STRENGTH OF MATERIALS
BEG 160 CI

Year: I **Semester: II**

Teaching schedule Hours/Week					Examination Scheme						Total marks
					Final				Internal Assessments		
					Theory		Practical		Theory Mark	Practical Mark	
Cr.hr	L	Tu	P	T	Duration	Mark	Duration	Mark			
2	2	1	1	4	3 hrs	80	-	-	20	-	100

1. a Introduction to Structures **-2 hrs.**

1.1 Structural components (Beam, frame, truss, 2-D plate, cable, arch, grid)
1.2 Types of loading and supports.
1.3 Differences between plane and space structures
1.4 Differences between mechanism and structure

1. b Introduction to Analysis of Beam **- 6 hrs.**

2.1 Definition and types of beam.
2.2. Definition and sign convention of axial forces, shear forces and bending moments.
2.3 Relationship between load, shear force and bending moment.
2.4 Axial force, shear force and bending moment diagram.
2.5 Maximum bending moments and shearing forces and their positions.

2. Introduction to Analysis of frame **- 6 hrs.**

3.1 Definition and types of frame.
3.2 Determinacy and stability.
3.3 Axial force, shear force and bending moment diagram

3. Introduction to Analysis of truss **- 6 hrs.**

4.1 Definition and types (according to support condition purpose of utilization, degree of complexity)
4.2 Determinacy and stability.
4.3 Analysis of truss (method of joints and method of section)

4. Direct Stresses and Strain **- 5 hrs.**

5.1 Stresses and strains, normal stress, normal strain, shear stress, shear strain, Hook's law modulus of elasticity, modulus of rigidity.
5.2 Stress-strain diagram for steel.
5.3 Ultimate stress, allowable stress, factor of safety, stress concentration
5.4 Elongation of bars, principle of superposition,
5.5 Compound bars subject to axial tension and compression.
5.6 Poisson's ratio, relation between modulus of elasticity, modulus of rigidity and bulk modulus.
5.7 Temperature stresses; single bar

5. a Torsion **- 2 hrs.**

8.1 Introduction
8.2 Calculation of torsional moments in elements

5.b Compressive Forces **- 3 hrs.**

9.1 Introduction
9.2 Behavior of columns

6. a Principle Stresses - 5 hrs.

6.1 Introduction
6.2 Stresses acting on a plane inclined to the direction of the applied force.
6.3 Stresses action on inclined plane subjected two mutually perpendicular normal and shear stresses
6.4 Principle Stresses and principle strains.

6.b Theory of Flexure - 5 hrs.

7.1 Pure bending, assumptions.
7.2 Radius of curvature, flexure stiffness.
7.3 Analysis of beams of symmetric cross-section
7.4 Beam deflection

Recommended books:

1. Gere and Timosenko, Mechanics of Material
2. E.P. Popov Mechanics of Materials, 2nd ed., Prentice Hall of India Pvt. Ltd. New Delhi, 1989.
3. Ashok K. Jain, Elementary Structural Analysis, Newchand & Bros.

Reference:

1. Strength of Materials - R.K. Rajput, S. Chand and Company Ltd.
2. Strength of Materials - Surendra Singh, 3rd Revised Edition.Konark Publishers Pvt. Ltd.
3. Strength of Materials - Andrew Pytel, AddiBion Wesley Publication

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EXAMINATION SCHEME

Theory: 100

1. Assessment Examination
   (Internal Evaluation) .....Full Marks: 20
   Pass Marks: 8
   Time: 3 hrs.

2. Final Examination .....Full Marks: 80
   Pass Marks: 32
   Time: 3 hrs.

Marks division according to course topics:

- Attempt FIVE questions.
- Attempt at least 2 questions from each group

Group	Question No.	Chapter	Topic	Type	Marks
Group 'A'	Q.1 a)	1	Introduction to structures	Theory	4
	Q.1 b)	2	Introduction to Analysis of beam	Numerical	12
	Q.2	3	Introduction to Analysis of Plane frame	Numerical	16
	Q.3	4	Introduction to Analysis of Truss	Numerical	16
Group 'B'	Q.4 a)	5	Direct Stress and Strain	Theory	4
	Q.4 b)	5	Direct Stress and Strain	Numerical	12
	Q.5 a)	6	Principal Stresses	Theory	4
	Q.5 b)	6	Principal Stresses	Numerical	12
	Q.6 a)	7	Theory of Flexure	Theory	4
	Q.6 b)	7	Theory of Flexure	Numerical	12
	Q.7 a)	8	Torsion	Numerical	6
	Q.7 b)	9	Compressive Forces	Numerical	10