# Kadi Sarva Vishwavidyalaya's
# LDRP Institute of Technology & Research
# Gandhinagar-382 015

## B.E. Semester: III
## Department of Civil Engineering
## Subject Name: Structural Analysis - I (CV305-N)

### A.     Objectives of the Course:

The course covers fundamentals of various structures and analysis of determinate structures. The aim of this subject is to understand the behaviour of the determinate structures through calculation of various forces and stresses in structures, which is essential for an economical dimensional proportioning of various civil engineering structures.  Different type structures like beams, frames and trusses are analyzed.

### B.     Teaching & Evaluation Scheme:

| Teaching Scheme | | | | Total Credit | Evaluation Scheme | | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| L hrs | T hrs | P hrs | Total Hrs | | Theory | | Mid Sem Exam | CIA | Pra/Viva | |
| | | | | | Hrs | Marks | Marks | Marks | Marks | |
| 3+1* | 2 | 0 | 6 | 5 | 3 | 70 | 30 | 20 | 30 | 150 |

### C.     Detailed Syllabus:

**1. Fundamentals:**

Introduction to Determinate and Indeterminate structures, Introduction and Calculation of SI and KI of various structures like beams, trusses, frames and grids

**2. Analysis of Determinate Beams:**

(A) Calculations of Shear Force and Bending Moment

Relation between Moment, Slope and Deflection, Differential Equation for Elastic Curve

(B) Calculations of Slope and Deflection using (i) Double Integration Method (ii) Macauli's Method (iii) Moment Area Method (iv) Conjugate Beam Method (v) Unit Load Method and (vi) Castigliano's First Theorem

**3. Analysis of Determinate Trusses:**

(A) Calculations of member forces using (i) Method of Joints (ii) Method of Sections

(B) Calculations of Vertical and Horizontal Deflections Using (i) Unit Load Method

**4. Analysis of Determinate Frames:**

Calculations of Shear Force and Bending Moment

**5. Strain Energy:**

Resilience, strain energy due to axial loads and flexure, proof resilience, modulus of resilience, impact loads and sudden loads

**6. Direct and Bending Stresses:**

Members subjected to eccentric loads, middle third rules, Kernel method of section

**7. Column and Strut:**

Buckling of columns, different end conditions, effective length, radius of gyration, Euler's and Rankine's formula, column with lateral loading and eccentric loading

## D.    Lesson Planning:

| Unit No | Title of the Unit | Minimum Hours | Weightage (%) |
|---|---|---|---|
| 1 | Fundamentals | 5 | 11 |
| 2 | Analysis of Determinate Beams | 14 | 31 |
| 3 | Analysis of Determinate Trusses | 8 | 17 |
| 4 | Analysis of Determinate Frames | 2 | 7 |
| 5 | Strain Energy | 10 | 22 |
| 6 | Direct and Bending Stresses | 3 | 6 |
| 7 | Column and Strut | 3 | 6 |

## E.    Assignments:

Minimum 10 examples from each topic

**Note: Students will have to submit the term work in one spiral bound of blank A4 Pages**

## F. Instructional method and pedagogy (Continuous Internal Assessment Scheme CIA):

➢ At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

➢ Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.

➢ Attendance is compulsory in lectures, practical and Tutorial which carries 05 Marks.

➢ At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.

➢ Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.

➢ Viva Voce will be conducted at the end of the semester of 05 Marks.

➢ One internal exam of 30 marks is conducted as a part of Mid Semester evaluation.

## G. Students Learning Outcomes:

➢ On the successful completion of this course

➢ The students will be able to understand the fundamentals of structure and various Methods of analysis.

➢ The students will be able to determine the effects of loads on physical structures and their components.

➢ The course gives students an understanding of the importance of structural analysis and the tools available to determine the response of a structural system to external loads.

## H. Recommended Study Materials:

**A. Text book & Reference Books:**

1. Junarkar, S.B. and Shah, H.J., Mechanics of Structures Vol. I, Charotar Publishing House

2. Negi, L.S. and Jangid, R.S., Structural Analysis, Tata McGraw Hill

3. Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill

4. Structure By Schedok

5. Gere and Timoshenko, Mechanics of Materials, CBS Publishers

6. Hibbler, R.C., Mechanics of Materials, Pearson Education

7. Wang, C.K., Intermediate Structural Analysis, Tata McGraw Hill 50

**B. Web Materials:**

1. http://www.nptel.iitm.ac.in/courses.php?branch=Civil

2. http://www.nptel.iitm.ac.in/video.php?courseId=1053

3.http://www.nptel.iitm.ac.in/courses/Webcoursecontents/IITDelhi/Mechanics%20Of%2

Solids/index.htm

4. http://www.nptel.iitm.ac.in/video.php?courseId=1069