

**DEPARTMENT OF PRODUCTION TECHNOLOGY**  
**MADRAS INSTITUTE OF TECHNOLOGY CAMPUS**  
**ANNA UNIVERSITY : : CHENNAI – 600 044.**

**COURSE PLAN**

**COURSE DETAILS:**

Degree	B.E.		
Programme Name	Mechanical Engineering		
Course Code & Title	<b>MF5651 – NON - TRADITIONAL MACHINING PROCESSES</b>		
Credits	3	Session	Jan 2024 – May 2024
Course Type	Theory/ Theory-with Lab/ Lab	Section	
Name of the Faculty	<b>Dr.C. NANDAKUMAR</b> Associate Professor Department of Production Technology MIT, Anna University, Chennai – 600044.		

**COURSE CONTENT:**

**Syllabus:** (Approved Syllabus as per Regulation 2019)

**MF5651**

**NON - TRADITIONAL MACHINING PROCESSES**

**L T P C**

**3 0 0 3**

**COURSE OBJECTIVES:**

- To classify non-traditional machining processes and describe mechanical energy based Non-traditional machining processes.
- To differentiate chemical and electro chemical energy based processes.
- To describe thermo-electric energy based processes
- To explain Nano finishing processes.
- To introduce hybrid non-traditional machining processes and differentiate hybrid non-traditional machining processes

**UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9**

Introduction - Need for non-traditional machining processes - Classification of non-traditional machining processes - Applications, advantages and limitations of non-traditional machining processes - Abrasive jet machining, Abrasive water jet machining, Ultrasonic machining their principles, equipment, effect of process parameters, applications, advantages and limitations.

**UNIT II CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES 9**

Principles, equipments, effect of process parameters, applications, advantages and limitations of Chemical machining, Electro-chemical machining, Electro-chemical honing, Electro-chemical grinding, Electro chemical deburring.



**UNIT III THERMO-ELECTRIC ENERGY BASED PROCESSES 9**  
Principles, equipments, effect of process parameters, applications, advantages and limitations of Electric discharge machining, Wire electric discharge machining, Laser beam machining, Plasma arc machining, Electron beam machining, Ion beam machining.

**UNIT IV NANO FINISHING PROCESSES 9**  
Principles, equipments, effect of process parameters, applications, advantages and limitations of Abrasive flow machining – Chemo mechanical polishing, Magnetic abrasive finishing, Magnetorheological finishing, Magneto rheological abrasive flow finishing.

**UNIT V HYBRID NON-TRADITIONAL MACHINING PROCESSES 9**  
Introduction - Various hybrid non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Selection and comparison of different non-traditional machining processes.

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES:**

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

**CO1:** Formulate different types of non-traditional machining processes and evaluate mechanical energy based non-traditional machining processes.

**CO2:** Illustrate chemical and electro chemical energy based processes.

**CO3:** Evaluate thermo-electric energy based processes.

**CO4:** Interpret nano finishing processes.

**CO5:** Analyse hybrid non-traditional machining processes and differentiate nontraditional machining processes.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.9	-	-	-	-	-	0.3	-	-	0.3	-	0.3	0.6	0.6	0.6
2	0.9	-	0.3	-	0.3	-	0.3	-	-	0.3	-	0.3	0.6	0.6	0.6
3	0.9	-	0.3	-	0.3	-	0.3	-	-	0.3	-	0.3	0.6	0.6	0.6
4	0.9	-	0.6	-	0.3	-	0.3	-	-	0.3	-	0.3	0.6	0.6	0.6
5	0.9	-	0.9	0.6	0.9	-	0.3	-	-	0.3	-	0.3	0.9	0.9	0.9

### **TEXT BOOKS:**

1. Adithan. M., "Unconventional Machining Processes", Atlantic, New Delhi, India, 2009. ISBN 13: 9788126910458
2. Anand Pandey, "Modern Machining Processes", Ane Books Pvt. Ltd., New Delhi, India, 2019.

### **REFERENCES :**

1. Benedict, G.F., "Non-traditional Manufacturing Processes", Marcel Dekker Inc., New York 1987. ISBN-13: 978-0824773526.
2. Carl Sommer, "Non-Traditional Machining Handbook", Advance Publishing., United States, 2000, ISBN-13: 978-1575373256.



3. Golam Kibria, Bhattacharyya B. and Paulo Davim J., "Non-traditional Micromachining Processes: Fundamentals and Applications", Springer International Publishing., Switzerland, 2017, ISBN:978-3-319-52008-7.
4. Jagadeesha T., "Non-Traditional Machining Processes", I.K. International Publishing House Pvt. Ltd., New Delhi, India, 2017, ISBN-13: 978-9385909122.
5. Kapil Gupta, Neelesh K. Jain and Laubscher R.F., "Hybrid Machining Processes: Perspectives on Machining and Finishing", 1st edition, Springer International Publishing., Switzerland, 2016, ISBN-13: 978-3319259208.

**COURSE ALIGNED PROGRAMME OUTCOMES (PO) & PROGRAMME SPECIFIC OUTCOMES (PSO)**

PO	Programme Outcome
1	Graduate will demonstrate strong basics in mathematics, science and engineering which serve as the foundation for the Programme.
2	Graduate will demonstrate the ability to design and conduct experiments, as well as to analyse and interpret data in the spheres of fundamental engineering.
3	Graduate will demonstrate the ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
4	Graduate will become familiar with modern engineering tools and analyse the problems within the domains of Production Technology as the members of multidisciplinary teams
5	Graduate will acquire the capability to identify, formulate and solve engineering problems related to production engineering.
6	Graduate will demonstrate an understanding of professional and ethical responsibility with reference to their career in the field of production engineering.
7	Graduate will be able to communicate effectively both in verbal and non verbal forms.
8	Graduate will be trained towards developing and understanding the impact of development of Production Technology on global, economic, environmental and societal context.
9	Graduate will be capable of understanding the value for life-long learning.
10	Graduate will demonstrate knowledge of contemporary issues pertaining to the health and well being of desirable living forms inhabiting the environment.
11	Graduate will demonstrate the ability to use the techniques, skills and modern engineering tools necessary for engineering practice in the field of Production Engineering.
12	Graduate will be able to design and develop innovative/ manufacturable / marketable / environmental friendly products useful to the nation and the society.

PSO	Graduates demonstrate
1	Knowledge on Production system: Familiarization of basic and advanced systems and practices.
2	Knowledge on design, analysis and development: Familiarization of system for Production processes, automation and quality systems.
3	Foundation of continuous improvement: Knowledge on application of appropriated materials, production processes and production system and development of an optimal solution to achieve continuous improvement to cater the needs of industry and society.



### COURSE TENTATIVE SCHEDULE / PLAN

Week	Day	Date	Hrs	Unit	Topics	Mode of Lecture	Text / Ref.
				1	<b>INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES</b>	<b>Chalk and Talk, PPT, Videos</b>	
1	Monday	22.01.2024	3	1	Introduction		T2
	Tuesday	23.01.2024	1	1	Need for non-traditional machining processes		T1
			2	1	Classification of non-traditional machining processes		T1
2	Monday	29.01.2024	3	1	Applications, advantages and limitations of non-traditional machining processes		T1
	Tuesday	30.01.2024	1	1	Abrasive jet machining		T1
			2	1	Abrasive water jet machining		T1
3	Monday	05.02.2024	3	1	Ultrasonic machining their principles, equipment.		T1
	Tuesday	06.02.2024	1	1	Ultrasonic machining - effect of process parameters, applications.		T1
			2	1	Ultrasonic machining - advantages and limitations.		T2
				2	<b>CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES</b>	<b>Chalk and Talk, PPT, Videos</b>	T1
4	Monday	12.02.2024	3	2	Principles, equipments, effect of process parameters - Chemical machining.		T1
	Tuesday	13.02.2024	1	2	Applications, advantages and limitations - Chemical machining.		T1
			2	2	Principles, equipments, effect of process parameters - Electro-chemical machining.		T1
5	Monday	19.02.2024	3	2	Applications, advantages and limitations - Electro-chemical machining.		T1
	Tuesday	20.02.2024	1	2	Principles, equipments, effect of process parameters, applications, advantages and limitations - Electro-chemical honing.		T1
			2	2	Principles, equipments, effect of process parameters - Electro-chemical grinding.		T1
6	Monday	26.02.2024	3	2	Applications, advantages and limitations - Electro-chemical grinding.		T1

	Tuesday	27.02.2024	1	2	Principles, equipments, effect of process parameters - Electro chemical deburring.		T1
			2	2	Applications, advantages and limitations - Electro chemical deburring.		
				3	<b>THERMO-ELECTRIC ENERGY BASED PROCESSES</b>	Chalk and Talk, PPT, Videos	
7	Monday	04.03.2024	3	3	Principles, equipments, effect of process parameters - Electric discharge machining		T1
	Tuesday	05.03.2024	1	3	Applications, advantages and limitations - Electric discharge machining.		T1
			2	3	Principles, equipments, effect of process parameters, applications, advantages and limitations – Wire Electric discharge machining.		T1
8	Monday	11.03.2024	3	3	Principles, equipments, effect of process parameters, applications, advantages and limitations – Laser beam machining.		T1
	Tuesday	12.03.2024	1	3	Principles, equipments, effect of process parameters - Plasma arc machining.		T1
			2	3	Applications, advantages and limitations - Plasma arc machining.		T1
9	Monday	18.03.2024	3	3	Principles, equipments, effect of process parameters, applications, advantages and limitations – Electron beam machining		T1
	Tuesday	19.03.2024	1	3	Principles, equipments, effect of process parameters - Ion beam machining.		T2
			2	3	Applications, advantages and limitations - Ion beam machining.		T1
10				4	<b>NANO FINISHING PROCESSES</b>	Chalk and Talk, PPT, Videos	T1
	Monday	25.03.2024	3	4	Principles, equipments, effect of process parameters, applications, advantages and limitations – Abrasive flow machining.		T1
	Tuesday	26.03.2024	1	4	Principles, equipments, effect of process parameters - Chemo mechanical polishing.		T2
			2	4	Applications, advantages and limitations - Chemo mechanical polishing.		T2



11	Monday	08.04.2024	3	4	Principles, equipments, effect of process parameters - Magnetic abrasive finishing.	Chalk and Talk, PPT, Videos	T1,T2
12	Monday	15.04.2024	3	4	Applications, advantages and limitations - Magnetic abrasive finishing.		T1
	Tuesday	16.04.2024	1	4	Principles, equipments, effect of process parameters - Magnetorheological finishing.		T1
2			4	Applications, advantages and limitations - Magnetorheological finishing.	T1		
13	Monday	22.04.2024	3	4	Principles, equipments, effect of process parameters - Magneto rheological abrasive flow finishing.		T2
	Tuesday	23.04.2024	1	4	Applications, advantages and limitations - Magneto rheological abrasive flow finishing.		
				5	<b>HYBRID NON-TRADITIONAL MACHINING PROCESSES</b>		T2
	Tuesday	23.04.2024	2	5	Introduction		T2
14	Monday	29.04.2024	3	5	Various hybrid non-traditional machining processes - their working principles		T1
	Tuesday	30.04.2024	1	5	Various hybrid non-traditional machining processes - equipments		T2
			2	5	Various hybrid non-traditional machining processes - effect of process parameters		T2
15	Monday	06.05.2024	3	5	Various hybrid non-traditional machining processes - effect of process parameters		T2
	Tuesday	07.05.2024	1	5	Various hybrid non-traditional machining processes - applications		T2
			2	5	Various hybrid non-traditional machining processes - advantages		T2
16	Monday	13.05.2024	3	5	Various hybrid non-traditional machining processes - limitations		T1
	Tuesday	14.05.2024	1	5	Selection and comparison of different non-traditional machining processes.		T1
			2	5	Selection and comparison of different non-traditional machining processes.	T2	

**COURSE DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

<input checked="" type="checkbox"/> Chalk & Talk	<input checked="" type="checkbox"/> Stud. Assignments	<input checked="" type="checkbox"/> Web Resources
<input checked="" type="checkbox"/> LCD/Smartboards	<input checked="" type="checkbox"/> Stud. Seminars	<input type="checkbox"/> Add-On Courses

**COURSE ASSESSMENT METHODOLOGIES-DIRECT**

<input checked="" type="checkbox"/> University (End Semester) Examination	<input checked="" type="checkbox"/> Internal Assessment Tests		
<input checked="" type="checkbox"/> Assignments	<input type="checkbox"/> Laboratory Practices	<input type="checkbox"/> Mini/Major Projects	<input checked="" type="checkbox"/> Stud. Seminars
<input type="checkbox"/> Viva Voce	<input type="checkbox"/> Certifications	<input type="checkbox"/> Add-On Courses	<input type="checkbox"/> Others

**COURSE ASSESSMENT METHODS**

S.N.	Mode of Assessment	Date	Duration	% Weight
1	Internal Assessment Tests1		1½ hr	25 %
2	Internal Assessment Tests2		1½ hr	25 %
3.	University Examination		3 hr	50 %
Additional marks may be given for Assignments / Group/ Team Seminar Presentation)				

**COURSE ASSESSMENT METHODOLOGIES-INDIRECT**

<input checked="" type="checkbox"/> Assessment of CO (By Feedback, Once)	<input checked="" type="checkbox"/> Student Feedback On Faculty (Once)
<input type="checkbox"/> Assessment of Mini/Major projects by Ext. Experts	<input type="checkbox"/> Others

**COURSE (EXTRA) ESSENTIAL READINGS:**

1. VIDEO LINK: <https://archive.nptel.ac.in/courses/112/105/112105212/>

**COURSE EXIT SURVEY** (will be collected at end of the course)

The purpose of this survey is to find out from students about their learning experiences and their thoughts about the course.

COURSE OUTCOMES	STUDENTS RATING Low (1) /Medium(2)/High(3)
CO1:	3
CO2:	1
CO3:	2
CO4:	1
CO5:	3



PROGRAMME OUTCOMES	STUDENTS RATING Low (1) /Medium(2)/High(3)
PO1	3
PO2	2
PO3	1
PO4	1
PO5	2
PO6	3
PO7	3
PO8	2
PO9	2
PO10	1
PO11	1
PO12	3
Average	2

PROGRAMME SPECIFIC OUTCOMES	STUDENTS RATING Low (1) /Medium(2)/High(3)
PSO1	2
PSO2	3
PSO3	2

#### COURSE POLICY (Compensation Assessment)

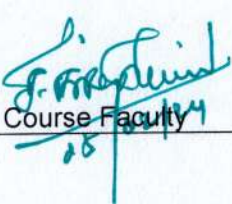
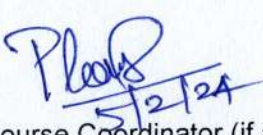
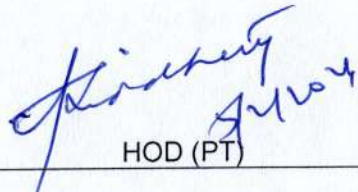
1. Attending all the assessment is mandatory for every student
2. Course policy will be followed as per the academic course regulation

#### COURSE ACADEMIC DISHONESTY AND PLAGIARISM

1. All rules and regulation prescribed by the ACOE, University Departments, are applicable in the Internal Assessment Tests and University (End Semester) Examinations. ([https://acoe.annauniv.edu/download\\_forms/student\\_forms/Guidelines.pdf](https://acoe.annauniv.edu/download_forms/student_forms/Guidelines.pdf))
2. In general, possessing a mobile phone, carrying bits of paper with materials, talking to other students, copying from other students during Internal Assessment Tests and University (End Semester) Examinations will be treated as Malpractice and punishable as per the rules and regulations. The misuse of Assignment / Project / Seminar works from others is considered as academic dishonesty and will be treated with the rules and regulations of the University.

#### COURSE ADDITIONAL INFORMATION

Queries / clarifications / discussion (if required) may be e-mailed to / contact the course instructors during their Office Hours.

For Approval		
 Course Faculty	 Course Coordinator (if any)	 HOD (PT)