



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-3

Subject : Engineering Materials - DETME13207

Type of course: Minor

Prerequisite: Physics

Rationale: Due to globalization manufacturing sector experiencing a major change over, where the emphasis is on reducing weight, fuel economy, ergonomically design and cost. It is essential to understand various materials, their composition, properties and applications. Engineering Materials play a vital role as the vital tool for solving the problems of material selection and application in the production and manufacturing of equipment/machines, devices, tools, etc. Therefore, an engineering diploma student must be familiar with the properties, composition and behavior of materials from the point of view of reliability and performance of the product. This subject is concerned with the changes in structure and properties of matter. Many of the processes which are involved to bring out these changes, forms the basis of engineering activities. The study of basic concepts of material science and metallurgy will help the students understand engineering subjects where the emphasis is laid on the application of these materials.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
3	-	2	4	60	30	10	20	30	150

Legends: CI-ClassRoom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

Sr. No	Course content	Hrs	% Weightage
1	<p>Introduction to Engineering Materials and Phase diagrams: -</p> <ul style="list-style-type: none"> ● Types of Bonds ● Intermolecular Force of Attraction ● Molecular Arrangement in Solid, Liquid and Gases, Structure of Solids ● Concept of crystalline structure of metal, Structure of metal in unit cell. B.C.C., F.C.C. & H.C.P. ● Properties of Material <p>Introduction to phase diagrams: -</p> <ul style="list-style-type: none"> ● Equilibrium Diagram, Solid solution, Alloys ● Cooling curve ● Classification of equilibrium diagram ● Solidification of Metals ● Time Temperature Transformation Curve (TTT-Curve) ● Iron-Carbon Equilibrium Diagram (Fe-c diagram) ● Heat-Treatment processes. 	14	35%
2	<p>Metallic Materials: -</p> <ul style="list-style-type: none"> ● Introduction of metals ● Classification of Metals ● Flow diagram for the Production of Iron and Steel ● Ferrous Metals: Classification of ferrous metals, Steel and its types, composition, properties, application for plain carbon steel, alloy steel, stainless steel and cast iron. ● Non-Ferrous Metals: Classification of non-ferrous metals, Types, composition, properties and applications of non-ferrous metals, properties and applications of Bearing metals. 	10	20%
3	<p>Non-metallic Materials: -</p> <ul style="list-style-type: none"> ● Introduction to Non-metallic materials ● Introduction & Classification of Non-metallic materials ● Classification of polymers, thermoplastics & thermosetting plastics. Properties & Applications of Polymers, Selection of plastics ● Fiber and Teflon ● Composite materials and its classification ● Properties and Applications of other types of Non-metallic Materials: Rubber, Ceramics, Refractory, Insulating, Abrasive 	11	25%



4	<p>Electrolytes, Oils, Paints/Varnish and Powder Materials & Green materials:</p> <ul style="list-style-type: none"> ● Introduction, Surface finishing process, Procedure and method of preparing surface ● Various types of surface coating methods, their procedures and applications, Electroplating ● Metallic coating processes other than plating ● Non-metallic coating. Painting, Porcelain enameling, Plastic coating ● Oils Paints & Varnishes ● Powder metallurgy: Basic concept, Properties of metal powder, blending or mixing, compacting and pressing, sintering, additional/supporting processes. Advantages, disadvantages & application of powder metallurgy. ● Powder coating process. ● Corrosion <p>Green material</p> <ul style="list-style-type: none"> ● Concept of Green material ● Sustainable and renewable material ● Need of Advanced material for mechanical and automobile sector: Battery Electric Vehicles (BEV) & its advantages, Plug-in Hybrid Electric Vehicles (PHEV), Solar Energy and Solar Panels. Green Battery 	10	20%
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Continuous Assessment (ALA):

Sr. No	Active Learning Activities	Marks
1	<p>Draw & Study To draw the structure of BCC, FCC & HCP and explain each of them in brief with figures. And upload drawing photographs on GMIU web portal.</p>	10
2	<p>Presentation on material Find any engineering material near you and prepare a presentation on it and upload PPT on GMIU web portal.</p>	10
3	<p>Identify applications Identify any five recent applications of composite materials and enter list of names on GMIU web portal</p>	10
Total		30



Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30	40	30	-	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Compare appropriate material for manufacturing various components.
CO2	Explain appropriate heat treatment process for various components
CO3	Describe various metal and its alloys based on composition and properties.
CO4	Understand classification and properties of non-metallic materials and composites,

List of Practical

Sr. No.	Descriptions	Unit No	Hrs
1	Prepare report on :types of bonds, construction and characteristics, Structure of BCC, FCC and HCP	1	4
2	State the criteria to identify any five (3 metallic and 2 nonmetallic) materials	2 & 3	4
3	Demonstrate/Study various heat treatment furnaces	1	4
4	Perform a hardening process on ferrous material and measure the hardness before and after hardening.	2	4
5	Prepare a report on metallurgical examination	1	4
6	Prepare non-ferrous micro specimens and examine them.	3	4
7	Prepare a report on at least four non-metallic materials.	3	4
8	Prepare a report on different types of corrosion, its reasons and suggest remedies for each.	4	2
		Total	30



Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

1. Material science By GBS Narang. Khanna publishers, New Delhi
2. Material science By R.S.Khurmi. S.Chand Publishers, Ahmedabad
3. Material science & Engineering By R.B.Gupta. Tech India Publication, New Delhi
4. Material science By O.P.Khanna. Dhanpatrai Publication, New Delhi
5. Material science By R.K.Rajput. S.K.Katariya & Sons, New Delhi

