COURSE MODULE

Faculty Name/s:			**Academic Year: 2025 - 2026**				
Department: **Mechanical Engineering**							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BME755A	**Introduction to Non-Traditional Machining**	**Elective**	**General science, Manufacturing Process**	**3**	**-**	**-**	**40**

Objectives	**Course objectives** • To appreciate the differences between conventional and non-conventional machining processes. • To acquire a functional understanding of non-traditional manufacturing equipment. • To know about various process parameters and their influence on performance and their applications. • To impart knowledge on various types of energy involved in non-traditional machining processes.
Teaching-Learning Process (General Instructions)	These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. • Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations. • Chalk and Talk method for Problem Solving. • Adopt flipped classroom teaching method. • Adopt collaborative (Group Learning) learning in the class. • Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.

MODULE 1

Introduction to Non-traditional machining, Need for Non-traditional machining process, comparison between traditional and non-traditional machining, general classification Non-traditional machining processes, classification based on nature of energy employed in machining, selection of non-traditional machining processes, Specific advantages, limitations and applications of non-traditional machining processes.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving/White board

MODULE 2

Ultrasonic Machining (USM): Introduction, Equipment and material process, Effect of process parameters: Effect of amplitude and frequency, Effect of abrasive grain diameter, effect of slurry, tool & work material. Process characteristics: Material removal rate, tool wear, accuracy, surface finish, applications, advantages & limitations of USM.

Abrasive Jet Machining (AJM): Introduction, Equipment and process of material removal, process variables: carrier gas, type of abrasive, work material, stand-off distance (SOD). Process characteristics-Material removal rate, Nozzle wear, accuracy & surface finish. Applications, advantages & limitations of AJM.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving/White board

MODULE 3

Electrochemical Machining (ECM): Introduction, Principle of electro chemical machining, ECM, elements of ECM operation, Chemistry of ECM. ECM Process characteristics: Material removal rate, accuracy, surface finish. Process parameters: Current density, Tool feed rate, Gap between tool & work piece, velocity of electrolyte flow, type of electrolyte, its concentration temperature, and choice of electrolytes. ECM Tooling: ECM tooling technique & example, Tool & insulation materials. Applications
ECM: Electrochemical grinding and electrochemical honing process. Advantages, disadvantages and application of ECG, ECH.

Chemical Machining (CHM): Elements of the process, Resists (maskants), Etchants. Types of chemical machining process-chemical blanking process, chemical milling process. Process characteristics of CHM: material removal rate, accuracy, surface finish, advantages, limitations and applications of chemical machining process.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving/White board

MODULE 4

Electrical Discharge Machining (EDM): Introduction, mechanism of metal removal, EDM equipment: spark erosion generator (relaxation type), dielectric medium-its functions & desirable properties, electrode feed control system.
Flushing types; pressure flushing, suction flushing, side flushing, pulsed flushing. EDM process parameters: Spark frequency, current & spark gap, surface finish, Heat Affected Zone. Advantages, limitations & applications of EDM, Electrical discharge grinding, Traveling wire EDM.

Plasma Arc Machining (PAM): Introduction, non-thermal generation of plasma, equipment mechanism of metal removal, Plasma torch, process parameters, process characteristics. Safety precautions. Safety precautions, applications, advantages and limitations.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving/White board

MODULE 5

Laser Beam Machining (LBM): Introduction, generation of LASER, Equipment and mechanism of metal removal, LBM parameters and characteristics, Applications, Advantages & limitations.**Electron Beam Machining (EBM):** Introduction, Principle, equipment and mechanism of metal removal, applications, advantages and limitations.

Teaching-Learning Process	1. Power-point Presentation, 2. Video demonstration or Simulations, 3. Chalk and Talk are used for Problem Solving/White board

Suggested Learning Resources:

Books

1 Modern Machining Process by P.C Pandey and H S Shah McGraw Hill Education India Pvt. Ltd. 2000

2 Production technology HMT McGraw Hill Education India Pvt. Ltd 2001

Reference Books

1 New Technology Dr. Amitabh Bhattacharyya the Institute of Engineers (India) 2000

2 Modern Machining process Aditya 2002

		Course outcomes On completion of the course, the students will be able to	**RBT Level**
Course Outcomes	**CO1**	**Describe** non-traditional machining process and **compare** with traditional machining process. R**ecognize** the need for Non-traditional machining process.	**L3**
	CO2	**Describe** the constructional features, performance parameters, process characteristics, applications, advantages, and limitations of USM, AJM and WJM.	**L3**
	CO3	**Characterize** the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages, and limitations.	**L3**
	CO4	**Illustrate** the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM	**L3**
	CO5	**Elucidate** the LBM equipment, LBM parameters, and characteristics. **Describe** EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.	**L3**

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Case studies
- Quiz
- Topic Seminar presentation
- Assignments

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BME755A	TITLE: Introduction to Non-Traditional Machining					Faculty Name:					
List of Course Outcomes	Program Outcomes											Total
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO-1	2	3	-	-	-	-	-	-	-	-	2	2	**9**
CO-2	2	3	-	-	-	-	3	-	-	-	2	2	**12**
CO-3	2	3	-	-	-	-	3	-	-	-	2	2	**12**
CO-4	2	3	-	-	-	-	3	-	-	-	2	2	**12**
CO-5	2	3	-	-	-	-	3	-	-	-	2	2	**12**
Total	**10**	**15**	**-**	**-**	**-**	**-**	**12**	**-**	**-**	**-**	**10**	**10**	**57**

Note:3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribution

The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Subject Code: BME755A	TITLE: Introduction to Non-Traditional Machining	Faculty Name:	
List of Course Outcomes	Program Specific Outcomes		
	PSO1	PSO2	Total
CO-1	-	-	-
CO-2	2	3	5
CO-3	2	3	5
CO-4	2	3	5
CO-5	2	3	5
Total	**08**	**12**	**20**

Note:3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribution