



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3162112

Semester – VI

Subject Name: Composite Materials

Type of course: Science & Engineering

Prerequisite: Knowledge of Engineering Materials.

Rationale:

The course on Composite Materials has unable Metallurgical / Materials engineer to meet the demand of the today's world applications, where advances in Technological needs demands High strength, corrosion resistance, fatigue / creep resistant & stiff structure with very lesser densities such as in making of automobiles, aircrafts, space crafts, Sports items etc. This course covers various classes of composite materials, their constituents' phases, manufacturing techniques, characteristics and tastings of the composites and relevant applications in various fields. This course also covers the state of the art fabrication techniques of composite materials and brief introduction to Hybrid composites, green composites & Nono-composites which are currents under trends of research. The aim of this course is to make students conversant with the latest technological materials in demand & their scope of applications.

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)		
2	1	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	Introduction: Definition, history, characteristics, matrices, reinforcements, classifications, advantages and limitations, industrial scenario and applications.	2
2	Material and microstructural parameters of composites. Unidirectional-fibre composites: Fibre characteristics. Longitudinal strength and modulus of composites, minimum and critical fibre volume fractions, factors affecting strength. Transverse strength and modulus.	5
3	Failure modes. Single and multiple fractures. Short-fibre composites: Stress transfer, critical fibre length. Modulus and strength. Whiskers and whisker reinforced composites.	5
4	Particulate composites: Large-particle composites and dispersion-strengthened composites. Cermets. Zirconia toughened ceramics. Interface: Interface characteristics and their effects on adhesive, frictional and mechanical bonding mechanisms. Coupling agents and their role on the properties composites. Interface coatings.	6
5	Properties of composites: Static mechanical properties, fatigue, impact and creep properties, fracture behaviour and damage tolerance.	6
6	Advanced composites: Nanocomposites, hybrid composites, sandwich composites, in-situ composites, smart composites, self-healing composites, carbon-carbon composites, surface	4



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composites.	
	Total
	28

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	35	10	10	05

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. K.K. Chawla, Composite Materials – Science & Engg., Springer- Veslag, New York, 2012.
2. Mel M. Schwartz, Composite Materials: Properties, Non-destructive testing and Repair, Prentice Hall, New Jersey
3. L.J. Broutman and R.M. Krock, Modern Composite Materials, Addison-Wesley, 1967.
4. David A Colling & Thomas Vasilos, Industrial Materials: Polymers, Ceramics and Composites, vol. 2, Prentice Hall, N. Jersey, 1995

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	Knowledge on classification, processing, characterization and applications of various composite materials	80
CO-2	Ability to arrive at deformation and failure mechanisms of composite materials under different loading conditions in engineering applications	20

List of Open Source Software/learning website:

1. nptel.ac.in/courses/101104010/
2. www.doitpoms.com
3. composite.about.com
4. <https://compositesuk.co.uk/composite-materials>
5. www.asminternational.org/documents/10192/1849770/05287G_Sample_Chapter.pdf