# DEPARTMENT OF PHYSICS

# TEACHING PLAN 2024-2025

## Academic-Pedagogical-Evaluation

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|---|---|---|
| **Pedagogy:** | $P_1$ | Black Board Method |
| | $P_2$ | Demonstration |
| | $P_3$ | Question andAnswer |
| | $P_4$ | Practice |
| | $P_5$ | ICT(Audio and Video) |
| | $P_6$ | ICT(Virtual and Online Learning) |
| | $P_7$ | Assignment(written) |
| | $P_8$ | Guest Lecture |
| | $P_9$ | Hands on Practice |
| | $P_{10}$ | Seminar |
| | $P_x$ | Problem solving |
| | $P_Q$ | Quiz |
| | $P_t$ | Test |
| **External: Internal Evaluation** | 70:30 | |

# Academic-Pedagogical-Evaluation: Course Overview

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|---|---|---|
| **Course:**<br>**B.Sc HONOURS PHYSICS** | **Year:I** | **Semester:II** |
| **Paper:**<br>**Course 33(MAJOR&MINOR)** | **MECHANICS AND PROPERTIES OF MATTER** | |
| **Units:** | 1 VECTOR ANALYSIS<br>2. MECHANICS OF PARTICLES<br>3. MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA<br>4. CENTRAL FORCES<br>5. SPECIAL THEORY OF RELATIVITY | |
| **Duration:** | 60hours | |
| **Learning Objectives** | 1. Students will be able to understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field.<br>2. Students will be able to apply the laws of motion, solve equations of motion for variable mass systems<br>3. Students will be able to define a rigid body and comprehend rotational kinematic relations, derive equations of motion for rotating bodies, analyze the precession of a top and gyroscope, understand the precession of the equinoxes<br>4. Students will be able to define central forces and provide examples, understand the characteristics and conservative nature of central forces, derive equations of motion under central forces.<br>**5.** Students will be able to differentiate between Galilean relativity and the concept of absolute frames, comprehend the postulates of the special theory of relativity, apply Lorentz transformations, understand and solve problems | |

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| **ResourceMaterial:** | **StudyMaterial(Handouts):**<br>https://www.youtube.com/watch?v=KsCfRPEGv9U<br>**ReferenceBooks:**<br>1. BSc Physics -Telugu Akademy, Hyderabad<br>2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi<br>3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra<br>4. Properties of Matter - D.S. Mathur, S.Chand & Co, New Delhi ,11th Edn., 2000<br>5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001<br>**YouTube Links:**<br>**https://youtu.be/DFQtVFEp_3E**<br>**Power Point Presentations:**<br>**https://youtu.be/NpzAsQ117Dw** |

# Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

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|---|---|---|---|---|---|
| **Unit-I** | I VECTOR ANALYSIS 9hrs<br>Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems. | | | | |
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 1 |

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|---|---|---|---|---|---|
| **Unit-II** | MECHANICS OF PARTICLES<br>Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.<br>. | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA<br>Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precession of a top, Gyroscope, Precession of the equinoxes.Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio.Classification of beams, types of bending, point load, distributed load. | | | | |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | CENTRAL FORCES<br>Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a . Derivation of Kepler's laws. Motion of satellites | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

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|---|---|---|---|---|---|
| **Unit-V** | SPECIAL THEORY OF RELATIVITY<br>Galilean relativity, Absolute frames. Michelson-Morley experiment, The negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 1 | - | - | 2 |

# I. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Subject:PHYSICS** | **Year: I** | **Semester:II** |
| **Course:4** | **COURSE:4 WAVES AND OSCILLATIONS** | |
| **Units** | 1. Simple Harmonic oscillations<br>2. Damped and forced oscillations<br>3. Complex vibrations<br>4. Vibrating Strings and Bars<br>5. Ultrasonics: | |
| **Duration:** | **45 hours** | |
| **LearningObjectives** | The student should be able<br>1. To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed.<br>2. To utilize mathematical relationships related to wave characteristics.<br>3. To compare particle motion and wave motion in different types of waves.<br>4. To distinguish between Longitudinal and Transverse waves.<br>5. To get the knowledge about how to construct and analysis the square waves, saw tooth waves, etc. from Fourier analysis<br>1. . | |

# Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| **Subject:** | **Physics** | | | | |
|---|---|---|---|---|---|
| **Year-Semester:** | IYear - IISemester | | | | |
| **Paper** | **WAVES AND OSCILLATIONS** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split:Total: 45** | 9 | 9 | 9 | 9 | 9 |
| **InternalEvaluationTotal: 40marks** | 10 | 10 | 5 | 5 | 10 |

| **Syllabus** | | | | |
|---|---|---|---|---|
| Unit-I | I Simple Harmonic oscillations<br><br>Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum-measurement of 'g', Principle of superposition, beats, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.<br>. | | | |
| Pedagogy | $P_1$, $P_3$, $P_4$, $P_5$, $P_6$, $P_8$,$P_9$,$P_X$ | | | |
| Pedagogy Evaluation | P7 | PQ | PT | Total IE |
| IE | 3 | 2 | 5 | 10 |

| **UNIT-II** | Damped and forced oscillations<br><br>Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance. |
|---|---|

| | | | | |
|---|---|---|---|---|
| **Pedagogy** | $P_1$,P2,P3,PT,P5,,P6,P10, | | | |
| **Pedagogy-Evaluation** | PQ | P10 | P7 | IE |
| **IE** | 5 | 3 | 2 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | Complex vibrations<br><br>Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave, simple problems on evolution of Fourier coefficients.<br>. | | | | |
| **Pedagogy** | P1,P2,,P7,P8,PX.P10. | | | | |
| **Pedagogy-Evaluation** | P7 | PX | | | IE |
| **IE** | 3 | 2 | - | - | 5 |

| | | | |
|---|---|---|---|
| **Unit-IV** | Vibrating Strings and Bars<br><br>Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance.Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end. Tuning fork.<br>). | | |
| **Pedagogy** | P1,P5,P6,PQ,PT,P10 | | |
| **Pedagogy-Evaluation** | PT | PQ | IE |
| **IE** | 2 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | Ultrasonics:<br><br>Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magneto strictive methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications and uses of ultrasonic waves.<br><br>. | | | | |
| **Pedagogy** | P1,P3,P7,P5,P6,P8, | | | | |
| **Pedagogy-Evaluation** | P7 | P10 | PQ | PT | IE |
| **IE** | 2 | 2 | 3 | 3 | 10 |

# ELECTRONIC DEVICES AND CIRCUITS LESSON PLAN

## I.Academic-Pedagogical-Evaluation:CourseOverview

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|---|---|---|
| **Course:**<br><br>**B.SC HONOURS PHYSICS** | **Year: II** | **Semester:IV** |
| **Subject:Physics COURSE9 MAJOR&MINOR** | **ELECTRICITY AND MAGNETISM** | |
| **Units:** | 1. **Electrostatics and Dielectrics**<br>2. **Current electricity**<br>3. **Magneto statics**<br>4. **Electromagnetic waves-Maxwell's equations**<br>5. **Varying and alternating currents:** | |
| **Duration:** | 60hours | |
| **LearningObjectives** | 1. Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.<br>2. To learn the methods used to solve problems using loop analysis, Nodal analysis, Thvenin's theorem, Norton's theorem, and the Superposition theorem<br>3. Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.<br>4. Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.<br>5. Develop an understanding on the unification of electric, and magnetic fields and Maxwell's equations governing electromagnetic waves.<br>6. Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits | |

**ResourceMaterial:**

ReferenceBooks:

REFERENCE BOOKS


1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand& Co.,
4. "Electricity and Magnetism" by Brijlal and SubramanyamRatan Prakashan Mandir, 1966
5. "Electricity and Magnetism: Fundamentals, Theory, and Applications" by R. Murugeshan, Kiruthiga Sivaprasath

# I. Academic-Pedagogical-Evaluation:Unit-wisePedagogy

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|---|---|---|---|---|---|
| **Subject:** | **Physics** | | | | |
| **Year-I B.SC HONOURS PHYSICS** | IIYear - IVSemester | | | | |
| **Paper** | **ELECTRICITY AND MAGNETISM** | | | | |
| **Units** | U1 | U2 | u 3 | U4 | U5 |
| **Hours Split:Total: 60** | 10 | 12 | 1 4 | 10 | 14 |
| **InternalEvaluationTotal: 25marks** | 5 | 5 | 5 | 5 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-I** | **I Electrostatics and Dielectrics**<br>Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere. Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics,Dielectric strength, Electric displacement D, electric polarization Relation between D, E and P, Dielectric constant and electric susceptibility | | | | |
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

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|---|---|---|---|---|---|
| **Unit-II** | **II Current electricity**<br>Electrical conduction-drift velocity-current density, equation of continuity, ohms law and limitations, Kirchhoff's Law's, Wheatstone bridge-balancing condition - sensitivity.Branch current method, Nodal Analysis, star to delta & delta to star conversions. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer theorem. | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy - Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 1 |

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|---|---|
| **Unit-III** | Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.<br>**Electromagnetic Induction:**<br>Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self-inductance of a long solenoid, Magnetic |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 |

| | | | | | |
|---|---|---|---|---|---|
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 1 | 1 | - | - | 2 |

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|---|---|---|---|---|---|
| **Unit-IV** | **Electromagnetic waves-Maxwell's equations:**<br>Basic laws of electricity and magnetism- Maxwell's equations-integral and differential forms Derivation, concept of displacement current. Plane electromagnetic wave equation, Hertz experiment-Transverse nature of electromagnetic waves. Electromagnetic wave equation in conducting media. Pointing vector and propagation of electromagnetic waves | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

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|---|---|---|---|---|---|
| **Unit-V** | **Varying and alternating currents:**<br>Growth and decay of currents in LR, CR, LCR circuits-Critical damping. Alternating current - A.C. fundamentals, and A.C through pure R, L and C. Relation between current and voltage in LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor.<br>) | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 2 | - | - | 1 |

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# I. Academic-Pedagogical-Evaluation:CourseOverview

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|---|---|---|
| **Subject:PHYSICS** | **Year: II** | **Semester:IV** |
| **Course:10 MAJOR&MINOR** | **MODERN PHYSICS** | |
| **Units:** | **1. Atomic structure and spectroscopy**<br>2. Molecular Structure and Spectroscopy<br>3. Matter Waves and Uncertainty Principle<br>4. Quantum(Wave)Mechanics<br>**5.** Superconductors | |
| **Duration:** | **60hours** | |
| **LearningObjectives** | 1. Understand the principles of atomic structure and spectroscopy.<br>2. Understand the principles of molecular structure and spectroscopy<br>3. Develop critical understanding of concept of Matter waves and Uncertainty principle.<br>4. Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.<br>5. Increase the awareness and appreciation of superconductors and their practical applications | |

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| Resource Material: | **REFERENCE BOOKS**<br><br>1. BScPhysics,Vol.4, TeluguAkademy,Hyderabad<br>2. AtomicPhysics byJ.B. Rajam; S.Chand&Co.,<br>3. ModernPhysics byR. MurugeshanandKiruthigaSivaPrasath. S. Chand& Co.<br>Concepts ofModernPhysics byArthurBeiser. TataMcGraw-HillEdition<br><br>YOUTUBE LINKS:<br><br>https://youtu.be/M0b9WJzQqKA<br><br>https://youtu.be/8yX1ojdCg94 |

# II.Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| **Subject:** | **Physics** | | | | |
|---|---|---|---|---|---|
| **Year-Semester:** | IIYear - IVSemester | | | | |
| **Paper** | **Electricity&Magnetism** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split: Total: 60** | 12 | 12 | 12 | 12 | 12 |
| **InternalEvaluationTotal: 40marks** | 10 | 10 | 10 | 5 | 5 |

| Unit-I | Atomic physics and spectroscopy |
|---|---|
| **Syllabus** | Bohr's model of the hydrogen atom -Derivation for radius, energy and wave number - Hydrogen spectrum, Vectoratommodel – Stern and Gerlach experiment, Quantumnumbersassociatedwithit, Coupling schemes, Spectral terms and spectral notations,Selectionrules. Zeemaneffect,Experimental arrangementtostudyZeemaneffect. |
| Pedagogy | P1,P2,P3,PT,P5,,P6,P10, |

| Pedagogy Evaluation | P7 | PQ | PT | Total IE |
|---|---|---|---|---|
| IE | 3 | 2 | 5 | 10 |

| | | | | |
|---|---|---|---|---|
| **UNIT2** | Molecular Structure and Spectroscopy<br>Molecular,Rotational and Vibrational spectra Electronic Transitions Raman Effect, Characteristics,Expermental Arrangement,Applications of RamanEffect.IR Spectroscopy,UV Spectroscopy and Raman Spectroscopy | | | |
| **Pedagogy** | $P_1$,P2,P3,PX,PQ,P8 | | | |
| **Pedagogy-Evaluation** | PQ | PX | | IE |
| **IE** | 5 | 5 | | 10 |

| | | | | |
|---|---|---|---|---|
| **Unit-III** | Matter Waves and Uncertainty Principle<br>Matter waves,Debroglie hypothesis properties ofmatterwaves,DavissonandGermer'sexperiment,Heisenberg'suncertaintyprincipleforpositionandmomentum<br>&energyandtime,Illustrationofuncertainty principle using diffraction of beam of electrons | | | |
| **Pedagogy** | P1,P3,,PX,,P7 | | | |
| **Pedagogy-Evaluation** | P7 | PX | P3 | IE |
| **IE** | 3 | 4 | 3 | 10 |

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|---|---|---|---|
| **Unit-IV** | Basic postulates of quantum mechanics, Schrodinger time independent and time dependentwave equations- Derivations, Physical interpretation of wave function, Eigen functions, Eigenvalues, Application of Schrodinger wave equation to (one-dimensional potential box ofinfiniteheight (Infinite PotentialWell) | | |
| **Pedagogy** | P1,P2,P8.P10,PQ,PT | | |
| **Pedagogy-Evaluation** | PT | PQ | IE |
| **IE** | 2 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect, London's Equation and Penetration Depth, Isotope effect, Type I and Type II superconductors, BCS theory, high Tc super conductors, Applications of superconductors<br><br>. | | | | |
| **Pedagogy** | P1,P2,P3,PX | | | | |
| **Pedagogy - Evaluation** | PX | P10 | P2 | P1 | IE |
| **IE** | 2 | 1 | 1 | 1 | 5 |

# INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS LESSON PLAN

## I. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Course:11** | **Year: II** | **Semester:IV** |
| **Paper:** | Intoduction to Nuclear and Particle Physics | |
| **Units:** | 1. Introduction to Nuclear Physics<br>2. **Elementary Particles And Interactions**<br>3. **Nuclear Reactions and Nuclear Detectors**<br>4. **Nuclear Decays and Nuclear Accelerators**<br>5. **Applications of Nuclear and Particle Physics** | |
| **Duration:** | 60hours | |
| **LearningObjectives** | 1. know about high energy particles and their applications which prepares them for further study and research in elcitrapphysics<br>2. Students can explain important concepts on nucleon-nucleon interaction, such as its short-range, spin dependence, isospin, and tensors.<br>3. Students can show the potential shapes from nucleon nucleon interactions.<br>4. Students can explain the single particle model, its strengths, and weaknesses<br>**5.** Students can explain magic numbers based on this model | |

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| **ResourceMaterial:** | **StudyMaterial(Handouts):**<br>https://www.gvrjobs4u.com/p/physics.html#<br><br>**ReferenceBooks:**<br><br>**REFERENCE BOOKS**<br>BSc Physics, Vol.4, Telugu Akademy, Hyderabad<br>Atomic Physics by J.B. Rajam; S.Chand& Co.,<br>Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co<br><br>Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)<br>Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath<br>and J Murday-Universities Press-IIM<br>**YouTube Links:**<br>**https://youtu.be/8vMwzkOi0v4**<br>**Power Point Presentation:**<br>**https://youtu.be/-ZWxA2xaShQ** |

# II. Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| **Subject:** | **PHYSICS** | | | | |
|---|---|---|---|---|---|
| **Year-Semester:** | II YEAR – IV SEMESTER | | | | |
| **Paper** | **INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split:Total: 60** | 10 | 12 | 14 | 10 | 14 |
| **InternalEvaluationTotal: 25marks** | 5 | 5 | 5 | 5 | 5 |

| **Unit-I** | Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces:Characteristicsof nuclear forces- Yukawa's mesontheory;NuclearModels-Liquiddropmodel-Semi empirical mass formula, nuclear shell model.<br>. | | | | |
|---|---|---|---|---|---|
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy - Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-II** | **2.**<br>Discovery and classification of elementary particles, properties of leptons, mesons and baryons; Types of interactions-strong, electromagnetic and weak interactions; Conservation laws – Isospin, parity, charge conjugation | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P 3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | **3. Quantum (wave) mechanics**<br>Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite boxand one dimensional oscillator | | | | |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | **1 Nuclear Reactions and Nuclear Detectors**<br>Nuclear Reactions:Types of reactions, Conservation Laws in nuclear reactions, Reaction energetic, Threshold energy, nuclear cross-section;Nuclear detectors: Geiger-Muller counter, Scintillation counter, Cloudchamber | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | **Applications of Nuclear and Particle Physics**<br>Medical Applications: Radiation therapy and imaging techniques, nuclear energy: nuclear reactors and power generation, Particle physics in high-energy Astro Physics | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 1 | - | - | 2 |

# DEPARTMENT OF PHYSICS

# TEACHING PLAN 2023-2024

## Academic-Pedagogical-Evaluation

| | | |
|---|---|---|
| **Pedagogy:** | $P_1$ | Black Board Method |
| | $P_2$ | Demonstration |
| | $P_3$ | Question andAnswer |
| | $P_4$ | Practice |
| | $P_5$ | ICT(Audio and Video) |
| | $P_6$ | ICT(Virtual and Online Learning) |
| | $P_7$ | Assignment(written) |
| | $P_8$ | Guest Lecture |
| | $P_9$ | Hands on Practice |
| | $P_{10}$ | Seminar |
| | $P_x$ | Problem solving |
| | $P_Q$ | Quiz |
| | $P_t$ | Test |
| **External: Internal Evaluation** | 70:30 | |

# Academic-Pedagogical-Evaluation: Course Overview

| | | |
|---|---|---|
| **Course:**<br>**B.Sc HONOURS PHYSICS** | **Year:II** | **Semester:III** |
| **Paper:Course 3** | **OPTICS** | |
| **Units:** | 1 . ABERRATIONS<br>2. INTERFERENCE<br>3. DIFFRACTION<br>4. POLORIZATIONS<br>5. LASERS AND HOLOGRAPHY | |
| **Duration:** | 60hours | |
| **Learning Objectives** | • Explain about the different aberrations in lenses and discuss the methods of minimizing them<br>• Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.<br>• Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens | |
| **ResourceMaterial:** | **StudyMaterial(Handouts):**<br>https://www.youtube.com/watch?v=KsCfRPEGv9U<br>**ReferenceBooks:**<br>❖ **BSc Physics, Vol.2, Telugu Academy, Hyderabad**<br>❖ **A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.**<br>❖ **Unified Physics Vol.II Optics & Thermodynamics – Jai Prakash Nath&Co.Ltd., Meerut**<br>❖ **Optics,F.A. Jenkins and H.G. White, Mc Graw-Hill**<br>**YouTube Links:**<br>**https://www.youtube.com/watch?v=SKozK4WfWLo**<br>**Power Point Presentations:**<br>**https://www.youtube.com/watch?v=s6pQf7EyFoo** | |

# Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

| | | | | | |
|---|---|---|---|---|---|
| **Unit-I** | Aberrations<br>Introduction – monocromtic aberration , spherical aberrations , methods of minimizing spherical aberration ,coma,astigmatism and curvature of field distortion .chromatic aberration the acromatic doublet . chromatioc for two lenses<br>i.in contact and ii. Separated by a distance | | | | |
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-II** | INTERFERENCE<br>Principles of superpositions ,coherence conditions for interference of light .frenels biprism determination of wavelength of light – change of phase on reflection .oblique incidence of a plane wave on a thin flim due to reflected light (cosine law 0 clolours in thin flims interaces by a film with two non-parallel reflecting surface (wedge shaped film ) determination of diameter of wire netons ring s in reflectd light . determination of wavelength of monochromaticlight using newtons rings and Michelson interferometer . | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | DIFFRACTION<br>Introduction distinction between frenels and fraunhoffer diffraction , fraunhoffer diffraction with N slits (diffraction granting . resolving powerof grating determination of wavelength of wavelength of light with normal incidence usinfg diffraction grating . frnels half period zone area of the hlf period zone plate comparision of zone plate of convex lens diffence between interference and diffration | | | | |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | POLARISATION<br>Polarized light methods of polarization by reflection refraction ,double refraction , Brewster law , maluslaw , nicol prism and poloriser and analyser , quarter wave plate half wav plate and opticakl activity , determination of specific rotation by laurenzts half shade polorimeter, idea of elliptical circular polorisation | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | LASER<br>Introduction ,spontaneous emission , stimulated emission population inversion , laser principle Einstein co efficients types of laser He-Ne laser ruby laser , application of laser , holography - basic principles of holography gabor hologram and its limitations , application of hologram | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 1 | - | - | 2 |

# HEAT AND THERMODYNAMICS LESSON PLAN

# PHYSICS

## I. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Subject:PHYSICS** | **Year: II** | **Semester:III** |
| **Course:** | **COURSE:3 HEAT AND THERMODYNAMICS** | |
| **Units** | 1. kinetic theory of gases<br>2. Thermodynamics<br>3. Thermodynamic Potentials and Maxwell equations<br>4. Low Temperature Physics<br>5. Quantum Theory of Radiation | |
| **Duration:** | **45 hours** | |
| **LearningObjectives** | 1. Understandthebasicaspectsofkinetictheoryofgases,Maxwell-Boltzmann distribution law, equipartition of energies, mean free path of molecular collisions andthetransportphenomenon in ideal gases<br>2. Gain knowledge on the basic concepts of thermodynamics, the first and the second lawof thermodynamics, the basic principles of refrigeration, the concept of entropy, thethermodynamicpotentials and their physical interpretations. UnderstandtheworkingofCarnot'sidealheatengine,Carnot cycleanditsefficiency<br>3. Develop critical understanding of concept of Thermodynamic potentials,the formulation of Maxwell's equations and its applications. | |

# Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | **Physics** | | | | |
| **Year-Semester:** | IIYear - IIISemester | | | | |
| **Paper** | **Mechanics and properties of matter** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split:Total: 45** | 9 | 9 | 9 | 9 | 9 |
| **InternalEvaluationTotal: 40marks** | 10 | 10 | 5 | 5 | 10 |

| **Syllabus** | KINETIC THEORY OF GASES | | | |
|---|---|---|---|---|
| Unit-I | Kinetic Theory of gases- Introduction, Maxwell's law of distribution of molecular velocities, Mean free path, Principle of equipartition of energy, Transport phenomenoninideal gases: viscosity and Thermal conductivity. | | | |
| Pedagogy | $P_1$, $P_3$, $P_4$, $P_5$, $P_6$, $P_8$,$P_9$,$P_X$ | | | |
| Pedagogy Evaluation | P7 | PQ | PT | Total IE |
| IE | 3 | 2 | 5 | 10 |

| **UNIT-II** | THERMODYNAMICS: IntroductionReversibleandirreversibleprocesses,Carnot'sengineanditseffi ciency,Carnot'stheorem,Thermodyn amicscaleoftemperature, Second law of thermodynamics Entropy: Physical significance, Change in entropy inreversibleandirreversibleprocesses;Temperature-Entropy (T-S) diagram and its uses; change of entropy when ice changes into steam | | | |
|---|---|---|---|---|
| **Pedagogy** | $P_1$,P2,P3,PT,P5,,P6,P10, | | | |
| **Pedagogy-Evaluation** | PQ | P10 | P7 | IE |
| **IE** | 5 | 3 | 2 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | THERMODYNAMICPOTENTIALSANDMAXWELL'S EQUATIONS<br><br>ThermodynamicPotentialsInternalEnergy,Enthalpy,HelmholtzFreeEnergy,Gibb'sFreeEnergyandtheirsignificance,Derivationof Maxwell'sthermodynamicrelationsfromthermodynamicpotentials,Applicationsto(i)ClausiusClayperon'sequation(ii)Joule-Kelvin coefficientforideal andVanderWaals'gases. | | | | |
| **Pedagogy** | P1,P2,,P7,P8,PX.P10. | | | | |
| **Pedagogy-Evaluation** | P7 | PX | | | IE |
| **IE** | 3 | 2 | - | - | 5 |

| | | | |
|---|---|---|---|
| **Unit-IV** | LOW TEMPERATUREPHYSICS: 9hrs<br><br>Methodsforproducingverylowtemperatures,JouleKelvineffect,porousplugexperiment,Jouleexpansion,DistinctionbetweenadiabaticandJouleThomsonexpansion,ExpressionforJouleThomsoncooling ,Productionoflow temperaturesbyadiabaticdemagnetization(qualitative). | | |
| **Pedagogy** | P1,P5,P6,PQ,PT,P10 | | |
| **Pedagogy-Evaluation** | PT | PQ | IE |
| **IE** | 2 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | UNIT-V:QUANTUMTHEORY OF RADIATION<br>Spectral energy distribution of black body radiation, Wein'sdisplacementlaw andRayleighJean'slaw(Noderivations),Planck's law of black body radiation-Derivation, Deduction of Wein's law and RayleighJean'slawfromPlanck'slaw,Solarconstantanditsdeterminationusing Angstrompyro heliometer,Estimation of surface temperature ofSun.<br><br>. | | | | |
| **Pedagogy** | P1,P3,P7,P5,P6,P8, | | | | |
| **Pedagogy-Evaluation** | P7 | P10 | PQ | PT | IE |
| **IE** | 2 | 2 | 3 | 3 | 10 |

# ELECTRONIC DEVICES AND CIRCUITS LESSON PLAN

## I.Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Course:**<br><br>**B.SC HONOURS PHYSICS** | **Year: II** | **Semester:III** |
| **Subject:Physics** | **ELECTRONIC DEVICES AND CIRCUITS** | |
| **Units:** | 1.PNJunction Diodes<br>2.Bipolar junction transistor and biasing<br>3.FET and Power Electronics<br>4.Photo Electronic Devices and Power Supplies<br>5.Photo Electronic Devices | |
| **Duration:** | 60hours | |
| **LearningObjectives** | 1. Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics.<br>2. Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.<br>3. Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJTs | |

| | |
|---|---|
| **ResourceMaterial:** | ReferenceBooks:<br>Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.<br>2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition<br>3. Integrated Electronics – Millmam & Halkias.<br>4. Electronic Devices & Circuits – Bogart.<br>5. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd<br>YouTube Links:<br>https://www.youtube.com/watch?v=cOICDYuY-gA<br><br>Power Point Presentations:<br>https://slideplayer.com/slide/4962297/ |

# I. Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| **Subject:** | **Physics** | | | | |
|---|---|---|---|---|---|
| **Year-I B.SC HONOURS PHYSICS** | IIYear - III Semester | | | | |
| **Paper** | **ELECTRRONIC DEVICES AND CIRCUITS** | | | | |
| **Units** | U1 | U2 | u 3 | U4 | U5 |
| **Hours Split:Total: 60** | 10 | 12 | 1 4 | 10 | 14 |
| **InternalEvaluation Total: 25marks** | 5 | 5 | 5 | 5 | 5 |

| **Unit-I** | P-N junction Diode, Formation of depletion region, Forward and Reverse bias Ideal Diode, Diode equation– Reverse saturation current – Tunnel Diode- Construction, working, V-I characteristics and Applications, Zener diode – V I characteristics, Applications., | | | | |
|---|---|---|---|---|---|
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-II** | BIPOLAR JUNCTION TRANSISTOR AND ITS BIASING: (D.C)<br><br>Transistor construction, working of PNP and NPN Transistors, Active, Cutoff and Saturation conditions, Configurations of Transistor - CB, CE, and CC, Input and Output Characteristics of CB and CE configurations. Hybrid parameters of a Transistor and equivalent circuit,BJT Transistor Biasing – Need for stabilization, Thermal runaway, Stability factor, Biasing methods - Voltage-Divider Bias. | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy - Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 1 |

| | |
|---|---|
| **Unit-III** | FIELD EFFECT TRANSISTORS & POWER ELECTRONIC DEVICES<br><br>Difference between JFET and BJT, Construction and working of JFET, Drain and Transfer Characteristics,MOSFET - Depletion-type, and Enhancement-Type MOSFETs. FET Biasing: Voltage Divider Biasing. UJT- Construction, working, V-I characteristics. SCR – Construction, Working and Characteristics |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 |

| | | | | | |
|---|---|---|---|---|---|
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 1 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | :PHOTO ELECTRIC DEVICES:<br><br>Light-Emitting Diodes (LEDs) - Construction, working, characteristics and Applications, IR Emitters, Photo diode - Construction, working characteristics and Applications, Phototransistors - Construction, working and characteristics,Applications, Structure and operation of LDR, Applications<br><br>UNIT | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | POWER SUPPLIES<br><br>Rectifiers:Half wave, Full wave and bridge rectifiers-Efficiency (with derivations), ripple factor- Zener diode as Voltage Regulator, Filters-choke input (inductor), L-section, π-section filters. Three terminal fixed voltage IC-regulators(78XX and 79XX) | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 2 | - | - | 1 |

# *ANALOG AND DIGITAL ELECTRONICS* PHYSICSLESSON PLAN

## I. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Subject:PHYSICS** | **Year: II** | **Semester:III** |
| **Course:8** | **PAPER- 5.ANALOG AND DIGITALELECTRONICS** | |
| **Units:** | 1. OPERATIONAL AMPLIFIERS<br>2. PRACTICAL OPERATIONAL AMPLIFIER AND APPLICATIONS<br>3. NUMBER SYSTEMS, CODES AND LOGIC GATES<br>4. ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS<br>5. SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS<br>a | |
| **Duration:** | **60hours** | |
| **LearningObjectives** | Understand Principles and Working of Operational Amplifier 2. Apply their knowledge on OP-Amp in different Applications 3. To understand the number systems, Binary codes and Complements. 4. To understand the Boolean algebra and simplification of Boolean expressions. 5. To analyze logic processes and implement logical operations using combinational logic circuits. 6. To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines. | |
| **Course Outcomes** | On Completion of this course the students will able to<br>1. .<br>2. Understand the concepts needed to understanding the transformer,Transistors,Diodes,Logicgates,HalfAdder and FullAddder.<br>3. Apply mathematical techniques to derive laws and for analyzing and solving problems.<br>4,Design set up and carry out experiments analyze data,compare with theoretical predictions and understand the orders of magnitude of various quantities. | |

| | |
|---|---|
| Resource Material: | 1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall 2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, 3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., TMH 4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd. 5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994) 6. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994) Hand outs:<br><br>YOUTUBE LINKS:<br><br>1. https://www.youtube.com/watch?v=fmRHDqcodS4<br>2. https://www.youtube.com/watch?v=kgL5UaSVuro |

# II.Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| | | | | |
|---|---|---|---|---|
| Unit-I | Electric<br>Field IntensityPotential&Dielectrics | | | |
| **Syllabus** | **1.** Gauss's law statement and its proof- Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces- potential due to i) a point charge, ii)charged spherical shell and uniformly charged sphere.<br>**2. Dielectrics:**<br>Electric dipolemoment and molecular polarizability- Electric displacement D, electric polarization P – relation between D, E and P- Dielectric constant and susceptibility. Boundary conditions at the dielectric surface | | | |
| Pedagogy | P1,P2,P3,PT,P5,,P6,P10, | | | |
| Pedagogy Evaluation | P7 | PQ | PT | Total IE |

| | | | | |
|---|---|---|---|---|
| IE | 3 | 2 | 5 | 10 |

| **Subject:** | **Physics** | | | | |
|---|---|---|---|---|---|
| **Year-Semester:** | IIIYear - VSemester | | | | |
| **Paper** | **Electricity,Magnetism&Electronics** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split: Total: 60** | 12 | 12 | 12 | 12 | 12 |
| **InternalEvaluationTotal: 40marks** | 10 | 10 | 10 | 5 | 5 |

| | | | | |
|---|---|---|---|---|
| **UNIT2** | **3. Electric and magnetic fields**<br><br>Biot-Savart's law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid – Lorentz force – Hall effect – determination of Hall coefficient and applications.<br><br>**4. Electromagnetic induction**<br><br>Faraday's law-Lenz's law- Self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid, energy stored in magnetic field.Transformer - energy losses - efficiency. | | | |
| **Pedagogy** | $P_1$,P2,P3,PX,PQ,P8 | | | |
| **Pedagogy-Evaluation** | PQ | PX | | IE |
| **IE** | 5 | 5 | | 10 |

| | | | | |
|---|---|---|---|---|
| **Unit-III** | **5. Alternating currents and electromagnetic waves**<br><br>Alternating current - Relation between current and voltage in LR and CR circuits,vector diagrams, LCR series and parallel resonant circuit, Q –factor, power in ac circuits.<br><br>**6. Maxwell's equations**<br><br>Idea of displacement current - Maxwell's equations (integral and differential forms) (no derivation), Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves.Poynting theorem (statement and proof), production of electromagnetic waves (Hertz experiment). | | | |
| **Pedagogy** | P1,P3,,PX,,P7 | | | |
| **Pedagogy-Evaluation** | P7 | PX | P3 | IE |
| **IE** | 3 | 4 | 3 | 10 |

| | | | |
|---|---|---|---|
| **Unit-IV** | **7. Basic electronics:**<br><br>PN junction diode, Zener diode, Tunnel diode, I-V characteristics PNP and NPN transistors, CB, CE and CC configurations – Relation betweenα, β and γ - transistor (CE) characteristics - Determination of hybrid parameters, Transistor as an amplifier. | | |
| **Pedagogy** | P1,P2,P8.P10,PQ,PT | | |
| **Pedagogy-Evaluation** | PT | PQ | IE |
| **IE** | 2 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | **8. Digital electronics**<br>Number systems - Conversion of binary to decimal system and vice versa.Binary addition and subtraction (1's and 2's complement methods).Laws of Boolean algebra - De Morgan's laws-statement and proof, Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder, Parallel adder circuits. | | | | |
| **Pedagogy** | P1,P2,P3,PX | | | | |
| **Pedagogy - Evaluation** | PX | P10 | | | IE |
| **IE** | 2 | 3 | | | 5 |

# MODERN PHYSICS LESSON PLAN

## I. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Course: B.Sc (M.P.C&M.P.CS)** | **Year: III** | **Semester:IV** |
| **Paper:VI** | Modern Physics | |
| **Units:** | 1. Atomic and molecular physics<br>2. Matter waves & Uncertainty Principle<br>3. Quantum (wave) mechanics<br>4. General Properties of Nuclei . and Radioactivity decay:<br>5. Crystal Structure and . Superconductivity: | |
| **Duration:** | 60hours | |
| **LearningObjectives** | *****Understandtheconceptof vector atom model<br>*Understanding the concept of Zeeman effect and its experimental arrangement<br>*davission germer experiment<br>*Understand the concepts of schrodinger time independent and dependent wave equations<br>*Understand the concepts of properties of NANO materials<br>*Type 1 and type 2 conductors and bcs theory applications of super conductors<br>*solving derivations and problems. | |

| | |
|---|---|
| **ResourceMaterial:** | **StudyMaterial(Handouts):**<br>https://www.gvrjobs4u.com/p/physics.html#<br><br>**ReferenceBooks:**<br><br>**REFERENCE BOOKS**<br>BSc Physics, Vol.4, Telugu Akademy, Hyderabad<br>Atomic Physics by J.B. Rajam; S.Chand& Co.,<br>Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co<br><br>Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)<br>Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath<br>and J Murday-Universities Press-IIM<br>**YouTube Links:**<br>**https://www.youtube.com/watch?v=M0lSpA154k0**<br>**Power Point Presentation:**<br>**https://www.slideserve.com/cissy/davisson-germer-experiment** |

# II. Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | **PHYSICS** | | | | |
| **Year-Semester:** | III YEAR – IV SEMESTER | | | | |
| **Paper** | **Modern Physics** | | | | |
| **Units** | U1 | U2 | U 3 | U4 | U5 |
| **Hours Split:Total: 60** | 10 | 12 | 1 4 | 10 | 14 |
| **InternalEvaluationTotal: 25marks** | 5 | 5 | 5 | 5 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-I** | **1. Atomic and molecular physics**<br><br>**UNIT-I :**<br>**1. Atomic and Molecular Physics:(12 hrs)**<br>Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Selection rules, Intensity rules, Fine structure of Sodium D-lines, Zeeman effect,Experimental arrangement to study Zeeman effect;Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman Effect,Applications of Raman Effect. | | | | |
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy - Evaluation** | PQ | P 6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-II** | **2. Matter waves & Uncertainty Principle**<br><br>Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities, Heisenberg's uncertainty principle for position and momentum& energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit)and photons(Gamma ray microscope),Bohr's principle of complementarity. | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | **3. Quantum (wave) mechanics**<br><br>Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite boxand one dimensional oscillator | | | | |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | **1. General Properties of Nuclei**<br><br>**4. Nuclear Physics:(12 hrs)**<br>*nuclear structure*:general properties of nuclei, mass defect, binding energy; *nuclear forces*: characteristics of nuclear forces- yukawa's meson theory; *nuclear models* liquid drop model, the shell model, magic numbers, *nuclear radiation detectors*: g.m. counter, cloud chamber, solid state detector; *elementary particles* elementary particles and their | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 2 | - | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | **5. Nano materials:(7hrs)**<br>Nanomaterials – Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D); Quantum dots, Nano wires, Fullerene, CNT, Graphene(Mention of structures and properties),Distinct properties of nano materials (Mention-*mechanical,optical, electrical, and magnetic properties*); Mention of applications of nano materials: (*Fuel cells,Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors*)<br>**6. Superconductivity: (5 hrs)**<br>Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect , Isotope effect,Type I and Type II superconductors, BCS theory (elementary ideas only),Applications of superconductors | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 1 | - | - | 2 |

# LOW TEMPERATURE PHYSICS AND REFRIGRATION LESSON PLAN

## III. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Course:**<br>**B.SC** | **Year: III** | **Semester:V** |
| **Subject:Physics** | **LOW TEMPERATURE PHYSICS AND REFRIGRATION** | |
| **Units:** | 1.production of low temperatures<br>2.measurement of low temperature<br>3.principles of refrigration<br>4.components of refrigration<br>5.applications of low temperature and refrigration | |
| **Duration:** | 60hours | |
| **LearningObjectives** | *****Understand the classification ,properties of Refrigrents and their Effects on Environment<br>*Identify various methods and Techniques used to produce low Temperatures in the Laboratory.<br>*Understanding the working of Gas Thermometers,Vapou Pressure Thermometers,magnetic Thermometers<br>*understanding the different Refrigrator components ,Types of Compressors,Evaporators, and condensora and their functional aspects.<br>*Comprehend the applications of Low Temperature Physics and Refrigration | |

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|---|---|
| **Resource Material:** | **ReferenceBooks:**<br>• Heat andThermodynamics by Brij Lal &N.Subramanyam<br>• Thermal Physics by S C.GargR M Bansal&C.K Ghosh,McGrawhill Education.<br>• Low Temperature Physics byChristianE.SigfriedH.Springer<br><br>**YouTube Links:**<br>**https://www.youtube.com/watch?v=Nh71u8LycKc**<br>**Power Point Presentations:**<br>**https://www.slideshare.net/ssmvjunwani/thermodynamics-137086320**<br>**QuestionBank:**<br>**https://www.jagannathuniversity.org/assets/jnu-docs/others/question-paper-bank/QuestionbankMech.pdf** |

# IV. Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| **Subject:** | **Physics** | | | | |
|---|---|---|---|---|---|
| **Year-Semester:** | IIIYear - IV SEMESTER | | | | |
| **Paper** | **Low Temperature Physics and Refrigeration** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split:Total: 60** | 10 | 12 | 14 | 10 | 14 |
| **InternalEvaluationTotal: 25marks** | 5 | 5 | 5 | 5 | 5 |

| **Unit-I** | PRODUCTION OF LOW TEMPERATURE<br>Production of Low Temperature-Introduction Freezing mixtures,Joule Thomson Effect,Regenrative cooling,Different methods of Liquification of Gases,Liqufication of air, ,Liquification of Air Production of liquid Hydrogen and Nitrogen,Adiabatic Demagnetisation,Properties of materials at Low Temperaures and Super conductivity | | | | |
|---|---|---|---|---|---|
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy - Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-II** | MEASUREMENT OF LOW TEMPERATURES<br><br>Gas Thermometer and its correction and calibration,Secondaty Thermometers and Resistance Thermometers,Thermocouples Vapour Pressure thermometers,Magnetic Thermometers Advantages and Drawbacks of Each Thermometer | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy - Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | PRINCIPLESOF REFRIGRATION<br><br>Introduction to Refrigration,Natural and Artificial Refrigration,stages of Refrigration,Types of Refrigration,Vapour Compression and Vapour Absorption Refrigration systems,Refrigration cycle and Explanation with block diagram,Introductary ideas on Air Conditioning<br><br>Refrigrants-Introduction Ideal Refrigrent,Properties of Refrigrent,Classification of Refrigrents commonly used Refrigrents,Eco friendly Refrigrents | | | | |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 1 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | COMPONENTS OF REFRIGRATOR<br><br>Refrigrator and its working,Block Diagram,Coefficien of Performance (COP),Tons of Refrigration(TR),Energy Efficiency Ratio(EER)<Refrigrator Components,Types of Compressors,evaporators and Condensors and their functional aspects,Defrosting in a Refrigrator,Refrigant Leakage and detection.l | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | UNIT-V APPLICATIONS OF LOW TEMPERATURES<br><br>Preservation of Biological materials,Food Freezing,liquid Nitrogen and Liquid Hydrogen in medicalfield,Superconducing magnets in MRI,Tissue Ablation,Cryosurgery-Crogenic rocket propulsion system<br><br>. | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 2 | - | - | 1 |

# SOLAR ENERGY AND ITS APPLICATIONS LESSON PLAN

## V. Academic-Pedagogical-Evaluation:CourseOverview

| | | |
|---|---|---|
| **Course:**<br>**B.SC** | **Year: III** | **Semester:V** |
| **Subject:Physics** | **SOLAR ENERGY AND ITS APPLICATIONS** | |
| **Units:** | 1. BASIC CONCEPTS OF SOLAR ENERGY<br>2. SOLAR THERMAL COLLECTORS<br>3. FUNDMENTALS OF SOLARCELLS<br>4. TYPES OF SOLARCELLS AND MODULES<br>5. SOLAR PHOTO VOLTAIC SYSTEMS | |
| **Duration:** | 60hours | |
| **LearningObjectives** | *****Understand the concept of solar constant ,zenith angle,Semiconductor Interface<br>*****Understanding Sun Structure ,forms of Energy coming from the sunand its measurement<br>*Acuire a critical knowledge on the working of Pyrometer ,Pyroheliometer,Solar water heater.<br>*Comprehend Applications of Thermal Collectors and PV Modules | |

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|---|---|
| **ResourceMaterial:** | **ReferenceBooks:**<br>• Solar Energy Utilization by G.D.Rai Khanna Publishers<br>• Solar Energy fundamentals,design,modelling and applications by G.N.Tiwari,Narosa Publications,2005<br>• Solar Energy principles of thermal energy collection and Energy storage by S.P.Suckatme,Tata and MeGraw Hill Publications<br><br>**YouTube Links:**<br>**https://www.youtube.com/watch?v=n7YavgJPkuw**<br><br>**Power Point Presentations:**<br>https://www.academia.edu/19635118/He_Ne_Laser<br><br>**QuestionBank:**<br>http://snehajobs.com/ii-sem-physics-wave-optics/ |

# VI. Academic-Pedagogical-Evaluation:Unit-wisePedagogy

| **Subject:** | **Physics** | | | | |
|---|---|---|---|---|---|
| **Year-Semester:** | IIIYear - V Semester | | | | |
| **Paper** | **Solary Energy And Applications** | | | | |
| **Units** | U1 | U2 | U3 | U4 | U5 |
| **Hours Split:Total: 60** | 10 | 12 | 14 | 10 | 14 |
| **InternalEvaluationTotal: 25marks** | 5 | 5 | 5 | 5 | 5 |

| **unit-I** | BASIC CONCEPTS OF SOLAR ENERGY<br>Spectral distribution of solar radiation,solar constant,zenith angle and air mass,standard time,local apparent time,equation of time,direct,diffuse and total radiations.Pyrheliometer-working principle,direct radiation measurements,Pyrometer-working principle,diffuse radiation measurement,distinction between the two meters | | | | |
|---|---|---|---|---|---|
| **Pedagogy** | P1,P2,P3,P4,P5,P6 | | | | |
| **Pedagogy-Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-II** | SOLAR THERMAL COLLECTORS<br><br>Solar thermal collectors-introduction,types of thermal collectors ,flate plate collector-liquid heating type,energy balance equation and efficiency,Evacuated tube collector,collector overall heat loss coefficient,definition of collector efficiency factor,collector heat-removal factor and collector flow factor,testing of flat plate collector,solar water heating system,natural and forced circulation types<br><br>Concentrating collectors,solar cookers,solar dryear,solar desalinators | | | | |
| **Pedagogy** | P1,P3,P6,P4,P2,P5 | | | | |
| **Pedagogy-Evaluation** | PQ | P3 | - | - | PT |
| **IE** | 1 | 2 | - | - | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-III** | FUNDAMENTALS OF SOLAR CELLS<br><br>Semiconductors interface. Types,homo junction,hetero junction and cshottky barrier,advantages and draw backs,photo voltaic,equivalent circuit,output,parameters,conversion efficiency,quantum efficiency.Measurement of I-V charecterstics,series and shunt resistance,their effect on efficiency,Effect of light intensity,inclination and temperature on efficiency | | | | |
| **Pedagogy** | P1,P2,P3,P6,P4,P5 | | | | |
| **Pedagogy - Evaluation** | PQ | P6 | - | - | PT |
| **IE** | 1 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-IV** | TYPES OF SOLAR CELLS AND MODULES<br>Types of solar cells,crystalline silicon solar cells,I-V characterstics,poly silicon cells,Amorphous silicon cells ,Thin film solar cells-CdTe/CdS and CullGaSe2/CdS cell configurations,structures,advantages and limitations,multi junction cells-Double and triple junction cells.Module fabrication steps,Modules in series and parallel,Bypass and blocking diodes | | | | |
| **Pedagogy** | P1,P3,P2,P4,P5,P6 | | | | |
| **edagogy-Evaluation** | PQ | P4 | - | - | PT |
| **IE** | 2 | 1 | - | - | 2 |

| | | | | | |
|---|---|---|---|---|---|
| **Unit-V** | SOLAR PHOTOVOLTAIC SYSTEMS<br>Energy storage PV systems.Enegy storage modes,electrochemical storage,Batteries Primary and secondary,Solid-State battery,Molten solvent battery,lead acid battery and dry batteries,Mechanical storage-Flywheel,Electrical storage-Super capacitor. | | | | |
| **Pedagogy** | P1,P2,P3,P5,P6,P4 | | | | |
| **Pedagogy-Evaluation** | PQ | P4 | | | PT |
| **IE** | 2 | 2 | - | - | 1 |