



MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.



MUST KNOW CONCEPTS

MKC

Mech

2020-21

Course Code & Course Name : 16MEE09& Unconventional Machining Processes

Year/Sem/Sec : IV / VII / A

S.No.	Term	Notation (Symbol)	Concept / Definition / Meaning / Units / Equation / Expression	Units
Unit-I : Introduction				
1	Unconventional Machining process	---	No direct contact between the tool and the work piece. Materials are not stressed and damaged	---
2	Conventional Machining process	---	Direct contact between the tool and the work piece.	---
3	Mechanical Energy Based Processes	---	<ul style="list-style-type: none"> • Abrasive Jet Machining (AJM) • Abrasive Water Jet Machining (AWJM) • Water Jet Machining (WJM) • Ultrasonic Machining (USM) 	---
4	Electrical Energy Based Processes	---	<ul style="list-style-type: none"> • Electro Discharge Machining (EDM) • Wire Cut Electrical Discharge Machining (WCEDM) 	---
5	Electro chemical energy Based Processes	---	<ul style="list-style-type: none"> • Electro Chemical Machining (ECM) • Electro Chemical Grinding (ECG) • Electro Chemical Honing (ECH) • Electro Chemical Deburring (ECD) 	---
6	Thermal energy Based Processes	---	<ul style="list-style-type: none"> • Laser Beam Machining (LBM) • Plasma Arc Machining (PAM) • Electronic Beam Machining (EBM) • Ion Beam Machining (IBM) 	---
Unit-II :Mechanical Energy based processes				
7.	Abrasives In AJM Process	---	Aluminum Oxide, Silicon Carbide, glass powder, Dolomite and specially prepared sodium bicarbonate.	---
8.	Transducer	---	This converts one form of energy into another form of energy. Ex: Piezoelectric transducer	---

9.	Abrasive grain size	---	For roughing work operation grit size of 200-400 For finishing operation, grit size of 800-1000 are used	---
10.	Typical Applications Of UCM	---	Holes as small as 0.1mm can be drilled	---
11.	Water jet Machining process	---	high pressure and high velocity stream of water is used to cut the relatively softer and non-metallic materials	---
12.	Catcher in WJM	---	Absorb the residual energy of the water jet and dissipate the same	---
13.	Horn In Ultrasonic Machining	---	To connect the tool to the transducer, amplifies the amplitude of vibration.	---
14.	SOD	---	Stand-Off-Distance	---
15.	Carrier gas in AJM	---	CO ₂ , Nitrogen, And air.	---
16.	Piezoelectric Effect	---	Mechanical forces are applied to one pair of opposite faces of certain crystals like quartz, tourmaline, etc., equal and opposite electrical charges appear across its other faces.	N/m

Unit -III: Electrical Energy Based Processes

17.	Electrical Discharge Machining	---	Its Spark Erosion Machining process. Melting and evaporation of material takes place.	---
18.	Functions Of Dielectric Fluid	---	Cooling of electrodes, Concentration of spark energy	---
19.	The Dielectric Fluids Commonly Used In EDM	---	Petroleum based hydrocarbon fluids, Paraffin, white sprite, transformer oil, Kerosene, mineral oil, Ethylene glycol and water miscible compounds.	---
20.	Tool Material Used In EDM	---	<ul style="list-style-type: none"> • Copper, brass, alloys of Zinc & tin. • Hardened plain carbon steel • Copper tungsten, silver tungsten, tungsten • Copper graphite and graphite. 	---
21.	Rehardening	---	While metal heated to a temperature above the critical and then rapidly cooled by the flowing dielectric fluid the metal is rehardened.	---
22.	Recast Metal	---	Melted and re-solidifies metal.	---
23.	Electrode Wear	---	A crater is produced in the electrode	---

24.	Wear Ratio	---	Wear ratio is defined as ratio between Work piece material removed and Loss of Electrode material.	---
25.	Debris	---	It is a removed material from the workpiece	---
Unit -IV: Chemical and Electrochemical Energy Based Processes				
26.	ECM	---	It is the controlled removal of metals by the anodic dissolution in an electrolytic medium with supply of current	---
27.	Faraday's first law of electrolysis	---	The amount of any material dissolved or deposited is proportional to the quantity of electrolyte passed.	---
28.	Electrolysis used in ECM	---	15 -20 % NaCl in water, sodium nitrate, potassium nitrate, sodium sulphate, sodium chromate	---
29.	Grinding wheel Material	---	<ul style="list-style-type: none"> • Metal bonded diamond • Aluminum oxide. 	---
30.	Maskants	---	In chemical machining process the areas of the work piece which are not to be machined are covered with a resistant material called resist or maskant	---
31.	Self-adjusting feature in ECM	---	In a constant feed rate the ECM system machining process is inherently self regulated since the MRR tend to approach the feed rate, to maintain the equilibrium the ECM adjust itself and gap remains constant	---
32.	Etch Factor	---	During machining all the exposed surfaces to the etching medium are subjected to undesired undercut which is known as etch factor. The etch factor restricts size of mask.	---
33.	Electrode wear	---	During machining process, the wire electrode (tool) is constantly fed into the work piece. So the wear of tool is practically ignored	---
34.	Electro plating	---	To make coating on the work material. It is a additive process.	---
35.	For producing Micro holes	---	LBM is best suited.	---
36.	For producing small holes	---	EBM is well suited.	---

37.	For deep holes, Honing	---	ECM is well suited	---
38.	For Grinding, Shallow pocketing	---	AJM and EDM are best suited.	---
Unit -V:Therml Energy based processes				
39.	Plasma arc machining	---	Material is removed by directing a high velocity jet of high temperature (11,0000C to 28,0000C) ionized gas on the work piece	---
40.	IEG	---	Inter electrode gap	---
41.	Pulse rectifier	---	Power supply used in EDM and ECM	---
42.	Duty cycle	---	Pulse on time/ Pulse on time + Pulse off time	---
43.	ECM	---	2-20V power supply	---
44.	EDM	---	30-200V power supply	---
45.	LBM	---	10KV /cm ² power supply	---
46.	Laser light	---	Monochromatic whose wavelength does changes for long distance	---
47.	Types of LASER	---	Solid ,gas lasers	---
48.	LBM	---	Cannot be applied for high heat conductivity and high reflecting materials like Al Cu	---
49.	PAM electrodes	---	Zirconium,Hafnium, Tungsten	---
50.	Electron beam machining	---	Kinetic energy of beam convert into heat	---
51.	EBM	---	Conductive and non conductive materials can be machined	---
52.	EBM	---	Can machine High aspect ratio holes 15:1	---
Placement Questions				
53.	Major characteristics of conventional machining		<ul style="list-style-type: none"> • Generally macroscopic chip formation by shear deformation • Material removal takes place due to application of cutting forces energy domain can be classified as mechanical • Cutting tool is harder than work piece at room temperature as well as under machining conditions 	
54.	High frequency vibrations in USM	KHz	20-30	

55.	The percentage of slurry used in USM	%	30	
56.	The key element in water jet machining is a water jet, which travels at velocities as high as	m/s	900.	
57.	Accumulator		Maintains the continuous flow of the high pressure water and eliminates pressure fluctuations.	
58.	Principle of ECM		Michael Faraday discovered that if two electrodes are placed in a bath containing a conductive liquid and D.C. potential is applied across them metal can be depleted from the anode and plated on the cathode	
59.	The current levels in ECD are of the order of	A/cm	6	
60.	A suitable voltage range applied, for the dielectric breaks down	V	50-450	
61.	In this the wires for wire EDM is made of		Brass, copper, tungsten, molybdenum.	
62.	During EBM process electrons with very high velocities can be obtained by using voltage of	V	1, 50,000 V	
63.	Some of the materials more readily machined compared to steel are		Al and Ti alloys	
64.	LASER		Light Amplification by Stimulated Emission of Radiation	
65.	Temperatures in the plasma zone range from		20,000° to 50,000° F	

Faculty Team Prepared

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Signatures

HoD