SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)

QUESTION BANK

Year / Semester: III B.Tech / VI Semester **Regulation: R23**

Subject and Code: Unconventional Machining Processes & 23MEC64E

III B.Tech. - VI Semester		
Course Code	**Unconventional Machining Processes (Professional Elective-II)**	**L T P C**
23MEC64E		**2 1 - 3**

PRE-REQUISITES: Manufacturing Technology	
COURSE EDUCATIONAL OBJECTIVES	
1	To acquire knowledge in the elementary mechanism and machinability of materials with different Mechanical energy based Machining Processes.
2	To learn electric discharge machining and wire cut EDM process for machining
3	To know the chemical based and electro chemical based machining process
4	To understand the working of Laser beam and Electron machining process.
5	To make student familiar with various advanced machining operations.

UNIT –1: Mechanical Energy Based Processes: (9)

Mechanical Energy Based Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultra Sonic Machining – Working Principle, Description of Equipment, Process Parameters, Metal Removal Rate, Applications, Advantages and Limitations.

UNIT –2: ELECTRICAL ENERGY BASED PROCESSES (9)

Electrical Energy Based Processes: Electric Discharge Machining – Wire cut EDM - Working Principles, Process Parameters, Applications Advantages and Limitations.

UNIT –3: Chemical and Electro Chemical Energy Based Processes (9)

Chemical and Electro Chemical Energy Based Processes: Chemical Machining and Electro Chemical Machining – Working Principle, Etchants, Maskants, Techniques of Applying - Process Parameters, Electro Chemical Grinding, Electro Chemical Honing, Applications, Advantages and Limitations.

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UNIT –4: THERMAL ENERGY BASED PROCESSES (9)

Thermal Energy Based Processes: Laser Beam Machining and Drilling, Plasma Arc Machining, Electron Beam Machining – Working Principle, Process Parameters, Applications, Advantages and Limitations.

UNIT –5: OTHER ADVANCED MACHINING PROCESS (9)

Magnetic Abrasive Finishing: Principle and working, material removal and surface finish and applications. **Abrasive Flow Finishing:** Principle and working – Process performance. **Electro Stream Drilling**: Principle and working – Process performance. **Shaped Tube Electrolytic Machining**: Principle and working, applications.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to POs		POs
CO1	Understand the working principles of mechanical energy based machining process	PO1, PO2, PO3
CO2	Explain electric discharge machining and wire cut EDM process for machining	PO1, PO2, PO3
CO3	Understand the working of Laser beam and Electron machining process	PO1, PO2, PO3
CO4	Explain the chemical based and electro chemical based machining process.	PO1, PO2, PO3
CO5	Summarize the advanced surface finishing processes and recent developments in the non-traditional machining processes.	PO1, PO2, PO3

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TEXT BOOKS:

1. V. K. Jain, "Advanced Machining Processes", Allied Publishers Pvt. Ltd., New Delhi, 2007.
2. M Adithan, "Unconventional Machining Process", Atlantic Publications, New Delhi, 2014.

REFERENCE BOOKS:

1. Golam Kibria, B. Bhattacharyya and J. Paulo Davim, "Non-traditional Micromachining Processes: Fundamentals and Applications", Springer, 2017.
2. V. K. Jain, "Micro Manufacturing Processes", CRC Press, Taylor & Francis Group, 2013.
3. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology (SI Edition)", Pearson Education, India, 7/e, 2018.
4. Hassan El-Hofy, "Advanced Machining Processes: Nontraditional and Hybrid Machining Processes", McGraw Hill, 2005.
5. Pandey P.C. and Shan H.S., "Modern Machining Processes", Tata McGraw Hill, New Delhi, 1980.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/103/112103202/
2. https://nptel.ac.in/courses/112/104/112104028/
3. https://nptel.ac.in/courses/112/107/112107078/

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
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Max Marks: 10

S.No.	CO	Questions	BT
		Unit-I **Mechanical Energy Based Processes**	
1	**1**	Explain the need for non-traditional machining processes with suitable examples.	L2
2	**1**	With a neat sketch, explain the principle, equipment, and working of Abrasive Jet Machining (AJM).	L2
3	**1**	Explain the applications and limitations of Abrasive Jet Machining.	L2
4	**1**	Describe the working principle of Abrasive Water Jet Machining (AWJM) with neat diagram.	L2
5	**1**	Compare Abrasive Water Jet Machining (AWJM) and Water Jet Cutting (WJC) with respect to applications and limitations.	L4
6	**1**	Explain the mechanics of metal removal in Ultrasonic Machining (USM) with a neat sketch.	L4
7	**1**	List and explain the process parameters affecting Ultrasonic Machining performance.	L4
8	**1**	Describe the working principle and constructional details of Water Jet Machining. Discuss the process parameters, MRR, industrial applications, advantages and limitations.	L2
9	**1**	Compare AJM and WJM with respect to working principle, operating pressure, abrasive usage, MRR, applications, advantages and limitations.	L4
10	**1**	Discuss the advantages and limitations of Mechanical Energy Based Non-Traditional Machining Processes. Compare their suitability for machining brittle and hard materials.	L4

S.No.	CO	Questions	BT
		Unit-II **ELECTRICAL ENERGY BASED PROCESSES**	
1	**2**	Explain the working principle of Electric Discharge Machining (EDM) with a neat sketch. Discuss the equipment setup, process parameters, applications, advantages and limitations.	L2
2	**2**	Explain the working principle of Wire EDM with neat diagram.	L2
3	**2**	Compare EDM and Wire EDM in terms of process, applications, and characteristics	L2

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4	**2**	With a circuit diagram, explain the electrode system and servo control in EDM.	L4
5	**2**	Write a detailed note on the applications and limitations of EDM.	L2
6	**2**	Explain the constructional details of EDM equipment including power supply, tool electrode, dielectric system, servo control system and work tank.	L4
7	**2**	Compare EDM and Wire Cut EDM in terms of working principle, tool design, machining capability, applications, advantages and limitations.	L2
8	**2**	Discuss the advantages and limitations of EDM. Why is EDM not suitable for non-conductive materials?	L4
9	**2**	Explain the factors affecting Metal Removal Rate (MRR) and Tool Wear Rate (TWR) in EDM and WEDM.	L4
10	**2**	Describe the process parameters of WEDM such as wire material, wire tension, pulse frequency, flushing pressure and feed rate.	L4

S.No.	CO	Questions	BT
		Unit III **Chemical and Electro Chemical Energy Based Processes**	
1	**3**	Explain the working principle of Chemical Machining (CHM). Discuss different types of etchants and maskants used in CHM.	**L2**
2	**3**	Explain the working principle of Electro Chemical Machining (ECM) with a neat diagram. Discuss its applications, advantages and limitations.	**L2**
3	**3**	Explain the working principle of Electro Chemical Grinding (ECG). Write its applications, advantages and limitations.	**L2**
4	**3**	Describe the working principle of Electro Chemical Honing (ECH). Compare it with conventional honing process.	**L4**
5	**3**	List the applications of Electrochemical Grinding.	**L1**

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6	**3**	Compare Chemical Machining (CHM) and Electrochemical Machining (ECM) with respect to working principle, material removal mechanism, accuracy, applications, advantages and limitations.	**L4**
7	**3**	Explain the factors affecting Material Removal Rate (MRR) in CHM and ECM. Discuss how these processes achieve stress-free machining.	**L2**
8	**3**	Discuss the applications of Chemical and Electrochemical Machining processes in aerospace, automobile and electronics industries.	**L2**
9	**3**	Explain the working principle of Electrochemical Honing with a neat diagram. Discuss its applications, advantages and limitations.	**L2**
10	**3**	Explain the properties of a good etchant and its effect on material removal rate.	**L4**

S.No.	**CO**	**Questions**	**BT**
		Unit IV **THERMAL ENERGY BASED PROCESSES**	
1	**4**	Explain the working principle of Laser Beam Machining (LBM). Discuss its process parameters, applications, advantages and limitations.	**L2**
2	**4**	Describe Laser Beam Drilling. Explain its working principle and list its industrial applications.	**L2**
3	**4**	Explain the working principle of Plasma Arc Machining (PAM) with a neat sketch. Discuss its process parameters.	**L2**
4	**4**	Discuss the applications, advantages and limitations of Plasma Arc Machining (PAM).	**L2**
5	**4**	Explain the working principle of Electron Beam Machining (EBM) with a neat diagram. Discuss its process parameters.	**L2**
6	**4**	Compare Laser Beam Machining (LBM), Plasma Arc Machining (PAM), and Electron Beam Machining (EBM).	**L4**

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7	**4**	Explain the working principle of Plasma Arc Machining with a neat diagram. Discuss the equipment setup, process parameters, applications, advantages and limitations.	**L2**
8	**4**	Discuss the process parameters of LBM such as laser power, wavelength, pulse duration, spot size and assist gas pressure. Explain their effect on MRR and surface finish.	**L4**
9	**4**	Compare PAM and LBM in terms of heat generation, material removal mechanism, applications, advantages and limitations.	**L4**
10	**4**	Discuss the applications of Thermal Energy Based Non-Traditional Machining Processes in aerospace, automobile and electronics industries.	**L2**

S.No.	CO	Questions	BT
		Unit V **OTHER ADVANCED MACHINING PROCESS**	
1	**5**	Explain the principle and working of Magnetic Abrasive Finishing.	**L2**
2	**5**	Discuss the mechanism of material removal and surface finish in Magnetic Abrasive Finishing.	**L4**
3	**5**	Write short notes on applications of Magnetic Abrasive Finishing.	**L1**
4	**5**	Explain the principle and working of Abrasive Flow Finishing.	**L2**
5	**5**	Discuss the process performance of Abrasive Flow Finishing.	**L4**
6	**5**	Explain the principle of Electro Stream Drilling with neat sketch.	**L2**
7	**5**	Discuss process performance and limitations of Electro Stream Drilling.	**L4**
8	**5**	Explain the working principle of Shaped Tube Electrolytic Machining.	**L2**
9	**5**	Discuss applications of Shaped Tube Electrolytic Machining.	**L1**
10	**5**	Compare Abrasive Flow Finishing and Magnetic Abrasive Finishing.	**L4**

Note: L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating