GANPAT UNIVERSITY
FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Civil/ Mechanical/Automobile Engineering		
Semester	II	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025
Course code	1ES2105	Course Name	Engineering Mechanics

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme											Total Marks
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical					Based on SL		
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1ES2105	3	-	2	1	6	3	40	60	100	40	30	20	50	20	20	8	170

Abbreviation:	CL- Classroom Learning	TL - Tutorial Learning	LL - Laboratory Learning
	SLH - Self Learning Hours	NLH - Notional Learning Hours	SLA - Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		SA - Summative Assessment

II. PRE-REQUISITES
Basic knowledge of laws of science.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES
Operate and Maintain Engineering Equipment for various Industrial/field applications using relevant knowledge and skills related to engineering.

IV. COURSE LEARNING OUTCOMES
At the end of the course, students will be able to achieve the followingcourselearningoutcomes:

CO1. Understand different types of concepts of forces in Static and Dynamics.

CO2. Apply their theoretical & graphical knowledge of various modern methods of Engineering.

CO3. Apply different laws of science work in geometrical properties such as centroid, etc. Sections of different shapes.

CO4. Develop knowledge of various types of mechanical properties of engineering materials.

CO5. Apply different laws of science and solve Static and Kinetic problems & verify theoretical knowledge to practical problem.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit-1 Analysis of Forces	**TLO 1.1** Describe the characteristics of given type of force. **TLO 1.2** Calculate the moment of forces in a given force system. **TLO 1.3** Suggest the suitable law for the analysis of a given force system. **TLO 1.4** Determine the components of given force. **TLO 1.5** Calculate analytically the resultant of given force system. **TLO 1.6** Calculate	1.1 Introduction of Mechanics: Engineering Mechanics, Statics, Dynamics, Kinetics, Kinematics, concept of rigid body, Force: definition, unit, graphical representation, characteristics, Types of force system. 1.2 Moment of force: Definition, unit, sign conventions, couple and its properties. 1.3 Law related to forces: Law of transmissibility of force, Law of polygon of forces, Varignon's theorem of moments, Law of moment, Law of parallelogram of	15	11

Unit				
	graphically the resultant of given force system.	forces, Lami's Theorems. **1.4** Resolution of coplanar forces **1.5** Composition of coplanar forces using analytical method. Resultant of collinear, concurrent and non-concurrent force system. **1.6** Composition of coplanar forces using graphical method. Resultant of concurrent force system and parallel force system consisting of maximum four forces only.		
Unit-2 Coplanar – Parallel and Non– Concurrent Forces	**TLO 2.1** Draw the Free Body Diagram for given loading in given situation. **TLO 2.2** Determine the equilibrant of the given concurrent force system. **TLO 2.3** Identify the type of loading and beam in a given structure. **TLO 2.4** Determine analytically the reactions in the given type of beam.	**2.1** Equilibrium and its conditions. **2.2** Equilibrant and relation with resultant, Equilibrant of concurrent force system. **2.3** Types of supports: fixed, simple, hinged and roller. Types of beams: cantilever, simply supported, overhanging, Continuous and fixed. Types of loads: vertical and inclined point load, uniformly distributed load (UDL). **2.4** Determination of Beam reactions using analytical method for cantilever, simply supported and overhanging beam subjected to vertical load, inclined load and uniformly distributed load (combination of any two types of loading).	12	8
Unit-3 Centroid and Centre of Gravity	**TLO 3.1** Determine the centroid of given plane figure. **TLO 3.2** Determine the centroid of given composite figure. **TLO 3.3** Determine centre of gravity of given solid. **TLO 3.4** Determine Centre of gravity of the given composite solid.	**3.1** Centroid of geometrical plane figures: square, rectangle, triangle, circle, semi-circle, quarter circle (IKS*: Archery arrowheads in Ramayana, Arch in archaeological structures such as Taj Mahal, Gol Gumbaz). **3.2** Centroid of composite figures such as L, T, I, C, H sections consisting of not more than three simple figures. **3.3** Centre of Gravity of simple solids: cube, cuboid, cylinder, cone, sphere and hemisphere (no hollow solids). **3.4** Centre of Gravity of composite solids composed of not more than two simple solids.	8	7
Unit-4 Friction	**TLO 4.1** Determine friction force along with coefficient of friction for the given condition. **TLO 4.2** Describe the conditions for friction for	**4.1** Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of	8	6

		the give situation. **TLO 4.3** Draw FBD and analyse it for equilibrium of bodies on inclined plane in the given situation **TLO 4.4** Draw free body diagram for showing forces acting on a ladder under given condition.	repose, and their relationship. **4.2** Equilibrium of bodies on level surface subjected to force (Pull and Push) parallel to plane and inclined to plane. **4.3** Equilibrium of bodies on inclined plane subjected to force parallel to the plane only. **4.4** Forces acting on ladder (only free body diagram, no numerical).		
Unit-5 Work, Power & Energy	**TLO 5.1** Demonstrate relation between Works, Power & Energy. **TLO 5.2** Describe the characteristics of Works **TLO 5.3** Describe the characteristics of Power **TLO 5.4** Describe the characteristics of Energy **TLO 5.5** Evaluate Engineering Problems.	**5.1** Explain different terms used in Works, Power & Energy. **5.2** Work – work done, force displacement diagram, torque, work done by torque. **5.3** Power – H.P of engine, Equation of H.P in terms of Torque and R.P.M, Engineering Problems. **5.4** Energy – Kinetic & Potential energy. **5.5** Engineering Problems on Works, Power & Energy.	**8**	**6**
Unit-6 Simple Machine	**TLO 6.1** Identify the type of machine based on efficiency of machine. **TLO 6.2** Calculate effort required and load lifted by the given simple lifting machine. **TLO 6.3** Verify law of machine for the given loading condition. **TLO 6.4** Determine effort required along with efficiency for given machine with varying velocity ratio.	**6.1** Concept of simple lifting machine, load, effort, mechanical advantage, velocity ratio, efficiency of machines, reversible and non-reversible machines. **6.2** Concept of ideal machine and its conditions, machine friction, ideal effort, ideal load, effort lost in friction and load lost in friction, maximum mechanical advantage and maximum efficiency. **6.3** Nature of graphs: Load vs. effort, load vs. ideal effort, load vs. MA, load vs. efficiency, Law of machine and its uses. **6.4** Velocity ratios of inclined plane, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block, two sheave pulley block, three sheave pulley block.	**9**	**7**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL

Sr. No.	Practical/Laboratory Learning Outcome (LLO)	Practical Titles	Relevant COs
1	**LLO 1.1** To Demonstrate law of parallelogram of forces using parallelogram apparatus.	Law of Parallelogram of Forces	CO1
2	**LLO 2.1** To Demonstrate law of triangle of forces using parallelogram apparatus.	Law of Triangle of Forces	CO1
3	**LLO 3.1** To Verify law of polygon of forces using universal force table for given forces.	Law of Polygon of Forces	CO1
4	**LLO 4.1** To Demonstrate impulse and reaction turbines and verify centroid of given plane lamina of by making simple paper model.	Centroid & Centre of Gravity	CO3
5	**LLO 5.1** Determine reaction of beam using beam reaction apparatus for given load.	Analyse Beam Reaction	CO2
6	**LLO 6.1** Determine coefficient of friction using friction apparatus for given block on inclined plane.	Co-Efficient of Static Friction	CO4
7	**LLO 7.1** Determine angle of repose using friction apparatus for given different surface block.	Angle of Repose	CO4

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Collect photographs of specific simple lifting machine and relate these machines with the machines being studied and prepare models of simple lifting machines
- Prepare chart or flex of laws related to engineering mechanics like law of moment, law of machine, law of parallelogram of forces, etc
- Collect a minimum Ten samples of materials having different coefficients of friction.
- Prepare a chart showing all types of beams having types of support (roller, hinged, fixed) with sketches and corresponding photographs of real-life examples.
- Prepare a chart of types of forces showing real-life examples.

Mini projects

- Prepare models of types of beams subjected to all loads (Point load, UDL, UVL, moment, couple) with sketches and corresponding photographs of real-life examples.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	Wall mount Parallelogram apparatus.
2	Universal Force Table (Consists of a circular 40 cm dia. Aluminium disc, graduated into 360 degrees.) with all accessories.
3	Beam Reaction apparatus (The apparatus is with two circular dial type 10 kg.) Wooden beam, Iron support, Portable Electronic Weighing Scale (02 Nos.)
4	Friction apparatus for motion along horizontal and inclined plane (base to which a sector with graduated arc and vertical scale is provided. The plane may be clamped at any angle up to 45 degrees. Pan. Two weight boxes (each of 5 gm, 10 gm, 2-20 gm, 2-50 gm, 2-100 gm weight).
5	Models of geometrical figures.

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Engineering Mechanics	R.S. Khurmi, N. Khurmi	S. Chand & Co.
2	Engineering Mechanics	D.S. Bedi, M.P. Poonia	Khanna Publication
3	Engineering Mechanics	Dr. R. K. Bansal	Laxmi Publication
4	Engineering Mechanics	S. Ramamrutham	Dhanpat Publication
5	Engineering Mechanics	S.S. Bhavikatti	New Age Int. Pvt.

X. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/112103108
2	https://nptel.ac.in/courses/112106180
3	https://nptel.ac.in/courses/112106286
4	https://www.youtube.com/@pravinspatil/playlists
5	https://www.youtube.com/watch?v=bA9zhZxw6dI
6	https://www.youtube.com/watch?v=snC8zzk_sj0&list=PLtElM8k8rEY1OWu7HCFe6_WrFNEXEJyw

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Analysis of Forces	CO1	12	4	6	5	15
2	Coplanar – Parallel and Non–Concurrent Forces	CO2	8	3	4	5	12
3	Centroid and Centre of Gravity	CO3	6	2	3	3	8
4	Friction	CO3	6	3	2	3	8
5	Work, Power & Energy	CO4	6	2	3	3	8
6	Simple Machine	CO5	7	2	2	5	9
		Grand Total	45	16	20	24	60

XII. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	3	3	3	2	3	2	1
CO2	2	1	3	2	2	3	2	1	2	3
CO3	2	1	1	2	3	3	1	2	3	1
CO4	1	2	2	1	3	1	2	1	2	1
CO5	3	2	1	1	3	2	1	2	3	2

Legends: -3- High   2-Moderate/Medium   1-Slight/Low   0-None