| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|---|---|---|---|
| **CE202** | **STRUCTURAL ANALYSIS -I** | **3-1-0-4** | **2016** |

**Prerequisite:** CE201 Mechanics of Solids

**Course objectives**:

- To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary structures.

**Syllabus** :

Truss analysis, Displacement response of statically determinate structural systems using energy methods, Principle of virtual work, Statically indeterminate structures, Strain Energy methods, Moving loads and influence lines, Cables and Suspension bridges, Arches.

**Expected Outcomes:**

The students will be able to

  i.   analyse trusses and study  displacement response of statically determinate structural systems using energy methods:

 ii.   apply unit load method and strain energy method for determination of deflection of statically determinate  beams, frames & pin jointed trusses

iii.   analyse statically indeterminate structures using strain energy method and method of consistent deformation

iv.   know about moving loads and influence lines

 v.   know about Statically determinate and indeterminate suspension bridges and arches

**Text Books:**

1. Gere and Timoshenko, Mechanics of materials, CBS. Publishers
2. Kenneth Leet,Chia M Uang& Anne M Gilbert., Fundamentals of Structural Analysis, McGraw Hill
3. R.Vaidyanathan and P.Perumal, Comprehensive Structural Analysis Volume I & II, Laxmi Publications (P) Ltd
4. Wang C.K., Intermediate Structural Analysis, McGraw Hill

**References:**

1. Aslam Kassimali., Structural Analysis, Cenage Learning
2. Chandramouli P N, Structural Analysis I –Analysis of Statically Determinate Structures, Yes DeePublishing Pvt Ltd.,Chennai,Tamil Nadu.
3. DevdasMenon, Structural Analysis, Narosa Publications
4. Hibbeler., Structural Analysis, Pearson Education
5. Kinney S., Indeterminate Structural Analysis, Oxford & IBH
6. M.L. Gambhir,  Fundamentals of structural Mechanics and analysis, Printice Hall India
7. Reddy C.S., Indeterminate Structural Analysis, Tata McGraw Hill
8. Timoshenko S.P.& Young D.H., Theory of Structures, McGraw Hill

| COURSE PLAN | | | |
|---|---|---|---|
| Module | Contents | Hours | Sem. Exam Marks |
| I | **TRUSS  ANALYSIS:** Analysis  of  determinate  truss-Methods  of | 8 | 15% |

| | | | |
|---|---|---|---|
| | joints and sections ( Numerical problems) Elastic theorems and energy principles - strain energy due to axial load, bending moment, shear and torsion - strain energy method, Castigliano's method for deflection (Derivations only) | | |
| II | **Principle of virtual work** – Unit load method-Betti's theorem – Maxwell's law of reciprocal deflections - principle of least work - application of unit load method and strain energy method for determination of deflection of statically determinate beams, frames - pin jointed trusses (simple numerical problems)<br>Concepts of temperature effects and lack of fit.( No numerical problems)<br>**Statically indeterminate structures:** Degree of static and kinematic indeterminacies – Introduction to force and displacement method(step by step procedure) | 9 | 15% |
| **FIRST INTERNAL EXAMINATION** | | | |
| III | **Strain Energy methods:**<br>Analysis of beams, frames and trusses with internal and external redundancy – (Simple problems with maximum two redundants)<br>Concepts of effect of prestrain, lack of fit, temperature changes and support settlement.(No numerical problems)<br>**Method of Consistent deformations:**<br>Analysis of beams frames and trusses with internal and external redundancy(Simple problems with maximum two redundants)<br>Concepts of effect of prestrain, lack of fit, temperature changes and support settlement.(No numerical problems) | 9 | 15% |
| IV | **Moving loads and influence lines**.<br>Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams - analysis for different types of moving loads - single concentrated load - several concentrated loads, uniformly distributed load on shorter and longer than the span. | 10 | 15% |
| **SECOND INTERNAL EXAMINATION** | | | |
| V | **Cables:**<br>Analysis of forces in cables under concentrated and uniformly distributed loads - Anchor Cables<br>**Suspension Bridges :**<br>Un-stiffened suspension bridges, maximum tension in the suspension cable and backstays, pressure on towers. | 10 | 20% |
| VI | **Arches :** Theory of arches - Eddy''s theorem - analysis of three hinged arches-Support reactions-normal thrust and Radial shear at any section of a parabolic and segmental arch due to simple cases of loading. Moving loads on three hinged arches ( simple problems) | 10 | 20% |
| **END SEMESTER EXAMINATION** | | | |

**QUESTION PAPER PATTERN (End semester examination) :**

**Maximum Marks :100**                                    **Exam Duration: 3 Hrs**

Part A -Module I & II    :   2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV:    2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI :    2 questions out of 3 questions carrying 20 marks each

**Note** :  1.Each part should have  at least  one question from each module

2. Each question can have a maximum of 4 subdivisions (a,b,c,d)