ENGINEERING MATERIALS (ME- 213)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Material Science and Engineering: An Introduction by William D. Callister, JrSecond Edition, John Wiley & Sons, Inc.

REFERENCE BOOK(S)

Materials and Processes in Manufacturing, By E. P Degarmo Prentice Hall
Process and Materials of Manufacturing by Lindberg.
Ceramic Science for Materials Technologist by T. J McCalm

COURSE OBJECTIVES

To understand the appropriate use and selection of various engineering materials in designing and manufacturing of components and associated processes. To acquire knowledge related to the microstructure of engineering materials

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** structures, properties and applications of metals, ceramics, polymer and composite materials	C1	01
2	**Explain** the effect of heat treatment in materials	C2	02
3	**Describe** the production methods for steels, polymers and alloys	C2	02

COURSE CONTENTS

Metals: Structure of Metals: Crystalline structure of metals, allotropy. Crystallographic planes, mechanisms in metals, slip and slip systems, dislocation, twinning, yield phenomenon and strain aging, Bauchinger effect.

Metals and Alloy Systems: Production of iron, wrought iron, cast iron. Production of steel and its classification ferrite, austenite, S-iron, cementite, pearlite, martensite, bainite, etc.Iron-carbon phase diagram, alloying elements and their effect on the properties of alloy steel.Refining of copper, aluminum and zinc. Aluminum alloys, zinc alloys, copper alloys, brass and bronzes. Metals and alloys for special application. Corrosion of metals anti-corrosive coatings and paints.

Material Forms and Designation: Heat treatment critical temp, transformation on heating/cooling, annealing, normalizing, tempering, quenching, austempering, hardening, rolling processes and production of various steel sections such a billet, bar, rod, channel, Roll load calculation, British standards and ASTM standard specification on iron/steel.

Non Metals Composition, properties and uses of plastics, rubber, ceramics, fiberglass, composite materials and polymers.

Polymers: Molecular structure, bonding & classification of polymer compounding, forming operations etc., plastics.

Ceramics and refractories: Ceramic bonding, properties, ceramics material, crystalline and amorphous, silica, glass etc., refractory materials and their types, Introduction to Composite Materials, Material failure analysis