APPLIED MECHANICS I (STATICS)

BEG156CI

Year: I **Semester: I**

Teaching Schedule Hours/week			Examination Scheme						Total Marks
			Final				Internal Assessment		
			Theory		Practical		Theory Marks	Practical Marks	
L	P	T	Duration	Marks	Duration	Marks			
3	-	2	3	80	-	-	20	-	100

Course Objective:

Course Contents :

1. Introduction: **(3 hrs)**

1.1 Definition & Scope of mechanics, Engineering mechanics and static.
1.2 Concepts of particle, rigid body, deformed & fluid bodies.
1.3 Equation of static equilibrium in 2D & 3D
1.4 Free body Diagram (Definition, importance & example)
1.5 System of units

2. Vector: **(5 hrs)**

2.1 Introduction (Vector & Scalar quantities, simple operation of vectors & their Laws, Position vectors)
2.2 Unit vectors in Cartesian co-ordinates.
2.3 Dot product (Definition, laws & applications)
2.4 Cross product (Definition, laws & applications)
2.5 Scalar and vector triple product

3. Forces: **(7 hrs)**

3.1 Definition & principles of forces
3.2 Types of forces (coplanar, collinear, concurrent, parallel, external & internal Forces)
3.3 Principle of transmissibility & its limitations.
3.4 Resolution & composition of forces
3.5 Lami's theorem, Varignon's theorem, triangle, parallelogram & polygon law of Forces
3.6 Moment of forces about a point & axis (In scalar & vector form)
3.7 Definition of couple & proof of it as a free vector
3.8 Resolution of force into force & a couple & vice versa.
3.9 Resultant of a system of forces. (Wrench, parallel, coplanar, concurrent & General)

4. Distributed Force: **(5 hrs)**

4.1 Definition & Derivation of center of gravity & centroid. (Composite figure & Direct Integration method)
4.2 Centroid of lines, areas and volumes.
4.3 Definition of second moment of area (moment of Inertia) and Radius of gyration
4.4 Parallel and perpendicular axis theorem, MOI of common figures (e.g. rectangle, Triangle, Circle and ellipse) and uniform thin rod
4.5 MOI of Built up section.
4.6 MOI by Direct integration method.

5. Friction: **(4 hrs)**

5.1 Introduction (Definition, Types, Cause & Effect)
5.2 Laws of Dry friction
5.3 Static friction, co-efficient of friction & angle friction
5.4 Condition of sliding or tipping
5.5 Application to static problems

6. Introduction to Structures: **(5 hrs)**

6.1 Structural components (Beam, Frame, truss, 2-D Plate, cable, Arch, Grid)
6.2 Difference between plane and space structures.
6.3 Difference between Mechanism & Structures.
6.4 Types of loading & supports.
6.5 Determinacy (internal & external) and stability (statical & geometrical) [General Concept]

7. Introduction to Analysis of Beam: **(6 hrs)**

7.1 Definition and types of beam
7.2 External and internal forces in beam
7.3 Definition and sign convection of axial forces, shear forces and bending moment
7.4 Relationship between load, shear force & Bending moment
7.5 Axial force, shear force & bending moment diagram

8. Introduction to Analysis of Frame: **(4 hrs)**

8.1 Definition & type of frame (rigid, deficient, redundant)
8.2 Determinacy & stability
8.3 Axial force, shear force & bending moment diagram

9. Introduction to Analysis of Plane Truss: **(4 hrs)**

9.1 Definition & types (according to support condition purpose of utilization, degree Of Complexity)
9.2 Determinacy & Stability
9.3 Analysis of trust (Method of joints & Method of section)

10. Introduction to Space Truss: **(2 hrs)**

10.1 Definition
10.2 Tension coefficients, shear leg, tripods.
10.3 Analysis of simple space truss.

References

- "Engineering Mechanics"- Statics and Dynamics" Shames,I.H, 3rd edition. New Delhi Prentice Hall of India 1990.
- "Mechanics for Engineers-Statics and Dynamics"- F.P. Beer and E.R. Johnston, JR 4th Edition, Mcgraw-Hill 1987.