ENGINEERING PHYSICS

I Semester

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5BS09	BSC	3	1	0	4	30	70	100

COURSE OBJECTIVES:

The course should enable the students to:
1. Describe the chemical reaction and phase transformation in materials by using modern thermodynamic models
2. Learn the fundamentals of transport properties of materials
3.Describe the interactions of light with materials which results in colour and the temperature dependence of magnetic susceptibility
4. Learn the basic principles of optical fiber and its communication system
5. Understand the development of Nano technology and synthesis of Nano materials by using different techniques

UNIT-I THE STRUCTURE OF MATERIALS &THERMODYNAMICS OF CONDENSED PHASES

The Structure of Materials: Structure of Metals and Alloys-- Space lattice, unit cell, basis, crystal systems, Bravais lattice, S.C, B.C.C & F.C.C Structures. Structure of Ceramics and Glasses – Rock salt structure, Diamond structure, structure of SiO4.
Thermodynamics of Condensed Phases: Introduction – Thermodynamics of Metals and Alloys, -Gibbs rule, Cu- Ni phase diagram, Eutectic systems, Iron-Iron carbide (Fe-Fe3C) equilibrium diagram.

UNIT-II TRANSPORT PROPERTIES OF MATERIALS& BAND THEORY OF SOLIDS

Transport Properties of Materials: Introduction -Momentum Transport properties of Materials, -The Molecular Origins of Viscosity, Temperature Dependence of Pure MetalViscosity, Composition Dependence of alloy Viscosity.

Band theory of solids: Free electron theory, Origin of energy band formation in solids, Estimation of Fermi-level, Kronig-Penny model, E-K diagram.

UNIT-III PROPERTIES OF MATERIALS

Electrical and Optical properties -Conduction, Semi conductivity, Electrical Conduction in Ionic Ceramics**.**Reflection, Refraction, Absorption and transmission. Opacity and Translucency in insulators. Light interaction with solids, EMR, atomic and electronic interaction.

Magnetic properties – Introduction, Types of magnetic materials, influence of temperature on magnetic behavior, Hysteresis curve, Soft and Hard magnetic materials, Magnetic storage, Ferrite applications.

UNIT-IV OPTO ELECTRONIC DEVICES AND OPTICAL FIBERS

Optoelectronic devices: Introduction to Semiconductors, PN Junction Diode, V-I characteristics and applications. LED - Construction, working and applications. Solar cells- working and its applications. Efficiency issues of Solar cell, PIN diode characteristics.

Fiber Optics: Structure of fibers, Principle of fiber (TIR), Acceptance angle and NA. Types of fibers-SI and GI fibers- R.I profiles. Single and Multimode fibers-SMSI, MMSI, MMGI. OFC System with block diagram. Fiber optic sensors – Basic principle, working of Pressure and Temperature Sensors.

Applications of fibers in different fields.

UNIT-V	INTRODUCTION TO ENGINEERED MATERIALS

Synthesis of Nano materials: Introduction to nano particles, nano scale, Surface to volume ratio and quantum confinement. Techniques for synthesis of nano materials-Top Down and Bottom Up methods– Sol gel, CVD methods and Photolithography.

Characterization of Nanomaterials: Imaging methods – SEM, TEM and STM. Applications of Nano materials in engineering and Biomedical fields and other fields**.**

Text Books:

1. P.K Palanisamy, Engineering Physics, Sitech Publications, 2013, IVthEdn.
2. Material science and metallurgy by pakkirappa.

Reference Books:

1. Engineering Physics by P.K.Pandey. S Chaturvedi-Cengage Learning.
2. An Introduction to material science and engineering by Brian S. Mitchell.

Course Outcomes:

The student will able to:

1. **Analyze** the bonding scheme and its physical properties of a given material
2. **Evaluate** the dimensionality, rates of a nucleation and growth process from kinetic data
3. **Evaluate** the curie and Neel temperature of a given substance.
4. **Justify** how the graded index optical fibre is more efficient than step index optical fiber in fiber optic communication system
5. **Recommend** appropriate synthesis method and explain the characterization techniques.