

Course Name : Civil Engineering Group. **Course Code** : CE/CS/CR/CV

Semester : Fourth

Subject Title : Mechanics of Structures **Subject Code:** 9046

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	Paper Hrs	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	--	--	25@	125

Rationale:

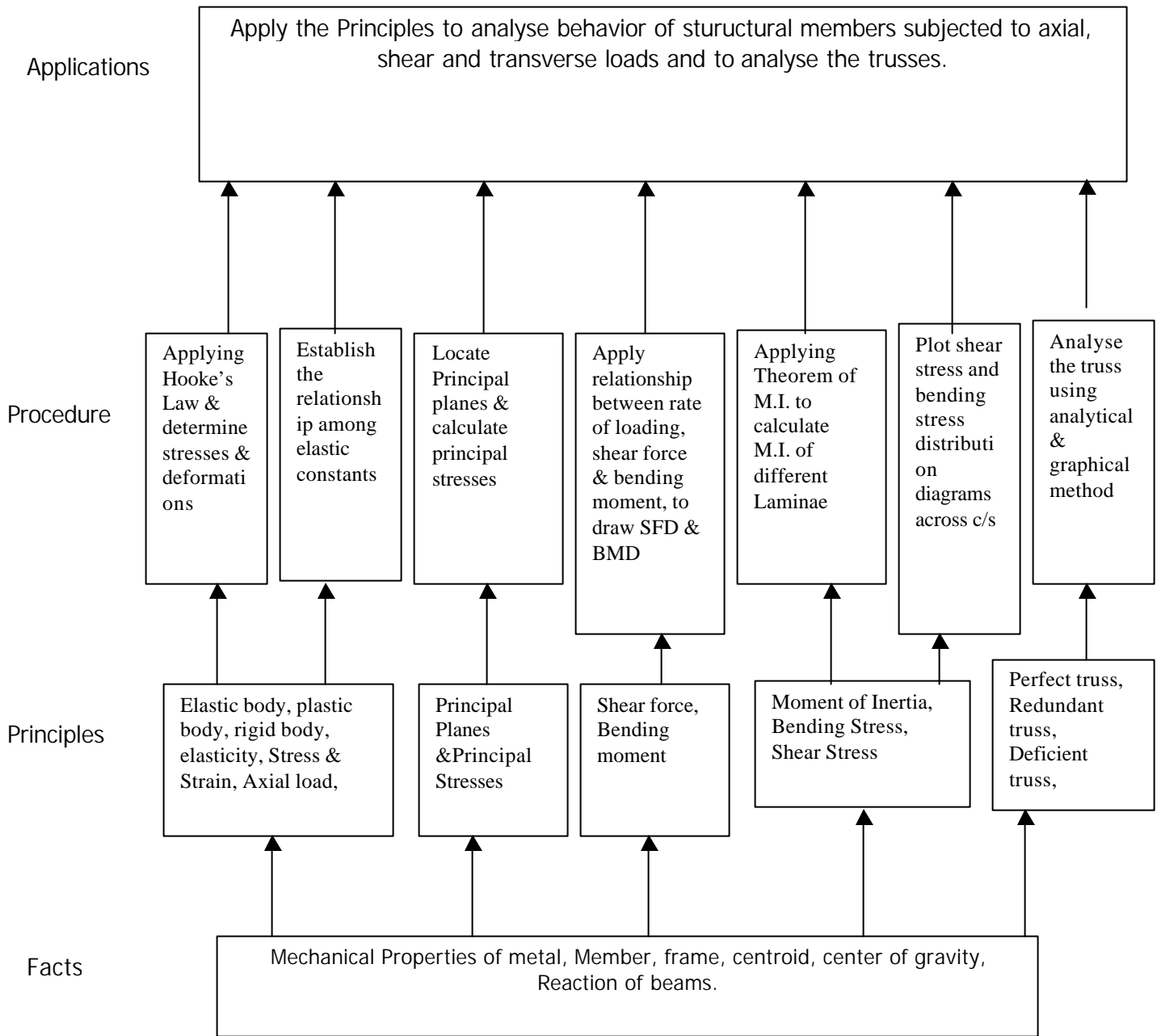
There are different types of structure depending upon type of materials like concrete steel, wood etc. They are subjected to various types of loading such as axial load, shear load, transverse load etc. This subject helps the student to analyze the internal behavior of structural members under different types of loading and to analyze trusses by using analytical and graphical method . The knowledge gained in this subject is helpful to study then subject Theory of Structure.

Objectives:

The students will be able to:

- 1 Calculate stresses in simple and composite sections
- 2 Calculate deformations of the specimen subjected to uni-axial, bi-axial & tri-axial stress system.
- 3 Analyse the truss by using different methods
- 4 Draw shear force and bending moment diagrams
- 5 Calculate moment of Inertia of standard plane section & their composites
- 6 Calculate shear stress & bending stress in beam cross section.
- 7 Calculate strain energy for different types of loading

Learning Structure:



Contents: Theory

Chapter.	Name of the Topics	Hours	Marks
01	<p>Stress & Strain</p> <p>1.1 Definition of rigid body, plastic body, mechanical properties of metal such as elasticity & elastic limit .</p> <p>1.2 Definition of stress, strain, modulus of elasticity, S. I. Unit. Classification of stress, strain, Sign convention. Stress, strain curve for mild steel and HYSD bar , yield stress/ proof stress, Ultimate stress, breaking stress and percentage elongation.</p> <p>1.3 Deformation of body due to axial load. Deformation of a Body subjected to axial forces. Deformation of body of stepped c/s due to axial load, max. stress and min. stress induced. Stresses in bars of composite section & deformation.</p> <p>1.4 Shear stress, shear strain & modulus of rigidity, complementary shear stress, state of simple shear, punching shear.</p>	10	12
02	<p>Elastic Constants & Principal Stressess</p> <p>2.1 Definition of lateral strain, Poisson's ratio, Change in lateral dimensions</p> <p>2.2 Volumetric strain due to uni-axial force and change in volume</p> <p>2.3 Biaxial and tri-axial stresses and volumetric strain & change in volume</p> <p>2.4 Definition of bulk modulus, volumetric strain.</p> <p>2.5 Relation between modulus of elasticity, modulus of rigidity and bulk modulus.</p> <p>2.6 Definition of principal planes & principal stresses</p> <p>2.7 Principal planes & stress due to bi-axial stress system & due to state of simple shear. (Analytical method only)</p>	08	12
03	<p>Shear Force And Bending Moment :</p> <p>3.1 Types of beams - cantilever, simply supported, fixed and continuous beams, types of loading-point load, uniformly distributed load, support reactions for determinate structures</p> <p>3.2 Concept of shear force and bending moment, sign convention. Relation between bending moment, shear force and rate of loading</p> <p>3.3 Shear force and bending moment diagrams for</p>	08	16

	simply supported beams, overhanging beams and cantilever subjected to point loads, UDL and couples, point of contra flexure		
04	Moment Of Inertia: 4.1 Concept of moment of inertia M.I of plane areas such as rectangle, triangle, circle, semicircle and quarter circle 4.2 Parallel axis and perpendicular axis theorem M.I of composite sections, built up sections, symmetrical and unsymmetrical sections, radius of gyration & polar moment of inertia.	06	10
05	Stresses In Beams: 5.1 Bending Stresses in Beams: Concept of pure bending, theory of simple bending, assumptions in theory of bending, neutral axis, bending stresses and their nature, bending stress distribution diagram, moment of resistance. 5.2 Application of theory of bending to symmetrical and unsymmetrical sections. 5.3 Shear stresses in beams: Shear stress equation, meaning of terms in equation, shear stress distribution for rectangular, hollow rectangular, circular sections and hollow circular sections 5.4 Relation between max. shear stress and average shear stress.	06	12
06	Analysis Of Trusses Definition frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumption in analysis. Method of joint, method of section and graphical method to find nature of forces.	06	10
07	Strain Energy 7.1 Types of loading – gradual, suddenly applied load & Impact load 7.2 Definition of strain energy, modulus of resilience and proof resilience. 7.3 Comparison of stresses due to gradual load, sudden load and impact load.	04	08
Total		48	80

Practical:

Skill to be developed:

Intellectual Skills:

1. Interpret the results
2. Calculate design parameters

Motor Skills:

1. Observe the phenomenon during testing of specimen
2. Draw the graphs and diagrams

List of Practical:**Group – A (Any Six)**

1. Identify the components of universal testing machine & tension test on mild steel.
2. Tension test on mild steel / deformed bars .
3. Izod Impact test on mild steel, brass, copper and cast iron.
4. Charpy impact test on mild steel, brass, copper and cast iron.
5. Flexural test on timber.
6. Flexure test on floor tiles or roofing tiles.
7. Shear Test on metal.
8. Water Absorption & Compression test (Dry & Wet) on bricks
9. Abrasion Test on flooring tiles.

Group - B

1. Drawing of Shear force and Bending Moment diagrams on Graph Paper (6 Problems)
2. Graphical Solution of Two Problems on simple frames i) Cantilever
ii) Simply supported on A2 size sheet with their analytical solutions.

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
1.	F. L. Singer	Strength of Materials	Harpe Collins Publishers India , Delhi
2.	R. S. Khurmi	Strength of Materials	S. Chand & Company Delhi
3.	S. B. Junnarkar	Mechanics of Structures volume –I & II	Charotar Publishing House, Anand.