectors (1 lecture) estimation of electric field, mobility of particle, for ionization chamber and GM Counter. (2 lectures)	4th	Nov.
13		Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). (1 lectures) Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility). (2 lectures)	1st	Dec.
14		Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator) (2 lectures) Linear accelerator, Cyclotron, Synchrotrons. (2 lectures)	2nd	Dec.
15		Assignment 5, (detectors) Class test/ quiz/seminar etc.	3rd	Dec.
Unit 4				
16	**Particle Physics:**	Particle interactions; basic features. Classification of elementary particles and its families. (1 lecture)	3rd	Dec.

17		Conservation Laws: energy and momentum, angular momentum, parity, Baryon number, Lepton number, Isospin, Strangeness (2 lectures) Gell-Mann-Nishijima Scheme, CPT theorem, parity violation in weak interactions. (1 lecture) Assignment 6, (half unit)	4th	Dec.
18		Particle Symmetries. Quarks Model, quantum number of quarks and gluons. Quark Model of Hadrons: Quark structure of non-strange and strange hadrons Mesons and baryons containing charm and bottom quarks, explanation of their quantum numbers in terms of their constituents' quarks	1st	Dec.
19		Quark wave function of Mesons and nucleons, need of color quantum number Cosmic Rays; origin of cosmic rays. primary and secondary cosmic rays	2nd	Feb.
20		hard component and soft component, the altitude effect, the latitude effect, East– west asymmetry, cosmic rays' showers.	3rd.	Feb.
21		Assignment 7 (full unit) Class test/ quiz/seminar etc. Submission of final assignment	4th	Feb.
		REVISION		

Department of Physics
Teaching Plan
Class: B.Sc-IIIrd Year
Title: Quantum Mechanics
Course Code: PHYS305TH
Lecture Allotted: 3 per week
Total Lectures: 60

S.No.	Topics	Week	Months
1.	**Unit-I:** Time dependent Schrodinger equation: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions.	3rd	July
2.	Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle. (6 Lectures)	4th	July
3.	Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions;	Ist	August
4.	General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to the spread of Gaussian wave packet for a free particle in one dimension	2nd	August
5.	wave packets, Fourier transforms and momentum space wavefunction; Position-momentum uncertainty principle.	3rd	August
6.	**Unit-II :**General discussion of bound states in an arbitrary potential- continuity of wave function,	4th	August
7.	boundary condition and emergence of discrete energy levels;	Ist	September
8.	application to one-dimensional problem- square well potential;.	2nd	September
9.	Quantum mechanics of simple harmonic oscillator-energy levels	3rd	September
10.	and energy eigenfunctions using Frobenius method	4th	September
11.	**Unit-III:** Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates;	Ist	October

12.	separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wave functions from Frobenius method;	2nd	October
13.	Orbital angular momentum quantum numbers l and m; s, p, d,.. shells (idea only) (9 Lectures) Atoms in Electric and Magnetic Fields:- Electron Angular Momentum	3rd	October
14.	. Space Quantization. Electron Spin and Spin Angular Momentum. Larmor"s Theorem. Spin Magnetic Moment.	4 th	October
15.	SternGerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton.	I st	November
16.	House Exams	2 nd and 3 rd	November
17.	**Unit IV:** Atoms in External Magnetic Fields:- Zeeman Effect, Normal and Anomalous Zeeman Effect. (4 Lectures)	4th	November
18.	Many electron atoms :- Pauli"s Exclusion Principle. Symmetric and Antisymmetric Wave Functions	I st -2nd	December
19.	. Periodic table. Fine structure. Spin orbit coupling.	3th -4th	December
20.	Spectral Notations for Atomic States. Total Angular Momentum. Vector Model.	2nd	February
21.	Spin-orbit coupling in atoms-L-S and J-J couplings.	3rd	February
22.	Revision and Class Tests	4th	February
23.	End Term Practicals		March
24.	End Term Exams		April

Department of Physics
Teaching Plan
Class: B.Sc-3rd Year
Title: Radiation Safety
Course Code: PHYS307TH
Lecture Allotted: 3 per week
Total Lectures: 30

Sr no.	General topic	topic	week	month
1.	**Basics of Atomic and Nuclear Physics**	Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay,	3rd - 4th	july
2.		Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.	1st	Aug.
3.		Assignment/test		
4.	**Interaction of Radiation with matter:**	Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources	2nd	Aug.
5.		Interaction of Photons - Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients	3rd	Aug.
6.		Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling	4th - 1st	Aug. sept.
7.		Channelling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons- Collision, slowing down and Moderation.	2nd	Sept.
8.		Assignment/ class test		
9.	**Radiation detection and monitoring devices**	Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose,	3rd	Sept.
10.		Annual Limit of Intake (ALI) and derived Air Concentration (DAC). Radiation detection: Basic concept and working principle of gas detectors (Ionization Chambers,	4th	Sept.
11.		Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter),	1st - 2nd	Oct.

		Scintillation Detectors (Inorganic and Organic Scintillators)		
12.		Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry.	3rd	Oct.
13.		Assignment/ class test		
14.	**Radiation safety management:**	Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles	4th – 3rd	Nov.
15.		justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management	4th	Nov.
16.		Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.	1st	Dec.
17.		Assignment/ class test		
18.	**Application of nuclear techniques:**	Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy)	2nd	Dec.
19.		Archaeology, Art, Crime detection, Mining and oil. Industrial Uses	3rd	Dec.
20.		Tracing, Gauging, Material Modification, Sterilization, Food preservation.	4th	Dec.
21.		Assignment/ class test	2nd	Feb.
22.		Final project	3rd	Feb.
23.		Submission of final assignment	4th	Feb.

Department of Physics
Teaching Plan
Class: B.Sc-IIIrd Year
Title: Renewable Energy And Energy Harvesting
Course Code: PHYS310TH
Lecture Allotted: 3 per week
Total Lectures: 30

S.No.	Topics	Week	Months
1.	Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources	3rd	July
2.	An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy,	4 th	July
3.	biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	I st	August
4.	Solar energy: Solar energy, its importance, storage of solar energy,	2nd	August
5.	solar pond, non-convective solar pond, applications of solar pond and solar energy	3rd	August
6.	solar water heater, flat plate collector, solar distillation, solar cooker	4 th	August
7.	solar green houses, solar cell, absorption air conditioning.	I st	September
8.	Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	2nd	September
9.	Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies	3rd	September
10.	Ocean Energy: Ocean Energy Potential against Wind and Solar,	4 th	September
11.	Wave Characteristics and Statistics, Wave Energy Devices.	I st	October
12.	Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.	2nd	October
13.	Geothermal Energy: Geothermal Resources, Geothermal Technologies.	3rd	October
14.	Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.	4 th	October

15.	Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect,	I st	November
16.	materials and mathematical description of piezoelectricity,	2 nd and 3 rd	November
17.	Piezoelectric parameters and modeling piezoelectric generators	4th	November
18.	, Piezoelectric energy harvesting applications, Human power	I st -2nd	December
19.	Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications	3th -4th	December
20.	Carbon captured technologies, cell, batteries, power consumption,	2nd	February
21.	Environmental issues and Renewable sources of energy, sustainability.	3rd	February
22.	Revision and Class Tests	4th	February
23.	End Term Practicals		March
24.	End Term Exams		April

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