

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Bachelor of Technology				Branch/Spec.	Mechanical Engineering /Mechatronics Engineering /Automobile Engineering /Marine Engineering /Electrical Engineering /Petrochemical Engineering			
Semester	II				Version	1.0.0.0			
Effective from Academic Year	2026-27				Effective from the batch admitted in	July 2026			
Course Code	2ESC1103				Course Name	Elements of Mechanical Engineering			
Course Category	Engineering Science Courses (ESC)								
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	50	50	100
Hours	3	0	2	0	5	Practical	25	25	50
Pre-requisites:									
Physics									
Course Outcomes									
COs	Description								
CO1	Recall basic thermodynamic concepts, gas/steam properties, boiler/IC engine components, fluid laws, manufacturing processes, kinematic elements, and refrigeration/energy systems.								
CO2	Explain interdisciplinary roles, working principles of boilers/engines/refrigeration, Industry 4.0 components, and power transmission comparisons across topics.								
CO3	Apply gas laws, steam tables, Bernoulli's theorem, velocity ratios, and performance parameters to solve numerical problems in thermodynamics, fluids, kinematics, and engines.								
CO4	Analyze relationships between non-flow processes, fluid statics/flow devices, gear trains/belts, and sustainable energy systems for engineering applications.								
Theory Syllabus									
Unit	Content								Hours
1	Fundamentals of Mechanical Engineering & Thermodynamics Scope and interdisciplinary role of Mechanical Engineering, Basic concepts: System, surroundings, state, process, and cycle, Properties: Work, heat, energy, power, temperature, and specific heat, Laws of Thermodynamics: Zero Law, First Law, Second Law and numerical problems.								6
2	Properties of Gases & Steam Perfect gas law; Boyle's, Charles's, Gay-Lussac's and combined gas laws; gas constant; internal energy; Cp-Cv relation; non-flow processes: constant volume, constant pressure, isothermal, adiabatic and polytropic, types of steam; properties of steam: enthalpy, internal energy, specific volume, dryness fraction; steam tables.								5
3	Steam Boilers & IC Engines Boilers: Construction and working of Cochran and Babcock & Wilcox boilers, IC Engine: 4-stroke SI (Otto) and CI (Diesel) engines; SI vs CI, Engine terminology and performance parameters (IP, BP, FP, Efficiencies).								6
4	Fluid Mechanics & Hydraulic Systems Fluid properties: Density, Viscosity, and Pascal's Law, Fluid Statics: Pressure measurement and Bernoulli's theorem, Flow measurement devices, their applications and relevance to various engineering industries								8
5	Manufacturing Processes & Industry 4.0 Casting, Forming, Machining, Welding, and Additive Manufacturing, Introduction to Industry 4.0 and its various components								8
6	Kinematics & Power Transmission Kinematic links, pairs, and mechanisms, Gear terminology, Types of gears, Simple gear								8

	train, Compound gear train, Belt, Chain, and Rope drives, Comparison of belt, chain, and gear drives. Velocity ratio. Shafts, Couplings, Bearings.	
7	Refrigeration, Air Conditioning & Sustainable Energy Vapour compression systems, Vapour absorption systems and Domestic Refrigerator, Non-conventional energy: Solar PV and Wind energy systems.	4
Practical and Self Learning Content		
Practical, assignments, quiz, industrial visit, field survey and tutorials are based on the above syllabus.		
Text Books		
1	S.M.Bhatt, H.G.Katariya "Elements of Mechanical Engineering" Books India publication.	
2	Dr. D.S. Kumar "Thermal Science and Engineering", S.K. Kataria & sons, Publication New Delhi.	
Reference Books		
1	Pravin Kumar" Basic Mechanical Engineering" Pearson Education India, Delhi.	
2	G.S. Sawhney "Fundamental of Mechanical Engineering", PHI Publication New Delhi.	
3	Sadhu Singh "Elements of Mechanical Engineering", S. Chand Publication.	
4	B. K. Agrawal "Introduction to Engineering Materials" ,Tata Mc-GraHill Publication, New Delhi.	
5	P.S.Desai and S.B.Soni "Elements of Mechanical Engineering", Atul Prakashan.	
ICT/MOOCs Reference		
1	https://www.youtube.com/watch?v=_7tE3W0fmOc (Introduction of EME)	
2	https://www.youtube.com/watch?v=vr3RXIba0D4 (Properties of Steam)	
3	https://www.youtube.com/watch?v=txoEqwSxUrQ (Types of Steam boiler)	
4	https://www.youtube.com/watch?v=9eGgTXfyxbg (Fundamentals of IC Engine)	
5	https://www.youtube.com/watch?v=5cjCgqaRjXU (Importance of Engineering Materials)	
6	https://www.youtube.com/watch?v=zqXgmVnI3L8&list=PLB7848E741209987E (Refrigeration & Air Conditioning)	

Mapping of COs, POs, and PSOs														
COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	0	0	0	0	0	0	0	0	2	2	0	2
CO2	2	2	0	0	2	2	0	2	2	1	2	3	2	2
CO3	3	2	1	2	2	0	0	0	1	0	1	3	1	1
CO4	2	3	2	2	2	2	0	0	1	1	2	3	2	2

Bloom's Taxonomy Level				
Unit	Unit Title	Aligned COs	Learning Hours	BTL Level
1	Fundamentals of Mechanical Engineering & Thermodynamics	CO1,CO2,CO3	6	R,U,A
2	Properties of Gases & Steam	CO1,CO3,CO4	6	R,A,N
3	Steam Boilers & IC Engines	CO1,CO2, CO3	6	R,U,A
4	Fluid Mechanics & Hydraulic Systems	CO1,CO3, CO4	7	R,A,N
5	Manufacturing Processes & Industry 4.0	CO1,CO2	8	R,U
6	Kinematics & Power Transmission	CO1,CO3, CO4	7	R,A,N
7	Refrigeration, Air Conditioning & Sustainable Energy	CO1,CO2, CO4	5	R,U,N

Note:

- Version 1.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme, Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)
- 1 Hour Lecture = 1 Credit, 1 Hour Tutorial = 1 Credit, 2 Hours Practical = 1 Credit, 2 Hours Internship/Project/Seminar = 1 Credit
- Bloom's Taxonomy Level (BTL): R: Remember, U: Understand, A: Apply, N: Analyze, E: Evaluate, and C: Create