GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3162511
Advance Material Processing
SEMESTER VI

Type of course: Departmental elective

Prerequisite: Basic Knowledge of Materials and Material Science

Rationale:

To impart comprehensive knowledge about consideration of advanced material processing techniques.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Rapid Prototyping** **Introduction Stereo Lithography Systems** Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems. Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application. **Selective Laser Sintering Fusion Deposition Modelling** Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications. Fusion Deposition Modelling: Principle, Process parameter, Path generation, Applications. **Solid Ground Curing** Principle of operation, Machine details, Applications. Laminated Object Manufacturing: Principle of operation, LOM materials. Process details, application. **Concepts Modelers** Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems.	**15**
2	**Laser Materials Processing** Fundamentals of industrial lasers. Laser materials interaction theories. Laser processing for various industries such as metals, non-metals, photovoltaic, biomedical applications.	**08**
3	**Ceramic Processing / Powder Processing** Synthesis of common ceramic powders such as Al2O3, ZrO2, Si3N4, and SiC, Powder characterization, Binders, Lubricants, Deflocculants and flocculants as processing aids, shaping techniques such as powder compaction, Extrusion, Injection moldings, Slip casting, Solid state and liquid phase sintering	**07**
4	**Glass Processing** Glass and Glassy State, Glass Compositions and Properties, Raw Materials, Glass Melting, glass furnace and furnace types, Glass Forming Processes, Glass processing, Application of	**07**

	Glass	
5	**Composite Materials** Introduction, Classification of composites, Manufacturing methods: Spray Lay-Up, Wet/Hand Lay-up, Vacuum Bagging, Filament Winding, Pultrusion, Resin Transfer Moulding (RTM), Resin Film Infusion (RFI), Mechanical Properties -Stiffness and Strength	**08**
	Total Hour	**45**

Reference Books:

1. 3D Printing and Additive Manufacturing: Principles and Applications, Chee Kai Chua and Kah Fai Leong, World Scientific
2. Rapid Prototyping, Adithan M., Atlantic Publisher
3. The Handbook of Glass Manufacture, F.Tooley, Tooley, New York : Books for Industry, [1974]
4. Mechanics of composite materials. Robert M.Jones, Taylor and Francis
5. Fundamentals of Ceramic Powder Processing and Synthesis ,Terry A. Ring, Academic Press.
6. Principles of Laser Materials Processing, Elijah Kannatey-Asibu Jr.Wiley

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	15
Comprehension	10
Application	50
Analysis	25
Evaluate	-
Create	-

Course Outcome:

After learning the course the students will able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Demonstrate the principles of advanced material Processing	25
CO-2	Categorized various material processing methods for industrial use.	25
CO-3	Make use of advanced material processing techniques like rapid prototyping, laser cutting, and composite processing for specific applications.	30
CO-4	Utilize material processing for glass and ceramics.	20

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List of Experiments:

1. Case Studies/ Brain storming for different advanced material processing techniques.
2. Case studies to understand various steps of advanced material processing.
3. Study on Laser Materials Processing
4. Case study of 3D Printing
5. Case study of Rapid Prototyping

Major Equipment:

1. Mechnical Workshop.
2. 3D Printer

List of Open Source Software/learning website:

1. http://nptel.ac.in