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 & Learning Scheme							Examination scheme (Marks)			
	L	TU	P	Total	SL	TSL		CE	SEE	Total
Credit	3	0	1	4	45	120	Theory	50	50	100
Hours (per week)	3	0	2	5			Practical	25	25	50

L: Lecture, TU: Tutorial, P: Practical/Lab., SL: Minimum Self-Learning or Term Work Hours per Semester, TSL: Minimum Total Teaching & Self-Learning Hours per Semester, CE: Continuous Evaluation, SEE: Semester End Examination.

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 train, Compound gear train, Belt, Chain, and Rope drives, Comparison of belt, chain, and gear drives. Velocity ratio. Shafts, Couplings, Bearings.	8
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
- As per NCrF/NEP 2020, Minimum Self-Learning or Term Work Hours per Semester should be calculated in such a way that 1 Credit should have a minimum 30 Hours of Teaching and Self Learning Engagement per semester
- Bloom's Taxonomy Level (BTL) : R: Remember, U: Understand, A: Apply, N: Analyze, E: Evaluate, and C: Create