

Engineering Program

Specialization Production and Computer Aided Manufacturing Technology

Course Number ۰۲۰۲۰۲۲۹۰

Course Title **Nontraditional Manufacturing**

Credit Hours (3)

Theoretical Hours (1)

Practical Hours (6)

Brief Course Description:

This course will cover the Non-traditional manufacturing processes, where is no Sharp tool is needed, classification, specification, components and process diagram, operation of those machines, electrodes. Mechanical Energy Processes, Electrochemical Machining Processes, Thermal Energy Processes, Chemical Machining, 3d Printing. Applications and Safety considerations.

Course Objectives:

At the end of this course student will be able to:

1. To distinguish between different non-traditional manufacturing machines (principle and procedure, equipment and tools, and advantages and disadvantages)
2. Create technical files and design preparation for different non-traditional manufacturing
3. Construct 3D models CAD then manufacturing these models CAM.
4. Adjust manufacturing parameters (current, resistance, forces, pressures, ...)
5. Make projects by manufacturing and assembly of specific parts.

Detailed Course Description:

Number	Title	Content	Time
	Comparison of traditional and non-traditional machining processes Advantages Disadvantages Limitations		
	Mechanical Energy Processes	Ultrasonic Machining Water Jets Processes: Water Jet Cutting Abrasive Water Jet Cutting Nontraditional Abrasive Processes: Abrasive Jet Machining Abrasive Flow Machining	
	Electrochemical Machining Processes	Electrochemical Machining Electrochemical Deburring Electrochemical Grinding	
	Thermal Energy Processes	Electric Discharge Processes: Electric discharge machining Electric discharge wire cutting Electron Beam Machining Laser Beam Machining Arc-Cutting Processes: Plasma Arc Cutting Air Carbon Arc Cutting gas metal arc cutting shielded metal arc cutting gas tungsten arc cutting Carbon arc cutting. Oxyfuel-Cutting Processes (flame cutting)	

	Chemical Machining	Mechanics Chemical Machining: Cut and peel Photoresist (photographic resist) Screen resist	
		Chemistry of Chemical Machining	
		Chemical Machining Processes: Chemical Milling Chemical Blanking Chemical Engraving Photochemical machining	
	3d printing	The additive manufacturing concept: Binder jetting Directed energy deposition Material extrusion Material jetting Powder bed fusion Sheet lamination Vat photo polymerization	
		Additive Manufacturing File	
	Application Considerations	Workpart Geometry and Work Materials Performance of Nontraditional Processes	
	Safety considerations		
	Components and process diagram		
	Related calculations, use of related data tables		
	Electrodes		
	Operation of non-traditional machines		
	Applications in a specialized work shop		

Evaluation Strategies:

Evaluation		Percentage	Date
Exams	Midterm	20%	
	Final Exam	50%	
Projects and Laboratory Assignments		30%	

Teaching Methodology:

- Workshop practicing
- Projects
- PC practicing
- Technical videos watching

Text Books & References:

Text Books:

- Groover, Fundamentals of Modern Manufacturing, 4th Ed

References:

- Supplied laboratory manual
- Kalpakjian, Manufacturing Engineering and Technology, 6th Edition in SI Units
- The Free Beginner's Guide to 3d Printing

Because some of the subjects are new so instructor may refer to scientific papers and technical manuals especially 3d printing.