GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology					Branch/Spec.	Mechatronics Engineering		
Semester	V					Version	2.0.0.0		
Effective from Academic Year			2025-26			Effective for the batch Admitted in			July 2025
Course Code	2MC4104		Course Name			**Materials and Manufacturing process-I**			
Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

Not Required

Course Outcomes:

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

CO1	**Understand** the basics of engineering materials, Conventional machining andmetal castingprocesses.
CO2	**Recognise** the importance of corrosion prevention methods, powder metallurgy procedures, and heat treatments for metals.
CO3	**Apply** the fundamentals of physical metallurgy to select the appropriate materials for modern casting processes.
CO4	**Analyze** the processes and **evaluate** the role of each process parameter during machining of various Ferrous and non-ferrous materials.

Theory syllabus

Unit	Content	Hrs
1	**Introduction to Materials:** Classification of steel and cast iron, Effect of alloying elements in steel and cast iron, Constituents and properties of copper and aluminium alloys, Classification, properties and applications of ceramic, polymer and composite materials.	3
2	**Theory of Alloys:** Systems, phases and phase rule, structural constituents, cooling curves, lever-arm principle, eutectic reaction, eutectoid reaction, peritectic reaction, Allotropy of iron, Iron-carbon equilibrium diagram, constituents, microstructures and properties of plain carbon steels.	7
3	**Heat Treatment of Steel:** Time-Temperature-Transformation Diagram, Study of heat treatment processes such as Annealing, normalizing, spherodizing, hardening, tempering, carburizing, nitriding, cyaniding, induction hardening, flame hardening and harden ability of steel. Application of above processes to machine components and mechanical equipment.	9
4	**Powder Metallurgy:** Applications of powder metallurgy, advantages of powder metallurgy, manufacturing processes, production of powder, compacting, sintering, products of powder metallurgy like filters, Babbitt bearings for automobiles, cemented carbides, diamond impregnated tools.	7
5	**Corrosion of Metal and Alloys:** Mechanism of corrosion, types of corrosion, corrosion prevention techniques.	4
6	**Conventional Machining:** Construction details and working of Lathe, Drilling Machine, Milling Machine, Shaper, Planer and Grinding Machine, work holding and tool holding device, Attachments and operations performed, calculation of Time of Machining(Tm).	8
7	**Metal Casting Processes:** Sand Casting, Sand Mould, Type of patterns, Pattern materials, Pattern allowances, Molding sand properties and testing, Cores types and applications, Molding machines, types and applications, Melting furnaces, Principle of special casting processes, Shell casting, Investment casting, Pressure die casting, Centrifugal casting, CO_2 casting, Defects in casting.	7

Practical Content	
Practical, assignments and tutorials are based on above syllabus.	
Text Books	
1	P.C. Sharma, “Production Technology”, S. Chand and Company Ltd., New Delhi, 10th Revised edition
2	R.K. Jain and S.C. Gupta, “Production Technology”, Khanna Publishers, New Delhi
3	Dr. O.P. Khanna, “Material science and metallurgy”, Dhanpat rai publications (P) Ltd.
Reference Books	
1	Serope Kalpakjian and Steven R. Schmid, “Manufacturing Engineering and Technology”, Addison Wesley Longman (Singapore) Pte Ltd, Delhi.
2	HMT, “Production Technology”, Tata McGraw Hill publishing co. ltd.
3	Pandey & Singh, “Production Engineering Science”, Standard Publishers, Delhi This Edition First Published.
4	Callister’s Material Science and Engineering, 2ed, R. Balasubramaniam, Wiley India.
5	V. Raghavan, “ Physical Metallurgy–Principles & Practice”, PHI Publisher
6	Y. Lakhtin, “ Engineering Physical Metallurgy & Heat-Treatment ”,C.B.S. Publisher
7	Fontanna M. G. & Green N. D, “Corrosion Engineering ”,Tata McGraw Hill
8	O.P. Khanna, “Foundry Technology”, Dhanpat Rai& Sons Publications, 15th Edition, 2011.
ICT/MOOCs references	
1	https://archive.nptel.ac.in/courses/112/104/112104290/ - Conventional Machining
2	https://archive.nptel.ac.in/courses/112/104/112104301/ - Metal Casting Processes
3	https://nptel.ac.in/courses/112/104/112104203/ - Nature and Properties of Materials
4	https://nptel.ac.in/courses/112/104/112104219/ - Heat Treatment and Surface Hardening
5	https://nptel.ac.in/courses/113102080 - Phase Diagram
6	https://archive.nptel.ac.in/courses/113/106/113106098/ - Powder Metallurgy

Mapping of CO with PO and PSO:

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