

Course Type	Course Code	Name of the Course	L	T	P	Credit
DE	OMED603	Advanced Machining Processes	3	0	0	3

Prerequisites

Bachelor/Master/PhD students having background in Mechanical Engineering/Production Engineering/Manufacturing Technology

Course Objectives

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

1. Understand the fundamental principles of various manufacturing processes such as casting, forming, machining, welding, and additive manufacturing.
2. Identify the appropriate manufacturing process based on material properties, product geometry, and required tolerances.
3. Analyze the influence of process parameters on productivity, surface finish, dimensional accuracy, and tool life.
4. Familiarize with different types of machine tools, cutting tools, jigs, fixtures, and measuring instruments used in manufacturing.
5. Understand the basics of automation, computer-aided manufacturing, and recent trends like CNC, robotics, and Industry 4.0 in production systems.
6. Apply safety standards, quality control measures, and sustainable practices in manufacturing operations.

Learning Outcome

On successful completion of this course, students will be able to:

1. Understand the principles of fundamental manufacturing processes such as casting, forming, machining, welding, and additive manufacturing.
2. Identify suitable manufacturing methods based on product geometry, material properties, and functional requirements.
3. Analyze the influence of process parameters on material removal rate, surface finish, tool wear, and product quality.
4. Describe various types of machine tools, cutting tools, jigs, and fixtures used in production.
5. Apply concepts of dimensional accuracy, tolerances, and surface roughness in manufacturing scenarios.
6. Understand inspection techniques, metrology instruments, and quality assurance in production environments.
7. Familiarize with modern manufacturing practices, including automation, CNC technology, and Industry 4.0 integration.
8. Evaluate the environmental impact and safety considerations associated with different production techniques.

Unit No.	Topics to be covered	No. of lecture videos	Video time (Minutes)	Learning Outcomes
1	Introduction to Advanced Manufacturing Processes	1	116	On successful completion of this unit students will be able to know the basics of Advanced Manufacturing Processes with examples.
2	Ultrasonic machining and its modelling and analysis.	2	117	On successful completion of this unit students will be able to know the basics of metal machining with examples.

3	Abrasive jet machining (AJM), Water jet cutting (WJC) and Abrasive water jet machining (AWJM), Magnetic abrasive finishing (MAF) and its modelling	3	137	On successful completion of this unit students will be able to know different components and their structure for Machining system.
4	Abrasive flow finishing (AFF) and its modelling Magnetorheological finishing (MRF)	3	103	On successful completion of this unit students will be able to understand the concept of friction in metal cutting
5	Magnetorheological abrasive flow finishing (MRAFF) and its modelling and analysis	3	149	On successful completion of this unit students will be able to understand the applications of ECM
6	Electric discharge machining (EDM): Principle, applications, process parameters, and modelling	3	147	On successful completion of this unit students will be able to understand the applications of ECM
7	Electric Discharge Grinding (EDG), Electric Discharge Diamond Grinding (EDDG), and Wire Electric Discharge Machining (W-EDM)	3	152	On successful completion of this unit students will be able to understand the applications of EDM and EBM
8	Laser beam machining (LBM), Plasma arc machining (PAM), Electron Beam Machining (EBM)	3	143	On successful completion of this unit students will be able to understand the applications of EDM and EBM
9	Electro chemical machining (ECM): Principle, applications, and process parameters and modelling	3	129	On successful completion of this unit students will be able to understand the LBM and EBM
10	Electrochemical Grinding (ECG), Electrostream Drilling (ESD), Shaped Tube Electrolytic	3	156	On successful completion of this unit students will be able to understand the non-conventional processes for micromachining.
11	Machining (STEM)	3	124	On successful completion of this unit students will be able to understand the Abrasive flow finishing
12	Chemical machining (ChM)	3	161	On successful completion of this unit students will be able to understand EDM, Photolithography
Total No. of Video lectures & Video time		33	1634	

Text Books:

1. G Boothroyd-Fundamentals of Metal Machining and Machine tools
2. A. Ghosh and Asok Mallik- Machining

Reference Books

1. Advanced manufacturing processes, Hassan Abdel, Gabad El HOFFY, McGraw Hill, 2005.
2. The Science and Engineering of Micro-fabrication (2nd edition), Stephen P. Campbell, Oxford university press, 2001.
3. Fundamentals of Stereolithography (1st Edition), Paul F. Jacobs, Society of manufacturing engineers, 2000.
4. GHOSH DASTIDAR, P. "Ghoshdastidar, PS Ghoshdastidar-heat Transfer-oxford University Press (2012).