

## BSM-127 ENGINEERING PHYSICS -II

<b>Course category</b>	: Basic Sciences & Maths (BSM)
<b>Pre-requisite Subject</b>	: Physics at 12 <sup>th</sup> standard
<b>Contact hours/week</b>	: Lecture : 3, Tutorial : 0 , Practical: 2
<b>Number of Credits</b>	: 5
<b>Course Assessment methods</b>	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
<b>Course Objectives</b>	: Understanding of the principle and concepts of Crystallography, Quantum Mechanics, Basic principles of electricity and magnetism, Maxwell's Equations, of and Advanced Materials for their applications Engineering.
<b>Course Outcomes</b>	: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Basics of crystallography application in Engineering
2. Quantum Mechanics and its application to understand material properties at atomic level.
3. Basic principles of electricity and magnetism applied in Engineering.
4. Maxwell's equation of electromagnetic theory and its application in engineering.
5. Basic principles of semiconducting materials and its application.
6. Basic Principles of advanced materials and their application in Engineering.

### Topics Covered

#### UNIT-I

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**Crystal Structures and X-ray Diffraction:** Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Bragg's Law, Bragg's spectrometer.

#### UNIT-II

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**Quantum Mechanics:** De Broglie waves and Group velocity concept, Uncertainty principle and its application, Davisson-Germer experiment, Derivation of Schrodinger equation for time independent and time dependent cases. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a free particle; Particle in a box (one dimensional)

#### UNIT-III

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**Electrodynamics –I:** Basic concepts of Gauss's law, Ampere's law and faradays law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement current), Maxwell's equation, transformation from integral form to differential form, physical significance of each equation

**Electrodynamics –II:** Maxwell's equation in free space, velocity of electromagnetic wave, transverse character of the wave and orthogonality of E, H and k vectors, Maxwell's equations in dielectric and conducting medium, velocity of e. m. wave, comparison with free space, penetration depth

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## UNIT-IV

### Physics of Advanced Materials

Semiconducting Materials, Concept of energy bands in solids, concept of direct and indirect band gap, Carrier concentration and conductivity in semiconductors, Optoelectronic Materials, Superconducting Materials, Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, BCS theory (Qualitative), Introduction of nanoscience and technology, structure, properties and applications of Carbon nanotubes

### EXPERIMENTS

1. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
2. To study the variation of magnetic field along the axis of current carrying circular coil.
3. To study the Hall's effect and to determine Hall coefficient in n type Germanium.
4. To study the energy band gap of n- type Germanium using four probe method
5. To determine  $e/m$  of electron using Magnetron valve
6. To draw hysteresis curve of a given sample of ferromagnetic material
7. To determine the velocity of Ultrasonic waves
8. To determine the Elastic constants ( $Y, \eta, \sigma$ ) by Searl's method

### Books & References

1. Introduction to Solid State Physics- Kittel , 7<sup>th</sup> edition, Wiley Eastern Ltd.
2. Solid State Physics - S. O. Pillai, 5<sup>th</sup> edition, New Age International.
3. Quantum Physics by H. C. Verma, 3<sup>rd</sup> Edition, Surya Publication Ghaziabad,
4. Introduction to Electrodynamics- David J. Griffiths Pearson, New International Edition
5. Semiconductor Devices and Application - S.M. Sze, Wiley
6. Introduction to Nano Technology - Poole Owens, Wiley India
7. *Master Hand book of Acoustics* - F. Alton Everest and Ken Pohlmann, 5<sup>th</sup> edition, McGraw Hill