

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

METALLURGICAL ENGINEERING

Subject Name: **SELECTION OF MATERIALS AND FAILURE ANALYSIS**

Sr. No.	Course Contents	Total Hrs
1.	Philosophy of material selection, motivation for selection, relationship to available resources, concept of resource base, Criteria for selection of engineering materials – service requirements, ease of manufacturing, availability of materials and cost effectiveness.	6
2.	Selection for mechanical properties like strength, toughness, stiffness, fatigue, creep and temperature resistance.	4
3.	Selection for surface durability like corrosion resistance, wear resistance. Relationship between material selection and material processing.	4
4.	Identification of required properties. Selection of materials based on available property data and optimization to select the best material.	6
5.	Case studies in material selection like materials for bearings, gears, automobile structures, aircraft components, ship structures, etc.	8
6.	Importance of failure analysis and its relationship to material selection, fundamental causes of failure. General practice in failure analysis.	6
7.	Failure- types and characteristics: Identification and characterization of ductile and brittle type of failures. Fracture mechanism, fracture modes and microfractographic features,	8
8.	Concept and Mechanism of Failure: Identification and characterization of fatigue failures. Types of fatigue, corrosion fatigue and contact fatigue, etc. Corrosion and corrosion related failures such as hydrogen embrittlement, stress-corrosion cracking and high temperature failures.	10
9.	In-process failures: Case studies, Service failures : Case studies	8

TEXT/REFERENCES:

1. Selection and Uses of Engineering Materials – F.A.A. Cranes & J.A. Charles, Butterworth & Com.Ltd., London.
2. Engineering Materials – Vol. 1 & 2 – Michael F. Ashby & David R.H. Jones, Pergamon Press, New York.
3. Engineering Materials-Selection and Value Analysis –H.J. Sharp, Elsevier Publishing Company Inc., New York.
4. Analysis of Metallurgical Failures- V.J. Colangelo & F.A. Heiser, John Wiley & Sons, New York.
5. Metals Handbook – Eighth edition – Failure Analysis and Prevention, American Society of Metals, Metals Park, Ohio.
6. Metals Handbook – Eighth edition – Fractography, American Society of Metals, Metals Park, Ohio.
7. Handbook of materials selection - Myer Kutz, John Wiley & Sons, New York.
8. Handbook of materials selection for engineering applications- G.T. Murray, M. Dekker
9. Failure Analysis of Engineering Materials – Charlie R. Brooks and Ashok Chaudhary, McGraw Hill, New York.
10. Metallurgy of Failure Analysis – A.K. Das, McGraw Hill, New York.