

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Master of Technology				Branch/Spec.		Mechanical Engineering/ AMS	
Semester		I				Version		2.0.0.1	
Effective from Academic Year			2025-26			Effective for the batch Admitted in			July 2025
Course code		3ME1103		Course Name		Advanced Manufacturing Processes-I			
Teaching scheme						Examination scheme (Marks)			
(Per week)		Lecture(DT)		Practical(Lab.)		Total			
	L	TU	P	TW			CE	SEE	Total
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50
Pre-requisites:									
Production Technology, Manufacturing Technology									
Course Outcomes:									
CO1	Remembers the principles of elasticity, plasticity, stress-strain relationships, flow rules for deformation, jigs & fixtures, and non-traditional machining & forming processes.								
CO2	Understand the mechanics and dynamics of metal forming and machining processes.								
CO3	Utilize principles of metal cutting and forming to calculate process parameters like load, force, and defect rectification.								
CO4	Evaluate the performance of machining processes to optimize energy consumption and tool wear.								
CO5	Develop jigs and fixtures for high-precision applications in various machining operations.								
CO6	Analyze unconventional forming and machining processes to solve complex manufacturing challenges.								
Theory syllabus									
Unit	Content								Hrs
1	Stress Strain Relationship & Yield Criteria: Theory of Elasticity and Plasticity, Stress transformation, plane stress and plane strain, yield criteria, effective stress and strain, flow rules of plastic stress-strain relationship, work hardening, strain rate and temperature effect								6
2	Analysis of Metal Forming Process: Forging: Plain strain approximation, load calculations, and frictional effects. Rolling: Calculations for roll separating force, bite angle, and roll flattening, with a focus on defect analysis. Extrusion: hot and cold extrusion, extrusion of metals and polymers, process mechanics, die design, material flow, defect analysis. Wire Drawing & Sheet Metal Work: Load determination, defect remedies, and spring-back behaviour in bending.								9
3	Theory of Metal Cutting and Economics of Machining Process: Orthogonal and Oblique Cutting: Analysis of forces, energy, chip formation, and machining economics. Tool Wear and Machinability: Impact of cutting fluids, material properties, and tool life. Thermal Analysis: Effects of cutting temperatures and strategies for optimization.								7
4	Gear and Thread Manufacturing: Different types of threading methods, tooling, and gear forming and gear finishing processes.								3
5	Jigs and Fixtures: Design principles for locating and clamping devices, along with application in high-precision processes like drilling, milling, and grinding.								4

6	Unconventional Forming Process: Explosive forming, Electromagnetic Forming, Magnetic Pulse Forming, high energy rate forming, hydro forming, stretch forming, contour roll forming etc.	6
7	Non-Traditional Machining Process: Process principles, metal removal mechanism, parametric analysis of processes, applications: Abrasive jet machining, abrasive water jet machining, ultrasonic machining, water jet machining, chemical machining, electrochemical machining, electrical discharge machining, laser beam machining, electron beam machining, Hot machining, cryogenic machining, micro machining, deep hole drilling, ultra-precision machining.	10

Practical content

The term work shall be based on experimental and analytical work on the topics mentioned above and will be defended by the candidates.

Text Books

- 1 Dieter G. E., "Mechanical Metallurgy", McGraw Hill.
- 2 P. C. Pandey and H. S. Shan, 'Modern Machining Processes', Tata McGraw Hill, New Delhi.

Reference Books

- 1 William F. Hosford and R. M. Caddell, 'Metal Forming Mechanics and Metallurgy', Prentice Hall.
- 2 A. Ghosh and A. K. Mallik, 'Manufacturing Science', East west press, New Delhi.
- 3 Mielnik Edward M., 'Metal Working Science and Engineering', McGraw Hill.
- 4 Rao P.N., 'Manufacturing Technology', Tata McGraw Hill.
- 5 Wangoner Robert H. and Jean-Loup Chenot, 'Fundamentals of Metal Forming', John Wiley & Sons.
- 6 Beddoes J. and Bibby M. J., 'Principles of Metal Manufacturing Processes', Viva Books.
- 7 P. K. Mishra, 'Nonconventional machining', Narosa publishing house, New Delhi.
- 8 V. K. Jain, 'Introduction to Micro Machining', 1st Edition, Narosa publishing house, New Delhi.
- 9 G. Benedict, 'Non-traditional manufacturing processes', 1st Edition, Marcel Dekker, New York.
- 10 V. K. Jain, 'Advanced Machining processes', Allied publishers, New Delhi.

ICT/MOOCs references

- 1 <https://nptel.ac.in/courses/112/105/112105233/>
- 2 <https://nptel.ac.in/courses/112/105/112105233/>
3. <https://nptel.ac.in/courses/112/105/112105127/>
- 4 <https://nptel.ac.in/courses/112/105/112105127/>
- 5 <https://nptel.ac.in/courses/112/105/112105127/>

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	2	1	1	0	0	0	0	0	0	3	1	1
CO2	3	3	0	3	2	0	0	0	0	0	1	1	3	2	0
CO3	3	2	3	3	3	2	2	0	0	0	0	0	3	2	2
CO4	3	3	0	3	3	3	2	2	0	0	2	3	3	3	3
CO5	1	3	3	2	2	0	0	2	3	2	0	0	2	3	2
CO6	3	2	0	3	3	3	3	2	0	0	3	3	3	3	3