

**B. E. MECHANICAL ENGINEERING**  
**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)**  
**SEMESTER – VI**  
**Professional Elective- 1**

**NON-TRADITIONAL MACHINING**

Course Code	18ME641	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

**Course Learning Objectives:**

- To learn various concepts related to modern machining processes & their applications.
- 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.

**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.

**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, surface finish, accuracy, applications, advantages & limitations of AJM.

**Module-3**

**ELECTROCHEMICAL MACHINING (ECM):** Introduction, Principle of electro chemical machining, ECM equipment, 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 ECM, 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.

**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.

**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.

**Course Outcomes:** At the end of the course, the student will be able to:

CO1: Understand the compare traditional and non-traditional machining process and recognize the need for Non- traditional machining process.

CO2: Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.

CO3: Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.

CO4: Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.

CO5: Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

SI No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbook/s</b>				
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
<b>Reference Books</b>				
1	New Technology	Dr. Amitabha Bhattacharyya	The Institute of Engineers (India)	2000
2	Modern Machining process	Aditya		2002