KCG College of Technology, Chennai-600 097

COURSE DELIVERY PLAN-THEORY

Department of Mechanical Engineering

Faculty Name : S. RAMESH, N. PRAGADESH, V GOPAL **Programme/Branch (or Specialization):** B.E - Mechanical

Academic Year : 2016-2017 **Semester/Section** : VI - A / B / C

Course Code and Name : ME 6004 -UNCONVENTIONAL MACHINING PROCESSES (ELECTIVE - I) **University/ Regulation Ref.**: Anna University / 2013

A. Details of the relevant POs & PSOs supported by the course:

PO/PSO No.	Description of the PO/PSO
PO 1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 12	Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technological change.
PSO 1	Model, analyze, design and realize physical systems, components or process by applying principles of three core streams of Mechanical Engineering, i.e.Design, Manufacturing ,Thermal and Fluid Engineering.
PSO 3	Engage in life long learning and follow professional ethics, codes and standards of professional practices.

B. Details of COs supporting the PO/PSOs identified for the course (this data to be included in NBA-CR3-01)
Level of correlation* of the COs with the relevant POs/PSOs

CO Nos.	Description of the COs	Level of correlation* of the COs with the relevant POs/PSOs														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	Classify the various unconventional machining processes.	2	1	-	-	-	2	3	-	-	-	-	2	2	-	2
2	Demonstrate the Mechanical energy based unconventional machining processes.	2	1	-	-	-	2	3	-	-	-	-	2	2	-	2
3	Demonstrate the Electrical energy based unconventional machining processes.	2	1	-	-	-	2	3	-	-	-	-	2	2	-	2
4	Demonstrate the Chemical energy based unconventional machining processes.	2	1	-	-	-	2	3	-	-	-	-	2	2	-	2
5	Demonstrate the Electrochemical energy based unconventional machining processes.	2	1	-	-	-	2	3	-	-	-	-	2	2	-	2
6	Demonstrate the Thermal energy based unconventional machining processes.	2	1	-	-	-	2	3	-	-	-	-	2	2	-	2
Overall correlation**		2	1	-	-	-	2	3	-	-	-	-	2	2	-	2

Note(*): 1- Low level, 2- Medium level and 3- High level
Note (**) Overall correlation of each PO/PSO:
Overall correlation (OC)= (sum of the correlation of each CO to PO)/ (Total number of COsX3)
and is given if OC is less than 1/3, 2 if OC is between 1/3 to 2/3 and 3 if OC is above 2/3

C: Prerequisite If any : (Course Code and Name of the course):
PH 6151 Engineering Physics - I, GE 6163 -Physics and Chemistry Laboratory - I, PH 6251 Engineering Physics - II, ME 6311 Manufacturing technology Laboratory - I, ME 6402 Manufacturing technology - II, ME 6411 Manufacturing technology Laboratory - II, ME 6403 Engineering Materials and Metallurgy.

D. Syllabus of the course:

Unit I INTRODUCTION Unconventional machining Process – Need – classification – Brief overview.
Unit II MECHANICAL ENERGY BASED PROCESSES Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining – Ultrasonic Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR- Applications.
Unit III ELECTRICAL ENERGY BASED PROCESSES Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.
Unit IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES Chemical machining and Electro - Chemical machining (CHM and ECM)-Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR - Applications. Principles of ECM- equipments - Surface Roughness and MRR Electrical circuit - Process Parameters - ECG and ECH - Applications.
Unit V THERMAL ENERGY BASED PROCESSES Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.
E. Content Beyond Syllabus: 1. Dry EDM 2. Application of Cryogenic cooling in Machining.

F. Delivery Resources:

Text Book(s): T1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi, 2007 T2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi, 2007.
Reference Book(s): R1. Benedict. G.F. “Nontraditional Manufacturing Processes”, Marcel Dekker Inc., New York, 1987. R2. Mc Geough, “Advanced Methods of Machining”, Chapman and Hall, London, 1998. R3. Paul De Garmo, J.T. Black, and Ronald . A. Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., 8thEdition, New Delhi , 2001.
On line learning materials (and Others if any): OL 1: **nptel**.ac.in/**courses**/112105126/36 OL 2 : **nptel**.ac.in/**courses**/112105126/39

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Unit No & Title: Unit I INTRODUCTION							
Planned Hour	**Description of Portion to be Covered**	**Relevant CO Nos**	**Highest Cognitive level****	**Delivery method**	**Reference Materials**	**Date and Hour of completion**	**Reason for deviation if any**
1	Introduction, Need for Unconventional Machining Processes	1	K2	Lecture with Discussion	T1,OL1,OL2		
2	Classification of Unconventional Machining Processes	1	K1	Lecture with Discussion	T1,OL1,OL2		
3	Overview of Mechanical Energy based Processes	1	K2	Lecture with Discussion	T1,OL1,OL2		
4	Overview of Electrical Energy based Processes	1	K2	Lecture with Discussion	T1,OL1,OL2		
5	Overview of Chemical and Electrochemical Energy based Processes	1	K2	Lecture with Discussion	T1,OL1,OL2		
6	Overview of Thermal Energy based Processes	1	K2	Lecture with Discussion	T1,OL1,OL2		

No of hours in the syllabus : 6
No of hours planned : 6
No of hours taught :

Faculty **Course Coordinator** **HOD** **Principal**

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Unit No & Title: Unit II MECHANICAL ENERGY BASED PROCESSES							
Planned Hour	**Description of Portion to be Covered**	**Relevant CO Nos**	**Highest Cognitive level****	**Delivery method**	**Reference Materials**	**Date and Hour of completion**	**Reason for deviation if any**
7	Abrasive Jet Machining – Working principle, Equipment used.	2	K2	Lecture with Demonstration	T1,OL1,OL2		
8	Abrasive Jet Machining –Process parameter, MRR, Applications.	2	K2	Lecture with Demonstration	T1,OL1,OL2		
9	Water Jet Machining – Working principle, Equipment used.	2	K2	Lecture with Demonstration	T1,OL1,OL2		
10	Water Jet Machining –Process parameter, MRR, Applications..	2	K2	Lecture with Demonstration	T1,OL1,OL2		
11	Abrasive Water Jet Machining – Working principle, Equipment used.	2	K2	Lecture with Demonstration	T1,OL1,OL2		
12	Abrasive Water Jet Machining – Process parameter, MRR, Applications..	2	K2	Lecture with Demonstration	T1,OL1,OL2		
13	Ultrasonic Machining - Working principle, Equipment used.	2	K2	Lecture with Demonstration	T1,OL1,OL2		
14	Ultrasonic Machining – Transducers used.	2	K2	Lecture with Demonstration	T1,OL1,OL2		
15	Ultrasonic Machining – Process Parameters, MRR and applications.	2	K2	Lecture with Demonstration	T1,OL1,OL2		

No of hours in the syllabus : 9
No of hours planned : 9
No of hours taught :

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Unit No & Title: Unit III ELECTRICAL ENERGY BASED PROCESSES							
Planned Hour	**Description of Portion to be Covered**	**Relevant CO Nos**	**Highest Cognitive level****	**Delivery method**	**Reference Materials**	**Date and Hour of completion**	**Reason for deviation if any**
16	Electric Discharge machining – Working principle	3	K2	Lecture with Demonstration	T1,OL1,OL2		
17	Electric Discharge machining – Equipments used	3	K2	Lecture with Demonstration	T1,OL1,OL2		
18	Electric Discharge machining – Process Parameters	3	K2	Lecture with Demonstration	T1,OL1,OL2		
19	Electric Discharge machining – MRR, Electrode/ tool	3	K2	Lecture with Demonstration	T1,OL1,OL2		
20	Electric Discharge machining – Breakdown mechanism	3	K2	Lecture with Demonstration	T1,OL1,OL2		
21	Electric Discharge machining – Tool wear, Applications	3	K2	Lecture with Demonstration	T1,OL1,OL2		
22	Electric Discharge machining – Dielectric, Flushing methods	3	K2	Lecture with Demonstration	T1,OL1,OL2		
23	Wire cut EDM – Working Principle, Equipments used	3	K2	Lecture with Demonstration	T1,OL1,OL2		
24	Wire cut EDM – Equipment used, Process Parameters, Applications	3	K2	Lecture with Demonstration	T1,OL1,OL2		

No of hours in the syllabus : 9

No of hours planned : 9

No of hours taught :

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Unit No & Title: Unit IV **CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES**							
Planned Hour	**Description of Portion to be Covered**	**Relevant CO Nos**	**Highest Cognitive level****	**Delivery method**	**Reference Materials**	**Date and Hour of completion**	**Reason for deviation if any**
25	Chemical machining - Etchants	4	K2	Lecture with Demonstration	T1,OL1,OL2		
26	Chemical machining - Maskants	4	K2	Lecture with Demonstration	T1,OL1,OL2		
27	Chemical machining - techniques of applying maskants	4	K2	Lecture with Demonstration	T1,OL1,OL2		
28	Chemical machining -Process Parameters, surface finish and MRR	4	K2	Lecture with Demonstration	T1,OL1,OL2		
29	Chemical machining – Applications, Advantages and Disadvantages	4	K2	Lecture with Discussion	T1,OL1,OL2		
30	Principles of ECM	5	K2	Lecture with Demonstration	T1,OL1,OL2		
31	ECM – equipments, construction and working	5	K2	Lecture with Demonstration	T1,OL1,OL2		
32	ECM - Surface Roughness and MRR, Electrical circuit	5	K2	Lecture with Demonstration	T1,OL1,OL2		
33	ECM - Process Parameters, Tool material, design and insulation	5	K2	Lecture with Demonstration	T1,OL1,OL2		
34	ECG - construction and working, Applications	5	K2	Lecture with Demonstration	T1,OL1,OL2		
35	ECH - construction and working, Applications	5	K2	Lecture with Demonstration	T1,OL1,OL2		

No of hours in the syllabus : 11
No of hours planned : 11
No of hours taught :

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Unit No & Title: Unit V THERMAL ENERGY BASED PROCESSES							
Planned Hour	**Description of Portion to be Covered**	**Relevant CO Nos**	**Highest Cognitive level****	**Delivery method**	**Reference Materials**	**Date and Hour of completion**	**Reason for deviation if any**
36	Laser Beam machining (LBM) – Principles, Equipment	6	K2	Lecture with Demonstration	T1,OL1,OL2		
37	LBM – Lasing Materials,Types,	6	K2	Lecture with Demonstration	T1,OL1,OL2		
38	LBM – Applications, Advantages and Limitations	6	K3	Lecture with Discussion	T1,OL1,OL2		
39	Plasma Arc machining (PAM) – Principles, Equipment	6	K2	Lecture with Demonstration	T1,OL1,OL2		
40	PAM – Types, Gases used, Process parameters	6	K3	Lecture with Demonstration	T1,OL1,OL2		
41	PAM – Applications, Advantages and Disadvantages	6	K2	Lecture with Discussion	T1,OL1,OL2		
42	Electron Beam Machining (EBM) - Principles, Equipment	6	K3	Lecture with Demonstration	T1,OL1,OL2		
43	EBM - Mechanics	6	K3	Lecture with Demonstration	T1,OL1,OL2		
44	EBM - Process parameters	6	K2	Lecture with Demonstration	T1,OL1,OL2		
45	EBM - Applications, Advantages and Disadvantages	6	K2	Lecture with Discussion	T1,OL1,OL2		

No of hours in the syllabus : 10
No of hours planned : 10
No of hours taught :

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Note (**) Highest Cognitive level to be included in the course delivery plan as detailed in NBA-CR3-03

Notes:

1) NBA-CR3-01 (CO evaluation for the course) to be completed for the course at the end of the semester.

2) For common courses between branches and sections, the lesson plan to be prepared jointly among the faculty members handling the course ensuring same PSO/PO/CO mapping and assessment methods