Applied Mechanics-I
BEG___CI

Year: I **Semester: I**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	3	-	40	-	3	60	-	-	100

Course Objective:

This course has been developed to provide the basic knowledge of engineering mechanics where in laws of physics are applied to solve engineering problems. This course will helps the students to understand structural engineering theory in later courses.

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Definition & scope of mechanics, engineering mechanics and static	✓						✓		5	
		1.2	Concepts of particle, rigid body, deformed & fluid bodies	✓						✓			
		1.3	Equation of static equilibrium in 2D & 3D		✓								
		1.4	Free body diagram	✓	✓		✓						
		1.5	System of units							✓			

2	Forces	2.1	Definition & principles of forces	✓								7		
		2.2	Types of forces (coplanar, collinear, concurrent, parallel, external & internal forces)	✓			✓			✓				
		2.3	Principle of transmissibility & its limitations	✓	✓		✓			✓				
		2.4	Resolution & composition of forces				✓	✓						
		2.5	Lami's theorem, Varignon's theorem, triangle, parallelogram & polygon law of forces	✓		✓	✓				✓			
		2.6	Moment of forces about a point & axis (in scalar & vector form)	✓		✓					✓			
		2.7	Definition of couple & proof of it as a free vector	✓		✓								
		2.8	Resolution of force into force & a couple & vice versa				✓				✓			
		2.9	Resultant of a system of forces (wrench, parallel, coplanar, concurrent & general)	✓	✓		✓			✓	✓			
3	Distributed Force	3.1	Definition & derivation of center of gravity & centroid (composite figure & direct integration method)	✓		✓	✓					6		
		3.2	Centroid of lines, areas and volumes	✓		✓	✓				✓			
		3.3	Definition of second moment of area (moment of Inertia) and radius of gyration	✓	✓		✓				✓			
		3.4	Parallel and perpendicular axis theorem, MOI of common figures (e.g. rectangle, triangle, circle and ellipse) and uniform thin rod	✓		✓	✓				✓			
		3.5	MOI of built up section.								✓			
		3.6	MOI by direct integration method.								✓			

4	Friction	4.1	Introduction	✓								4	
		4.2	Laws of dry friction	✓									
		4.3	Static friction, co-efficient of friction & angle friction	✓			✓						
		4.4	Condition of sliding or tipping		✓								
		4.5	Application to static problems						✓		✓		
5	Introduction to Structures	5.1	Structural components (beam, frame, truss, 2-D plate, cable, arch, grid)	✓			✓					3	
		5.2	Difference between plane and space structures.	✓			✓						
		5.3	Difference between mechanism & structures	✓			✓						
		5.4	Types of loading & supports		✓		✓			✓			
		5.5	Determinacy (internal & external) and stability (statical & geometrical)		✓				✓		✓		
6	Introduction to Analysis of Beam	6.1	Definition and types of beam	✓			✓					8	Any types of determinant beam with any types of static loading
		6.2	External and internal forces in beam	✓			✓						
		6.3	Definition and sign convection of axial forces, shear forces and bending moment	✓			✓						
		6.4	Relationship between load, shear force & bending moment			✓			✓				
		6.5	Axial force, shear force & bending moment diagram								✓		
7	Introduction to Analysis of Frame	7.1	Definition & type of frame (rigid, deficient, redundant)	✓			✓					6	Portal frame and cantilever frame (without internal hinge, inclined and overhanging member) with combination of point load, moment and UDL.
		7.2	Determinacy & stability								✓		
		7.3	Axial force, shear force & bending moment diagram								✓		

8	Introduction to Analysis of Truss	8.1	Definition & types of plane (according to support condition purpose of utilization, degree of complexity)	✓			✓				✓	6	
		8.2	Determinacy & Stability pf plane								✓		
		8.3	Analysis of plane truss (method of joints & method of section)								✓		
		8.4	Introduction of space truss	✓			✓						
Note: Define(SD), Description (D), Derive (D), Illustration (I), Explanation (E), Application (A), Explanation (Ex), Numerical (N)													

Final Examination Scheme:

Chapters	Marks	Remarks
1,4,5	10	Th+ N
2	10	Th+N
3	10	Th+N
6	10	Th + N
7	10	N
8	10	Th + N
Total	60	
Note: There might be minor deviation in mark distribution. Mandatory: Marks should be evaluated based on solving steps.		

References:

1. Beer F.P., & Johnston, E.R. (1987). *Mechanics for Engineers-Statics and Dynamics.* 4th edition, Mcgraw-Hill.
2. Hibbeler, R.C., & Gupta, A. (2009). *Engineering Mechanics-Statics and Dynamics.* 11th edition. Pearson Education.
3. Shames, I.H. (1990). *Engineering Mechanics-Statics and Dynamics*. 3rd edition. Prentice Hall of India.