

RASHTRASANT TUKADOJI MAHARAJ
NAGPUR UNIVERSITY



FOUR YEAR UNDERGRADUATE
PROGRAMME
B. Sc. Physics (Honours/Research)

(Courses effective from Academic Year 2024-25)

SYLLABUS

Semester-III & IV

B. Sc. Semester-III			
Discipline Specific Core Course (DSC-5)-PHYSICS - Paper-5 (BPH3T05)			
(Solid State Physics)			
DSC-5 THEORY	Hours: 2+2=04 Hours /Week	Marks: 80+20=100	Credit: 2+1=03
Unit-I			
Crystal structure	Introduction, Amorphous and Crystalline materials, lattices and basis, fundamental translation vector, Unit cell, Bravais lattices, Cubic crystal structures: SC, BCC and FCC unit cells, Crystal planes and Miller indices, Inter-planer distances, Bragg's law, Crystal structures- NaCl, diamond, CsCl, ZnS		7 Hrs
Unit-II			
Crystal Bindings	Classification of Crystals based on Bonding - Ionic, Covalent, Metallic, van der Waals (Molecular) and Hydrogen bonded. Crystals of inert gases, Attractive interaction (van der Waals London) & Repulsive interaction, Equilibrium lattice constant, Cohesive energy and Compressibility & Bulk modulus, Ionic crystals, Cohesive energy, Madelung energy and evaluation of Madelung constant.		7 Hrs
Unit III			
Free electron and Band theory of solids	Drude Lorentz model, Mean free path, Electrical and thermal conductivity, Wiedemann Franz law (Derivation), Density of states, Fermi energy, Fermi temperature. Bloch theorem (statement only), Kroning Penny model, Concept of hole, Hall effect, Energy bands in solid, distinction between metal, semiconductor and insulator		8 Hrs
Unit IV			
Magnetic and Superconducting materials	Origin of magnetism, Types of magnetic materials, Langevin's theory of diamagnetism, Langevin's theory of paramagnetism, Ferromagnetism, Domain theory, Curie temperature, Hysteresis and energy loss, Antiferromagnetism, Neel temperature, Ferrimagnetism, Soft and Hard magnetic materials, ferrites. Type-I and Type-II superconductors, Critical current, Meissner effect, Josephson effect & types, Applications of superconductivity		8 Hrs

Reference Books:

1. Solid state physics, by- S. O. Pillai
2. Solid state physics, by- A. J. Dekker
3. Solid State Physics, by- R. K. Puri, and V. K. Babbar
4. Solid State Physics, by- P. K. Palanisamy
5. Solid State Physics, by- M. A. Wahab
6. Crystallography Applied to Solid State Physics A. R. Verma, O. N. Srivastava; Publisher, New Age International, 1991
7. Solid State Physics, by- Gupta Kumar Pragati Publications
8. Modern Physics, by- R. Mugadeshm

9. Modern Physics, by- J. B. Rajam, S Chand
10. Modern Engineering Physics by- S. L. Gupta and Sanjeev Gupta
11. Solid State Physics, by H.C. Gupta, Vikas Publishing House Pvt Limited, 2001
12. Materials Science and Engineering, V. Raghavan, Prentice Hall of India Private Limited, New Delhi (2004).
13. Introduction to Solid State Physics, Kittel, Willey Eastern Ltd (2003).
14. Solid State Physics, Rita John ,1st edition, Tata McGraw Hill publishers (2014).
15. Solid State Physics, R L Singhal, Kedarnath Ram Nath& Co., Meerut (2003).

List of Experiments:

1. Goniometric study of crystal faces using models.
2. To construct SC, BCC, FCC and to find packing fraction, coordination number.
3. To study the miller indices of the crystal planes in the unit cell of crystalline materials.
4. To determine lattice parameter 'a' of a unit cell of a cubic crystal using X-ray diffraction film.
5. To determine Hall coefficient and mobility of charge carriers in a semiconductor.
6. To determine the energy gap of a semiconductor using four probe method.
7. To determine energy gap of a semiconductor using PN junction diode in reverse bias mode.
8. Thermal conductivity of a metal rod using Forbes method.
9. To determine the permittivity of free space.
10. Thermal conductivity of a bad conductor by Lee's disc method.
11. To determine magnetic susceptibility of paramagnetic solution (FeCl_3) by Quincke's method.
12. Study of hysteresis curve of a transformer core and determine the losses in a transformer.
13. Determination of dielectric constant of a solid.
14. Identification of unknown element from a line emission spectra.

Course outcomes

After this course the students will be able to

Sr. No.	Course outcome
1.	Classify materials as amorphous or crystalline and explain crystal structures.
2.	Calculate unit cell properties like atomic packing fraction and density
3.	Apply Bragg's Law to determine crystal structures and use Miller indices
4.	Differentiate between polar and non-polar dielectrics and analyse polarization.
5.	Explain the Clausius-Mossotti equation and calculate dielectric constants.
6.	Understand and Analyse magnetic properties
7.	Discuss superconductivity concepts like critical temperature and the Meissner effect.
8.	Use the Drude-Lorentz model to calculate electrical and thermal conductivity.
9.	Understand band theory to classify metals, semiconductors, and insulators.
10.	Explain the Hall effect and analyse Fermi energy in relation to material properties.

B. Sc. Semester-III			
Discipline Specific Core Course (DSC-6)-PHYSICS - Paper-6 (BPH3T06)			
(Optics)			
DSC-6 THEORY	Hours: 2+2=04 /Week	Hours	Marks: 80+20=100
			Credit: 2+1=03
Unit-I			
Geometrical optics	Elementary geometrical optics in the paraxial approximation. Refractive index; reflection and refraction at a plane boundary from Huygens' principle and Fermat's principle; Snell's Law; total internal reflection. Image formation by reflection at a spherical boundary; Real and virtual images. Magnification. Image formation by refraction at a spherical boundary and by converging and diverging thin lenses. Derivation of the expression for the focal length of a thin lens.		7 Hrs
Unit-II			
Interference	Interference in equal thickness thin film, Phase change on reflection, refraction and transmitted system. Newton's ring and its application to determine the wavelength and refractive index, Michelson Interferometer and its application to wavelength determination and wavelength difference, Fabry- Parrot Interferometer and its application.		7 Hrs
Unit III			
Diffraction	Fresnel's diffraction- Half period zones, Zone plates, Diffraction due to straight edge and due to narrow slit. Fraunhofer diffraction- Fraunhofer diffraction at a single slit, Plane diffraction grating, Resolving power of grating, Rayleigh's criterion for resolution.		8 Hrs
Unit IV			
Polarization	Brewster's law, Polarization by scattering (concept only), Uniaxial and biaxial crystal, ordinary and extraordinary rays, Nicol prism, its application as an analyser and polarizer, phase retardation plate (Half and Quarter wave), Double prism.		8 Hrs

Reference books -

1. Physics for Degree students for B. Sc. Second year, by- C. L. Arora, Dr. P. S. Hemne.
2. Optics and Spectroscopy, by- R. Murugesan, Kiruthign Sivaprakash.
3. Optics, by- Brijlal and Subramayam, S Chand Publication
4. Optics, by- Ajay Ghatak, McGraw Hill Education India
5. A textbook of optics, by- Dr. Subrahmanyam, Brijlal and M. N. Avadhanulu.
6. Optics, by- J. K. Sharma, K. K. Sarkar.
7. Fundamentals of optics, by- Jenkins and white.
8. Optics, by- D. P. Khandelwal.
9. Electromagnetic field and waves, by- Paul Lorrain and Dale R. Corson.
10. Foundation of Electromagnetic theory, by- John R. Retitz, Fredrick, J. Milford.
11. Introduction to Modern Optics, Grant R. Fowles, Dover

12. Lasers, Anthony E. Siegman Photonics, Saleh Teich
13. Optics, Eugene Hecht, 2019, Pearson
14. Principles of Optics, B.K. Mathur, 1995, Gopal Printing.
15. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, S. Chand Publication

List of Experiments:

1. To produce interference pattern using Lloyd's mirror and to determine the wavelength of sodium light.
2. To determine the focal length of a short focus convex lens by using an auxiliary lens.
3. To determine the refractive index of a material of prism by spectrometer.
4. To determine the dispersive power of a prism.
5. Study of polarization of light by reflection (Brewster's law).
6. To find R.I. of glass by using Brewster's law.
7. To determine the resolving power of a grating.
8. To study diffraction at straight edge and to determine the wavelength of monochromatic light.
9. To determine the resolving power of a telescope.
10. Study of wavelength of Monochromatic source (Sodium) light using plane diffraction grating.
11. To determine the wavelength of prominent lines of mercury by plane transmission grating.
12. To determine wavelength of sodium light using Fresnel Biprism.
13. To determine wavelength of sodium light using Newton's Rings
14. To determine the Resolving Power of a Prism.

COURSE OUTCOMES

After this course the students will be able to

Sr. No.	Course outcome
1.	Describe fundamental principles of geometric optics, including Snell's Law and total internal reflection.
2.	Explain image formation by spherical boundaries and thin lenses.
3.	Derive focal length equations for thin lenses using paraxial approximations.
4.	Analyse interference patterns in thin films for wavelength and refractive index measurements.
5.	Utilize interferometers to determine wavelength differences with precision.
6.	Explore diffraction phenomena, including Fresnel and Fraunhofer diffraction, and their impact on optical resolution.
7.	Apply polarization principles such as Brewster's law and Nicol prism.
8.	Discuss the principles of lasers, focusing on population inversion and coherence.
9.	Identify various laser types (e.g., Ruby, He-Ne, semiconductor) and their applications.
10.	Examine coherence in laser systems and its practical applications in optics.

B. Sc. Semester-III
Minor-1 PHYSICS (BPH1T01)
(Measurements, Mechanics, and Properties of Matter)

DSC-1 THEORY	Hours: 2+2=04 Hours /Week	Marks: 80+20=100	Credit: 2+1=03
Unit-I			
Measurements	Definition of Physics; levels and need of measurement; CGS and SI units, fundamental and derived physical quantities, and their units. Length, mass, and time measurements. Definition of Seven Fundamental Units and their applications in industries and society. Least count, accuracy, and precision of measuring instruments (Viz. Meter scale, Vernier Callipers, Screw Gauge, Travelling microscope, spectrometer, voltmeter, ammeter, etc.). Errors in measurement, Significant figure. Dimensions of Physical quantities, dimensional analysis, and its applications.		7.5 Hrs
Unit-II			
Newtonian Mechanics	Force and Inertia, Newton's First Law of motion; Momentum, Newton's Second Law of motion; Impulse; Newton's Third Law of motion. Law of conservation of linear momentum and its applications, Collisions. Static and Kinetic friction, laws of friction, rolling friction. Dynamics of uniform circular motion: Centripetal and centrifugal forces and their applications		7.5 Hrs
Unit III			
Motion	Frame of reference, motion in a straight line: position-time graph, speed, and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion. Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion.		7.5 Hrs
Unit IV			
Properties of Matter	Elastic behaviour, Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, modulus of rigidity. Pressure due to a fluid column; Pascal's law and its applications. Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, application of surface tension – drops, bubbles, and capillary rise.		7.5 Hrs

Reference Books:

1. Mechanics: D.S. Mathur, S. Chand, and Company.
2. The Physics of Sound Third Edition Richard E. Berg, David, David G. Stork, Pearson Publication, 2012.
3. Introduction to Classical Mechanics, 2nd ed. - Atam P. Arya by Prentice Hall Publishing
4. Continuum Mechanics and Elements of Elasticity Structural Mechanics - Victor E. Saouma.
5. Feynman Lectures on Physics (Volumes 1,2,3)- Feynman, Leighton and Sands.
6. Theory of elasticity, McGraw-Hill Education (India) Private Limited, 2010
7. Handbook of Measurement Error Models, Edited By Grace Y. Yi, Aurore Delaigle, Paul Gustafson, 2021, published by Chapman & Hall

List of Experiments:

1. Torsional Oscillations: To determine modulus of rigidity η of a material of wire by torsional pendulum
2. Torsional Oscillations: To determine modulus of rigidity η of a material of wire by Maxwell's needle
3. Spectrometer: To find least count of a spectrometer.
4. Spectrometer: To determine angle of prism.
5. To determine 'Y' (Young's Modulus) of a wire material by method of vibrations- Flat spiral Spring
6. To find the Young's Modulus of a material by method of bending of beam
7. To determine Coefficient of Viscosity (η) of a given liquid by Poiseuille's Method
8. Determination of Surface Tension of mercury / Angle of contact of liquids
9. To determine equivalent focal length of a lens system by magnification method.
10. Spectrometer: To determine refractive index μ of the material of prism
11. To determine the moment of inertia of a fly-wheel.
12. To find the surface tension by capillary rise method
13. To determine the surface tension of a liquid by Jaeger's method.

Course outcomes

After this course the students will be able to

Sr. No.	Course outcome
11.	Develop interest in measurement with conceptual knowledge of physics.
12.	Develop practical skills in accurate measurements with minimal errors.
13.	Understand and practice these skills while performing physics practical.
14.	Understand the use of apparatus and their use without fear.
15.	Correlate their physics theory concepts with practical outcomes.
16.	Understand the concepts of errors and their estimation.

B. Sc. Semester-III Minor-2 PHYSICS (BPH1T02) (Kinetic theory of gases and Thermodynamics)			
DSC-2 THEORY	Hours: 2+2=04 /Week	Hours	Marks: 80+20=100
Credit: 2+1=03			
Unit-I			
Kinetic Theory of Gases	Assumptions of kinetic theory of gases, Molecular collision, Mean free path and collision cross section, Expression for mean free path (Clausius Expression) Degrees of freedom, Law of equipartition of energy, Derivation of Maxwell's law of distribution of velocities and its experimental verification. Momentum and viscosity of gas, Transport of energy and thermal conductivity, Transport of mass and diffusion, their relationship,		7.5 Hrs
Unit-II			
Real Gases and Thermodynamics	Van der wall's real gas, Equation of state, Critical constants, Van der wall's constants, Critical coefficient, limitations. Thermodynamic variables, Thermal equilibrium and temperature, Zeroth law of thermodynamics, Thermodynamic processes (isothermal, adiabatic, isochoric, isobaric), Indicator diagram, Work done during isothermal and adiabatic processes, Specific heats at constant pressure and volume, First law of thermodynamics,		7.5 Hrs
Unit III			
Heat Engine and Entropy	Thermodynamic processes (Reversible and Irreversible), Heat engine, Carnot's ideal heat engine, Carnot's cycle and it's efficiency, Second law of thermodynamics, Carnot's theorem. Concept of entropy, Change in entropy in reversible cycle, Principle of increase of entropy of the universe in reversible and irreversible process. Second law of thermodynamics in terms of entropy, Thermodynamic scales of temperature, Absolute zero on thermodynamic scale, Third law of thermodynamics, T-S diagram.		7.5 Hrs
Unit IV			
Maxwell's Relations	Maxwell's thermodynamic relations [$\delta(T, S)/\delta(x, y) = \delta(P, V)/\delta(x, y)$] and it's applications, Clausius-Clapeyron latent heat equation, Joule-Thomson effect, Porous plug experiment, Joule-Thomson coefficient. Inversion temperature, Boyls law.		7.5 Hrs

Reference books -

1. Heat, Thermodynamics and Statistical Physics, by- Singhal, Agrawal.
2. Heat and Thermodynamics, by- Brijlal, Subramanyam.
3. A Text Book of Heat, by- J. B. Rajam.
4. Heat, thermodynamics and statistical physics, by- Brijlal, Subramayam and Hemne.
5. Heat and thermodynamics, by- C. L. Arora.
6. Principles of Thermodynamics by Jean-Philippe Ansermet, Sylvain D. Brechet, Cambridge University Press; 1st edition (2019)
7. Introduction to Electrodynamics by David J. Griffiths (Author)Cambridge University Press; 4th edition (2017)

List of Experiments:

1. To determine the pressure coefficient of air by constant volume air thermometer.
2. To verify the Stefan's law of radiation by using an incandescent lamp.
3. Thermal conductivity of a metal rod using Forbes method.
4. Thermal conductivity of a bad conductor by Lee's disc method.
5. To determine the critical temperature and critical pressure of a gas.
6. To determine the coefficient of thermal conductivity of glass in the form of a tube.
7. To determine specific heat of a given liquid by method of cooling.
8. Mechanical equivalent of heat by Calendar- Barne's constant flow method.
9. To determine the mechanical equivalent of heat (J) with the help of Joule's calorimeter.
10. To determine temperature coefficient of resistance of platinum using platinum resistance thermometer
11. Study of heating efficiency of electrical kettle with varying voltages.
12. To determine the ratio of specific heats of a gas (γ) by Clement and Desormes method.
13. To study the Boyle's law and to verify it experimentally.
14. To study Charle's law and to verify it experimentally.
15. To verify the Stefan's law of radiation by using an incandescent lamp.

COURSE OUTCOMES

After this course the students will be able to

Sr. No.	Course outcome
11.	Understand the assumptions of kinetic theory of gases, ideal and real gases.
12.	Understand the nature of calorimetry by specific heat of solids and gases.
13.	Analyses different transport phenomena in gases
14.	Describe basic concepts of Thermodynamics.
15.	Analyses the laws of thermodynamics in different cases and entropy.
16.	Restate definition of system, surrounding, closed and open system, extensive and intensive variables and properties.
17.	Design various types of basic heat engines.
18.	Apply Maxwells thermodynamic relations.
19.	Understanding the low temperature physics

Semester-III Generic Elective / Open Elective Course (GE/OE-5) (BGO3T05) (Digital Systems)			
GE/OE-5 THEORY	Hours: 04 Hours /Week	Marks: 80 + 20 = 100	Credit: 02
Unit-I			
Number Systems	Number Systems: Introduction, Digital Vs Analog systems, Binary, Octal, Decimal, and Hexadecimal number systems. Conversion between different number systems. Binary Arithmetic: Addition, subtraction, and multiplication in binary. Digital Codes: Binary Coded Decimal (BCD), Gray code, and ASCII.		7 Hrs
Unit-II			
Boolean Algebra and Logic Gates	Basic theorems and properties. Simplification of Boolean expressions. Logic Gates: Introduction to basic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR Basic Logic Gate ICs with Pin Configurations Truth tables and symbolic representation, Logic families: Characteristics of logic families. TTL, CMOS, and ECL families.		8 Hrs
Unit III			
Combinational Logic Circuits	Combinational Logic Circuits: Introduction to Combinational Circuits: Concept of combinational logic. Half-Adder and Full-Adder. Half-Subtractor and Full-Subtractor. Multiplexers, Demultiplexers, Encoders, and Decoders. Sequential Circuits: Difference between combinational and sequential circuits. Introduction to flip-flops		8 Hrs
Unit IV			
Digital Devices	Computer Organization: Input/Output Devices. Data storage, Primary and Secondary Memory (idea of RAM and ROM). EPROM, Computer memory. Memory organization & addressing, LI-FI, Wi-Fi, Blue Tooth, CPU processor, USB, CD and DVD, flash memory, SSD		7 Hrs

Reference Books:

1. Digital Principles and Applications" by Malvino and Leach
2. Digital Logic and Computer Design" by M. Morris Mano
3. Digital Electronics: Principles, Devices and Applications" by Anil K. Maini
4. Digital Design: With an Introduction to Verilog HDL" by V. K. Srivastava and G. D. Gaiha
5. Digital Circuits and Design by S. Salivahanan and S. Arivazhagan
6. Fundamentals of Digital Circuits by A. Anand Kumar

7. Digital Logic Design" by John F. Wakerly
8. Digital Systems: Principles and Applications" by Ronald J. Tocci, Neal S. Widmer, and Gregory L. Moss
9. Modern Digital Electronics" by R.P. Jain
10. Digital Fundamentals" by Thomas L. Floyd
11. Logic and Computer Design Fundamentals" by M. Morris Mano and Charles R. Kime
12. Digital Logic and Microprocessor Design with VHDL" by Enoch O. Hwang
13. Principles of Electronics by V K Mehta & Rohit Mehta
14. Basic Electronics (Solid State) In Multicolor Ed. by B L Theraja
15. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
16. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill. 4. Digital Electronics G K Kharate ,2010, Oxford University Press
17. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning
18. Logic circuit design, Shimon P. Vingron, 2012, Springer.
19. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
20. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill
21. Microprocessor Architecture Programming & applications with 8085, 2002, R.S. Goankar, Prentice Hall.

Course outcomes

After the completion of this course students will be able to

Sr. No.	Course Outcome
1	Differentiate between analog and digital systems and understand the significance of digital systems in modern technology.
2	Perform binary arithmetic operations and convert between different number systems.
3	Apply Boolean algebra and logic gates to simplify and design basic digital circuits.
4	Design and analyse simple combinational and sequential circuits, including adders, subtractors, multiplexers, flip-flops, and counters.

B. Sc. Semester-III Vocational Skill Course (VSC - 5) - PHYSICS Course Code (BVS3P05) (Regulated Power Supply)			
VSC-5 Practical	04 Hours /Week	Marks: 100	Credit: 02
Topic	Name of Experiments (Any 10 to be performed)		
<i>Transformer Identification and Testing</i>	1. Understand different types of transformers and test primary and secondary windings. To measure primary and secondary voltages, check winding continuity, and identify polarity.		
<i>Half-Wave Rectifier Construction</i>	2. Construct a half-wave rectifier and observe its output waveform. Assemble the circuit using a single diode, measure output DC voltage, and analyse ripple content.		
<i>Full-Wave Rectifier Construction</i>	3. Construct a full-wave rectifier and examine its performance. Assemble the circuit using two diodes, measure the output, and observe waveform characteristics.		
<i>Bridge Rectifier Circuit</i>	4. Build a bridge rectifier circuit and compare it with previous rectifier types. Use four diodes to form a bridge rectifier, measure output voltage, and compare ripple voltage with half and full-wave rectifiers.		
<i>Capacitor Filter Design</i>	5. Analyse the impact of capacitors as filters in rectifier circuits. Add capacitor filters to the rectifier circuits, measure the output voltage, and observe the reduction in ripple.		
<i>LC Filter Design and Testing</i>	6. Understand the function of LC filters in smoothing rectified output. Construct an LC filter circuit, connect it to the rectifier output, and measure the DC voltage and ripple factor.		
<i>Voltage Regulation with Zener Diode</i>	7. Construct voltage regulator using Zener diode. Measure the output voltage under different loads, and analyse voltage stability.		
<i>Using LM7805 for Fixed Voltage Regulation</i>	8. Implement a regulated power supply with LM7805 for a fixed 5V output. Construct the LM7805 to the rectified and filtered power supply, measure output stability, and observe thermal effects.		
<i>Adjustable Voltage Regulation using LM317</i>	9. Design an adjustable voltage regulator using an LM317 IC. Vary resistor values to change the output voltage, measure results, and document the voltage range achieved.		
<i>Heat Sink Testing and Analysis</i>	10. Evaluate the effects of heat sinks on voltage regulators. Attach heat sinks to voltage regulator ICs, monitor temperature changes, and measure voltage stability under load.		
<i>Short-Circuit and Overload Protection in Power Supplies</i>	11. Implement short-circuit protection using fuses and thermistors. Test circuit behaviour under short-circuit conditions, analyse protection effectiveness, and measure recovery time.		
<i>Ripple Measurement and Minimization Techniques</i>	12. Measure and minimize ripple voltage in regulated power supplies. Use different capacitor values and types, measure ripple with an oscilloscope, and analyse improvements.		
<i>Load Regulation and Line Regulation Testing</i>	13. Test the power supply for load and line regulation characteristics. Measure output voltage changes under varying loads and input voltage conditions and calculate regulation percentage.		
<i>Power Supply Design Project</i>	14. Design and build a regulated power supply circuit with specified output voltage and current. Submission of project report.		

References:

1. Power Supply Cookbook by Marty Brown
2. Designing Control Loops for Linear and Switching Power Supplies: A Tutorial Guide" by Christophe Basso
3. Basic Electronics by B.L. Theraja and A.K. Theraja
4. Electronic Devices and Circuits" by S. Salivahanan, N. Suresh Kumar, and A. Vallavaraj
5. Power Electronics: Devices, Circuits, and Applications" by V. Subrahmanyam
6. Switching Power Supply Design" by Abraham I. Pressman, Keith Billings, and Taylor Morey
7. Linear and Switching Voltage Regulator Fundamentals by Texas Instruments
8. Power Electronics: Converters, Applications, and Design by Ned Mohan, Tore M. Undeland, and William P. Robbins
9. Practical Electronics for Inventors by Paul Scherz and Simon Monk
10. The Art of Electronics by Paul Horowitz and Winfield Hill
11. DC Power Supplies: Power Management and Surge Protection for Power Electronic Circuits by Joseph Weiss
12. Power Electronics by P.S. Bimbhra
13. Principles of Power Electronics by M.D. Singh and K.B. Khanchandani

Course outcomes

After the completion of this course students will be able to

Sr. No.	Course Outcome
1	Understand the working principles of different types of power supplies and the significance of regulated power supplies in electronic circuits.
2	Demonstrate the ability to construct and test rectifier circuits, including half-wave, full-wave, and bridge rectifiers, and evaluate their performance.
3	Analyse and implement various filtering techniques to reduce ripple in rectified DC output, including capacitor and LC filters
4	Design and construct voltage regulator circuits using Zener diodes, fixed voltage regulators (e.g., LM7805), and adjustable regulators (e.g., LM317).
5	Identify and implement short-circuit and overload protection mechanisms in power supplies to ensure safe and reliable operation.
6	Troubleshoot common faults in regulated power supply circuits, including rectifier failure, excessive ripple, and thermal issues.
7	Design a complete regulated power supply system based on specified voltage and current requirements,

B. Sc. Semester-IV			
Discipline Specific Core Course (DSC-7)-PHYSICS - Paper-7 (BPH4T07)			
(Lasers and Optical Fibres)			
DSC - 7 THEORY	Hours: 2+2=04 Hours /Week	Marks: 80+20 = 100	Credit: 2+1=03
Unit-I			
LASER and MASER	Introduction to LASER, Properties of LASER, Spatial and temporal coherence, purity of spectral line, Interaction of Radiation with Matter, , Einstein's co-efficient (derivation), Induced absorption, Spontaneous and stimulated emission, Population inversion, Active material, Optical pumping, Resonant cavity, Three level and four level laser system. MASERS,		8 Hrs
Unit-II			
Laser Types and Applications	Construction and working of Ruby Laser, Gas laser (He-Ne Laser), Semiconductor Laser, Idea of Tuneable Lasers. General Applications of Lasers in industry: Laser Printer, Bar Code reader, Optical reading and writing on CD and DVD, Laser Machining, drilling and cutting, defence, medicine-surgery, space, entertainment, Laser communications, Holography		7 Hrs
Unit III			
Basic Principles of Fiber Optic	Basic structure, Total Internal reflection, Propagation of light in optical fiber, Acceptance angle and acceptance cone, Numerical aperture, Normalized frequency (V-number), Classification of Optical Fibers: Single mode and multimode fibers, Step indexed and Graded index fibers. Optical fiber losses (attenuation, absorption, scattering, bending, etc.), Dispersion in optical fiber, Pulse broadening.		8 Hrs
Unit IV			
Applications of Optical Fibers	Fiber Optics Communication- Need of fiber optic communication, Optical fiber Communication System, Optical Sources, Optical Detectors Optical transmitters and receiver, Optical filters and Couplers, Optical amplifiers, Fiber optic sensors Medical Applications of optical Fibers: Medical Endoscopy, Military applications,		7 Hrs

Reference Books:

1. William T Silfvast, "Laser Fundamentals", Cambridge University Press, UK (2003).
2. B. B. Laud,, "Lasers and Non-linear Optics", New Age International (P) Ltd., New Delhi.
3. Andrews, "An Introduction to Laser Spectroscopy (2e)", Ane Books India (Distributors).
4. K. R. Nambiar, "Lasers: Principle, Types and Applications", New Age International (P) Ltd., New Delhi.
5. T. Suhara, "Semiconductor Lasers Fundamentals", Marcel Dekkar (2004).
6. A. K. Ghatak and K. Thyagarajan, "Laser: Theory and Applications", McMillan (2003).
7. Optical Fiber Communications – Gerd Keiser, Tata Mc Graw-Hill International edition, 4th Edition, 2008.
8. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

9. R. Allen Shotwell, "An introduction to fiber optics".
10. Ghatak A K and Thyagarajan, "Introduction to Fiber Optics", K Cambridge University Press.
11. John M. Senior, "Optical fiber communication".
12. Joseph C Palais, "Fiber optic communication", 4th Edition, Pearson Education.
13. Govind P. Agrawal, "Fiber-Optic Communication Systems", John Wiley & Sons, Third edition (2002)
14. Senior J.M, —Optical Fibre Communication - Principles and Practice, Prentice Hall of India, 1985.
15. Wilson J and Hawkes J.F.B, —Introduction to Opto Electronics, Prentice Hall of India, 2001.
16. Keiser G, —Optical Fibre Communication, McGraw Hill, 1995.
17. Arumugam M, —Optical Fibre Communication and Sensors, Anuradha Agencies, 2002.
18. John F. Read, —Industrial Applications of Lasers, Academic Press, 1978.
19. Monte Ross, —Laser Applications, McGraw Hill, 1968.
20. Fiber Optic Communications – D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
21. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
22. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.

Physics Practical /Laboratory

List of the experiments-

1. To study the Snell's laws of reflection at optical boundaries by LASER
2. To study the laws of refraction at optical boundaries by LASER.
3. To find the wavelength of LASER light by plane diffraction grating
4. To study the diffraction of LASER light by a thin straight wire.
5. To study the LASER beam divergence
6. To study the attenuation of intensity of LASER light
7. To find the numerical aperture of optical Fiber
8. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
9. To study the Characteristics of LED.
10. To study the Characteristics of Photo Diode
11. Measurement of Losses in Optical Fibers
12. Determination of particle size using LASER source
13. To set-up and study communication system using optical fibre.
14. To determine the focal length of convex lens using LASER
15. Determining Wavelength of Laser Using a Ruler.

COURSE OUTCOMES

After completing this course students will be able to

Sr. No.	Course outcome
1.	Understand LASER and MASER Fundamentals: Describe the basic principles and properties of LASER and MASER technologies.
2.	Explain Coherence and Spectral Purity: Discuss spatial and temporal coherence and its importance in laser technology.
3.	Differentiate Laser Types: Identify and compare different types of lasers, including solid-state, gas, and semiconductor lasers.
4.	Evaluate Laser Applications: Discuss various applications of lasers in industries such as medicine, defence, and communications.
5.	Comprehend Fiber Optics Principles: Explain the fundamental principles of fibre optics, including total internal reflection and numerical aperture.
6.	Classify Optical Fibers: Differentiate between single-mode and multimode fibres, as well as step-index and graded-index fibres.
7.	Assess Optical Fiber Losses: Analyse the types of losses in optical fibres, including attenuation and dispersion.
8.	Explore Fiber Optic Applications: Describe the applications of optical fibres in communication and medical fields, including endoscopy and sensing technologies.

B. Sc. Semester-IV			
Discipline Specific Core Course (DSC-8)-PHYSICS - Paper-8 (BPH4T08)			
(Mathematical Physics)			
DSC - 8 THEORY	Hours: 2+2=04 Hours /Week	Marks: 80 + 20 = 100	Credit: 2+1=03
Unit-I			
Differential Calculus	Classification of differential equations: linear and nonlinear, homogeneous and non-homogenous equations. First order differential equation: Separable and exact equations. Integrating factor. Second Order: Homogeneous equations with constant coefficients. Applications to simple harmonic motion and electrical circuits, Introduction to Partial Differential Equations, exact and inexact differentials.		8 Hrs
Unit-II			
Special Functions and Series Expansions in Mathematical Physics	Polynomial Functions, Its applications fitting experimental data (least square fitting), Exponential Functions, Properties and characteristics of exponential functions, Applications to : Radioactive decay and population growth, Logarithmic Functions, Hyperbolic Functions (sin, cosine & tangent), Its applications in Relativity Series Expansions in Mathematical Physics: Taylor Series, Maclaurin Series and Binomial Series		7 Hrs
Unit III			
Vector Calculus and Fields	Scalar and Vector fields Polar and Axial vectors with physical examples, Triple product and Directional derivatives and normal derivative, Gradient of a scalar field: Definition and geometrical interpretation, Divergence and Curl of a vector field, Del and Laplacian operators, Vector identities: Gradient, Divergence, Curl, and Laplacian in spherical and cylindrical coordinates, Orthogonal Curvilinear Coordinates,		8 Hrs
Unit IV			
Vector Integration	Ordinary integrals of vectors, Multiple integrals and the Jacobian, Infinitesimal line, surface, and volume elements, Line, surface, and volume integrals of vector fields, Flux of a vector field, Gauss' Divergence Theorem, Green's Theorem, and Stokes' Theorem: Statements and applications (no rigorous proofs)		7 Hrs

Reference Books:

1. Mathematical Physics by H. K. Das, S chand Publications
2. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th Edn., Elsevier.
3. An introduction to ordinary differential equations, E.A. Coddington, 2009, PHI learning
4. Differential Equations, George F. Simmons, 2007, McGraw Hill.
5. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.
6. Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book
7. Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jones and Bartlett Learning

8. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
9. Essential Mathematical Methods, K.F.Riley & M.P.Hobson, 2011, Cambridge Univ. Press
10. Mathematical Physics by P. K. Chattopadhyay
11. Mathematical Physics by B. S. Rajput
12. Mathematical Physics by Mathews and Walkers
13. Mathematics for Physicists by Mary L Boas.

List of Experiments

1. To study the nature of radioactive decay by using six face dice.
2. To study the nature of radioactive decay using Geiger counter and measure the rate of decay.
3. To study logarithmic decrement of decay of amplitude by compound pendulum by
4. To study the nature of discharge of a charged capacitor through resistance.
5. To study the pH of a solution.
6. To study the Motion of a Spring and calculate Spring Constant & Value of g
7. To study Simple harmonic motion using spring mass system
8. To study series LCR AC circuit
9. To study the Faraday's law of electromagnetic induction.
10. To study waves on a stretched string and to determine wave velocity.
11. To study the effect of damping of spring mass system in a viscous medium.
12. To verify the laws of probability distribution
13. To study logarithmic/ exponential amplifier using OPAMP
14. To study integrator and differentiator amplifier

COURSE OUTCOMES

After completing this course students will be able to

Sr. No.	Course outcome
1.	Classify and solve first-order and second-order differential equations, applying them to physical problems.
2.	Understand and apply partial differential equations and exact differentials.
3.	Utilize polynomial, exponential, logarithmic, and hyperbolic functions in data fitting and real-world applications.
4.	Differentiate between scalar and vector fields, including polar and axial vectors, with physical examples.
5.	Compute and interpret gradient, divergence, and curl of vector fields with geometric significance
6.	Derive and apply the Del operator and Laplacian in various coordinate systems.
7.	Perform vector integration, including line, surface, and volume integrals, with physical interpretations.
8.	Apply Gauss' Divergence Theorem, Green's Theorem, and Stokes' Theorem in practical situations.

B. Sc. Semester-IV			
Minor -3 PHYSICS (BPH2T03)			
(Acoustic and Ultrasonics)			
DSC - 3 THEORY	Hours: 2+2=04 Hours /Week	Marks: 80+20 = 100	Credit: 2+1=03
Unit-I			
Musical Sound and Noise	Musical Sound, characteristics of musical sound (Loudness, Quality, and Pitch) sound intensity level, bel and decibel, Consonance and Dissonance, Harmony and melody, Musical interval, Musical Scales (diatonic scale), temperament, Musical instruments (sitar, flute, harmonium), Weber-Fechner law, Limits of human audibility, Noise, Noise thermometer, Noise standards, Noise Hazards, and control.	7.5 Hrs	
Unit-II			
Acoustics	Absorption coefficient, Reverberation and reverberation period, Live and Dead room, Sabine's formula, Factors affecting the acoustics of the building, Sound absorbers, Requirements for good acoustics. Transducers and their characteristics, Active and Passive Transducers, Microphone (Moving coil electrodynamic microphone, Crystal microphone, Condenser microphone), Loudspeaker (Moving coil loudspeaker), Hearing aids, Earphone, headphone, Recording and reproduction of sound.	7.5 Hrs	
Unit III			
Ultrasonic Waves	Introduction, Properties of Ultrasonic waves (velocity, specific acoustic impedance, intensity & pressure), detection of ultrasonic waves, production of USW, Mechanical method (Galton whistle), electrostatic method, piezoelectric effect, piezoelectric generator, Magnetostriction oscillators, measurement of Frequency and velocity of ultrasonic waves (Acoustical Grating), Sing around technique	7.5 Hrs	
Unit IV			
Application of Ultrasonic Waves	Measurement of depth of sea, SONAR system, Non-destructive testing, Pulse Echo testing, Soldering Cavitation), Ultrasonic welding, cleaning, flowmeters, Medical applications: ultrasonography, Types of scan, applications of B scan (Qualitative), Ultrasonic Microscopy, Blind stick	7.5 Hrs	

Reference Books:

1. Modern Acoustics by A.B. Gupta Books and Allied (P) Ltd. 2016
2. Oscillation, Waves and Sound by- Sharma and Saxena.
3. Waves and Oscillation by- N. Subrahmaniam and Brijlal, Vikas Publishing House Pvt. Ltd., Second Revised Edition, 2010
4. Science and Technology of Ultrasonics, Bldev Raj, V, Rajendran, P, Palanichamy, Narosa Pub. House, 2004
5. A Text Book of Oscillations, Waves and Acoustic by Dr. M. Ghosh, Dr. D. Bhattacharya, S. Chand Publication
6. 7. The Physics of Waves and Oscillation by- N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd. 1984

7. Textbook of Sound by V.R. Khanna and R.S.Bedi, 1st edition, Kedharnaath Publish & Co, Meerut (1998)
8. Oscillations and Waves by Satya Prakash Pragathi Prakashan, Meerut, Second Edition, 2003
9. Mechanics: D.S. Mathur, S. Chand, and Company.
10. The Physics of Sound Third Edition Richard E. Berg, David, David G. Stork, Pearson Publication, 2012

Physics Practical / Laboratory

List of the experiments-

1. To determine the frequency of unknown tuning fork by Helmholtz resonator
2. To determine the velocity of sound by resonance method.
3. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.
4. To determine the velocity of sound wave in air (gas) with Kundt's tube.
5. To determine the velocity of ultrasonic wave using ultrasonic interferometer.
6. To study the characteristics of micro phone.
7. Study of loudspeaker (woofer, squawker, tweeter) as a transducer.
8. Study of Piezoelectric transducer.
9. To study the Noise level in the different places with the help of sound level meter.
10. To study the characteristics of an NTC/PTC thermistor as transducer.
11. To study the thermocouple as transducer.
12. To determine velocity of ultrasonic waves using by acoustical grating method.

COURSE OUTCOMES

After completing this course students will be able to

Sr. No.	Course outcome
1.	Understand the different aspects and attributes of a musical sounds. Also response of ear to sound and audible limits of human ear
2.	Learn about various musical scales and musical instruments
3.	Learn about acoustics of a hall and requirement of a good acoustic of a hall
4.	Learn about different microphones their design and action and also about loudspeaker.
5.	Learn about the characteristics and production method as well as detection of USW.
6.	Learn about different applications of USW like SONAR, soldering, cleaning and medical applications like sonography etc.

B. Sc. Semester-IV			
Minor -4 PHYSICS (BPH2T04)			
(Oscillations and Black body radiation)			
DSC - 4 THEORY	Hours: 2+2=04 Hours /Week	Marks: 80 + 20 = 100	Credit: 2+1=03
Unit-I			
Free Oscillation	Introduction to linear and angular S.H.M., , Differential equation of S.H.M. and its solution, Mass attached to spiral spring, Torsional pendulum, Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figure. Applications of Lissajous figures.		7.5 Hrs
Unit-II			
Damped and Forced Oscillation	Differential equation of damped harmonic oscillator and its solution, logarithmic decrement, Energy equation of damped oscillations, Power dissipation and quality factor. Forced oscillation, Differential equation of forced oscillation and its solution, Resonance, Sharpness of resonance, Power Absorption, Power dissipation, Quality factor and bandwidth,		7.5 Hrs
Unit III			
Waves in Media	Introductions, transverse and longitudinal waves, General equation of progressive wave, Speed of transverse wave on a stretched string, differential equation of a wave motion in a fluid, Wave equation for a transverse wave in a string, harmonics and overtones, phase velocity and group velocity and their relation. Doppler effect.		7.5 Hrs
Unit IV			
Black Body Radiation	Properties of Thermal Radiation, Blackbody radiation, spectral distribution, Weins Displacement law, Wiens distribution Law, Sahas Ionization Formula, Rayleigh Jeans Law, Ultra-Violet catastrophe concept of energy density and pressure of radiation. Derivation of Planck's law, deduction of Wien's distribution law, Rayleigh-Jeans law, Stefan-Boltzmann law and Wien's displacement law from Planck's law.		7.5 Hrs

Reference Books:

1. Mechanics: D.S. Mathur, S. Chand, and Company.
2. The Physics of Waves and Oscillation by- N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd. 1984
3. Modern Acoustics by A.B. Gupta Books and Allied (P) Ltd. 2016
4. Oscillation, Waves and Sound by- Sharma and Saxena.
5. Waves and Oscillation by- N. Subrahmaniam and Brijlal, Vikas Publishing House Pvt. Ltd., Second Revised Edition, 2010
6. A Text Book of Oscillations, Waves and Acoustic by Dr. M. Ghosh, Dr. D. Bhattacharya, S. Chand Publication
7. Textbook of Sound by V.R. Khanna and R.S.Bedi, 1st edition, Kedharnaath Publish & Co, Meerut (1998)
8. Oscillations and Waves by Satya Prakash Pragathi Prakashan, Meerut, Second Edition,2003

List of Experiments

1. Study the speed of waves on stretched string.
2. Determination of velocity of sound using volume resonator.
3. To Stefan's constant by incandescent bulb
4. To study the Lissajous's figure using CRO.
5. To determine the frequency of tuning fork using sonometer.
6. To study the logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum.
7. To study the logarithmic decrement using compound pendulum.
8. To find Planck's constant using photocell.
9. To study the oscillation of bifilar suspension
10. To study the oscillations of compound pendulum
11. To study the oscillations of rubber band and draw its potential energy curve.
12. To study the oscillations of spring and find spring constant and verify laws of spring.

COURSE OUTCOMES

After completing this course students will be able to

Sr. No.	Course outcome
1.	Understand the simple harmonic motion, and properties of different oscillatory motion of an object
2.	Understand the damped and forced oscillation
3.	Understand mechanical waves in a medium and wave equation of the transverse waves on string and longitudinal waves in a fluid.
4.	Understand black body radiation and development of quantised nature of blackbody radiation.
5.	Understand the temperature of heavenly bodies

Semester-IV Generic Elective / Open Elective Course (GE/OE-6) (BGO4T06) (Communication Systems)			
GE/OE-5 THEORY	Hours: 04 Hours /Week	Marks: 80 + 20 = 100	Credit: 02
Unit-I			
Introduction to Communication Systems	Basic concepts of communication: Radio waves and its use for communication, Information, signal, noise, signal to noise ratio, noise figure, channel, Bandwidth types of communication systems: Analog and digital, Receiver, transmitter, Antennas, Types of antenna		8 Hrs
Unit-II			
Analog Communication Systems	Modulation and demodulation techniques, modulation index, Amplitude modulation (AM): SSB, DSB, generation, demodulation, Frequency modulation (FM): theory, generation, demodulation, Phase modulation (PM): theory, generation, demodulation, Noise in Analog communication systems		7 Hrs
Unit III			
Digital Communication Systems	Pulse amplitude modulation (PAM): theory, generation, demodulation, Pulse code modulation (PCM): theory, quantization, coding, Digital modulation techniques: amplitude-shift keying (ASK), frequency-shift keying (FSK), phase-shift keying (PSK) Noise in digital communication systems, Multiple Access Techniques (FDMA, TDMA, CDMA), Multiplexing		8 Hrs
Unit IV			
Applications of Communication Systems	Wireless communication: Cellular networks, Wi-Fi, Bluetooth, Optical communication: fiber optics, laser communication, Satellite communication: satellite orbits, satellite links, Generation of communications 2G, 3G, and 4G Emerging trends in communication systems: 5G, IoT, AI.		7 Hrs

Reference books:

1. "Modern Digital and Analog Communication Systems" by B. P. Lathi
2. "Communication Systems" by Simon Haykin
3. "Electronic Communication Systems" by Rodger E. Ziemer and Roger L. Peterson
4. Wireless Communications: Principles and Practice" by Theodore S. Rappaport
5. "Fundamentals of Wireless Communication" by David Tse and Pramod Viswanath
6. "Communication Systems" by Simon Haykin
7. "Communication Theory: Analysis and Application" by Alan G. B. T. Davis
8. Fundamentals of Digital Communication" by S. K. Gupta and S. C. Gupta
9. "Communication Systems" by R. P. Singh and J. C. Gupta

COURSE OUTCOMES

After completing this course students will be able to

Sr. No.	Course outcome
1.	Demonstrate a clear understanding of key communication concepts, including information, signals, noise, and bandwidth
2.	Differentiate between Analog and digital communication systems, including their components like transmitters and receivers.
3.	Describe various modulation and demodulation techniques used in analogy communication, including AM, FM, and PM.
4.	To understand Signal Quality and impact of noise on Analog communication systems and compute signal-to-noise ratios and noise figures.
5.	Explain and implement pulse amplitude modulation (PAM), pulse code modulation (PCM), and digital modulation techniques like ASK, FSK, and PSK.
6.	Understand Multiple Access Techniques: Explain different multiple access techniques (FDMA, TDMA, CDMA) and their applications in communication systems.
7.	Describe the principles of multiplexing and its significance in efficient communication system design.
8.	Familiarise Emerging Technologies: Analyse the applications and trends in wireless communication, including cellular networks, Wi-Fi, and 5G technologies.

B. Sc. Semester-IV			
Skill Enhancement Course (SEC - III) - PHYSICS Course Code (BVS4P06) (Advanced Experimentation)			
SEC-3 Practical	04 Hours /Week	Marks: 100	Credit: 02

Name of Experiments (Any 10 experiments to be performed):

1. Study of radioactivity by GM Counter and a radioactive source.
2. Determination of Rydberg's constant
3. Precision measurement using Michelson Morley Apparatus
4. Magnetic susceptibility by Guys balance.
5. Study of Flame thermometry using by reversal spectral lines
6. Measurement of the dielectric constant and study the variation of dielectric constant with temperature.
7. Determination of frequency of VHF oscillator using Letcher wire
8. To write a program and execute on a Microprocessor 8085 or 8086.
9. Design and study of Crystal Oscillator.
10. Design Analog computer to solve the differential equation.
11. Study of absorption spectrum of iodine.
12. Study of Faraday effect and to determine the Verdet constant of the material for a given wavelength of light
13. Use of Hall effect sensors to measure magnetic fields.
14. To study the Hall effect in semiconductors
15. Study of absorption (Iodine) and emission spectra (Mercuri source).
16. Use of software tools for statistical data analysis (e.g., Excel, Python, Origin)
17. Use of thermocouple to measure high temperature.
18. To determine the Plack's constant using Photocell

References Books

1. B.Sc. Practical Physics, by Harnam Singh and Dr. P. S. Hemne
2. B.Sc. Practical Physics, by C. L. Arora
3. Advanced Practical Physics for students, B. L. Flint & H. T. Workshop, 1971, Asia Publishing House.
4. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
5. A Textbook of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Course Outcomes:

After the completion of this course students will be able to

1. Study regular experiments with great details with precision and perform error analysis of result obtained against standard value of a physical quantity in an experiment.
2. Understand Radioactive Decay: Demonstrate the ability to measure and analyze radioactive decay using a Geiger-Müller (GM) counter and a radioactive source.
3. Calculate Rydberg's Constant: Accurately determine Rydberg's constant through experimental measurements of spectral lines.
4. Setup the Michelson-Morley apparatus to conduct precision measurements of light interference and demonstrate wave properties.

5. Find the magnetic susceptibility of materials using a Guoy balance and interpret the results.
6. Employ flame thermometry to find flame temperatures through the analysis of reversal spectral lines.
7. Study the variation of dielectric constant with temperature and analyse its implications for material properties.
8. Find the frequency of a VHF oscillator using a Lichtenberg wire and interpret the results.
9. Write and execute a program on a Microprocessor 8085 or 8086, demonstrating an understanding of assembly language.