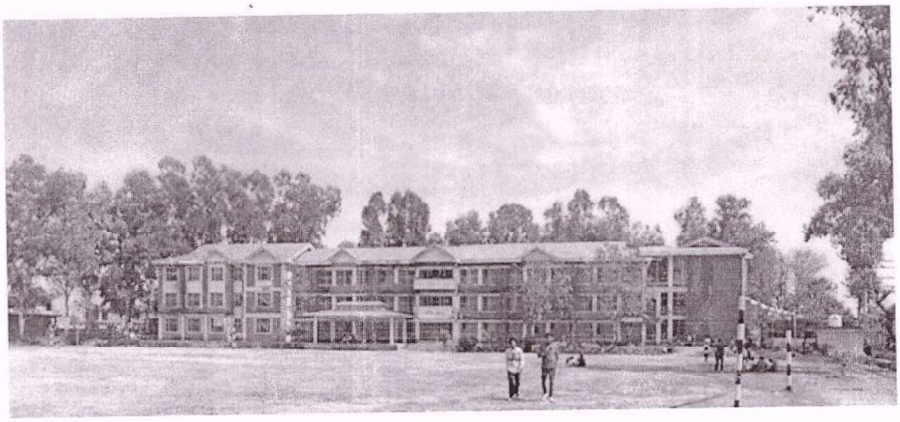
Shree Guru Gobind Singh Ji Government College Paonta Sahib

PREPARATION AND ADHERENCE OF ACADEMIC CALENDAR AND TEACHING PLANS



TEACHING PLAN

Department of Physics
Shree Guru Gobind Singh Ji Government College
Paonta Sahib (H.P.)

Department of Physics

Lesson Plan

Class B.Sc. 1st Year

Title: Mechanics

Lecture Allotted: 3 per week

Course Objective:

1 To make students aware of basic principles, laws and Mathematical analysis of various concepts in physics.

2 To encourage Innovative ideas through Projects based on theories, concepts and practical by students.

Course Outcome:

1 To impart knowledge about various aspects of mechanics

2 Application of principles in terrestrial world development

3 Applications of theory of relativity in astronomy and space science.

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

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21	Michelson- Morley experiment, postulates of special theory of relativity.	4th week	
22	Lorentz transformations. Observer in relativity. Relativity of simultaneity.	2nd week	February
23	**Effects of Relativity:** Length contraction. Time dilation. Relativistic addition of velocities.	3rd week	
24	Relativistic Doppler effect. Variation of mass with velocity and mass energy equivalence.	4th week	
25	Increase of mass in an inelastic collision, Relativistic momentum and energies.	1st week	March
26	Transformation of momentum, energy. Minkowsky space.	2nd Week	
27	Revision	3rd week	
28	Revision	4th week	

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Class B.Sc. 1st Year

Title: Electricity Magnetism and EMT
Lecture Allotted: 3 per week

Objective

1. To make students aware of basic principles, laws and Mathematical analysis of various concepts in physics.
2. To encourage Innovative ideas through Projects based on theories, concepts and practical by students.

Course Outcome:

1. To impart knowledge about static electricity with applications in science.
2. To make aware about various principles of current electricity and its applications.
3. To make students aware of Magnetic effects of current and applying it to science
4 To develop interest in concept of em waves. Role of em waves in science today.
5 Electromagnetic waves and understanding universe.

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	**July**
2.	**Unit-I: Vector Analysis**: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance,	2nd week	
3.	Vector Integration, Line, surface and volume integrals of Vector fields,	3rd week	
4.	Gauss-divergence theorem, Stokes"s theorem, Green's theorem.	4th week	
5.	**Electrostatics**: Significance of electrostatic force, Electrostatic Field, electric flux, Gauss's theorem of electrostatics.	1st week	**August**
6.	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.	2nd week	
7.	Electric potential due to a dipole and quadrupole, long uniformly changed wire, charged disc. Electric potential energy. Electric field as a gradient of a scalar potential.	3rd week	
8.	Calculation of electric field due to a point charge and a dipole from potential. Method of Electrical Images. Poisson and Laplace equations.	4th week	
9.	**Electric Current and Fields of Moving charges**: Current and current density. Continuity equation; $\nabla J + \rho\partial/\partial t = 0$.	1st week	**September**
10.	Microscopic form of Ohm"s law ($J \alpha E$) and conductivity. Failure of Ohms law and its explanation. Invariance of charge.	2nd week	
11.	**Unit-II: Magnetism:** Ampere circuital law and its applications. Hall Effect, Expression for Hall constant and its significance.	3rd week	
12.	Divergence and curl of magnetic field **B**. Vector potential: Definition of vector potential **A** and derivation.	4th week	
13.	**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).	1st week	**October**
14.	**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 week	
15.	Dielectrics, parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, displacement vector **D**, molecular interpretation of Claussius – Mossotti equation	3rd & 4th week	

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16.	**Unit-III : Electrostatic Fields in Dielectrics:** Polarization of matter. Atomic and molecular dipoles, induced. Dipole moment and atomic polarizability	1st week	**November**
17.	Electric susceptibility and polarization vector Capacity of a capacitor filled with Dielectrics. Dielectrics and Gauss's law Displacement vector	2nd & 3rd week	
18.	Establishment of relation $\nabla . D = \rho_{free}$. Energy stored in a dielectric medium.	4th week	
19.	House Exams	1st or 2nd week	**December**
20.	**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 week	
21.	Magnetic permeability and susceptibility and their interrelation. Orbital motion of electrons and diamagnetism. Electron spin and paramagnetic..	4th week	
22.	Ferromagnetism. Domain theory of ferromagnetism, magnetization curve, hysterics loss, ferrites	2nd week	**February**
23.	**Maxwell`s equations and Electromagnetic wave propagation:** Displacement current, Maxwell's equations and its physical interpretation,	3rd week	
24.	EM waves and wave equation in a medium having finite permeability and permittivity but with conductivity $\sigma = 0$. Poynting vector, Poynting theorem	4th week	
25.	Impedence of a dielectric to EM waves, EM waves in conducting medium and skin depth. EM waves velocity in a conductor and anomalous dispersion.	1st week	**March**
26.	Transmission of EM waves at a boundary of two dielectric media for normal and oblique incidence	2nd Week	
27.	Revision	3rd week	
28.	Revision	4th week	

***The schedule is subject to changes depending upon the circumstances**

4. Class tests to be conducted at the end of each unit

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Class B.Sc. 2nd Year
Title: Statistical Mechanics and Thermal Physics
Lecture Allotted: 3 per week

Objective

1 To make students aware of basic principles, laws and Mathematical analysis of various concepts in physics.

2 To encourage Innovative ideas through Projects based on theories, concepts and practical by students.

Course Outcome:

1. To train students in statistical methods.
2. To use Statistical phenomenon in thermal applications of solids and gases.
3. To impart knowledge about various devices and making use of thermodynamics

S. No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	July
2.	**Unit-I: Basic Ideas of Statistical Physics:** Scope of statistical physics, basic ideas about probability	2nd week	
3.	distribution of four distinguishable particles in two compartments of equal sizes. Concept of macro-states, micro-states	3rd week	
4.	thermodynamic probability, effect of constraints on the system	4th week	
5.	**Distribution of Particles in Compartments:** Distribution of n particles in two compartments	1st week	August
6.	Deviation from the state of maximum probability. Equilibrium state of a dynamic system	2nd week	
7.	distribution of n distinguishable particles in k compartments of unequal sizes	3rd week	
8.	**Unit-II: Types of Statistics in Physics:** Phase space and division into elementary cells	4th week	
9.	Three kinds of statistics. The basic approach in the three statistics.	1st week	September
10.	M-B. Statistics applied to an ideal gas in equilibrium, experimental verification of the Maxwell Boltzmann,,s law of distribution of molecular speeds.	2nd week	
11.	Need for quantum statistics, h as a natural constant and its implications	3rd week	
12.	indistinguishability of particles and its implications.	4th week	
13.	B-E statistics: Derivation of Planck's law of radiation	1st week	October
14.	Deduction of Wien"s distribution law and Stefan's law from Plank"s law	2nd week	
15.	Fermi-Dirac statistics. Applications to liquid helium, free electrons gas (Fermi level and Fermi Energy)	3rd & 4th week	
16.	Comparison of M-B, B-E, F-D statistics	1st week	November
17.	**Unit-III: Entropy and Laws of Thermodynamics:** Application of thermodynamics to the thermoelectric effect	2nd & 3rd week	
18.	change of entropy along a reversible path in a p-v diagram, entropy of a perfect gas	4th week	
19.	House Exams	1st or 2nd week	December
20.	equation of state of ideal gas from simple statistical considerations, heat death of the universe	3rd week	
21.	, change of entropy of system, additive nature of entropy, law of increase of entropy. **Statistical Interpretation of entropy:** Statistical definition of entropy	4th week	

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22.	Reversible and irreversible processes, example of reversible and irreversible processes. Work done in a reversible process, example of entropy in natural process, entropy and disorder	2nd week	**February**
23.	**Unit-IV: Maxwell's Thermodynamic Relations and Their Applications:** Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy	3rd week	
	functions. Derivation of Maxwell's thermodynamic relations		
24.	Applications of thermodynamics relations. Cooling produced by adiabatic stretching, adiabatic compression, adiabatic Stretching of a wire, stretching of thin films	4th week	
25.	Clausius - Clapeyron Equation, Thermo dynamical treatment of Joule Thomson effect for liquification of Helium.	1st week	**March**
26.	Production of very low temperatures by adiabatic demagnetization, TdS equations	2nd Week	
27.	Revision	3rd week	
28.	Revision	4th week	

***The schedule is subject to changes depending upon the circumstances**
Class tests to be conducted at the end of each unit

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Class B.Sc. 2nd Year
Title: Waves and Optics
Lecture Allotted: 3 per week

Course Objective:

1 To make students aware of basic principles, laws and Mathematical analysis of various concepts in physics.

2 To encourage Innovative ideas through Projects based on theories, concepts and practical by students.

Course Outcome:

1 To impart knowledge about waves & oscillations.

2 Applications of waves & oscillations to solids.

3 To make students understand basic concept of optics.

4 Applications of concepts of optics in explaining various phenomenon of nature and astronomical phenomenon.

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	**July**
2.	**Unit-I: Simple harmonic motion**: characteristics, graphical representation of SHM, phase relation between displacement, velocity and acceleration of a particle executing SHM	2nd week	
3.	SHM oscillator (mass attached to a spring placed on horizontal frictionless surface). energy of a simple harmonic oscillator.	3rd week	
4.	solution of the differential equation of SHM. Average kinetic energy, average potential energy and total energy	4th week	
5.	**Damped SHM:** Damped oscillations. differential equation of motion of one dimensional damped harmonic mechanical oscillator.	1st week	**August**
6.	Types of damping. damped harmonic electric oscillator (differential equation and its solutions). Determination of the damping constants.	2nd week	
7.	Logarithmic decrement. Relaxation time. The quality factor, power dissipation in a damped harmonic oscillator when damping is weak.	3rd week	
8.	Relation between power dissipation energy and relaxation time of damped harmonic oscillator.	4th week	
9.	**Unit-II: The Forced Oscillator:** Transient and steady behavior of forced oscillator. Displacement and velocity variation with driving force frequency	1st week	**September**
10.	Variation of phase with frequency. Power supplied to an oscillator and its variation with frequency.	2nd week	
11.	Q- value and band width. Q-value as an amplification factor (Phasor treatment to be followed).	3rd week	
12.	**Coupled Oscillators:** Stiffness coupled pendulums. Normal co-ordinates and normal modes of vibration. Inductance coupling of electrical oscillators.	4th week	
13.	**Wave Motion:** The type of waves. The wave equation and its solution. Characteristic impedance of a string.	1st week	**October**
14.	Impedance matching. Reflection and transmission of energy. Reflected and transmitted energy coefficients.	2nd week	
15.	Standing waves on a string of fixed length. Energy of a vibrating string. Wave velocity and group velocity.	3rd week	
16.	**Unit-III: Wave Optics:** Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.	4th week	

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17.	**Interference:** Division of wavefront and division of amplitude. Young's Double Slit experiment.	1st week	**November**
18.	Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment.	2nd week	
19.	Interference in Thin Films: parallel and wedge-shaped films.	3rd week	
20.	Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes).	4th week	
21.	House Exams	1st, 2nd week	**December**
22.	Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer.	3rd week	
23.	**Unit-IV: Diffraction:** Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating, Dispersive power of diffraction grating	4th week	
24.	Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis.	2nd week	**February**
25.	**Polarization:** Transverse nature of light waves. Unpolarized and plane polarized light, production of polarized light, Wire grid polarizer, Polaroid	3rd week	
26.	Effect of intensity of light passing through Polaroid, Malus" law, double refraction; ordinary ray and extraordinary ray, positive and negative crystals, birefringence	4th week	
27.	Nicol Prism, quarter wave plate and half wave plate, Polarization by reflection (Brewster law), polarization by scattering	1st week	**March**
28.	Circular and elliptical polarization, production of elliptically polarized and circularly polarized light	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

***The schedule is subject to changes depending upon the circumstances**

1 Class tests to be conducted at the end of each unit

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Class B.Sc. 3rd Year
Title: Elements of Modern Physics
Lecture Allotted: 3 per week

Course Objective:

1 To make students aware of basic principles, laws and Mathematical analysis of various concepts in physics.

2 To encourage Innovative ideas through Projects based on theories, concepts and practical by students.

Course Outcome:

1 To make students aware of basic principles of micro world.
2 To differentiate micro from macro world.
3 To explains facts through application of these principles.
4 To explains atomic energy.

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	**July**
2.	**Unit-I:** Planck"s quantum, Planck"s constant and light as a collection of photons; Photo-electric effect	2nd week	
3.	Compton scattering. De Broglie wavelength and matter waves. Davisson-Germer experiment.	3rd week	
4.	Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra	4th week	
5.	Bohr's quantization rule and atomic stability	1st week	**August**
6.	calculation of energy levels for hydrogen like atoms and their spectra.	2nd week	
7.	**Unit-II:** Heisenberg uncertainty principle- impossibility trajectory; estimating minimum energy of a confined principle	3rd week	
8.	Energy-time uncertainty principle. Wave-particle duality	4th week	
9.	Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles	1st week	**September**
10.	Momentum and Energy operators; stationary states	2nd week	
11.	physical interpretation of wave function, probabilities and normalization	3rd week	
12.	Probability and probability current densities in one dimension.	4th week	
13.	**Unit-III:** One dimensional infinitely rigid box	1st week	**October**
14.	energy eigenvalues and eigenfunctions normalization	2nd week	
15.	Quantum mechanical scattering and tunnelling	3rd week	
16.	tunnelling in one dimension -across a step potential.	4th week	
17.	tunnelling across a rectangular potential barrier.	1st week	**November**
18.	Size and structure of atomic nucleus and its relation with atomic weight	2nd week	
19.	Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle	3rd week	
20.	Nature of nuclear force, NZ graph	4th week	
21.	House Exams	1st, 2nd week	**December**
22.	semi-empirical mass formula and binding energy	3rd week	
23.	**Unit-IV:** Radioactivity: stability of nucleus; Law of radioactive decay	4th week	
24.	Mean life & half-life; α decay, β-decay : energy released	2nd week	**February**
25.	γ-ray emission, Fission and Fusion, mass deficit,	3rd week	

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26.	relativity and generation of energy. Fission - nature of fragments and emission of neutrons	4th week	
27.	Nuclear reactor: slow neutrons interacting with Uranium-235	1st week	**March**
28.	Fusion and thermonuclear reactions.	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

***The schedule is subject to changes depending upon the circumstances**
Class tests to be conducted at the end of each unit

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Class B.Sc. 3rd Year
Title: Nuclear and Particle Physics
Lecture Allotted: 3 per week

Course Outcome

1. To make student aware of nucleus and it' constituents and models to explain nucleus.
2. To make students understand various underlying principles that explain Nuclear properties.
3. To make students aware of it's applications in nuclear energy and origin of solar energy
4. To tell students about elementary particle and it's applications to unfold mysteries of universe.

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	July
2.	**Unit-I: General Properties of Nuclei**: Constituents of nucleus and their Intrinsic properties	2nd week	
3.	quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number	3rd week	
4.	main features of binding energy versus mass number curve, N/A plot	4th week	
5.	angular momentum, parity, magnetic moment, electric momcnts, nuclear excites states.	1st week	August
6.	**Nuclear Models**: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability	2nd week	
7.	Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers	3rd week	
8.	basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.	4th week	
9.	**Unit-II: Radioactivity decay**: (a) Alpha decay: basics of α -decay processes, theory of α-emission	1st week	September
10.	Gamow theory of α-decay, Geiger Nuttall law, α -decay spectroscopy	2nd week	
11.	β-decay: energy kinematics for β- decay, positron emission, electron capture, neutrino hypothesis.	3rd week	
12.	Gamma decay: Gamma rays emission & kinematics, internal conversion.	4th week	
13.	**Nuclear Reactions:** Types of Reactions, Conservation Laws, kinematics of reactions, Q-value	1st week	October
14.	reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering).	2nd week	
15.	**Unit-III: Nuclear Detectors and Accelerators:** Interaction of nuclear radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons	3rd week	
16.	Cerenkov radiation, Detector for Nuclear Radiations: Gas detectors	4th week	
17.	estimation of electric field, mobility of particle, for ionization chamber and GM Counter.	1st week	November
18.	Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT).	2nd week	
19.	Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility).	3rd week	
20.	facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator	4th week	
21.	House Exams	1st, 2nd week	December
22.	Cyclotron, Synchrotrons.	3rd week	
23.	**Unit-IV: Particle Physics:** Particle interactions; basic features. Classification of elementary particles and its families.	4th week	

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24.	Conservation Laws: energy and momentum, angular momentum, parity, Baryon number, Lepton number, Isospin, Strangeness	2nd week	**February**
25.	Gell-Mann-Nishijima Scheme, CPT theorem, parity violation in weak interactions. Particle Symmetries	3rd week	
26.	Quarks Model, quantum number of quarks and gluons. Quark Model of Hadrons: Quark structure of non strange and strange hadrons	4th week	
27.	Mesons and baryons containing charm and bottom quarks, explanation of their quantum numbers in terms of their constituents quarks, Quark wave function of Mesons and nucleons, need of color quantum number	1st week	**March**
28.	Cosmic Rays; origin of cosmic rays. primary and secondary cosmic rays, hard component and soft component, the altitude effect, the latitude effect, East–west asymmetry, cosmic rays showers.	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

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Class B.Sc. 2nd Year SEC-I
Title: Physics Workshop Skills
Lecture Allotted: 2 per week

Course Outcome:

1. To enable the students to get familiar with various mechanical and electrical tools.
2. Applications of with various mechanical and electrical tools through hands-on mode.

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	July
2.	Measuring units. conversion to SI and CGS. Familiarization with meter scale	2nd week	
3.	Vernier calliper, Screw gauge and their utility	3rd week	
4.	Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc.	4th week	
5.	Use of Sextant to measure height of buildings, mountains, etc.	1st week	August
6.	**Mechanical Skill**: Concept of workshop practice. Overview of manufacturing methods	2nd week	
7.	casting, foundry, machining	3rd week	
8.	forming and welding. Types of welding joints and welding defects	4th week	
9.	Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood	1st week	September
10.	Concept of machine processing	2nd week	
11.	introduction to common machine tools like lathe, shaper	3rd week	
12.	drilling, milling and surface machines	4th week	
13.	Cutting tools, lubricating oils. Cutting of a metal sheet using blade	1st week	October
14.	Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block	2nd week	
15.	Use of bench vice and tools for fitting	3rd week	
16.	Make funnel using metal sheet	4th week	
17.	**Electrical and Electronic Skill**: Use of Multimeter	1st week	November
18.	Soldering of electrical circuits having discrete components (R, L, C, diode)	2nd week	
19.	Soldering of ICs on PCB	3rd week	
20.	Operation of oscilloscope	4th week	
21.	House Exams	1st, 2nd week	December
22.	Making regulated power supply	3rd week	
23.	Timer circuit, Electronic switch using transistor and relay	4th week	
24.	**Introduction to prime movers**: Mechanism	2nd week	February
25.	gear system, wheel, Fixing of gears with motor axel.	3rd week	
26.	Lever mechanism, Lifting of heavy weight using lever	4th week	
27.	braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.	1st week	March
28.	Revision	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

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Class tests to be conducted at the end of each unit

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Class B.Sc. 2nd Year SEC-II
Title: Electrical Circuits and Network Skills
Lecture Allotted: 2 per week

Course Outcome:

1. To enable the students to design the electrical circuits and networks .
2. To understand trouble shoots in electrical circuits, networks and appliances.
3. Hands-on mode applications

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	July
2.	**Basic Electricity Principles**: Voltage, Current, Resistance, and Power	2nd week	
3.	Ohm's law. Series, parallel, and series-parallel combinations	3rd week	
4.	AC Electricity and DC Electricity	4th week	
5.	Familiarization with multimeter, voltmeter and ammeter	1st week	August
6.	**Understanding Electrical Circuits**: Main electric circuit elements and their combination	2nd week	
7.	Rules to analyze DC sourced electrical circuits	3rd week	
8.	Current and voltage drop across the DC circuit elements	4th week	
9.	Single-phase and three-phase alternating current sources	1st week	September
10.	Rules to analyze AC sourced electrical circuits	2nd week	
11.	Real, imaginary and complex power components of AC source	3rd week	
12.	Power factor. Saving energy and money	4th week	
13.	Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams	1st week	October
14.	Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics	2nd week	
15.	Tracking the connections of elements and identify current flow and voltage drop	3rd week	
16.	: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers	4th week	
17.	Single-phase, three-phase & DC motors	1st week	November
18.	Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor	2nd week	
19.	Resistors, inductors and capacitors. Diode and rectifiers	3rd week	
20.	Components in Serics or in shunt. Response of inductors and capacitors with DC or AC sources	4th week	
21.	House Exams	1st, 2nd week	December
22.	**Electrical Protection**: Relays. Fuses and disconnect switches. Circuit breakers. Overload	3rd week	
	devices. Ground-fault protection		
23.	Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device)	4th week	
24.	**Electrical Wiring**: Different types of conductors and cables. Basics of wiring-Star and delta connection.	2nd week	February
25.	Voltage drop and losses across cables and conductors	3rd week	
26.	Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable	4th week	
27.	Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder	1st week	March
28.	Preparation of extension board.	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

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Class B.Sc. 3rd Year SEC-I
Title: Radiation Safety
Lecture Allotted: 2 per week

Course Outcome:

1.To Make students aware of Radiation hazards.
2.To make them understand ill effects of radiation exposure.
3.To make students aware of radiation safety procedures and techniques.
4.To explain safe use of radiation equipment in medical and other applications.

S.No.	Topics	Week	Month
1.	**Introduction to Course and syllabus**	1st Week	July
2.	**Basics of Atomic and Nuclear Physics:** Basic concept of atomic structure; X rays characteristic and production	2nd week	
3.	concept of bremsstrahlung and auger electron, The composition of nucleus and its properties	3rd week	
4.	mass number, isotopes of element, spin, binding energy, stable and unstable isotopes	4th week	
5.	law of radioactive decay, Mean life and half-life, basic concept of alpha, beta and gamma decay	1st week	August
6.	concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission	2nd week	
7.	**Interaction of Radiation with matter: Types of Radiation:** Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources	3rd week	
8.	**Interaction of Photons** - Photoelectric effect, Compton Scattering, Pair Production	4th week	
9.	**Interaction of Charged Particles:** Heavy charged particles - Beth-Bloch Formula	1st week	September
10.	Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation	2nd week	
11.	Beta Particles- Collision and Radiation loss (Bremsstrahlung)	3rd week	
12.	**Interaction of Neutrons**- Collision, slowing down and Moderation.	4th week	
13.	**Radiation detection and monitoring devices: Radiation Quantities and Units:** Basic idea of different units of activity	1st week	October
14.	KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose	2nd week	
15.	Annual Limit of Intake (ALI) and derived Air Concentration (DAC).	3rd week	
16.	**detection:** Basic concept and working principle of gas detectors, Ionization Chamber.	4th week	
17.	Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter	1st week	November
18.	Scintillation Detectors (Inorganic and Organic Scintillators),	2nd week	
19.	Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry	3rd week	
20.	**Radiation safety management:** Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control	4th week	
21.	House Exams	1st, 2nd week	December
22.	radiation protection standards, International Commission on Radiological Protection (ICRP) principles	3rd week	
23.	justification, optimization, limitation, introduction of safety and risk management of radiation	4th week	
24.	Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.	2nd week	February
25.	**Application of nuclear techniques:** Application in medical science	3rd week	

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26.	MRI, PET, Projection Imaging Gamma Camera, radiation therapy	4th week	
27.	Archaeology, Art, Crime detection, Mining and oil	1st week	**March**
28.	Industrial Uses. Tracing, Gauging, Material Modification, Sterilization, Food preservation	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

***The schedule is subject to changes depending upon the circumstances**
Class tests to be conducted at the end of each unit

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Class B.Sc. 3rd Year SEC-II
Title: Physics Renewable Energy and Energy Harvesting
Lecture Allotted: 2 per week

Course Outcome:

1.To impart knowledge about primary sources and secondary sources of Energy.
2.To impart knowledge about various harvesting techniques .
3.To provide them with exposure and hands-on learning .
4.To enable students develop better harvesting methods for betterment of society.

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

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22.	mathematical description of piezoelectricity, Piezoelectric parameters	3rd week	
23.	modeling piezoelectric generators. Piezoelectric energy harvesting applications	4th week	
24.	**Electromagnetic Energy Harvesting**: Linear generators	2nd week	**February**
25.	Physics mathematical models, recent applications	3rd week	
26.	Carbon captured technologies, cell, batteries, power consumption	4th week	
27.	Environmental issues and Renewable sources of energy, sustainability	1st week	**March**
28.	Revision	2nd Week	
29.	Revision	3rd week	
30.	Revision	4th week	

***The schedule is subject to changes depending upon the circumstances**

2 Class tests to be conducted at the end of each unit

(H.O.D)

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