GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3161922
Advanced Manufacturing Processes
Semester VI

Type of course: Departmental elective

Prerequisite: Basic Knowledge of Manufacturing Processes

Rationale:

To impart comprehensive knowledge about consideration of manufacturing processes and metal removal rate during different advanced processes as well as product development processes.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	**Unconventional Machining Processes:** **Mechanical Energy Based Processes** Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Ultrasonic Machining (USM). Working Principles – equipment used – Process parameters – MRR- Applications. **Electrical Energy Based Processes** Electric Discharge Machining (EDM)- working Principle- equipment used -Process Parameters - Surface Finish and MRR - electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications. **Chemical and Electro-Chemical Energy Based Processes** Chemical machining and Electro - Chemical machining (CHM and ECM) - Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR - Applications. Principles of ECM - equipments-Surface Roughness and MRR Electrical circuit-Process Parameters- ECG and ECH - Applications. **Thermal Energy Based Processes** Laser Beam machining and drilling (LBM), Plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.	**25**
2	**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**	**10**

	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.	
3	**Glass Science** Glass and Glassy State, Glass Compositions and Properties, Raw Materials, Glass Melting, glass furnace and furnace types, Glass Forming Processes, Glass processing, Application of Glass	**5**
4	**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	**5**

Reference Books:

1. Unconventional Machining process, Dr. Senthil, A R S Publishers
2. Modern Machining Processes, P. C. Pandey, H. S. Shan, Tata McGraw-Hill
3. Design for Advanced Manufacturing: Technologies and Processes, LaRoux K. Gillespie, McGraw-Hill Education
4. Advanced Machining Processes / Non Traditional and Hybrid Machining Processes, Hassan El-Hofy,McGraw-Hill
5. The Handbook of Glass Manufacture, F.Tooley, Tooley, New York : Books for Industry, [1974]
6. 3D Printing and Additive Manufacturing: Principles and Applications, Chee Kai Chua and Kah Fai Leong, World Scientific
7. Rapid Prototyping, Adithan M., Atlantic Publisher

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	40
Analysis	20
Evaluate	20
Create	00

Course Outcome:

After learning the course the students will able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Demonstrate the principles of advanced manufacturing processes.	20
CO-2	Distinguish various metal removing processes based on surface finish.	20
CO-3	Select appropriate advanced manufacturing Processes as per row materials and surface finish.	20
CO-4	Identify appropriate advanced material processing techniques for different requirements and applications.	20
CO-5	Compare different advance material processing techniques for industry applications.	20

List of Experiments:

1. Case Studies/ Brain storming for selection criteria for different manufacturing processes.
2. Case studies for cost estimation of various advanced manufacturing processes.
3. Case study of 3D Printing
4. Case study of design for advance machining processes.
5 Case study of Rapid Prototyping

Major Equipment:

1. Lathe Machine, Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Ultrasonic Machining (USM). Electric Discharge Machining (EDM**),** Chemical machining and Electro - Chemical machining (CHM and ECM), Laser Beam machining and drilling (LBM), Plasma Arc machining (PAM) and Electron Beam Machining (EBM)
2. 3D Printer

List of Open Source Software/learning website:

1. http://nptel.ac.in