Structural Analysis-III

Course Code	Credit Hours
CE-309	2-0

Course Description

This course provides the knowledge and understanding of analyzing structural elements by Matrix Method of analysis. The course is covered in three primary parts as matrix stiffness method of analysis, matrix flexibility method of analysis and introduction to structural dynamics. Each primary part has three to four secondary parts based on structural element degrees of freedom per node like springs, truss, beam and frame elements. Each structural element is covered in details encompassing formulations for load, displacement and stiffness/flexibility matrices and subsequent solution procedure for analysis and obtaining the desired outputs in terms of external reactions, internal forces like shear force and bending moments and displacements.

Text Book:

1. Structural Analysis By R.C.Hibbeler
2. Matrix Structural Analysis By Ronald L. Sack
3. Fundamentals of Finite Element Analysis By David V. Hutton
4. Structural Dynamics By Clough And Penzien

Reference Book:

Prerequisites :

CE-306 Structural Analysis-II**.**

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1-2	**Introduction** • Course Introduction • Introduction to matrix algebra • Degree of Indeterminacy and Degree of freedom Linear Springs
2-5	**Matrix Stiffness Method** **2D Truss Analysis** • Notations, node and member numbering, local and global axis, Coordinate transformation matrix, Compatibility and equilibrium • Assembly of structural stiffness matrix Finding displacements, member forces and reaction due to Loads Settlement, Temperature and Fabrication error/lack of fit
6-8	**Beam Analysis** • Notations used, Development of stiffness matrix for beams, Load vector for beams Problem solution for finding deflection, rotations and reactions for SFD and BMD
9	**Mid Semester Exam**
10-13	**Frames-2D** • Notations, Coordinate transformation matrix, Compatibility and equilibrium, Assembly of structural stiffness matrix Problem solution for finding deflection, rotations and reactions for SFD and BMD
14-16	**Matrix Flexibility Method** Introduction, Derivation and formulation of flexibility matrix for Trusses, Beams and frames
17-18	**End Semester Exam**

Practical: Nil