GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Metallurgy Engineering

Course / Subject Code : DI01C21021(Only for C to D Students)

Course / Subject Name : Introduction to Engineering Materials

w. e. f. Academic Year:	2024-25
Semester:	1st
Category of the Course:	PCC 01

Prerequisite:	Students should have a basic understanding of metallurgy and its importance, along with familiarity with metals, ceramics, polymers, and composites. Knowledge of fundamental properties such as hardness, ductility, and thermal conductivity is essential. Additionally, students should grasp material processing techniques like casting and heat treatment and be aware of various engineering applications of these materials.
Rationale:	This course has been intended to introduce the diploma holders to the characteristics of various types of engineering materials used in our world. New and more advanced materials are also been developed to suit the service requirements. There have been changes in man's choice of materials for his engineering activities. Materials went through ages of man's activities on earth like the Stone Age, the Iron Age and the current Silicon age, etc. But the challenges of current worlds needs are constantly fuelling the need discovery and development of new kinds of materials with the desired properties and the relevant cost to meet the challenges of the world. This course aims at developing knowledge on various types of materials and their applications.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the importance of Engineering materials.	U
02	Differentiate between Ferrous &Non-Ferrous Metals/Alloy.	U
02	Discuss about various ceramics, polymers, and composite materials.	R
03	Select the suitable engineering materials for advance application.	A

**Revised Bloom's Taxonomy (RBT)*

GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Metallurgy Engineering

Course / Subject Code : DI01021021

Course / Subject Name : Introduction to Engineering Materials

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
4	0	0	4	70	30	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to Engineering Materials:** 1.1 Introduction to Engineering Materials 1.2 Engineering requirements of different materials 1.3 Classification of Engineering Materials 1.4 Properties of Engineering materials: Mechanical Properties, Optical Properties, Physical Properties and Electrical Properties 1.5 Criteria for selection of materials for engineering applications.	14	19%
2.	**Ferrous and Non- Ferrous Metals & Alloys:** 2.1 Ferrous Metals & Alloys: Introduction, Classification, properties, composition and applications of Pig Iron, Cast Irons, Carbon Steel and Alloy Steels (S.S., Tool steel). 2.2 Non-Ferrous Metals & Alloys Introduction, Classification properties and applications of Cu alloys and Al-alloys	12	19%

3.	**Ceramics, Polymers & Composite Materials:** 3.1 Ceramic Materials: 3.1.1 Engineering Ceramics-Introduction and Classification of Ceramic Materials 3.1.2 Properties and Applications of Ceramics 3.2 Polymer Materials: 3.2.1 Introduction, Classification and forms of polymers. 3.2.2 Thermosetting and thermoplastic polymers 3.2.3 Applications of polymeric materials. 3.3 Composite Materials: 3.3.1 Introduction and classification of Composite Materials 3.3.2 Fiber and Matrix Phases in Composite Materials 3.3.3Polymer-Matrix Composites, Metal-Matrix Composites, Ceramic- Matrix Composites 3.3.4 Applications of Composite Materials	18	33%
4.	**Advanced Materials:** 4.1 Advanced Materials (Definition, Introduction and Applications): 4.1.1 Shape Memory alloys, Piezoelectric Material and Self-healing material 4.1.2 Nano-Materials and Bio Materials 4.1.3 High temperature superconductors 4.1.4 Cryogenic Materials and Optical Fiber.	16	29%
	Total	**60**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
18	**26**	**26**	**0**	**0**	**0**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Material Science and Metallurgy O.P Khanna Dhanpat Rai, New Delhi, 2nd Edition, 2014 ISBN: 9789383182459, 9383182458

2. Engineering Materials and Metallurgy Er. R. K Rajput S. Chand New Delhi, 2006 ISBN: 9788121927093
3. Materials Science and Engineering: An Introduction William D. Callister Jr.David G. Rethwisch Wiley, United States of America,10th Edition, June-2018 ISBN: 978-1-119-40549-8
4. Material Science and Metallurgy Dr. G.H. Upadhyay Dr. Bharati R Rehani Prof. A. H. Dafda Atul Prakashan Ahmedabad, January 2020 edition ISBN: 978-93-81518-38-0

(b) Open source software and website:

- https://www.coursera.org/lecture/material-behavior/1-6-composites-R1boo
- https://www.open.edu/openlearn/science-maths-technology/science/chemistry/introduction-polymers/content-section-0?active-tab=description-tab
- https://www.sciencelearn.org.nz/resources/1769-what-are-ceramics
- https://www.classcentral.com/course/swayam-advanced-materials-and-processes-13888 https://ocw.mit.edu/courses/materials-science-and-engineeringsted

* * * * * * *