

ME293: Non-Traditional Manufacturing Processes

Teaching Scheme			Credits C	Marks Distribution				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE	CE	ESE	CE	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Topics	Teaching Hrs.
1	<p><u>Introduction:</u></p> <p>History of nontraditional machining, Classification of nontraditional machining processes.</p>	02
2	<p><u>Thermal Processes:</u></p> <p>Electro-discharge Machining: Mechanism of material removal, machining system, EDM-Spark Circuits, material removal rates, surface integrity, Heat-affected zone, applications, process control, EDM automation, environmental impact, Electrical Discharge Milling, Wire EDM.</p> <p>Laser Beam Machining: Material removal mechanism, types of Lasers, LBM equipment, process characteristics, applications.</p> <p>Electron Beam Machining: Basic equipment and metal removal mechanism, process characteristics, applications.</p> <p>Plasma Beam Machining: Machining systems, material removal rate, accuracy and surface quality, applications.</p> <p>Ion Beam Machining: Introduction, material removal rate, accuracy and surface effects, applications.</p>	09
3	<p><u>Mechanical Processes:</u></p> <p>Ultrasonic Machining: Definitions, characteristics, machining system, material removal process, design of acoustic horns, factors affecting material removal rate, dimensional accuracy and surface quality, applications.</p> <p>Water Jet Machining: Introduction, machining system, process parameters, and applications.</p> <p>Abrasive Jet Machining: Introduction, machining system, material removal rate, applications.</p> <p>Abrasive Water Jet Machining: Process Characteristics, machining system, process capabilities, and applications.</p>	07

4	<u>Chemical Processes:</u>	03
	Chemical Milling: Introduction, tooling for CHM, process parameters, material removal rate, accuracy and surface finish, applications.	
	Photochemical Milling: Introduction, process description, applications.	
5	<u>Electrochemical Processes:</u>	06
	Electrochemical Machining: Principles of electrolysis, theory of ECM, ECM equipment, basic working principles, process characteristics, process control, applications, micro-ECM, environmental impacts.	
	Electrochemical Drilling, Shaped Tube Electrolytic Machining, Electrostream (capillary) Drilling, Electrochemical Jet Drilling, Electrochemical Deburring.	
6	<u>Hybrid Machining Processes:</u>	05
	Hybrid Electrochemical Processes: Electrochemical Grinding, Electrochemical Honing, Electrochemical Superfinishing, Electrochemical Buffing, Ultrasonic-Assisted ECM, Laser-Assisted ECM.	
	Hybrid Thermal Processes: Electro-erosion Dissolution Machining, Electro-discharge Grinding, Abrasive Electro-discharge Machining, EDM with Ultrasonic Assistance, Electrochemical Discharge Grinding, Brush Erosion-Dissolution Mechanical Machining.	
7	<u>Additive Manufacturing:</u>	08
	Basics and definitions: Principle of layer-based technology, advantages, classification.	
	Rapid Prototyping Process Chain: 3D Modeling, Data Conversion and Transmission, Checking and Preparing, model building, post processing.	
	Rapid prototyping techniques: Stereo lithography, Solid Ground Curing (SGC), Fused Deposition Modeling (FDM), Selective Laser Sintering (SLS), Three-dimensional printing, Laminated Object Modeling (LOM).	
	Rapid manufacturing and Rapid tooling.	
<hr/> Total Hrs.		40

Reference Books:

1. Jain V. K., “*Advanced Machining Processes*”, Allied Publishers, New Delhi.
2. Mishra P. K., “*Non-conventional Machining*”, Narosa Publishing House.

3. Hassan El-Hofy, "*Advanced Machining Processes: Nontraditional and Hybrid Machining Processes*", McGraw-Hill Co., New York (2005).
4. Benedict, Gary F., "*Non-Traditional Manufacturing Processes*", Marcel Dekker Inc., New York (1987).
5. Pandey, P. C. and Shan, H. S., "*Modern Machining Processes*", Tata McGraw Hill Co, New Delhi (1980).
6. Chua C. K. and Leong, Lim, "*Rapid Prototyping Principles and Applications*", 2nd edition, John Wiley and Sons.
7. Pham D. T. and Dimov S.S., "*Rapid Manufacturing*", Springer.