

As per the NEP 2020
Physics
(Minor Syllabus)
(Effective from Academic Year 2024-2025 onwards)



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Semester	Course Code	Course Title	Contact Hrs per Week			Credits	Weightage (%)		
			L	T	P		CWS	MTE	EFE
I	24BPH5101M	Mechanics and Heat Transmission	2	0	0	2	10	20	70
II	24BPH5201M	Wave Theory and Optics	2	0	0	2	10	20	70
III	24BPH6301M	Electromagnetism	4	0	0	4	10	20	70
IV	24BPH6401M	Semiconductor and Modern Physics	4	0	0	4	10	20	70
V	24BPH7501M	Thermodynamics and Statistical Physics	4	0	0	4	10	20	70
VI	24BPH7601M	Material Science	4	0	0	4	10	20	70
VI	24BPH7602M	Mathematical Physics and LASER	4	0	0	4	10	20	70

Semester – I

Learning Objectives:

Learning Objectives: The objective of this course is to introduce the different phenomena that exist in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which such objects behave. The course will help students to apply the basic concepts and principles in different applications.

Learning Outcomes:

Learning Outcomes: On completion of the course the student will be able to understand the the different aspects of mechanics, Concept of force and its applications, Gravitation and different properties of matter. It also helps them to understand the basic heat transmission methods which will help them to understand different phenomena's related to daily life.

Course Title:	Mechanics and Heat Transmission	Course Code: 24BPH5101M
Total Lecture hour 30		Hours
Unit I	Distance, Displacement, Speed, Velocity, Acceleration, Equations of motion, Laws of motion, Force, Energy, Work, Power	9
Unit II	Universal law of gravitation, Gravitational acceleration, Kepler's law, Escape velocity, Motion of satellite	7
Unit III	Properties of Matter: Elasticity, Hooks law, Modulus of elasticity, Pressure, Surface tension with applications(only introduction)	9
Unit IV	Heat, Transfer of heat, Modes of heat transmission of Heat, Idea of conduction, convection and radiation	5
Suggestive Readings:		
1	Concept of Physics by H.C. Verma, Vol I, Bharti Bhawan Ltd., New Delhi	
2	A text book of Applied Physics by N.S.Kumar	
3	Practical Physics by C.L. Arora, S. Chand Publication	

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Semester – II**Learning Objectives:**

The objective of this course is to introduce the different Aspects of Wave theory and Optics.

Learning Outcomes:

On completion of the course the student will be able to understand the use of waves in our daily life. They will understand about the propagation of sound waves and also about the different effects observed in our daily life

Course Title:	Wave Theory and Optics	Course Code: 24BPH5201M
Total Lecture hour 30		Hours
Unit I	Light, Reflection of light, Laws of reflections, Reflection through plane and spherical mirrors, Mirror formula	8
Unit II	Refraction of light, Snell's law, Lens, Refraction through prism, Total internal reflection and it's applications	8
Unit III	Wave motion, Longitudinal and transverse waves, Sound wave, types of sound waves, Propagation of sound waves	7
Unit IV	Introduction of Interference, Diffraction, Polarization, Scattering of light	7
Suggestive Readings:		
1	Concept of Physics by H.C. Verma, Vol I, Bharti Bhawan Ltd., New Delhi	
2	A text book of Applied Physics by N.S.Kumar	
3	Practical Physics by C.L. Arora, S. Chand Publication	

Semester - III**Learning Objectives:**

The objective of this course is to introduce the different phenomena of electrostatics which exists in our day to day life.

Learning Outcomes:

On completion of the course the student will be able to understand about charges, electric field, magnetic field, Ac and Dc current and also the use of electricity in our daily life

Course Title:	Electromagnetism	Course Code: 24BPH6301M
Total Lecture Hours 60		Hours
Unit I	Coulomb's law, Electric field, Electric flux, Electric dipole and dipole moment	14
Unit II	Magnetic field, Magnetic lines of force, force on moving charge,	14
Unit III	Direct and alternating current, Electromagnetic induction, Faraday's law, Lenz's law, AC generator, Transformer	16
Unit IV	Electric current, Resistance, Ohm's law, Series and parallel combination of resistances, Internal resistance,	16
Suggestive Readings:		
1	Concept of Physics by H.C. Verma, Vol I, Bharti Bhawan Ltd., New Delhi	
2	A text book of Applied Physics by N.S.Kumar	
3	Practical Physics by C.L. Arora, S. Chand Publication	

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Semester – IV**Learning Objectives:**

The objective of this course is to introduce about the modern part of Physics like semiconductors, semiconductor devices and also about some aspects of modern Physics

Learning Outcomes:

On completion of the course the student will be able to understand the classification of materials on the basis of their electrical behavior and also about some elementary Quantum mechanics and Nuclear Physics.

Course Title:		Semiconductor and Modern Physics	Course Code: 24BPH6401M
Total Lecture Hours 60			Hours
Unit I	Types of materials (Insulator, Semiconductor, Conductor), Type of semiconductors, Use of Semiconductor		15
Unit II	P-N Junction diode, Zener diode, Photo diode, Introduction of power supply		15
Unit III	De Broglie hypothesis, Matter waves, Uncertainty principle		15
Unit IV	Nucleus, Nuclear fission and fusion, Radioactivity		15
Suggestive Readings:			
1	Concept of Physics by H.C. Verma, Vol I, Bharti Bhawan Ltd., New Delhi		
2	A text book of Applied Physics by N.S.Kumar		
3	Practical Physics by C.L. Arora, S. Chand Publication		

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Semester V**Course Objectives:**

The objective of the course Thermodynamics and Statistical Physics is to develop understanding of thermodynamical process, thermodynamic laws, specific heat, thermodynamic effects and thermodynamic statistics.

Course outcomes:

On completion of this course students will be able to understand about basics of temperature, thermodynamic laws and process, heat engine, thermodynamic probability and various types of statistics.

Course Title:	Thermodynamics and Statistical Physics	Course Code: 24BPH7501M
Total Lecture hours 60		
Unit I	Thermal interaction, Zeroth law of thermodynamics, General interaction and first law of thermodynamics, Phase transitions, Triple point, First and second-order phase transition, Clausius-Clapeyron equation, Vapour-pressure curve, Heat engine and efficiency of engine, Carnot's Cycle, Carnot's Engine Thermodynamic scale as an absolute scale.	15
Unit II	Second law of thermodynamics, Entropy, Maxwell relations and their applications, Derivation of Maxwell's law of distribution of velocities and its experimental verification, most probable, average and RMS velocities, Mean free path, Distribution of free path.	15
Unit III	Equipartition Theorem, Specific heat capacity, Classical theory of Specific heat capacity, heat capacity of solids. Joule Thomson effect, J-T coefficient for ideal as well as-Vander Waal's gases, Temperature of inversion, Regenerative cooling, Liquid He I and He II, Superfluidity.	15
Unit IV	Introduction to Phase space, Micro and Macro states, Thermodynamic probability, Relation between Entropy and thermodynamic probability, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distribution laws, Nuclear Spin statistics (para and ortho hydrogen).	15
Reference and Reading Books:		
1. Kittel-Thermal Physics. 2. Berkeley Series, Vol. V, Statistical Physics 3. Reif-Thermodynamics and Statistical Physics. 4. Lokanathan and Khandelwal Thermodynamics and Statistical Physics. 5. Sears Thermodynamics, Kinetic Theory of Gases and Statistical Physics.		

Semester VI**Course Objectives**

The objective of the course Material Science is to understand the fundamental concepts of crystal structure, to analyze the crystal structure using X-ray diffraction methods, to understand the characteristics of semiconductor material, to acquire knowledge on the basics of magnetic phenomena on materials and to learn the properties of superconducting materials.

Course outcomes:

This course helps students to understand relationship between structure and properties of the solid state systems, different types of bonding in solid substances, the magnetic properties of crystalline structures, the importance of superconducting materials in engineering applications.



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Course Title:	Material Science	Course Code: 24BPH7601M
Total Lecture hours 60		
Unit I	Force between atoms: Ionic bonds, Covalent and metallic bonds, Vander waal's and Hydrogen bonding, Lattice and Basis, Unit cell and primitive cell, Crystal systems, Bravais space lattices, Cubic lattice structures: Simple Cubic (SC), Body Centred Cubic (BCC), Face Centred Cubic (FCC).	15
Unit II	Direction: Planes and miller indices in a crystal lattice, X-ray diffraction by solids: Laue and Braggs equation. Magnetic properties of Materials: Classification of Magnetic Materials, Origin of Atomic Magnetism, Curie's law, Concept of Domain Wall and Magnetostriiction in ferromagnets.	15
Unit III	Classification of materials, Energy band Structures in Insulators, Conductors and Semiconductors, Dependence of resistivity of materials on temperature, Generation and recombination of charge carriers, Mobility of charge carriers. Hall Effect in semiconductors, Hall coefficient, Mobility, Charge carrier concentration.	15
Unit IV	Superconductivity: Experimental features of superconductivity- Critical Temperature, Critical magnetic field, Meissner effect, Type I and type II Superconductors, London's Equation and Penetration Depth, Isotope effect, Idea of BCS theory (No derivation); Cooper Pair and Coherence length, , flux quantization, Josephson Effect (No derivation).	15
Reference and Reading Books:		
1. Solid State Physics - S.O. Pillai (New Age International Pvt. Ltd.) 2. Introduction to Solid State Physics - Charles Kittel (Wiley Publication) 3. Solid State Physics - HC Gupta (Vikas Publishing House Pvt. Ltd., New Delhi) 4. Materials Science and Engineering - V. Raghavan (Prentice Hall of India Pvt. Ltd, New Delhi) 5. Elementary Solidstate Physics - M. Ali Omar (Pearson Education) 6. Elements of X-ray diffraction - B. D. Cullity (Prentice Hall)		

Semester VI**Course Objectives:**

The objective of the course Mathematical Physics and LASER is to provide knowledge of basic concept of Coordinate systems, mathematical operations and special functions, theory of relativity and Laser.

Course outcomes:

On completion of this course students will be able to understand about basics of coordinate systems and interrelation between them, relativity, vector and tensor operations, Laser and its process.

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Course Title:	Mathematical Physics and LASER	Course Code: 24BPH7602M
Total Lecture hours 60		
Unit I	Frame of reference: inertial and non-inertial, Orthogonal curvilinear coordinate systems: Cartesian coordinate system, Cylindrical coordinate system and Spherical coordinate system, relation between these coordinate systems, coordinate transformation.	15
Unit II	Special theory of relativity: postulates, Lorentz transformations, addition of velocities and accelerations, Length contraction, time dilation and relativistic variation of mass with velocity.	15

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 Shaikhkhatun
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B.Sc. Physics (Minor)

Unit III	Dirac delta function, its properties and applications, Vector quantities and its properties, vector operations- addition, subtraction and multiplication, Tensor-basic definitions and operations.	15
Unit IV	Absorption, spontaneous and stimulated emission, Einstein's coefficients and relation between them, population inversion, method of optical pumping, energy level schemes, Ruby Laser- principal, construction and working.	15
Reference and Reading Books: 1. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th Edn., Elsevier. 2. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications. 3. Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book. 4. Mathematical Physics, Goswami, 1st edition, Cengage Learning. 5. Laser Physics and Spectroscopy, P.N.Ghosh, Levant Books, India, 2016.		


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