GURU JAMBHESHWAR UNIVERSITY OF SCIENCE AND TECHNOLOGY, HISAR
(Established by State Legislature Act 17 of 1995)
`A+' Grade, NAAC Accredited State Govt. University

Acad./AC-III/BOS&R-12/2025/ _2998_

Dated: _05/6/25_

To

The Controller of Examinations,
GJUST, Hisar.

Sub: Approval of the scheme of examinations and syllabi of additional subject of "Physics" for the pass out students of Dual degree B.Sc. (Hons.) – M.Sc. Programme(s) in Chemistry/Mathematics w.e.f. Batch-2016 onwards and also for the pass out students of Integrated B.Sc. (Hons./Hons. with Research) – M.Sc. programmes in Chemistry/ Mathematics, w.e.f. academic session 2023-24 for becoming eligible for Trained Graduate Teacher (TGT) for the purpose of job etc.

Sir,

I am directed to inform you that the Vice-Chancellor, on the recommendations of Dean, Faculty of Physical Sciences & Technology on 20.05.2025, is pleased to approve the scheme of examinations and syllabi of additional subject of "Physics" for the pass out students of Dual degree B.Sc. (Hons.) – M.Sc. Programme(s) in Chemistry/Mathematics w.e.f. Batch-2016 onwards and also for the pass out students of Integrated B.Sc. (Hons./Hons. with Research) – M.Sc. programmes in Chemistry/ Mathematics, w.e.f. academic session 2023-24 for becoming eligible for Trained Graduate Teacher (TGT) for the purpose of job etc., under Section 11(5) of the University Act, 1995 in anticipation of approval of the Academic Council.

A copy of the scheme of examinations & syllabi of above said course is enclosed herewith.

You are therefore, requested to take further necessary action accordingly.

Yours faithfully

Asstt. Registrar (Academic)
for Registrar

Endst. No. Acad./AC-III/BOS&R-12/2025/ _2998-3002_   Dated: _5/6/25_

A copy of above is forwarded to the following for information and necessary action:-

1. Dean, Faculty of Physical Sciences & Technology, GJUST, Hisar.
2. Chairperson, Department of ~~Mathematics~~ Physics, GJUST, Hisar. He is requested to arrange to upload the scheme of examinations and syllabi of additional subject of "Physics" for the pass out students of Dual degree B.Sc. (Hons.) – M.Sc. Programme(s) in Chemistry/ Mathematics w.e.f. Batch-2016 onwards and also for the pass out students of Integrated B.Sc. (Hons./Hons. with Research) – M.Sc. programmes in Chemistry/ Mathematics, w.e.f. academic session 2023-24 for becoming eligible for Trained Graduate Teacher (TGT) for the purpose of job etc., on the website of the University.
3. OSD to Vice-Chancellor (for kind information of the Vice-Chancellor), GJUST, Hisar.
4. Secretary Office of the Registrar (for kind information of the Registrar), GJUST, Hisar.

Assistant Registrar (Academic)

PHYSICS SCHEME & SYLLABUS

(Hons with Research)

For Dual degree B.Sc. (Hons.)-M.Sc. programme in Chemistry and Mathematics-Additional Subjects

SEMESTER-III

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
BPL 306 AD	Theory-III	Physics-III (Basics of Electromagnetism)	4	4	70	30	100
BPP 303 AD	Practical-III	Physics Lab-III	2	4	70	30	100

SEMESTER-IV

(For session 2016 onwards)

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
BPL 406 AD	Theory-IV	Physics-IV (Thermal Physics)	4	4	70	30	100
BPP 403 AD	Practical-IV	Physics Lab-IV	2	4	70	30	100

(For session 2019 onwards)

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
BPL 406 AD	Theory-IV	Physics-IV (Waves and Optics)	4	4	70	30	100
BPP 403 AD	Practical-IV	Physics Lab-IV	2	4	70	30	100

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BPL 306 AD: PHYSICS-III (Basics of Electromagnetism)

Marks (Theory) : 70

Credits :4 (60 lectures)

Marks (Internal Assessment) : 30

Time : 3 Hrs

Note: Paper setter is to set nine questions in all. Question no. 1 (compulsory based on the entire syllabus) will consist of seven short answer type questions, each of two marks. Rest of Eight questions is to be set uniformly selecting two questions from each Unit. A student is required to attempt five questions in all selecting one from each Unit and a compulsory question 1. The question paper shall contain 20% numerical problems in the relevant papers.

Course Objective: The course on Electricity and Magnetism deals with Coulomb's law, Electric field, potential formulation of electrostatic, Capacitors, Magnetism and magnetic materials along with the applications of these concepts	Course Outcome: The student will be able to understand Gauss-divergence theorem, Stokes theorem in dielectrics, electrical and magnetic properties of materials.

UNIT-I

Electrostatics: Electric field, Electric field lines, Electric flux, Divergence of electrostatic field, Gauss' Law with applications, Conservative nature of Electrostatic Field, Electrostatic Potential, Potential and Electric Field of a dipole, Force and Torque on a dipole, Laplace's and Poisson equations, Laplace equation in three dimension, The Uniqueness Theorems

UNIT-II

The method of images: Point charge in the presence of grounded conducting sphere, Solution of Laplace equation by separation of variables for Cartesian and spherical coordinates

Dielectric Properties: Dielectric medium, Polarization, Bound charges in a polarized dielectric and their physical interpretation, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric, dielectric constant.

UNIT-III

Magnetism: Lorentz force law, Magnetic forces, Magnetostatics: Biot-Savart's law & its applications (1) straight conductor (2) circular coil (3) solenoid carrying current, Divergence and curl of magnetic field, Ampere's circuital law and it's applications for simple current configurations, Magnetic vector potential.

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UNIT-IV

Magnetic Properties of Matter: Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H, M, Para-, Dia- and Ferromagnetism, B-H curve and hysteresis

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits, Complex Reactance and Impedance, Series & Parallel LCR Circuits.

Reference Books:

- D.J. Griffith, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
- Electricity and Magnetism, Edward M.Purcell, 1986,McGraw-HillEducation..
- Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
- University Physics, Ronald Lane Reese, 2003, ThomsonBrooks/Cole.

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BPP 303 AD: PHYSICS LAB - III

Marks (External) : 70

Credits : 2(60Hrs)

Marks (Internal Assessment) : 30

Time : 3 Hrs

1. Each student should perform at-least eight experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. List of experiments may vary.

List of Experiments:

1. To study the characteristics of a series RC Circuit.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.
4. To determine the value of e/m by Bar magnet
5. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
6. To study the response curve of a parallel LCR circuit and determine its (a) Anti resonant frequency and (b) Quality factor Q.
7. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer
8. Determine a high resistance by leakage method using Ballistic Galvanometer.
9. Determination Wavelength of Ultrasonic Wave.
10. To study the damped oscillations
11. To study Lissajous Figures.

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) A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub

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BPL 406 AD: Physics-IV (Thermal Physics)

Marks (Theory): 70

Marks (Internal Assessment): 30

Credits: 4 (60 lectures)

Time: 3 hrs

Note: Paper setter is to set nine questions in all. Question no. 1 (compulsory based on the entire syllabus) will consist of seven short answer type questions, each of two marks. Rest of Eight questions is to be set uniformly selecting two questions from each Unit. A student is required to attempt five questions in all selecting one from each Unit and a compulsory question 1. The question paper shall contain 20% numerical problems in the relevant papers

Course Objective: The course on thermal physics is framed with the objective that students are able to understand basic concepts of thermos-dynamical systems. Students will be able to understand heart, work, temperature, entropy and the laws of thermodynamics. Behavior of real gases as thermos-dynamical systems has also been included.

UNIT-I

Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, zeroth law and Concept of Temperature, Work and heat, State functions, First law of thermodynamics, Internal energy, Applications of first law, General relation between C_p and C_v, Work done during isothermal and adiabatic processes.

UNIT-II

Second Law of Thermodynamics: Reversible and Irreversible process with examples, Conversion of Work into Heat and Heat into Work, Heat Engines, Carnot's Cycle, Carnot engine &its efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck andClausius Statements and their equivalence, Carnot's Theorem.

UNIT-III

Entropy and Third law of Thermodynamics: Concept of entropy, Clausius theorem, Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy, Third Law of Thermodynamics, Unattainability of absolute zero, T-S Diagrams, Phase Change, Classification of Phase Changes.

UNIT-IV

Thermodynamic Potentials: Extensive and Intensive Thermodynamic Variables; Internal Energy; Definition, importance, properties and applications of Chemical Potential, Enthalpy, Gibbs function and Helmholtz function.

Real gases: Behavior of Real Gases, Deviations from the Ideal Gas Equation. The Virial Equation, Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas, Boyle Temperature, Van-der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves, P-V Diagrams, Joule's Experiment, Free Adiabatic Expansion of a Perfect Gas.

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Reference Books:

1. A Treatise on Heat: Meghnad Saha and B.N. Srivastava, Indian Press
2. Thermal Physics: S. Garg, R. Bansal and Ghosh, Tata McGraw-Hill
3. Concepts in Thermal Physics: S.J. Blundell and K.M. Blundell, Oxford University Press
4. Heat and Thermodynamics: An Intermediate Textbook by M. W. Zemansky and R. Dittman, McGraw-Hill.

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BPP-403 AD: PHYSICS LAB - IV

Marks (External) : 70

Marks (Internal Assessment) : 30

Credits : 2

Time : 3 Hrs

Note:

1. *Each student should perform at-least eight experiments.*
2. *The students are required to calculate the error involved in a particular experiment.*
3. *List of experiments may vary.*

List of Experiments:

1. To determine Mechanical Equivalent of Heat, J. by Callender and Barne's constant flow method.
2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Leeand Charlton's disc method.
5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
7. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.
8. Study of Electrochemical Equivalent of Hydrogen using Voltmeter
9. Study of Newton's Law of cooling.
10. Determination of specific heat of Solids

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, KitabMahal
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.

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BPL 406 AD: Physics-IV (Wave and Optics)

Marks (Theory) : 70
Marks (Internal Assessment) : 30

Credits : 4 (60 lectures)
Time : 3 Hrs

Note: Paper setter is to set nine questions in all. Question no. 1 (compulsory based on the entire syllabus) will consist of seven short answer type questions, each of two marks. Rest of Eight questions is to be set uniformly selecting two questions from each Unit. A student is required to attempt five questions in all selecting one from each Unit and a compulsory question 1. The question paper shall contain 20% numerical problems in the relevant papers.

Course Objective: The course covers basics of several optical phenomena including Geometrical optics specifically present day ray tracing, image evaluation; Wave Optics consisting interference, diffraction and polarization of light. Further, the course provides an insight of practical applications of Lasers and Optical fibers.	Course Outcomes: After completion of this course, students will be able to understand the behavior of wave, geometric optics, interference, diffraction, polarization of light wave and laser.

UNIT- I

Simple Harmonic Oscillations (SHM): Differential equation of SHM and its solution. Simple pendulum and compound pendulum, Superposition of Collinear Harmonic oscillations: Linearity and Superposition Principle, Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats); Superposition of N Collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.

UNIT- II

Interference of light waves: Intensity distribution in Young's experiment, concept of spatial and temporal coherence, coherence time and coherence length. Examples of interference by division of amplitude: interference in thin films and wedges, Newton's rings, Diffraction: Fraunhoffer and Fresnel diffraction- analytical and graphical solutions for diffraction from Single and multiple slits, Resolution of optical systems, Grating and its application

UNIT-III

Polarization: Different states of polarization, double refraction, Huygens' construction for uniaxial crystals, polaroids and their uses. Production and analysis of plane, circularly and elliptically polarized light by retardation plates and rotary polarization and optical activity, Fresnel's explanation of optical activity: Biquartz and half shade polarimeter.

UNIT – IV

Lasers: Basic concept of stimulated emission, amplification and population inversion; Main components of lasers: (i) Active Medium (ii) Pumping (iii) Optical Resonator; Einstein's 'A' and 'B' coefficients and their relationship; Properties of laser beam: Monochromaticity, Directionality, Intensity, Coherence (Spatial & Temporal coherence); Energy levels, Excitation mechanism and Applications of Gas laser (He-Ne) and Solid-state laser (Ruby).

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Reference Books:
1. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.

2. Optics, AjoyGhatak, 2008, Tata McGraw Hill
3. Optics, Hetch,2008, Pearson
4. Fundamentals of Photonics, SPIE, Opens Source

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BPP 403 AD: PHYSICS LAB- IV

Marks (External) : 70

Credits : 2(60Hrs)

Marks (Internal Assessment) : 30

Time : 3 Hrs

1. Each student should perform at-least eight experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. List of experiments may vary.

List of Experiments:

1. To determine the frequency of an electric tuning fork by Melde's experiment.
2. To determine refractive index of the Material of a prism using sodium source.
3. To determine the dispersive power of the material of a prism using mercury source.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
6. To determine wavelength of laser using plane diffraction grating.
7. To determine wavelength of spectral lines of Hg source using plane diffraction grating.
8. To determine dispersive power and resolving power of a plane diffraction grating.
9. To find the polarization angle of laser light using polarizer and analyzer.
10. To verify Malus law of polarization
11. Measurement of focal length of Mirrors and Lenses

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.

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PHYSICS SCHEME & SYLLABUS

Hons. with Research)

For Integrated B.Sc. (Hons)-M.Sc. programme in Chemistry and Mathematics-Additional Subjects

(for 2023 session onwards)

SEMESTER-II

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
BPP 201 AD	Practical-II	Physics Lab-II	2	4	70	30	100

SEMESTER-III

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
BPL 306 AD	Theory-III	Physics-III (Basics of Electromagnetism)	4	4	70	30	100
BPP 303 AD	Practical-III	Physics Lab-III	2	4	70	30	100

SEMESTER-IV

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
BPL 406 AD	Theory-IV	Physics-IV (Wave and Optics)	4	4	70	30	100
BPP 403 AD	Practical-IV	Physics Lab-IV	2	4	70	30	100

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BPP 201 AD: PHYSICS LAB - II

Marks (External) : 70   Credits : 2

Marks (Internal Assessment) : 30   Time : 3 Hrs

Note:

1. *Each student should perform at-least eight experiments.*
2. *The students are required to calculate the error involved in a particular experiment.*
3. *List of experiments may vary.*

List of Experiments:

1. To determine Mechanical Equivalent of Heat,J. by Callender and Barne's constant flow method.

2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.

3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.

4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Leeand Charlton's disc method.

5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).

6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.

7. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.

8. Study of Electrochemical Equivalent of Hydrogen using Voltmeter

9. Study of Newton's Law of cooling.

10. Determination of specific heat of Solids

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, KitabMahal
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.

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BPL 306 AD: PHYSICS-III (Basics of Electromagnetism)

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Credits :4 (60 lectures)

Time : 3 Hrs

Note: Paper setter is to set nine questions in all. Question no. 1 (compulsory based on the entire syllabus) will consist of seven short answer type questions, each of two marks. Rest of Eight questions is to be set uniformly selecting two questions from each Unit. A student is required to attempt five questions in all selecting one from each Unit and a compulsory question 1. The question paper shall contain 20% numerical problems in the relevant papers.

Course Objective: The course on Electricity and Magnetism deals with Coulomb's law, Electric field, potential formulation of electrostatic, Capacitors, Magnetism and magnetic materials along with the applications of these concepts	Course Outcome: The student will be able to understand Gauss-divergence theorem, Stokes theorem in dielectrics, electrical and magnetic properties of materials.

UNIT-I

Electrostatics: Electric field, Electric field lines, Electric flux, Divergence of electrostatic field, Gauss' Law with applications, Conservative nature of Electrostatic Field, Electrostatic Potential, Potential and Electric Field of a dipole, Force and Torque on a dipole, Laplace's and Poisson equations, Laplace equation in three dimension, The Uniqueness Theorems

UNIT-II

The method of images: Point charge in the presence of grounded conducting sphere, Solution of Laplace equation by separation of variables for Cartesian and spherical coordinates

Dielectric Properties: Dielectric medium, Polarization, Bound charges in a polarized dielectric and their physical interpretation, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric, dielectric constant.

UNIT-III

Magnetism: Lorentz force law, Magnetic forces, Magnetostatics: Biot-Savart's law & its applications (1) straight conductor (2) circular coil (3) solenoid carrying current, Divergence and curl of magnetic field, Ampere's circuital law and it's applications for simple current configurations, Magnetic vector potential.

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UNIT-IV

Magnetic Properties of Matter: Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H, M, Para-, Dia- and Ferromagnetism, B-H curve and hysteresis

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits, Complex Reactance and Impedance, Series & Parallel LCR Circuits.

Reference Books:

- D.J. Griffith, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
- Electricity and Magnetism, Edward M.Purcell, 1986,McGraw-HillEducation..
- Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
- University Physics, Ronald Lane Reese, 2003, ThomsonBrooks/Cole.

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BPP 303 AD: PHYSICS LAB - III

Marks (External) : 70   Credits : 2(60Hrs)

Marks (Internal Assessment) : 30   Time : 3 Hrs

4. Each student should perform at-least eight experiments.
5. The students are required to calculate the error involved in a particular experiment.
6. List of experiments may vary.

List of Experiments:

1. To study the characteristics of a series RC Circuit.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.
4. To determine the value of e/m by Bar magnet
5. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
6. To study the response curve of a parallel LCR circuit and determine its (a) Anti resonant frequency and (b) Quality factor Q.
7. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer
8. Determine a high resistance by leakage method using Ballistic Galvanometer.
9. Determination Wavelength of Ultrasonic Wave.
10. To study the damped oscillations
11. To study Lissajous Figures.

Reference Books

4) Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
5) A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
6) A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub

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BPL 406 AD: Physics-IV (Wave and Optics)

Marks (Theory) : 70   Credits : 4 (60 lectures)
Marks (Internal Assessment): 30   Time: 3 Hrs

Note: Paper setter is to set nine questions in all. Question no. 1 (compulsory based on the entire syllabus) will consist of seven short answer type questions, each of two marks. Rest of Eight questions is to be set uniformly selecting two questions from each Unit. A student is required to attempt five questions in all selecting one from each Unit and a compulsory question 1. The question paper shall contain 20% numerical problems in the relevant papers.

Course Objective: The course covers basics of several optical phenomena including Geometrical optics specifically present-day ray tracing, image evaluation; Wave and Optics consisting interference, diffraction, and polarization of light. Further, the course provides an insight of practical applications of Lasers and Optical fibers.	Course Outcomes: After completion of this course, students will be able to understand the behavior of wave, geometric optics, interference, diffraction, polarization of light wave and laser.

UNIT- I

Simple Harmonic Oscillations (SHM): Differential equation of SHM and its solution. Simple pendulum and compound pendulum, Superposition of Collinear Harmonic oscillations: Linearity and Superposition Principle, Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats); Superposition of N Collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.

UNIT- II

Interference of light waves: Intensity distribution in Young's experiment, concept of spatial and temporal coherence, coherence time and coherence length. Examples of interference by division of amplitude: interference in thin films and wedges, Newton's rings, Diffraction: Fraunhoffer and Fresnel diffraction- analytical and graphical solutions for diffraction from Single and multiple slits, Resolution of optical systems, Grating and its application

UNIT-III

Polarization: Different states of polarization, double refraction, Huygens' construction for uniaxial crystals, polaroids and their uses. Production and analysis of plane, circularly and elliptically polarized light by retardation plates and rotary polarization and optical activity, Fresnel's explanation of optical activity: Biquartz and half shade polarimeter.

UNIT – IV

Lasers: Basic concept of stimulated emission, amplification and population inversion; Main components of lasers: (i) Active Medium (ii) Pumping (iii) Optical Resonator; Einstein's 'A' and 'B' coefficients and their relationship; Properties of laser beam: Monochromaticity, Directionality, Intensity, Coherence (Spatial & Temporal coherence); Energy levels, Excitation mechanism and Applications of Gas laser (He-Ne) and Solid state laser (Ruby).

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Reference Books:

5. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.

6. Optics, AjoyGhatak, 2008, Tata McGraw Hill

7. Optics, Hetch,2008, Pearson

8. Fundamentals of Photonics, SPIE, Opens Source

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BPP 403 AD: PHYSICS LAB- IV

Marks (External) : 70

Credits : 2(60Hrs)

Marks (Internal Assessment) : 30

Time : 3 Hrs

4. Each student should perform at-least eight experiments.
5. The students are required to calculate the error involved in a particular experiment.
6. List of experiments may vary.

List of Experiments:

1. To determine the frequency of an electric tuning fork by Melde's experiment.
2. To determine refractive index of the Material of a prism using sodium source.
3. To determine the dispersive power of the material of a prism using mercury source.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
6. To determine wavelength of laser using plane diffraction grating.
7. To determine wavelength of spectral lines of Hg source using plane diffraction grating.
8. To determine dispersive power and resolving power of a plane diffraction grating.
9. To find the polarization angle of laser light using polarizer and analyzer.
10. To verify Malus law of polarization
11. Measurement of focal length of Mirrors and Lenses

Reference Books

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

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