

# THEORY OF STRUCTURE I

**Year-II**

**Semester-IV**

Teaching Hours/week				Examination Scheme						Total
				Internal		Final				
				Theory	Practical	Theory		Practical		
Credit Hours	L	T	P			Duration	Marks	Duration	Marks	
3	3	3	2/2	40	25	3 Hrs.	60	-	-	125

## Course Objective:

This course is designed to give students an understanding of structural analysis, with a focus on statically determinate structures. It is expected that by the conclusion of the course, students will be able to carry out analysis of determinate structures both manually and with the help of computer software.

## Course Contents:

### 1. Introduction

**(2 hours)**

- 1.1. Types of structures
- 1.2. Linearly elastic structures
- 1.3. Non-linearity in structural behavior
- 1.4. Methods of analysis

### 2. Strain Energy Method

**(4 hours)**

- 2.1. Strain energy and complementary strain
- 2.2. Strain energy due to gradually applied, suddenly applied and impact loads
- 2.3. Strain energy due to bending, shear and torsion
- 2.4. Displacement by method of Real work/strain energy
- 2.5. Limitation of the method of real work

### 3. Virtual Work Method

**(6 hours)**

- 3.1. Work and complementary work
- 3.2. Direct and bending effects
- 3.3. Deflection by unit load virtual work methods
- 3.4. Temperature effects and misfits
- 3.5. Combination of different effects in statically determinate beams, frames and trusses

### 4. Deformation of Statically Determinate Beams

**(10 hours)**

- 4.1. Curvature, slope and deflection
- 4.2. Differential equation of the deflection curve

- 4.3. Deflection by method of integration
- 4.4. Deflection by moment area method
- 4.5. Deflection by conjugate beam method

## **5. Influence Lines for Simple Structures (12 hours)**

- 5.1. Concept of influence lines
- 5.2. Influence Line diagrams for reactions, bending Moments and shear forces in beams
- 5.3. Calculation of reactions, bending moments and shear forces from the influence line
- 5.4. Criterion for maximum reaction, shear force, bending moment in simple beams
- 5.5. Inflection diagram using train of loads
- 5.6. Influence line diagrams for forces in members of plane trusses
- 5.7. Criterion for maximum axial force in a member of a plane truss

## **6. Statically Determinate Arches (6 hours)**

- 6.1. Various types of arches
- 6.2. Various types of three hinged structures - symmetrical and unsymmetrical, supports at different levels, arches parabolic and circular
- 6.3. Support reactions, bending moments, normal and radial shear forces in circular and parabolic three hinged arches
- 6.4. Introduction to influence line diagram for support reactions, shear forces, bending moments and radial shear in three hinged arches

## **7. Cable Structure (6 hours)**

- 7.1. Cable and cables bridges
- 7.2. General cable theorem
- 7.3. Cables under uniformly distributed load
- 7.4. Elements of simple suspension bridge
- 7.5. Suspension bridge with three-hinged stiffening girder

### **Laboratories:**

Students should perform experiments in the lab to analyze the structure of a given system and verify their results using computer simulations. This process of combining experiments and simulations will allow students to gain a deeper understanding of the system and its underlying structure.

## Practical

1. Practising English Pronunciation in the laboratory
2. Locating the stress in words and also to point out the features distinguishing American English and British English pronunciation.
3. Listening to the text played in the audio or visual and answer the given comprehension questions after it.
4. Critically analyzing the recorded speech played on audio or visual and finding the theme.
5. Practicing writing CV of each student.
6. Participating in a meeting and preparing the minutes of the meeting (Listening to English speakers and their speech).
7. Analyzing scientific paper of indexed journals
8. Writing Technical Proposals.
9. Getting students to involve in group discussion, debate and public speaking
10. Conducting a Demo Seminar.

## EVALUATION SCHEME

**Internal Assessment:** 40 marks

**Final examination:** 60 marks

**Pass Marks for each:** 40%

Units	Loads	Marks	Total	No. of questions
1	6	2+2+4	8	3
2	8	3+3+8	14	3
3	10	5+5+8	18	3
4	15	4+8	12	2
5	6	4+4	8	2
	<b>45</b>		<b>60</b>	<b>13</b>