

Branch Name:	Mechanical Engineering (CAD/CAM)
Program Code:	ET201
Course Name:	Applied Materials Engineering
Course Code:	2ET2010204T
Pre-requisite Course:	Zeal to learn the subject with UG level material science course knowledge.

Course Objective: This course provides knowledge in the areas of Industrial metallurgy, advanced materials and selection of materials for industrial applications.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	SEE		CCA		SEE		CCA						
	L	T	P	Total	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
2	2	-	-	2	24	60	16	40	-	-	-	-	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Elastic And Plastic Behaviour: Mechanism of Elastic and Plastic deformation, strengthening mechanism, work hardening, solid solutioning, grain boundary strengthening, Poly phase mixture, precipitation, particle fiber and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behavior, Super plasticity.	05	20
2	Fracture Behaviour: Griffith's theory, stress intensity factor and fracture toughness, Toughening mechanisms, Ductile-brittle transition in steel, High temperature fracture, creep, Larson-Miller Parameter, Deformation and fracture mechanism maps, Fatigue.	05	20
3	Selection of Materials: Motivation, cost basis and service requirements, selection for Mechanical properties, strength, toughness, fatigue and creep; Selection for surface durability corrosion and wear resistance, Relationship between materials selection and processing.	05	20
4	Material Processing: Processing of engineering materials, Primary and Secondary processes, stability, Weldability, forgeability and malleability Criteria; Process induced defects, Monitoring and control.	05	20
5	Modern Materials and Treatment: Dual phase steels, high strength low alloy steel, transformation included plasticity steel, maraging steel, smart materials, properties and applications of engineering plastics and composites materials.	05	20

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same. Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (4) ieeexplore.ieee.org (5) scholar.google.co.in or others of similar repute.

List of References:

1. Dieter, G.E., “Mechanical Metallurgy”, McGraw Hill, 1988.
2. Charles, J.A., Crane, F.A.A and Furness, J.A.G., “Selection and use of engineering Materials”, (3 rd Edition, Butterworth – Heiremann, 1977.
3. W. D. Callister, Jr, John Wily and Sons, Inc., “Material Science for Engineers: An Introduction”.
4. James, K.W., Wiley, Intersam, John, “The Hand book of Advance Materials”, Wilson Publishers., 2004.
5. Burakonsa, T.Z. and Wierzchan. T., “Surface Engg of Meterials”- Principles of Equipment, Techniques.
6. Courtney, T.H., “Mechanical Behavior of Materials” ,(2nd edition), McGraw Hill, 2000.
7. Flinn, R.A. and Trojan ,P.K., “Engineering Materials and their Applications” (4th Edition), Jaico, 1999.
8. Metals hand book, vol. 10, “Failure Analysis and Prevention”, (10th edition), 1994.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom’s Taxonomy Level
CLO1	To know the different classes of materials used in engineering applications and would be able to choose the right materials for specific applications.	2 Understanding 3 Applying
CLO2	Have insights on the basic deformation behavior of various materials.	2 Understanding
CLO3	Able to make the right choice of material for a given loading conditions.	5 Evaluating
CLO4	To know the relation of the microstructure and mechanical properties, processing techniques for controlling shape and properties in the final product.	2 Understanding 6 Creating
CLO5	Able to work in R&D activity in the field of materials science.	3 Applying 4 Analyze
CLO6	Has the capacity to design, plan and execute complex processes adhering to environmental considerations and cost effectiveness.	4 Analyze 6 Creating

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	H					H	M	M					M	
CLO2	L	M			M	M			L			H	L	
CLO3	M	H	H	L	M									
CLO4	H			M	L			M			M		M	
CLO5		H	H	H	H	M	M	H		L		M		H
CLO6		H	H		M	M	H	M	M		M			H

H: High, M: Medium, L: Low