

MATERIALS FOR ENGINEERING

UNIT NO	Unit Learning outcomes (In cognitive domain)	Topics/Subtopics
UNIT-1 BASICS OF ENGINEERING MATERIALS	<ol style="list-style-type: none"> 1. Identify the crystal structure of the given material 2. Explain specimen preparation procedure 3. Distinguish various engineering properties of materials 	<ol style="list-style-type: none"> 1.1 Classification of Engineering Material 1.2 Structure of metal-unit cell, BCC, FCC and HCP structures 1.3 Types of microscopes 1.4 Specimen preparation procedure 1.5 Properties of metals-Physical-mechanical-Thermal properties
UNIT-2 STEELS AND ALLOYS	<ol style="list-style-type: none"> 1. Select relevant cast iron for the given job with justification 2. Select relevant steel for the given application 3. Able to designate different plain and alloy steel, cast iron as per BIS, ASME 	<ol style="list-style-type: none"> 2.1 Types of cast iron-White-grey-Nodular-malleable - Selection of appropriate cast iron for engineering application 2.2 Broad classification of steels <ol style="list-style-type: none"> I. Plain carbon steels-Definition-types-properties-composition and applications of low-medium-high carbon steels II. Alloy steels-definition-effect of alloying elements on properties of alloy steel III. Tool steel-cold worked-Hot work tool steel-High speed steel(HSS) IV. Stainless steel-Types and application V. Spring steel-composition and application 2.3 Steels for following-shaft -axles-bolts-nuts-Agriculture Equipment's-household utensils-Antifriction bearings. 2.4 Designation and coding (as per BIS, ASME) of plain & alloy steel and cast iron.
UNIT-3 NON FERROUS METALS AND ALLOYS	<ol style="list-style-type: none"> 1. Describe the properties and application of the given copper alloy 2. Describe the properties and application of the given Aluminum alloy 3. Describe the properties and application of the given Nickel alloy 4. Describe the properties and application of the given Bearing material 5. Select relevant non ferrous material for specified application with justification 	<ol style="list-style-type: none"> 3.1 Copper and its alloys-Brasses-Bronzes-Chemical composition-Properties and applications 3.2 Aluminum and its alloys-Alloy-Hindalium-duralium with their -Chemical composition-Properties and applications. 3.3 Nickel and its alloys with their -Chemical Composition-Properties and applications 3.4 Bearing materials like White metal (Sn based), Aluminum Bronzes-Self-lubricating Bearings

<p style="text-align: center;">UNIT-4 NON METALIC AND ADVANCED MATERIALS</p>	<ol style="list-style-type: none"> 1. Distinguish between metallic and non metallic materials on the basis of given composition 2. Select relevant non metallic material for the given job with justification 3. Select relevant Composite material for the given job with justification 4. Select relevant Alternative material for the given job with justification 	<ol style="list-style-type: none"> 4.1 Polymeric materials-Polymer-types-characteristics 4.2 Classification of Polymers on basis of Thermal behavior -Thermo plastics and thermo setting plastics-Properties -uses 4.3 Ceramics-types of ceramics-properties and applications 4.4 Composite materials-properties and application of laminated and fiber reinforced materials 4.5 Advanced engineering materials-properties and application of, Biomaterials, nano materials and smart materials 4.6 Designation and coding of important non metallic materials as per BIS
<p style="text-align: center;">UNIT-5</p>	<ol style="list-style-type: none"> 1. Interpret Iron-carbon equilibrium diagram of Mild steel 2. Identify the given phase diagram and reactions with justification 3. Conceptualize with sketches the specified heat treatment process 4. Select relevant Heat treatment process for the given material with justification 	<ol style="list-style-type: none"> 5.0 Concept of phase-pure metal-alloy -Solid solution 5.1 Iron-carbon equilibrium diagram indicating various phases-Critical temperature and its significance-Reactions on Iron carbon equilibrium diagram of Mild steel 5.2 Heat treatment-Definition- purpose of heat treatment--Mechanism of heat treatment Types of heat treatment process 5.3 Annealing-purposes of annealing-Annealing temperature range-applications. 5.4 Normalizing- purposes of Normalizing-temperature range-Broad applications 5.5 Tempering-Purposes of tempering-Types of tempering-Applications 5.6 Hardening -purposes of hardening - temperature range- Broad applications of hardening 5.7 Case hardening- Carburizing-Nitriding-Cyaniding
<p style="text-align: center;">UNIT-6 SURFACE TREATMENT FOR MATERIALS</p>	<ol style="list-style-type: none"> 1. Describe corrosion and its prevention 2. Select proper electrolysis process for surface coating 	<ol style="list-style-type: none"> 6.1 Corrosion-types and reasons for corrosion, protection from corrosion 6.2 Surface protection treatments-Methods of Surface treatments. 6.3 Electrolytes and Non-electrolytes - definition-Types of electrolytes 6.4 Construction and working of electro chemical cell 6.5 Electro-chemical series, galvanic series. 6.6 Surface coating through electrolysis-setup and working.