

**ME353: NON-TRADITIONAL MANUFACTURING PROCESS**  
**CREDITS = 5 (L=3, T=0, P=2)**

**Course Objective:**

This course provides fundamental principles of non-traditional manufacturing processes, the influencing parameters and processes capability.

**Teaching and Assessment Scheme:**

Teaching Scheme			Credits	Assessment Scheme				Total Marks
L	T	P		Theory		Practical		
			ESE	CE	ESE	CE		
3	0	2	5	70	30	30	20	150

**Course Contents:**

Sr. No.	Topics	Teaching Hrs.
1	<p><b><u>Introduction:</u></b></p> <p>History of nontraditional machining, Classification of nontraditional machining processes.</p>	02
2	<p><b><u>Thermal Processes:</u></b></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Laser Beam Machining: Material removal mechanism, types of Lasers, LBM equipment, process characteristics, applications</li> <li>• Electron Beam Machining: Basic equipment and metal removal mechanism, process characteristics, applications</li> <li>• Plasma Beam Machining: Machining systems, material removal rate, accuracy and surface quality, applications</li> <li>• Ion Beam Machining: Introduction, material removal rate, accuracy and surface effects, applications.</li> </ul>	09
3	<p><b><u>Mechanical Processes:</u></b></p> <ul style="list-style-type: none"> <li>• Ultrasonic Machining: Definitions, characteristics, machining system, material removal process, design of acoustic horns, factors affecting</li> </ul>	07

material removal rate, dimensional accuracy and surface quality, applications

- Water Jet Machining: Introduction, machining system, process parameters, applications
- Abrasive Jet Machining: Introduction, machining system, material removal rate, applications
- Abrasive Water Jet Machining: Process Characteristics, machining system, process capabilities, and applications.

4 **Chemical and Electro Chemical Processes:**

- Chemical Milling: Introduction, tooling for CHM, process parameters, material removal rate, accuracy and surface finish, applications 09
- Photochemical Milling: Introduction, process description, applications
- Electrochemical Processes,*
- 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 Debarring.

5 **Hybrid Machining Processes:**

- Hybrid Electrochemical Processes: Electrochemical Grinding, Electrochemical Honing, Electrochemical Super finishing, Electrochemical Buffing, Ultrasonic-Assisted ECM, Laser-Assisted ECM 05
- 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.

6 **Additive Manufacturing:**

- Basics and definitions: Principle of layer-based technology, advantages, classification 08
- 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.

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**TOTAL 40**

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**List of References:**

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., Leong, Lim, *Rapid Prototyping Principles and Applications*, 2<sup>nd</sup> edition, John Wiley and Sons.
7. Pham D. T. and Dimov S.S., *Rapid Manufacturing*, Springer
8. Production Technology , HMT

**Course Outcomes (COs):**

1. Categorize various types of Non-Traditional manufacturing Processes.
2. Analyze various thermal processes, its process characteristics and its applications.
3. Analyze various mechanical processes, its process characteristics and its applications.
4. Analyze various chemical and electrochemical processes, its process characteristics and its applications.
5. Analyze various hybrid processes, its process characteristics and its applications.
6. Analyze various additive processes, its process characteristics and its applications.