

# **SIDO KANHU MURMU UNIVERSITY, DUMKA**

(A State University recognized under Section 2(f) & 12(B) of the UGC Act, 1956)



## **SYLLABUS OF ASSOCIATED CORE & ELECTIVE COURSES**

OF

### **PHYSICS**

**In Accordance with the  
Implementation of FYUGP under the State Universities of  
Jharkhand Regulations, 2024**

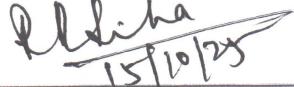
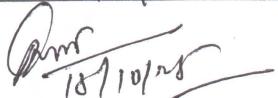
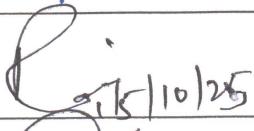
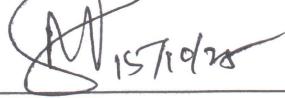
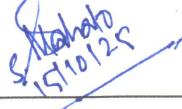
***Implemented from the  
Academic Session 2025-2029 Onwards***

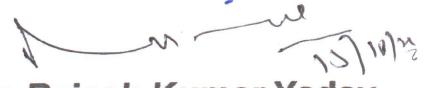
**Board of Studies Meeting Proceedings**

A meeting of the Board of Studies for the revision and finalization of the **PHYSICS ASSOCIATED CORE & ELECTIVE COURSE** syllabus for the Four-Year Undergraduate Programme (FYUGP), in accordance with the Implementation of FYUGP in State Universities of Jharkhand Regulations, 2024, was convened on **15/10/2025**.

The following members of the Board of Studies were present in this meeting. The committee unanimously accepted and recommended the syllabi, incorporating minor modifications.

**Members of the Board of Studies:**

S. NO.	MEMBERS	SIGNATURE
1.	<b>Dr. Rajesh Kumar Yadav, Head</b> University Department of Physics	 15/10/25
2.	<b>Prof. Kamal Prasad, Professor and Head,</b> University Department of Physics, TMBU Bhagalpur	Online
3.	<b>Dr. R .R. Sinha, Assistant Professor,</b> University Department of Physics	 15/10/25
4.	<b>Dr. R. S. Kumar, Assistant Professor,</b> S. P. College, Dumka	 15/10/25
5.	<b>Dr. Indrajeet kumar, Assistant Professor,</b> S. P. College, Dumka	 15/10/25
6.	<b>Mr. Rajesh Kumar, Assistant Professor,</b> Model College, Dumka	 15/10/25
7.	<b>Dr. Mahendra Goray, Need Based Assistant Professor,</b> S. P. College, Dumka	 15/10/25
8.	<b>Dr. Dharmendra Yadav, Need Based Assistant Professor,</b> B. S. K. College, Berherwa	
9.	<b>Dr. Jitendra Saha, Need Based Assistant Professor,</b> Sahibganj College, Sahibganj	Online -
10.	<b>Dr. Shyam Sundar Mahato, Need Based Assistant Professor,</b> RDBM College Deoghar	 15/10/25

  
**Dr. Rajesh Kumar Yadav**  
**(Chairperson)**

**Semester wise AC & ELC Subject Combination of PHYSICS**

Semester	Course Category	Code	Papers	Credits
Semester I / II	Associated Core (PHYSICS)	AC-1/2	MECHANICS	4
Semester III / IV	Elective Course (PHYSICS) - 1	ELC-1	ELECTRICITY AND MAGNETISM	4
Semester V / VI	Elective Course (PHYSICS) - 2	ELC-2	THERMODYNAMICS AND STATISTICAL PHYSICS	4
Semester VII / VIII	Elective Course (PHYSICS) - 3	ELC-3	WAVES AND OPTICS	4

**INSTRUCTIONS FOR QUESTION SETTER**

**1. Semester Internal Examination Question Pattern (15 Marks)**

The Semester Internal Examination (SIE) will carry a total of **15 marks**, which includes **10 marks for the internal test** and **5 marks for class attendance**. The question paper will have **two groups**.

**Group A** will have: **Question 1**: Five very short answer questions (1 mark each, total 5 marks)

**Group B** will have: Two descriptive-type questions of 5 marks each, out of which students must answer **any one** (total 5 marks)

The remaining **5 marks** will be based on **class attendance**, as per the following:

- Up to 45% attendance: 1 mark
- 46% to 54%: 2 marks
- 55% to 64%: 3 marks
- 65% to 74%: 4 marks
- 75% and above: 5 marks

**2. End Semester University External Examination Question Pattern (60 Marks)**

The End Semester Examination (ESE) will be of **60 marks** and will also have **two groups**.

**Group A (Compulsory)** will include: **Question 1**: Five very short answer questions (1 mark each, total 5 marks)

**Questions 2 and 3**: Two short answer questions (5 marks each, total 10 marks) **Group B** will contain **five descriptive-type questions of 15 marks each**, out of which students must answer **any three** (total 45 marks)

**Note:** Questions may have sub-parts if needed in the theory examination.

**3. End Semester University Practical Examination Question Pattern (25 Marks)**

The End Semester Practical Examination (ESE) will be of **6 hours** duration. The total marks and evaluation should be done as per the following guidelines:

- **Experiment/Activity performed during the exam** – 15 marks
- **Practical record notebook** – 5 marks
- **Viva-voce (oral questions)** – 5 marks

Students must score **at least 10 marks** to pass the practical examination.

## FYUGP SYLLABUS OF PHYSICS AC & ELECTIVES COURSES

### Internal Semester Examination: 10 Marks

F.M.=10	Subject/Code Time= 1 Hrs.	Exam Year
i. <b>Group A</b> carries very short answer type <b>compulsory</b> questions. ii. <b>Answer 1 out of 2</b> subjective/ descriptive questions given in <b>Group B</b> . iii. Answer in your own words as far as practicable. iv. Answer all sub parts of a question at one place. v. Numbers in right indicate full marks of the question.		
1.	<b>Group A</b>	[5x1=5]
1.	i. ....	
	ii. ....	
	iii. ....	
	iv. ....	
	v. ....	
2.	<b>Group B</b>	[5]
2.	.....	[5]
3.	.....	[5]
<b>Note:</b> There may be subdivisions in each question asked in Theory Examination.		

### End Semester Examination: 60 Marks

F.M.=60	Subject/Code Time= 3 Hrs.	Exam Year
i. <b>Group A</b> carries very short answer type <b>compulsory</b> questions. ii. <b>Answer 3 out of 5</b> subjective/ descriptive questions given in <b>Group B</b> . iii. Answer in your own words as far as practicable. iv. Answer all sub parts of a question at one place. v. Numbers in right indicate full marks of the question.		
1.	<b>Group A</b>	[5x1=5]
1.	i. ....	
	ii. ....	
	iii. ....	
	iv. ....	
	v. ....	
2.	<b>Group B</b>	[5]
2.	.....	[5]
3.	.....	[5]
4.	<b>Group A</b>	[5x1=5]
4.	.....	[15]
5.	.....	[15]
6.	.....	[15]
7.	.....	[15]
8.	.....	[15]
<b>Note:</b> There may be subdivisions in each question asked in Theory Examination.		

**PROMOTION CRITERIA**

- All students will be promoted in odd Semesters (I, III, V & VII).
- To get a promotion from Semester II to Semester III, from Semester IV to Semester V, and from Semester VI to Semester VII a student has to procure a minimum of 4 CGPA.
- However, it will be necessary to obtain a minimum credit (4) to pass in each of the subjects individually before completion of the course.

**CALCULATION OF MARKS FOR THE PURPOSE OF RESULT**

The passing in a subject will be based on the combined marks obtained in both the internal and external examinations of the semester. However, the student must pass theory and practical examinations separately.

---

**SEMESTER –I/II****COURSE: ASSOCIATED CORE (PHYSICS)  
PAPER NAME: MECHANICS****TOTAL CREDITS: THEORY-03, PRACTICAL-01  
TEACHING HOURS: THEORY-45, PRACTICAL-30**

<b>EVALUATION</b>			
	<b>External Exam</b>	<b>Internal Exam</b>	<b>Practical</b>
<b>Full Marks</b>	<b>60</b>	15 (10 Written + 5 Attendance/Overall Class Performance)	<b>25</b>
<b>Duration of Exam</b>	3 Hours	1 Hour	6 Hours
<b>Pass Marks</b>		30 Marks	10 marks

**Course Objectives:**

This course aims to enable the students to acquire the mathematical knowledge about the vector algebra and ordinary differential equation with their role in applied physics. Key concepts of the general properties of matter, the motion of a particle under central force field, oscillations and non-inertial systems.

**Learning Outcomes:**

- Understanding about vector algebra and ODEs will be developed.
- Learn about the behaviour of physical bodies around us in daily life.
- Understand the dynamics of planetary motion.
- Build a foundation of various applied field in science and technology.
- Develop the analytical thinking on Mechanics in order to understand the response of the classical systems to external forces.

**PART A****THEORY COURSE CONTENTS:****UNIT I:**

**Introductory Mathematics (10 Lectures):** Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

## **UNIT II:**

**General Properties of Matter (15 Lectures):** Hooke's law. Stress-strain diagram. Elastic moduli. Poisson's Ratio-expression for Poisson's ratio in terms of elastic constants. Relation between Elastic constants. Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder. Kinematics of Moving Fluids: Viscous fluid, Poiseuille's Equation for Flow of a Liquid through a Capillary Tube with correction, Flow of compressible fluid through a capillary tube. Effect of temperature and pressure on viscosity. Surface tension and surface energy. Angle of contact. Expression for excess pressure. Effect of temperature and pressure on surface tension.

## **UNIT III:**

**Work, Energy and Motions (20 Lectures):** Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work and Potential energy. Work done by nonconservative forces. Law of conservation of Energy. Motion of a particle under a central force field. Two bodies problem. Conservation of angular momentum. Kepler's Laws of planetary motion and their derivation. Satellite in circular orbit and applications. Weightlessness. Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations. Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.

## **SUGGESTED READINGS:**

1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
2. Mechanics, D. S. Mathur.
3. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
4. Feynman Lectures, Vol. I, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education.
5. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
6. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

## **PART B**

### **PRACTICAL COURSE CONTENTS:**

#### **List of Practical:**

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study errors: Truncation and round off errors, Absolute and relative errors.
3. To determine the elastic Constants of a wire by Searle's method.
4. To determine the value of  $g$  using Bar Pendulum.
5. To determine the value of  $g$  using Kater's Pendulum.
6. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

#### **SUGGESTED READINGS:**

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
2. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal.
5. Numerical Methods, E Balagurusamy, McGraw Hill Education.



## SEMESTER –III/IV

**COURSE:** ELECTIVE COURSE (PHYSICS)-1  
**PAPER NAME:** ELECTRICITY AND MAGNETISM

**TOTAL CREDITS:** THEORY-03, PRACTICAL-01  
**TEACHING HOURS:** THEORY-45, PRACTICAL-30

<b>EVALUATION</b>			
	<b>External Exam</b>	<b>Internal Exam</b>	<b>Practical</b>
<b>Full Marks</b>	<b>60</b>	15 (10 Written + 5 Attendance/Overall Class Performance)	<b>25</b>
<b>Duration of Exam</b>	3 Hours	1 Hour	6 Hours
<b>Pass Marks</b>		30 Marks	10 marks

### Course Objective:

This course aims to provide students with a comprehensive understanding of electric and magnetic fields, their interactions, and their applications in electrical circuits, preparing them for advanced studies in electromagnetism and electrical engineering.

### Learning Outcomes:

- Understand the concepts of electric flux, Gauss's law, and its applications in determining electric fields.
- Analyze the conservative nature of electrostatic fields and solve Laplace's and Poisson's equations for various configurations.
- Evaluate electric fields and potentials due to electric dipoles and conductors, and calculate capacitance of charged systems.
- Describe dielectric properties of matter, including polarization, dielectric constant, and susceptibility, and analyze Gauss's law in dielectrics.
- Apply Biot-Savart's law to calculate magnetic fields produced by current-carrying wires and loops, and determine torque on current loops in magnetic fields.
- Explain magnetic properties of matter, including magnetization, magnetic intensity, and susceptibility, and interpret B-H curves and hysteresis.
- Analyze electromagnetic induction phenomena, including Faraday's law, self-inductance, mutual inductance, and energy storage in magnetic fields.
- Apply Kirchhoff's laws to analyze AC circuits, calculate complex reactance and impedance, and study resonance, power dissipation, and quality factor in LCR circuits.

## **PART A**

### **THEORY COURSE CONTENTS:**

#### **UNIT I:**

**Electric Field and Electric Potential (15 Lectures):** Electric flux. Gauss' law in integral and differential form and its applications. Conservative nature of Electrostatic Field. Laplace's and Poisson equations. The Uniqueness Theorem. Electric field and Potential due to electric dipole and quadrupole. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors.

#### **UNIT II:**

**Dielectric and Magnetic Properties of Matter (15 Lectures):** Electric Field in matter. Polarization and Polarizability. Electrical susceptibility and Dielectric constant. Displacement vector  $\mathbf{D}$ . Relations between  $\mathbf{E}$ ,  $\mathbf{P}$  and  $\mathbf{D}$ . Clausius-Mossotti equation, Gauss' Law in dielectrics. Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment. Torque on a current loop in a uniform Magnetic Field. Magnetization vector ( $\mathbf{M}$ ). Magnetic Intensity ( $\mathbf{H}$ ). Magnetic Susceptibility and permeability. Relation between  $\mathbf{B}$ ,  $\mathbf{H}$ ,  $\mathbf{M}$ . B-H curve and hysteresis. Properties of magnetic materials- Dia, Para and Ferromagnetism.

#### **UNIT III:**

**Electromagnetic Induction and Electrical Circuits (15 Lectures):** Faraday's Law, Lenz's Law, Self-Inductance and Mutual-Inductance, Reciprocity Theorem, Energy stored in a Magnetic Field, Charge Conservation and Displacement current. Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit. Transformer, Losses in transformer.

### **SUGGESTED READINGS:**

1. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw.
2. Introduction to Electrodynamics, D.J. Griffiths, Cambridge University Press.
3. Feynman Lectures Vol.2, R. P. Feynman, R. B. Leighton, M. Sands, 2008, Pearson Education.
4. Electricity and Magnetism by R. K. Tewary, S Chand.

## **PART B**

### **PRACTICAL COURSE CONTENTS:**

#### **List of Practical:**

1. Use a Multimeter for measuring: (a) Resistances (b) AC and DC Voltages (c) DC Current (d) Capacitances (e) Checking electrical fuses.
2. Determine an unknown Low Resistance using: (a) Potentiometer (b) Carey Foster's Bridge.
3. Compare capacitances using De'Sauty's bridge.
4. Verify the Thevenin and Norton theorems.
5. Verify the Superposition and Maximum power transfer theorems.
6. Determine self-inductance of a coil by Anderson's bridge.
7. Study the response curve of a Series LCR circuit and determine: (a) Resonant frequency (b) Impedance at resonance (c) Quality factor Q (d) Bandwidth.
8. Study the response curve of a parallel LCR circuit and determine: (a) Anti-resonant frequency (b) Quality factor Q.

#### **SUGGESTED READINGS:**

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.

\*\*\*\*

## SEMESTER –V/VI

**COURSE:** ELECTIVE COURSE (PHYSICS)-2  
**PAPER:** THERMODYNAMICS AND STATISTICAL PHYSICS

**TOTAL CREDITS:** THEORY-03, PRACTICAL-01  
**TEACHING HOURS:** THEORY-45, PRACTICAL-30

<b>EVALUATION</b>			
	<b>External Exam</b>	<b>Internal Exam</b>	<b>Practical</b>
<b>Full Marks</b>	<b>60</b>	15 (10 Written + 5 Attendance/Overall Class Performance)	<b>25</b>
<b>Duration of Exam</b>	3 Hours	1 Hour	6 Hours
<b>Pass Marks</b>		30 Marks	10 marks

### Course Objective:

This course aims to provide students with a thorough understanding of the laws of thermodynamics, kinetic theory of gases, quantum theory of radiation, and statistical mechanics, enabling them to analyze and solve complex thermodynamic problems and phenomena.

### Learning Outcomes:

- Understand the fundamental principles of thermodynamics, including the zeroth, first, second, and third laws, and apply them to analyse heat and work interactions, thermodynamic processes, and entropy changes.
- Describe the kinetic theory of gases, including Maxwell-Boltzmann distribution, mean speeds, degrees of freedom, and the law of equipartition of energy, and apply it to calculate specific heats of gases.
- Explain the quantum theory of radiation, including Planck's law of blackbody radiation and its implications for spectral distribution, energy density, and various radiation laws.
- Analyse statistical mechanics concepts such as macrostates, microstates, entropy, and thermodynamic probability, and apply distribution laws like Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac to describe the behaviour of gases at different temperature regimes.
- Apply theoretical principles from thermodynamics, kinetic theory, quantum theory, and statistical mechanics to solve problems related to heat, work, radiation, and gas behaviour in various physical systems.

## **PART A**

### **THEORY COURSE CONTENTS:**

#### **UNIT I:**

**Laws of Thermodynamics and Kinetic Theory of Gases (25 lectures):** Zeroth Law of thermodynamics and concept of temperature. First law of thermodynamics and internal energy. Conversion of heat into work. Various Thermodynamical Processes. Applications of First Law: General Relation between  $C_p$  and  $C_v$ , Work Done during Isothermal and Adiabatic Processes. Compressibility and Expansion Coefficient. Reversible and irreversible processes with examples. Second law of thermodynamics and concept of Entropy. Carnot's cycle & Carnot theorem. Entropy-temperature diagrams for Carnot's cycle. Entropy changes in reversible & irreversible processes. Third law of thermodynamics and Unattainability of absolute zero. Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Mean, RMS and Most Probable Speeds. Degrees of Freedom. Law of Equipartition of Energy & its applications to specific heat of gases; monoatomic and diatomic gases.

#### **UNIT II:**

**Quantum Theory of Radiation (10 Lectures):** Spectral Distribution of Black Body Radiation. Concept of Energy Density. Planck's Quantum Postulates. Planck's Law of Blackbody Radiation: Experimental Verification. Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan-Boltzmann Law, (4) Wien's Displacement law from Planck's law.

#### **UNIT III:**

**Statistical Mechanics (10 Lectures):** Macrostate & Microstate, Elementary Concept of Ensemble, Phase Space, Entropy and Thermodynamic Probability. Maxwell-Boltzmann Distribution Law. B-E distribution law, Thermodynamic functions of a strongly Degenerate Bose Gas, Bose Einstein condensation. Fermi-Dirac Distribution Law, Thermodynamic functions of a completely and strongly Degenerate Fermi Gas, Fermi Energy.

### **SUGGESTED READINGS:**

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
3. Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears and G.L. Salinger. 1988, Narosa
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. Statistical Mechanics, R.K. Pathria, Butterworth Heinemann: 2nd Ed., 1996, Oxford University Press.

## **PART B**

### **PRACTICAL COURSE CONTENTS:**

#### **List of Practical:**

1. Measurement of Planck's constant using black body radiation and photo-detector.
2. Determine the Planck's constant using LEDs of at least 4 different colours.
3. Verify the Stefan's law of radiation and to determine Stefan's constant.
4. Determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
5. Determine the temperature co-efficient of resistance by Platinum resistance thermometer.
6. Study the variation of thermo emf across two junctions of a thermocouple with temperature.
7. Record and analyse the cooling temperature of a hot object as a function of time using a thermocouple.

#### **SUGGESTED READINGS:**

1. Advanced Practical Physics for students, B. L. Flint & H. T. Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. A Laboratory Manual of Physics for Undergraduate Classes, D. P. Khandelwal, 1985, Vani Publication.



## SEMESTER –VII/VIII

**COURSE:** ELECTIVE COURSE (PHYSICS)-3  
**PAPER:** WAVES AND OPTICS

**TOTAL CREDITS:** THEORY-03, PRACTICAL-01  
**TEACHING HOURS:** THEORY-45, PRACTICAL-30

<b>EVALUATION</b>			
	<b>External Exam</b>	<b>Internal Exam</b>	<b>Practical</b>
<b>Full Marks</b>	<b>60</b>	15 (10 Written + 5 Attendance/Overall Class Performance)	<b>25</b>
<b>Duration of Exam</b>	3 Hours	1 Hour	6 Hours
<b>Pass Marks</b>		30 Marks	10 marks

### Course Objective:

This course aims to provide students with a comprehensive understanding of wave motion and optics, covering topics such as wave types, wave equations, wave optics principles, interference phenomena, and polarization of light. Through theoretical lectures, students will develop a strong foundation in wave mechanics and optical principles essential for further studies in physics and related fields.

### Learning Outcomes:

- Understand the characteristics and behaviour of plane and spherical waves, including longitudinal and transverse waves, and their propagation properties.
- Apply the wave equation and differential equations to describe wave motion, including the determination of particle and wave velocities and the pressure of longitudinal waves.
- Understand the electromagnetic nature of light and the principles of wave optics, including wavefront properties, Huygens Principle, and laws of reflection and refraction.
- Analyse interference phenomena, including thin film interference, Newton's rings, and measurement techniques for determining wavelength and refractive index.
- Understand Fresnel and Fraunhofer diffraction principles, including their assumptions, explanations of light propagation, and applications in resolving power and grating analysis.
- Explain polarization phenomena, including Brewster's law, double refraction, and the production and detection of polarized light using various optical elements such as Nicol prisms and retardation plates.

## **PART A**

### **THEORY COURSE CONTENTS:**

#### **UNIT I:**

**Wave Motion (15 Lectures):** Plane and Spherical Waves, Longitudinal and Transverse Waves, Plane Progressive (Travelling) Waves, Wave Equation, Particle and Wave Velocities, Differential Equation, Pressure of a Longitudinal Wave, Energy Transport. Electromagnetic nature of light, Definition and properties of wave front, Huygens Principle, Temporal and Spatial Coherence, Fermat's Principle, Lens and Mirror formula, Laws of reflection and refraction, Cardinal points.

#### **UNIT II:**

**Interference (10 Lectures):** Division of amplitude and wavefront, Interference in Thin Films, Fringes of equal inclination (Haidinger Fringes), Fringes of equal thickness (Fizeau Fringes), Newton's Rings: Measurement of wavelength, Measurement of refractive index.

#### **UNIT III:**

**Diffraction and Polarization (20 Lectures):** Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave, Explanation of Rectilinear Propagation of Light, Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fraunhofer Diffraction: Single slit diffraction, Double slit diffraction, Circular aperture and disc diffraction, Resolving Power of a telescope, Rayleigh criteria, Plane transmission grating, Concave grating, Resolving power of grating. Polarization: Polarization by reflection, Brewster's law, Double refraction, Nicol prism, Retardation plate:  $\lambda/2$  and  $\lambda/4$  plates. Production and detection of plane, circular, and elliptically polarized light.

### **SUGGESTED READINGS:**

1. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
2. Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
3. Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.
4. Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
5. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
6. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
7. Optics by B. K. Mathur.

## **PART B**

### **PRACTICAL COURSE CONTENTS:**

#### **List of Practical:**

1. Determine the value of Cauchy Constants.
2. Determine the Resolving Power of a Prism.
3. Determine wavelength of sodium light using Fresnel Biprism.
4. Determine wavelength of sodium light using Newton's Rings.
5. Determine the wavelength of Laser light using Diffraction of Single Slit.
6. Determine wavelength of (1) Sodium source and (2) Spectral lines of the Mercury light using plane diffraction Grating.
7. Determine dispersive power and resolving power of a plane diffraction grating.

#### **Reference Books:**

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.

