SCHEME OF COURSE WORK

Course Title	MICRO MACHINING LAB (Virtual lab)		
Course Code	19ME21M3	L P C	0 3 1.5
Program:	M.Tech.		
Specialization:	CAD/CAM		
Semester	II		

Course Outcomes (COs):

At the end of the course, the student will be able to

1	CO1: Describe study pulsed-heating of materials.
2	CO2: Explain erosion mechanism from Lazarenko's model.
3	CO3: Identify various process parameters and study the thermal models of EDM.
4	CO4: Describe laser hardening and spot welding using NdYAG laser system.
5	CO5: Discuss electrochemical machining process and study the effect of process parameters in electrochemical grinding.

Program Outcomes (POs)

At the end of the program, the students in CAD/CAM will be able to

1. acquire fundamentals in the areas of computer aided design and manufacturing
2. apply innovative skills and analyze computer aided design and manufacturing problems critically
3. identify, formulate and solve design and manufacturing problems
4. carry out research related to design and manufacturing
5. use existing and recent CAD/CAM software
6. collaborate with educational institutions, industry and R&D organizations in multidisciplinary teams
7. apply project and finance management principles in engineering projects
8. prepare technical reports and communicate effectively
9. engage in independent and life-long learning and pursue professional practice in their specialized areas of CAD/CAM
10. exhibit accountability to society while adhering to ethical practices
11. act independently and take corrective measures where necessary

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1		M		S	M							
CO-2		M		M	M							
CO-3		M		M	M							
CO-4		M		M	M							
CO-5		M		M	M							

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

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Teaching-Learning and Evaluation

WEEK	TOPIC / CONTENTS	COURSE OUTCOMES	SAMPLE VIVA QUESTIONS	TEACHING-LEARNING STRATEGY	ASSESSMENT METHOD & SCHEDULE
1	To acquaint the user to pulsed-heating technique and its implications, using conduction mode of heat transfer, differing from continuous conventional heating.	CO1	1.What is the working fluid in EDM ? 2.What is the order of pulsing frequency in EDM ?	To study pulsed-heating of materials	Day to day experiments by simulation, Record
2	To understand the effect of variation of pulse time, leading towards variation in desired output. To acquire knowledge regarding erosion characteristics in EDM	CO1	1. What is the order of applied pulses voltage in EDM 2.What is the working pulsing frequency in WEDM ?		
3	To quantify the stock removal rate form basic concept of bulk boiling for metals using Lazeranko's model.	CO2	1. In EDM process, which of the materials the erosion is higher? 2. State the reason for breakdown of EDM fluid.	To study erosion mechanism from Lazarenko's model	
4	To estimate the effect of pulse energy and pulse width on crater depth, crater volume assuming bulk boiling using Lazeranko's model. To understand the phenomenon of over cut, taper and surface finish as a result of variation in pulse energy.	CO2	1.What is Lazarenko theory ? 2.Explain Static field theory.		

5	To acquaint the knowledge of various thermal models considering conduction mode of heat transfer; and a comparative study to estimate crater depth, profile due to heat source.	CO3	1.What are the features of Snoeys Thermal model? 2.What is disc heat source model?	To study various thermal models for EDM	
6	To understand the effect of variation of pulse time, leading towards variation in desired output in context with various thermal models. To acquire knowledge regarding erosion characteristics in EDM. To study the temperature distribution along the crater depth	CO3	1.What is the percentage of energy to be considered for evaluating MRR? 2.Which is the best thermal model considers surface roughness approach.		
7	To study the significance of process parameters viz., voltage, current and pulse on, off time; on Wire EDM process.	CO3	1.What are the process parameters of the wire EDM process? 2.What is flushing pressure ?	To study influence of process parameters on the Wire EDM	
8	To understand the effect of variation of pulse time, leading towards variation in desired output. To acquire knowledge regarding effect of voltage and current on the Material removal rate in WEDM	CO3	1What is the influence of pulse and frequency parameters on desirable output in EDM process? 2.Does porosity in job material affect machining process ?		
9	Mid-Test 1	CO-1, CO-2, CO3			Internal Exam-1 & Viva voce

10	To acquaint the user to the phenomenon of laser hardening; differing from conventional heating.	CO4	1. What are the principles of Laser transformation hardening? 2. What is Beam material interaction?	Laser hardening using NdYAG laser system	
11	To understand the effect of variation of Beam power, Beam spot diameter leading towards variation in desired output	CO4	1.Which are the conditions need to be satisfied for Laser hardening. 2. How do you prepare test specimen for Laser hardening of Grey cast iron?		
12	To acquaint the user to significance of laser welding and its importance in context with typical applications.	CO4	1.What are the process mechanisms of Laser spot welding? 2.What is conduction welding?	Laser spot welding using NdYAG laser system	Day to day experiments by simulation, Record
13	To understand the effect of variation of Beam power/density, leading towards variation in case depth, weld strength. To understand significance of laser welding in comparison with other welding techniques	CO4	1.What are the advantages of Laser spot welding? 2.What are the applications of Laser welding ?		
14	To understand the operating principle of electro chemical machining process.	CO5	1.What is Electrolysis? 2. Explain Faraday law of electrolysis.	Study of Electrochemical machining process	
15	To understand the process parameters affecting the machining process. To understand the significance of governing equation for estimation of Material	CO5	1. Explain the working principle of Electrochemical machining. 2. Name important process parameters effect on the result of ECM process.		

	Removal Rate.				
16	To study the influence of process parameters in electrochemical grinding process.	CO5	1. What is the effect of current density on MRR in Electrochemical grinding? 2. Which is the commonly used metal for grinding wheel.	Study the effect of process parameters in electrochemical grinding	
17	To understand the operating principle of electro chemical grinding process. To understand the process parameters affecting the process	CO-5	1.For grinding steel work piece which is the commonly used abrasive material. 2.What are the process parameters governing MRR in electrochemical grinding?		
18	Backlog Experiment/ Revision/ Practice		.		
19	Mid-Test 2	CO-4, CO-5			Internal Exam-2 & Viva voce
20	END EXAM	All Cos			Experiments & Viva voce