MINOR PAPERS

B.Sc. Four Year Program in Physics as per NEP (2022)

SEMESTER-I

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
4.5	I	MNR	08/PHY/MNR/101T	Concepts of Mechanics	4	-	4	4
		MNR-P	08/PHY/MNR/101P	Mechanics Lab	-	2	4	2

SEMESTER-II

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
4.5	II	MNR	08/PHY/MNR/151T	Fundamentals of Optics	4	-	4	4
		MNR-P	08/PHY/MNR/151P	Optics Lab	-	2	4	2

UG Certificate:
Students who opt to exit after completion of the first year and have secured **50 credits** will be awarded a **UG Certificate** if, in addition, they complete **one internship of 4 credits** during the summer vacation of the first year.

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Department of Physics
Jai Narain Vyas University, Jodh

Undergraduate Programme (PHYSICS) Syllabus, Semester-I		
Session -2026-2027		
Part-A		
Subject	Physics	
Semester	I	
Name of Course	Concepts of Mechanics	
Course Code	08/PHY/MNR/101T	
Course Type:	Minor	
Level of Course	100-199	
Pre-requisite for course	--	
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1:Analyse the elastic behaviour of materials by calculating stress, strain, and various elastic moduli. CLO2: Apply Galilean transformations and understand the coordinate transformations. CLO3: Understand basics of work , energy, forces and centre of mass and its characteristics. CLO4: to Evaluate the dynamics of rigid bodies through moment of inertia and angular momentum. CLO5: Learn about basics of the SHM and waves.	
Credits	4	
Total Marks	20+80=100	
Part-B Contents of the Course		
Total Lectures per Week	**4 (Theory)**	

UNITS	TOPICS	No. of Lectures
I	Elasticity: Deforming force, Elastic limit, stress, strain and their types, Hooke's law, Young's modulus, bulk modulus, Modulus of rigidity, Poisson ratio, elastic energy stored in an elastic body, relation between elastic constants, Relation between shear angle and angle of twist, Torque required for twisting cylinder, torsional constant.	12
II	Frames of reference: Newton's laws of motion, conservation of linear momentum and energy, cartesian coordinate system, inertial and non-inertial frames of reference, coordinate transformations, Galilean transformations of displacement, velocity and acceleration in inertial frames, invariance of laws of Physics under Galilean transformations, non-inertial frames and pseudo forces.	12
III	Concept of Work and Energy, Work-Energy Theorem, conservative and non conservative forces, potential energy, Force as gradient of potential energy, law of gravitation. Gravitational field and potential energy, Escape velocity. Center of mass: two particle and many particle systems, position, velocity and acceleration of CM, concept of reduced mass and its applications.	12
IV	Rigidbody dynamics: Rigid body, MomentofInertia,RadiusofGyration,Theoremsofperpendicularandparallel axis(withproof),MomentofInertiaof some regular objects like ring, disc, solid cylinder, hollow cylinder, solid sphere, hollowsphere etc.Angular momentum, angular velocity, Torque, LawofconservationofangularmomentumRotationalKineticEnergy.	12
V	Simple harmonic motion: periodic motion, potential well and stable, unstable equilibrium, General differential equation of SHM, position, velocity, kinetic and potential energy, Examples of SHM: mass attached to a spring, two connected Springs in series and parallel. Wave motion: transverse and longitudinal waves, differential equation and its solution for a one dimensionalwaves,examples of wave motion.	12

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. Berkeley: Physics Course, Vol. I, Mechanics, Tata McGraw Hill, New Delhi.
2. R. S. Gambhir: Mechanics, CBS Publishers.
3. J.C. Upadhyaya: Mechanics, Ram Prasad & Sons, Agra.
4. Mechanics, Jaipur Publishing House
5. Mechanics, College Book House

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Undergraduate Programme (PHYSICS) Syllabus, Semester-I	
Session -2026-2027	
Part-A	
Subject	Physics
Semester	I
Name of Course	Mechanics Lab
Course Code	08/PHY/MNR/101P
Course Type:	Minor
Level of Course	100-199
Pre-requisite for the course	--
Course Learning Outcomes (CLO)	The students will be able to learn and measure elastic properties of rods, wire, rubber etc. They will get an idea of the order of the magnitude of the elastic properties and can relate that with the performance.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	**4 (Practical)**

Students will perform following experiments-

1. Determination of Young's modulus by bending of a beam.
2. To determine Young's modulus of the material of a given wire.
3. Determination of Modulus of rigidity by statical method using Barton's apparatus (horizontal mode).
4. Determination of Modulus of rigidity by statical method using Barton's apparatus (vertical mode).
5. Determination of Elastic constants by Searle's method.
6. To determine the Poisson's ratio of a rubber tube.
7. Determination of surface tension of water by Jagger's method.
8. Determination of Modulus of rigidity by dynamical method using hollow Maxwell needle.
9. Determination of Modulus of rigidity by dynamical method using solid Maxwell needle.

Note: - New experiments may be added on availability of equipments.

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1.Practical Physics, Pragati Prakashan, Meeerut
2. Practical Physics, College Book House
3. B. Sc. Practical Physics, CL Arora, S. Chand Publications

Head
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Jai Narain Vyas University, Jodhpur

Undergraduate Programme (PHYSICS) Syllabus, Semester-II		
Session -2026-2027		
Part-A		
Subject	Physics	
Semester	II	
Name of Course	Fundamentals of Optics	
Course Code	08/PHY/MNR/151T	
Course Type:	Minor	
Level of Course	100-199	
Pre-requisite for course	None	
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1:evaluate the behaviour of co-axial lens systems by identifying cardinal points. CLO2: Differentiate between Ramsden and Huygens eyepieces to calculate and minimize spherical and chromatic aberrations. CLO3: Analyse the principles of interference and some important interference patterns CLO4: Apply interferometric techniques to measure optical parameters, such as wavelength, refractive index etc. CLO5:Describe the fundamental concepts and working principles of lasers and optical fibers together with their applications.	
Credits	4	
Total Marks	20+80=100	
Part-B Contents of the Course		
Total Lectures per Week	**4 (Theory)**	

UNITS	TOPICS	No. of Lectures
I	Ray Optics: reflections and refraction and dispersion of light, Laws of reflection and refraction, mirrors and lenses, sign conventions, Refraction at a spherical surface, Axial, Lateral and angular magnifications by spherical surface and their inter-relationship, refraction by a thin lens, Focal length of a thin lens, deviation by a thin lens, Focal length of two thin lenses separated by a distance.	12
II	Optical Instruments: spherical and chromatic aberration in lenses and methods to remove them, magnifying lens, compound microscope, Eyepieces: principle and working of Huygen's and Ramsden's eye piece, Telescopes: Refracting telescopes, reflecting telescopes	12
III	Wave optics: wave nature of light, wavefront, Huygens Principle, superposition of waves, temporal and spatial coherence, conditions for interference, method to obtain coherent sources, Young's two-slit experiment, constructive and destructive interference, width and shape of fringes, Interference in thin film, intensity pattern for refracted and reflected waves in thin film.	12
IV	Diffraction: Introduction, Types of diffraction, Fraunhofer diffraction due to a single slit, Fraunhofer Diffraction due to N parallel slits, diffraction by plane transmission grating, grating spectra, measurement of wave-length of light by grating, Rayleigh's criterion of resolution, Resolving Power of a Prism and grating.	12
V	Polarization: plane polarized light, methods of production of plane polarized light, double refraction, Nicol Prism: its construction and working, optical active materials, specific rotation, Malus law, half shade and Biquartz Polarimeters, determination of specific rotation and strength of sugar solution.	12

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. A text book of Optics, Subramanayam and Brijlal: S. Chand, New Delhi.
2. Optics, AK Ghatak, Tata McGraw Hill.
3. Jenkins and White: Optics, McGraw Hill
4. Optics, College Book House, Jaipur
5. Optics, Jaipur Publishing House, Jaipur

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Undergraduate Programme (PHYSICS) Syllabus, Semester-II	
Session -2026-2027	
Part-A	
Subject	Physics
Semester	II
Name of Course	Optics Lab
Course Code	08/PHY/MNR/151P
Course Type:	Minor
Level of Course	100-199
Pre-requisite for course	None
Course Learning Outcomes (CLO)	Students will develop the ability to experimentally determine key optical properties—such as focal length, wavelength, refractive index, and dispersive power—using lens combinations, Newton's rings, and prism-based methods.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	**4 (Practical)**

Students will perform following experiments-

1. Determination of focal length of combination of two lenses, separated by finite distance using nodal slide.
2. Determination of wavelength of monochromatic light (Sodium/ Laser) by Newton's rings.
3. Determination of dispersive power of prism.
4. Determination of wavelength of light by plane transmission grating.
5. Verification of Malus's law.
6. Determination of specific rotation of sugar solution using a polarimeter (half-shade method).
7. Verification of laws of reflection and refraction using optical bench.
8. Determination of angle of a prism using a spectrometer.

Note: - New experiments may be added on availability of equipment.

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1.Practical Physics, Pragati Prakashan, Meeerut
2. Practical Physics, College Book House
3. B. Sc. Practical Physics, CL Arora, S. Chand Publications

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B.Sc. Four Year Program in Physics as per NEP (2022)

SEMESTER-III

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
5	III	MNR	08/PHY/MNR/201T	Mathematical Tools in Physics	4	-	4	4
		MNR-P	08/PHY/MNR/201P	Electromagnetics Lab	-	2	4	2

SEMESTER-IV

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
5	IV	MNR	08/PHY/MNR/251T	Basics of Thermodynamics	4	-	4	4
		MNR-P	08/PHY/MNR/251P	Thermal &Statistical Physics Lab	-	2	4	2

UG Diploma:
Students who opt to exit after completion of the second year and have secured **95 credits** will be awarded a **UG Diploma** if, in addition, they complete **one internship of 4 credits** during the summer vacation of the second year.

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Undergraduate Programme (PHYSICS) Syllabus, Semester-III		
Session -2027-2028		
Part-A		
Subject	Physics	
Semester	III	
Name of Course	Mathematical Tools in Physics	
Course Code	08/PHY/MNR/201T	
Course Type:	Minor	
Level of Course	200-299	
Pre-requisite for course	None	
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1: Formulate problems using vector algebra in physical contexts. CLO2: Evaluate correctness of computed flux, divergence, and curl. CLO3: Develop algorithms for solving systems of linear equations. CLO4: Assess simplifications using tensor symmetry and contraction. CLO5: Apply four-vector formalism to advanced electrodynamics and field theory.	
Credits	4	
Total Marks	20+80=100	
Part-B Contents of the Course		
Total Lectures per Week	**4 (Theory)**	

UNITS	TOPICS	No. of Lectures
I	Vector Algebra: Cartesian coordinate system, Scalar and vectors, types of vectors, vector addition rules, dot and cross products, scalar and Vector fields, partial and exact differentiation of vector, gradient of a scalar field, electric field and electric potentials.	12
II	Integration of vectors, line and surface integral of vector field. Flux of a vector field, divergence of vector field and its physical significance, Gauss divergence theorem, curl of vector field and its physical significance, Stokes curl theorem, Gauss law in integral and differential form.	12
III	Matrix algebra: matrices, types of matrices, matrix operations, matrix arithmetic, transpose and adjoint of a matrix, inverses, diagonal, triangular and symmetric matrices, determinants, cofactor expansion, row reduction, Systems of linear equations, Guas-Jordan elimination.	12
IV	Tensors: Coordinate Transformation, Invariant, covariant and contravariant tensors, Mixed Tensor, Rank of a Tensor, Symmetric and skewsymmetric Tensors, tensors of second and higher rank, addition, subtraction, contraction, outer and inner product of tensors.	12
V	Four vector formulation: Minkowski space, geometrical interpretation of Lorentz transformation, space like and time like intervals, four vectors, four dimensional gradient, divergence and curl operators, four-velocity, four-acceleration, four-momentum, four-force.	12

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates and Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. Mathematical Physics, College Book House
2. Berkeley: Physics Course, Vol. II: Electricity and Magnetism, Tata McGraw Hill.
3. D.C. Tayal: Electricity and Magnetism, Himalaya Publishing House
4. S.P. Puri: Electrodynamics, Tata McGraw Hill
5. Electrodynamics, K.R. Patel et al., Jaipur Publishing House

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Undergraduate Programme (PHYSICS) Syllabus, Semester-III	
Session -2027-2028	
Part-A	
Subject	Physics
Semester	III
Name of Course	Electromagnetics Lab
Course Code	08/PHY/MNR/201P
Course Type:	Minor
Level of Course	200-299
Pre-requisite for the course	None
Course Learning Outcomes (CLO)	Students will develop the ability to analyze electrical circuits, phase relationships, electromagnetic induction, and accurately measure resistance and galvanometer constants using standard experimental techniques.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	**4 (Practical)**

Students will perform following experiments-
Determination of low resistance using Carey Foster Bridge.
Study of charging and discharging of R-C (D.C.) circuit.
Study of electro-magnetic induction and verification of Faraday's Laws.
Study of phase relationship of L-R circuit.
Study of phase relationship of C-R circuit.
Study of phase relationship of L-C-R circuit.
e/m by Thomson's method.
Measurement of inductance of coil by Anderson's bridge.
Measurement of capacitance and dielectric constant of a liquid and gas by De-Sauty Bridge.

Note: - New experiments may be added on availability of equipments.

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books
1.Practical Physics, Pragati Prakashan, Meeerut
2. Practical Physics, College Book House
3. B. Sc. Practical Physics, CL Arora, S. Chand Publications

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Undergraduate Programme (PHYSICS) Syllabus, Semester-IV		
Session -2027-2028		
Part-A		
Subject	Physics	
Semester	IV	
Name of Course	Basics of Thermodynamics	
Course Code	08/PHY/MNR/251T	
Course Type:	Minor	
Level of Course	200-299	
Pre-requisite for course	None	
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1: Understand Fundamental Concepts CLO2: Analyze Thermodynamic Cycles CLO3: Apply the Laws of Thermodynamicss CLO4: Practical Application and Calculation CLO5: Analyze Engineering Devices	
Credits	4	
Total Marks	20+80=100	
Part-B Contents of the Course		
Total Lectures per Week	**4 (Theory)**	

UNITS	TOPICS	No. of Lectures
I	Fundamental Concepts:Definitions; systems (open, closed, isolated), surroundings, boundaries .Properties; Intensive (independent of mass) vs Extensive(dependent of mass), pressure, volume, temperature, Equilibrium; Thermal, mechanical and chemical equilibrium, Equation of state; ideal gas law(PV=nRT) and deviation in real gases. Zeroth law, definition of temperature and thermometry.	12
II	The First Law of Thermodynamics (Energy Conservation),Concepts: Internal energy, enthalpy, heat, work, Energy Balance; Calculation of energy change in closed and open systems .Processes; Isothermal, isobaric (constant pressure), isochoric (constant volume), and adiabatic (no heat transfer).Heat Capacity; Specific heat at constant volume(Cv) and constant pressure Cp)	12
III	The Second Law and Entropy Limitations; Why natural processes occur in one direction. Entropy ; Definition as a measure of disorder or quality of energy. Cycles; Carnot cycle, efficiency of heat engines, and refrigerators. Spontaneity; Using entropy to determine if a reaction or process will occur spontaneously.	12
IV	Thermodynamic Potentials and Equilibrium: Free Energy; Helmholtz and Gibbsfree energy, particularly for chemical reactions. Phase Equilibrium; Phase changes, phase diagrams, and Clausius-Clapeyron equation. Chemical Potential; Introduction to multi-component systems.	12
V	Thermal Physics Applications: Power Cycles; Rankine cycle (steam power plants). Refrigeration/HVAC: Air conditioners, heat pumps, and coolers. Industrial Processes; Turbines, nozzles, heat exchangers. Bio-thermodynamics: Energy exchange in the human body(sweating, shivering).	12

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates and Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. Basic Thermodynamics by Venkanna B. K. , Swati B. V.
2. Basic Thermodynamics By BasavrajTalikoti.
3. Heat Thermodynamics and Statistical Physics by Subrahmaniyam N. & et al.
4. Thermodynamics and statistical Physics by JPH

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Undergraduate Programme (PHYSICS) Syllabus, Semester-IV	
Session -2027-2028	
Part-A	
Subject	Physics
Semester	IV
Name of Course	Thermal &Statistical Physics Lab
Course Code	08/PHY/MNR/251P
Course Type:	Minor
Level of Course	200-299
Pre-requisite for the course	None
Course Learning Outcomes (CLO)	Students will be able to experimentally determine and analyze key thermal, electrical, and thermodynamic properties of materials using standard laboratory methods and instruments.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	**4 (Practical)**

Students will perform following experiments-

1. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee's Method.
2. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
3. To determine energy band gape of semiconductor by PN junction diode.
4. To determine the thermodynamics constant $\gamma = \frac{C_p}{C_v}$ using Clement and Desormes method.
5. Verification of thermodynamics first by discharging of condenser through resistance.
6. Verification of Gaussian distribution law with help of statistical board and dice.
7. Verification of Rutherford -Sodi law with help of statistical board and dice.

Note: - New experiments may be added on availability of equipments.

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1 Under graduate Practical Book by Kumar and Gupta.
2 Thermal Physics byKiruthiga Sivaprasath.
3 Thermal Physics By Ralph Baierlein.
4 An Advanced Course in Practical Physics: D. Chattopadhyay& C. Rakshit, New Central Book Agency
5 Practical Physics: G.L. Squires ,Cambridge University Press

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B.Sc. Four Year Program in Physics as per NEP (2022)

SEMESTER-V

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
5.5	V	MNR	08/PHY/MNR/301T	Basics of Electronics	4	-	4	4
		MNR-P	08/PHY/MNR/301P	Modern Physics Lab	-	2	4	2

SEMESTER-VI

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
5.5	VI	MNR	08/PHY/MNR/351T	Digital Electronics	4	-	4	4
		MNR-P	08/PHY/MNR/351P	Advance Physics Lab	-	2	4	2

UG Degree:
Students who opt to exit after completion of the second year and have secured **140 credits** will be awarded a **UG Degree** if, in addition, they complete **one internship of 4 credits** during the summer vacation of the second year.

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Undergraduate Programme (PHYSICS) Syllabus, Semester-V		
Session -2028-2029		
Part-A		
Subject	Physics	
Semester	V	
Name of Course	Basics of Electronics	
Course Code	08/PHY/MNR/301T	
Course Type:	Minor	
Level of Course	300-399	
Pre-requisite for course	None	
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1:Explain semiconductor fundamentals including energy bands, chargecarriers, and conduction mechanisms in intrinsic and extrinsic materials. CLO2: Analyze the behavior and characteristics of PN junction diode under different biasing conditions and breakdown mechanisms. CLO3: Evaluate rectifier circuits and filter networks used in DC power supplies for efficiency and ripple reduction. CLO4: Describe the construction, working, and applications of special diodes such as Zener, LED, photodiode, and solar cell. CLO5: Understand the operation, configurations, and applications of Bipolar Junction Transistor including its use as a switch.	
Credits	4	
Total Marks	20+80=100	

Part-B Contents of the Course

Total Lectures per Week | **4 (Theory)**

UNITS	TOPICS	No. of Lectures
I	**Semiconductor Fundamentals:** Atomic structure and energy bands, Conductors, semiconductors and insulators, Intrinsic and extrinsic semiconductors; P-type and N-type semiconductors, Charge carriers; electrons and holes, Drift and diffusion current, Diode current equation (Derivation not required).	12
II	**PN Junction Diode:** PN junction, Depletion region and barrier potential, Forward bias and reverse bias, V–I characteristics of PN junction diode, Static and dynamic resistance temperature variation of Forward and Reverse Current, Breakdown mechanisms: Zener and Avalanche	12
III	**DC Power Supply:**Rectifiers- Need for rectification, Half-wave rectifier, Full-wave rectifier (center-tapped), Bridge rectifier, Comparison of rectifiers, Rectifier efficiency, Ripple factor Filters - Need of filters, Shunt capacitor filter, Series Inductor filter, L and π section filters, Basic DC power supply block diagram	12
IV	**Special diodes:** Zener Diode, its construction and characteristics, Zener Diode as Voltage Regulator, Tunnel Diode, LED, Solar Cell, Photodiodes, Voltage dependent Junction Capacitance of a PN junction, Varactor diode.	12
V	**Transistors:** Bipolar Junction Transistor (BJT) construction, Basic Transistor Action, NPN and PNP transistors, characteristics in different configuration, Current gain (α, β and γ), Transistor as a switch	12

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates and Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. Robert Boylstead and Louis Nashelsky: Electronic Devices and circuit theory, PHI, 2013.
2. Allen Mottershed: Electronic Devices and Circuits, PHI, 1984.
3. N.N. Bhargava: D.C. Kulshrestha and S.C. Gupta: Basic Electronics and Linear Circuits, T.T. T. I, Chandigarh, Tata Mc-Graw Hill Publishing Company Ltd., New Delhi, 1984.
4. R. S. Sedha: A Textbook of Applied Electronics, S. Chand and Company Ltd., 1990
5. V.K. Mehta and R. Mehta: Principles of Electronics, S. Chand and Company, Rev. Ed., 2010.
6. Bernard Grob: Basic Electronics, McGraw-Hill Publishing Co

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Undergraduate Programme (PHYSICS) Syllabus, Semester-V	
Session -2028-2029	
Part-A	
Subject	Physics
Semester	V
Name of Course	Modern Physics Lab
Course Code	08/PHY/MNR/301P
Course Type:	Minor
Level of Course	300-399
Pre-requisite for the course	None
Course Learning Outcomes (CLO)	Perform and analyze electronic circuit experiments involving semiconductor devices, amplifiers, filters, oscillators, feedback systems, and logic gates to evaluate their characteristics and practical behavior.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	**4 (Practical)**

Students will perform following experiments-

1. Study of the characteristics of a given transistor (PNP/NPN) in common emitter configuration and find the value of parameter of given transistor.
2. Study the characteristics of rectifier junction diode and Zener diode.
3. Study of ripple factor for shunt capacitor, series inductor, L-section and π section filters using full wave rectifier circuit.
4. Study of series and parallel L-C-R resonance circuit.
5. Determination of specific charge of electron (e/m) by Thomson's method.
6. Verification of Stefan's law (Black Body method).

Note: - New experiments may be added on availability of equipments.

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books
1.Practical Physics, Pragati Prakashan, Meeerut
2.Practical Physics, College Book House

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Undergraduate Programme (PHYSICS) Syllabus, Semester-VI		
Session -2028-2029		
Part-A		
Subject	Physics	
Semester	VI	
Name of Course	Digital Electronics	
Course Code	08/PHY/MNR/351T	
Course Type:	Minor	
Level of Course	300-399	
Pre-requisite for course	None	
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1:Understand number systems, coding schemes, and perform arithmetic operations using binary, octal, decimal, and hexadecimal systems. CLO2: Apply Boolean algebra laws and Karnaugh Map techniques to simplify logical expressions. CLO3: Analyze the operation and implementation of basic and universal logic gates in digital circuits. CLO4: Design and evaluate combinational circuits such as adders, subtractors, multiplexers, and comparators. CLO5: Explain the working and applications of sequential circuits including flip-flops, counters, and shift registers.	
Credits	4	
Total Marks	20+80=100	
Part-B Contents of the Course		
Total Lectures per Week	**4 (Theory)**	

UNITS	TOPICS	No. of Lectures
I	**Number Systems:** Binary, octal, decimal, hexadecimal and their inter-conversion, Binary, octal, decimal, hexadecimal and their inter-conversion, BCD code. **Binary Arithmetic:** Binary, octal and hexadecimal arithmetic (addition, subtraction by complement method), representation of signed and unsigned numbers.	12
II	**Basic logic gates and their electronic circuits:** Introduction to Boolean operators, Truth Tables and symbols of basic gates - OR, AND, NOT, Universal (NOR and NAND) gates, construction and symbolic representation of XOR, XNOR, simple logic gate circuits.	12
III	**Boolean Algebra:**Introduction to Boolean algebra, Boolean laws and theorems, DeMorgan's Theorem, Simplification of Boolean expressions, Minterms and Maxterms, Sum of Products (SOP) and Products of Sum (POS), Conversion of SOP/POS to standard form, Universal Gates, Simplification of logical expression using Boolean algebra laws, Karnaugh Map (up to 3 variables)	12
IV	**Arithmetic and Combinational Circuits:**Adder& Subtractor Circuits- Half Adder, Full Adder, Half Subtractor, Parallel Binary Adder, 2's complement Adder/Subtractor, Combinational Circuits-Digital Comparator, Multiplexer, Demultiplexer	12
V	**Sequential Circuits**:Latches and Flip flops- RS- Flip Flop using NAND and NOR Gates, D-Flip Flop, JK Flip-Flop, T Flip Flop, Timing Diagrams, clocked and edge triggered, PRESET and CLEAR, Active low and active high conditions, J-K Master Slave Flip-Flop. Counters- Asynchronous counters, Synchronous counter, Up-Down counter, Timing Diagrams. Registers- shift register, SISO, SIPO, PISO, PIPO registers	12

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates and Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1A.P. Malvino: Digital Computer Electronics, Tata McGraw Hill
2 A.P. Malvino and D. Leach: Digital Principle and applications, Tata McGraw Hill
3 Thomas L. Flyod: Digital Fundamentals, Pearson Education Asia (1994)
4 R.P. Jain: Modern Digital Electronic

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Undergraduate Programme (PHYSICS) Syllabus, Semester-VI	
Session -2028-2029	
Part-A	
Subject	Physics
Semester	VI
Name of Course	Advance Physics Lab
Course Code	08/PHY/MNR/351P
Course Type:	Minor
Level of Course	300-399
Pre-requisite for the course	None
Course Learning Outcomes (CLO)	Interpret physical significance of measured quantities. Compare experimental values with theoretical predictions. Evaluate the accuracy and reliability of different experimental methods. Develop alternative methods for measuring band gap and magnetic properties.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	**4 (Practical)**

Students will perform following experiments-

1. To determine the energy band gap of a semiconductor using a p-n junction diode.
2. To determine the energy band gap of a semiconductor using four probe method.
3. To study hysteresis loss of transformer by B-H curve using C.R.O.
4. Determination of specific charge of electron (e/m) by helical method.
5. Determination of separation of plates of Etalon using spectrometer.
6. To study the variation of refractive index of the material of the prism with wavelength and to verify Cauchy's dispersion formula.

Note: - New experiments may be added on availability of equipments.

Activities:
Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation :
Case Debates a nd Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1.Practical Physics, Pragati Prakashan, Meeerut
2.Practical Physics, College Book House

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