

<b>INSTITUTE</b>	<b>FACULTY OF ENGINEERING AND TECHNOLOGY</b>
<b>PROGRAM</b>	<b>BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING - ARTIFICIAL INTELLIGENCE &amp; MACHINE LEARNING)</b>
<b>SEMESTER</b>	<b>3</b>
<b>COURSE TITLE</b>	<b>MANUFACTURING TECHNOLOGY</b>
<b>COURSE CODE</b>	<b>01ML0302</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 To introduce the principles, processes, and applications of micro and nano manufacturing, and develop the ability to select suitable techniques for fabrication and inspection of miniaturized components used in modern engineering systems

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Apply the principles and process parameters of conventional machine tools, casting, and welding processes in practical engineering applications.
- 2 Compare and analyze different machining, casting, and welding processes based on operating parameters, capabilities, and limitations
- 3 Select the appropriate manufacturing process and machine tool for a given component considering design requirements, material, accuracy, and productivity
- 4 Perform and analyze manufacturing operations, including machining, casting, and welding, and identify defects with suitable causes and remedies
- 5 Develop a logical sequence of manufacturing operations to produce a product while evaluating the scope, limitations, and feasibility of the selected processes

**Pre-requisite of course:** Knowledge of Fundamental Subjects such as Elements of Mechanical Engineering, Engineering Physics, Basics of Environmental Studies

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	<p><b>Introduction to Manufacturing Technology</b> Overview of Manufacturing and Its Importance, Classification of Manufacturing Processes, Product Life Cycle and Manufacturing, Manufacturing Systems and Production Types, Role of Manufacturing in Mechanical Engineering, Conventional and Non-Conventional Manufacturing Processes, Selection Criteria for Manufacturing Processes, Accuracy, Surface Finish, and Tolerances, Productivity, Quality, and Cost Considerations, Safety, Sustainability, and Environmental Aspects in Manufacturing</p>	5
2	<p><b>Conventional Machining Processes</b> Introduction to machine tools and manufacturing systems, Lathe Machine: Types, construction, working principle, Tooling, attachments, accessories, Lathe Machine Operations and process parameters, Lathe Machine:MRR, cutting time, and economy, Shaper Machine: Construction, working principle, operations,, Drilling Machine: Types, tools, Drilling Machine: operations, parameters, Grinding Machine: Types, abrasives, operations, Grinding Machine: Surface finish,, Grinding Machine:Selection of machine tools based on job requirements</p>	10
3	<p><b>Metal Casting Processes</b> Introduction to casting processes,types of casting process, Pattern Making, Types of patterns, Pattern allowances, Pattern materials and design considerations,, Moulding Sand, Composition and properties, Sand Testing: permeability, clay content,, Green sand mould, Sodium silicate mould, Melting and pouring of metals, Gating and Feeding system design,, Casting defects, Casting defects causes, Casting defects remedies</p>	10
4	<p><b>Metal Joining Processes</b> Classification of welding processes, Types of joints and edge preparation, Arc Welding Processes, SMAW – principle, equipment, parameters, performance, MIG – principle, parameters, advantages,, TIG – principle, parameters, applications, Resistance Welding, Spot welding – principle and parameters,, Gas Welding, Oxy-acetylene welding and cutting, Solid State Welding: Friction stir welding, Welding defects: causes and remedies</p>	10
5	<p><b>Metal Forming Processes</b> Introduction to metal forming, Rolling: working principle, parameters, defects,, Forging: Types, working principle, defects, Extrusion: Hot and cold extrusion, Drawing: Working principle and applications, Deep Drawing: Working principle and applications, Metal forming defects, Metal forming defects: preventive measures</p>	8
<b>Total Hours</b>		<b>43</b>

### Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	<b>Experiment 01</b> Prepare a component as per drawing using lathe machine	2
2	<b>Experiment 02</b> Machine a given job using milling machine	2
3	<b>Experiment 03</b> Prepare flat/slot surface using shaper machine	2
4	<b>Experiment 04</b> Perform drilling and grinding operations and analyze surface finish	2
5	<b>Experiment 05</b> Design a pattern with appropriate allowances	2
6	<b>Experiment 06</b> Prepare mould using green sand mould and cast a component	2
7	<b>Experiment 07</b> Perform different types of welding joints using SMAW	2
8	<b>Experiment 08</b> Perform welding joints using MIG welding process	2
9	<b>Experiment 09</b> Perform welding joints using TIG welding process	2
10	<b>Experiment 10</b> Demonstrate gas welding or resistance spot welding.	2
11	<b>Experiment 11</b> Perform friction welding on lathe machine.	2
12	<b>Experiment 12</b> Perform friction stir welding on Aluminum Material	2
<b>Total Hours</b>		<b>24</b>

### Textbook :

- 1 Manufacturing Technology: Materials, Processes, and Equipment (2nd Edition), Helmi A. Youssef, Hassan A. El-Hofy, Mahmoud H. Ahmed, CRC Press, 2024
- 2 Manufacturing Engineering and Technology (SI Units Edition)tions in Biochemical and Biomedical Engineering, Serope Kalpakjian, Steven Schmid, Pearson, 2022

### References:

- 1 Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, Mikell P. Groover, Wiley, 2021
- 2 Advanced Manufacturing Technology, Advanced Manufacturing Technology, Amitabha Ghosh, Ashok Kumar Mallik, East-West Press, 2021
- 3 Manufacturing Processes for Engineering Materials, Manufacturing Processes for Engineering Materials, Serope Kalpakjian, Steven Schmid, Pearson, 2021
- 4 Modern Manufacturing Processes, Modern Manufacturing Processes, Muammer Koç, Turgay Özel, Wiley, 2021

**References:**

- 5 Manufacturing Processes and Systems, Manufacturing Processes and Systems, Phillip F. Ostwald, Jairo Muñoz, Wiley, 2021

**Suggested Theory Distribution:**

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
0.00	0.00	45.00	45.00	10.00	

**Instructional Method:**

- 1 Presentations
- 2 Experiments
- 3 Video Presentations

**Supplementary Resources:**

- 1 <http://nptel.iitm.ac.in/>
- 2 <https://swayam.gov.in/>
- 3 <https://msvs-dei.vlabs.ac.in/>
- 4 <https://www.sme.org/fmp/>
- 5 [https://onlinecourses.nptel.ac.in/noc23\\_me131/preview](https://onlinecourses.nptel.ac.in/noc23_me131/preview)
- 6 [https://onlinecourses.nptel.ac.in/noc23\\_me90/preview](https://onlinecourses.nptel.ac.in/noc23_me90/preview)