



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3132107**

**Semester – III**

**Subject Name: Introduction to Materials Engineering**

**Type of course:** Science & Engineering

**Prerequisite:** Appearing in 3110001\_Chemistry

**Rationale:** The course on materials engineering is basic of engineering branch. The materials make modern life possible. In routine life from smaller pin to rocket science without material not possible to engineer the product. This course will provide a firm foundation for the pursuit of graduate studies in metallurgy engineering.

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	0	2	2	70	30	30	20	150

### Content:

Sr. No.	Content	Total Hrs
1	Historical aspects and Scope of materials and metallurgy, Various fields of metallurgical engineering, Status of metallurgical and materials industry in India.	02
2	Classification, properties and applications of Engineering Materials, Engineering requirements of materials, Structure-property relationships in materials, Criteria for selection of materials for engineering applications. Videos and simulations describing materials and their properties with case studies.	05
3	Introduction to manufacturing processes like: Metal forming, joining, casting and powder metallurgy.	05
4	Introduction to mechanical & chemical failure analysis procedure of engineering materials.	02

### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	35	15	0	0

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

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.

### Reference Books:

1. Materials Science and Engineering: An Introduction: William D Callister; Wiley, 2014.
2. Materials and Design: The Art and Science of Material Selection in Product Design, Mike Ashby and Kara Johnson, 3rd Edition, Butterworth-Heinemann, 2014.



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3. Engineering Materials 1 (2011) and 2 (2012), D.R.H. Jones and M.F. Ashby, 4th Edition, Butterworth-Heinemann.
4. Stuff Matters, Mark Miodownik. Penguin, 2014
5. Elements of Metallurgy, D. Swarup, Banaras Hindu University Press, Varanasi.
6. Elements of Materials Science, L. H. Van Vlack, Addison-Wesley.

### Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Acquire broad knowledge of the discipline.	20
CO-2	Analyze the general and special purpose engineering materials with respective manufacturing processes.	65
CO-3	Understand failure analysis procedure of engineering materials.	15

### List of Experiments:

1. Theoretical exercise on various fields of metallurgical engineering with metallurgical and materials industries in India.
2. Classify engineering materials.
3. Select engineering material for a given application.
4. To study manufacturing processes in metallurgy.
5. Visit industry / research laboratories for demonstration of sophisticated and state-of-art instruments related to metallurgy.
6. Practice simulation software used for identification of materials and their properties.
7. Introduce failure investigation procedure of a given sample. (Case Study 1)
8. Introduce failure investigation procedure of a given sample. (Case Study 2)

**Major Equipment:** This is an introductory subject to discipline so equipment's available in different subject laboratories of discipline will be used for demonstration.

### List of Open Source Software/learning website:

1. [nptel.ac.in](http://nptel.ac.in)
2. [www.ocw.mit.edu](http://www.ocw.mit.edu)