GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT NAME: Elements of Metallurgy
SUBJECT CODE: 2132101
B.E. 3RD SEMESTER

Type of course: Engineering Science

Prerequisite: None

Rationale:
The Elements of Metallurgy program is to prepare students for careers in engineering where Material Science can be applied to the advancement of technology. This education at the intersection of engineering and Material Science will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	0	3	70	30		00		00	100

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction to Material Science and Metallurgy :** Classification of Engineering Materials, Engineering requirements of materials, Structure-property relationships in materials, Properties of engineering materials, Criteria for selection of materials for engineering applications.	**06**	**10**
2	**Metallic materials :** Types, Properties and applications, Imperfection in crystals, Elastic and plastic deformation of metallic materials	**05**	**10**
3	**Ceramic and Composite materials:** Classification of ceramics, Structure of ceramics, Properties of Ceramics, Conventional Ceramic, Traditional ceramics, Brick and tile, Cement and cement products, Refractories, Abrasives. Classification of Composites, Wood- a natural composite, Asphalt concrete, Brief description of metal matrix, polymer matrix and ceramic matrix composites.	**08**	**20**
4	**Organic materials :** Polymerization mechanisms, Polymer structures, Classification of polymers, Plastics, Synthetic resins, Rubber	**05**	**10**
5	**Scope of metallurgy :** Various fields of metallurgical engineering, Status of metallurgical and materials industry in India Sources of metals Basic outline of the principles of production of iron and steel, copper, aluminum, zinc, lead.	**05**	**10**

6	**Introduction to Manufacturing processes :** Foundry practice, Rolling, Forging, Extrusion, Wire drawing, tube drawing, Powder metallurgy. Welding, Soldering, Brazing.	**08**	**20**
7	**Material degradation:** Corrosion: Principle, Causes, Types & Characteristics. Corrosion Testing and Protection. Wear: Principle, Causes, Types, Characteristics & Protection.	**08**	**20**

Reference Books:

1. Material Science and Engineering: An Introduction , W. D. Callister, John Wiley.
2. Introduction to Materials Science for Engineers, James, F. Shackelford, Prentice Hall.
3. Engineering Materials and their Applications, Richard A. Flinn and P. K. Trojan, Jaico Pub. House.
4. Elements of Materials Science, L. H. Van Vlack, Addison-Wesley.
5. The Science and Engineering of Materials, Donald R. Askeland and Pradeep P. Phule, Thomson.
6. Elements of Metallurgy, D. Swarup, Banaras Hindu University Press, Varanasi.
7. Materials Science and Processes, S. K. Hajra Choudhary, Indian Book Distributing Co., Ilifo book distributiors Co., Kolkata, 1985
8. Corrosion Engineering, Fontanna M. G. and Green N. D., McGraw Hill

Course Outcome:

After learning the course the students should be able to:

1. The student will demonstrate the ability to think in core concept of their Metallurgy engineering application by studying various topics involved in branch specific applications.
2. The student will demonstrate the ability to use appropriate material to obtain qualitative solutions to Engineering materials.
3. Understand the relevance and importance of the Engineering materials & their suitable Processes.
4. Identify & choose appropriate manufacturing Processes for the selected Metals & alloys.
5. Understand the importance of Corrosion & Wear, their Causes & protection methods.

List of Open Source Software/learning website:

I. http://nptel.iitm.ac.in/
II. www.ocw.mit.edu

Active learning Assignments (AL) : Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The Power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU