

UNCONVENTIONAL MACHINING PROCESSES
(Professional Elective - VI)

B.Tech. IV Year II Sem.
Course Code: ME863PE

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Course Overview:

The objective of this course is to introduce the student to more advanced topics in the machining processes. The concept of material removal by an edged tool, involving plastic deformation and formation of chips, has been known to man for several hundred years. In recent years on increasing demand for the machining of components of complex shape made hard, difficult-to-machine materials with exacting tolerances and surface finish has resulted in the development of a number of new machining processes.

Course Objectives:

1. To teach the modeling technique for machining processes
2. To teach interpretation of data for process selection
3. To teach the mechanics and thermal issues associated with chip formation
4. To teach the effects of tool geometry on machining force components and surface finish
5. To teach the machining surface finish and material removal rate

Course Outcomes:

1. Understand the basic techniques of machining processes modeling
2. Understand the mechanical aspects of orthogonal cutting mechanics
3. Understand the thermal aspects of orthogonal cutting mechanics
4. Ability to extend, through modeling techniques, the single point, multiple point and abrasive machining processes
5. Estimate the material removal rate and cutting force, in an industrially useful manner, for practical machining processes.

UNIT – I

Introduction – Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.

Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

UNIT - II

Abrasive Jet Machining, Water Jet Machining And Abrasive Water Jet Machine: Basic principles, equipments, process variables, and mechanics of metal removal, MRR, application and limitations.

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple

problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

UNIT - III

Thermal Metal Removal Processes: General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT – IV

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT - V

Application of plasma for machining, metal removing mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining – principle - maskants - applications.

Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, shaped tube electrolyte machining.

TEXT BOOKS:

1. Advanced Machining Processes / VK Jain / Allied publishers
2. Modern Machining Processes - P. C. Pandey, H. S. Shan

REFERENCE BOOKS:

1. Manufacturing Engineering And Technology By Serope Kalpakjain, Pearson Publications. 2001
2. Manufacturing Engineering & Technology, Kalpakjain
3. Unconventional Manufacturing Processes, Singh M.K