OFFICE OF THE CHAIRPERSON BOARD OF STUDIES IN PHYSICS,

UNIVERSITY COLLEGE OF SCIENCE, OSMANIAUNIVERSITY,

HYDERABAD

NO 09/CBOSP/2024 DATE 2024/8/2

Engineering Physics Syllabus for Osmania University Affiliated Engineering Colleges
B.E (SEM–I & II) AICTE
Academic Year 2024-2025 onwards (Common to All Branches)

CourseCode: BS202PH	CourseTitle : Physics						Core/Elective: Core
Prerequisite	ContactHoursper Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	-	-	30	70	04

Course objectives

- Understand the Fundamental Principles and Applications of Lasers, Fiber Optics & Ultrasonics
- Explore Semiconductor Physics and Electromagnetic Theory
- Analyze Magnetic Materials and Superconductors
- Investigate Wave Mechanics and Quantum Computation
- Explore Nano Materials and Thin Film Technologies

Course outcomes

Upon successful completion of the course student will able to:

- Understand and apply the principles of lasers, fiber optics & ultrasonics, including their construction, types, and engineering applications.
- Gain thorough knowledge of semiconductor physics, including key devices and energy harvesting technologies, and understand fundamental electromagnetic theory.
- Analyze magnetic materials and superconductors, including their properties, theories, and technological applications.
- Grasp wave mechanics concepts and quantum computing fundamentals, including quantum gates and their practical applications.
- Explore nano materials and thin film technologies, including preparation methods, characterization techniques, and their engineering uses.

2/8/2024

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UNIT I

Lasers, Fiber Optics & Ultrasonics

Characteristics of Lasers, Stimulated Emission, Population Inversion, Einstein's Coefficients, CO2 Laser, Semiconductor Laser, working of Laser Induced Breakdown Spectroscopy (LIBS) Instrument, Engineering Applications of Lasers.

Construction of Optical Fiber, Types of Optical Fibers (Refractive Index Profiles), Fiber Drawing Process (Double Crucible Method), Basic Principles of Fiber Optics Sensors, Construction and Working of Pressure Sensors, Applications of Optical Fibers in Engineering.

Introduction to Ultrasonic Waves, Production of Ultrasonic Waves - Magnetostriction Method, Ultrasonic Pulse-Echo Testing Method, Engineering Applications of Ultrasonics.

UNIT II

Semiconductor Physics and EM Theory

Types of Semiconductors, Direct and Indirect Bandgap Semiconductors, Hall Effect, Construction and Working of Quantum Light Emitting Diodes (QLEDs) & Solar Cells, Applications of Semiconductor Devices, Concept of Harvesting Energy Devices (Piezoelectric Generators, Thermoelectric Generators), Properties and Advantages of Graphene.

Basic Laws of Electricity and Magnetism, Displacement Current, Maxwell's Equations, Expression for Maxwell's Integral to Differential Equations, Poynting Theorem.

UNIT III

Magnetic Materials & Superconductors

Types of Magnetic Materials, Weiss Molecular Field Theory, Magnetic Domains, Hysteresis Curve, Soft and Hard Magnetic Materials, Magneto-Resistance Materials (CMR & GMR), Applications of Magnetic Materials.

Superconductors, Properties of Superconductors, Meissner Effect, Type I and Type II Superconductors, BCS Theory (Qualitative), High-Tc Superconductors, Applications of Superconductors.

UNIT IV

Wave Mechanics & Quantum Computation

Matter Waves, de-Broglie Wavelength, Physical Significance of Wave Function, Schrödinger Time-Independent Wave Equation, Energy of Particle in 1-D Potential Box, Kronig-Penney Model (Qualitative).

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Introduction to Quantum Computing, Idea of Classical Bits and Qubits, Basics of Quantum Gates (Hadamard, CNOT), Comments on No-Cloning Theorem, Basic Idea of Quantum Teleportation, Applications of Quantum Computing.

UNIT V

Nano Materials & Thin Films

Introduction, Properties of Materials at Reduced Size, Surface-to-Volume Ratio at Nano Scale, Classification of Nano Materials, Preparation Techniques: Bottom-Up Method (Sol-Gel), Top-Down Methods (Ball Milling), Principles of Characterization Techniques (X-ray Diffraction, Scanning Electron Microscope, Transmission Electron Microscope), Applications of Nano Materials.

Distinction between Bulk and Thin Films, Thin Film Preparation Techniques: Thermal Evaporation Method, Electron Beam Evaporation Method, Applications of Thin Films.

PRESCRIBED BOOKS

1. Modern Engineering physics-I &II : S. Chandralingam, K. Vijayakumar, S Chand Co.
2. Engineering Physics: P.K.Palanisamy, Scitech Publishers.
3. Engineering Physics: S.O.Pillai, New age International.
4. Nielsen M. A., I. L Chung, Quantum Computation & Quantum Information, Cambridge Univ. Press
5. Thin Film Fundamentals, A. Goswami , New Age International New Delhi
6. Nano Materilas, A.K. Bandyopadhyay, Newagepublishers

REFERENCE BOOKS

1. Solid State Physics: Charles Kittel, Wiley & Sons (Asia) Pvt. Ltd.
2. Fundamentals of physics:Halliday,Resnick,Walker.
3. Engineering Physics – By V Rajendran, McGraw Hill Edn.
4. Solar Photovoltaics – Fundamentals, Technologies and Applications 3rd Edition, PHI
5. Principles of Quantum computation and Information – By G. Benenti, G. Casati, G. Strini, World scientific.

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NO 09/CBOSP/2024 DATE 2/8/2024

Engineering Physics Lab Syllabus for Osmania University Affiliated Engineering Colleges
B.E (SEM-I&II) AICTE
Academic Year 2024-2025 Onwards (Common to All Branches)

CourseCode: BS251PH	CourseTitle: Physics Lab						Core/Elective : Core
Prerequisite	ContactHoursper Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	3	25	50	1.5

Course Objective

- Master experimental procedures and programming techniques.
- Conduct experiments independently with precision and measurement accuracy
- Analyze data graphically and derive conclusions from graphs
- Evaluate experiment results critically and draw meaningful conclusions.
- Improve communication skills through group work and effective laboratory report writing.

Course Outcomes

- Apply the various procedures and programming techniques for the experiments.
- Demonstrate the experiment with task and take the measurement independently
- Examine the graphical representation data and estimate results from the graph.
- Compare and evaluate the results of the experimentand draw relevant conclusions
- Develop communication skills through working ingroups in performing the laboratory Experiments andby writing laboratory reports.

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Listof Experiments

1. Determination of Dielectric Constant and Phase Transition Temperature of Dielectric Materials
2. To study the I-V Characteristics of P-N Junction Diode and Resistance Evaluation
3. Find the Electrical Conductivity and Energy Gap of Germanium (Ge) Crystal
4. Study Hall Effect in Semiconductors & find Hall Coefficients. Hall Voltage. and Conductivity
5. Study Characteristics of Thermistor: Determination of Constants A and B
6. Draw Hysteresis Loop for Ferromagnetic Material (B-H Curve)
7. Study V-I Characteristics of Solar Cell: Fill Factor and Series Resistance Calculation
8. Visualization Energy Levels of 1-Dimensional Potential Box Using Schrödinger Wave Equation in Python
9. Visualization of Allowed Energy Levels and Kronig-Penney Model in Python/MATLAB
10. Determine the Density and Elastic Properties of Oxide Glasses/polymers Using Machine learning algorithms
11. Calculate the Numerical Aperture (NA) and Acceptance Angle of Optical Fiber
12. Find the Wavelength of Laser Source using diffraction grating
13. To study the Transition Temperature Measurement of High-Temperature Superconductor
14. Find the Rigidity Modulus of Wire Using Torsional Pendulum
15. To estimate the pressure using optical fiber sensor.

Note: **Minimum Eight experiments should be conducted in the semester**

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