CEU360 ADVANCED STRUCTURAL ANALYSIS

L = 3 T = 0 P = 0 Cr = 3

Prerequisite CEU301 Structural Analysis II

Evaluation Policy : Test 1 - 15, Test 2 - 20, Assignments - 15, End semester examination - 50

Lecture Plan

Module 1 (11 hours)

1. Approximate methods of analysis of multistorey frames

L1 Introduction to Linear S.A
- Assumptions
- Sign Conventions
- Exact Methods
  - Force
  - Displacement
- Limitations of exact analysis procedures
- Multistory frames – Problem size for exact analysis
  - Need for suplified modeling

T1 Determinate Frames - N, Q, M dia
Deflections of Determinate beams

L2 Modeling from physical behaviour
Separate models for vertical loads & horizontal loads.

Models under vertical loads.
- Basic characteristic of frames under vertical loads.
- Substitute frame – Basic assumptions
- Derivation simplified models

L3: Analysis of simplified substitute frames,
- Numerical example.

L4: Maximum effects and corresponding loading condition
- Positive/ Negative in beam
- Axial load, Moment in Column

Numerical example.

L5: Models for lateral behaviour
Portal method
Assumptions
Numerical example

L6: Cantilever method
Assumptions
Numerical example

L7: Factor method
Assumptions
Numerical example

Overviews of portal, Cantilever and Factor methods and choice of the model.

2 Matrix analysis of structures

L8: Static and kinematic indeterminacy – force and displacement methods of analysis

L9: Definition of flexibility and stiffness influence coefficients

L10: Development of flexibility matrices by physical approach

Module II (14 hours)

Flexibility method:

L11: Flexibility method: flexibility matrices for truss and frame elements

L12: Load transformation matrix – development of total flexibility matrix – analysis of simple structures

L13: Plane truss

L14: Plane frame – nodal loads and element loads

L15: Lack of fit and temperature effects

Stiffness method:

L16: Stiffness method: Development of stiffness matrices by physical approach

L17: Stiffness matrices for truss elements

L18: Stiffness matrices for frame elements

L19: Displacement transformation matrix

L20: Development of total stiffness matrix

L21: Analysis of simple structures

L22: Plane truss example

L23: Plane frame example – nodal loads and element loads

L24: Lack of fit and temperature effects

Module III (9 hours)

Direct stiffness method

L25: Introduction – element stiffness matrix

L26: Rotation transformation matrix – transformation of displacement, load vector stiffness matrix

L27: Equivalent nodal forces and load vectors

L28: Assembly of stiffness matrix and load vector –determination of nodal displacements and element forces

L29: Analysis of plane truss

L30, L31: Analysis of Plane frame (with numerical examples)

L32: Analysis of grid

L33: Space-truss and space frame (without numerical examples)

Module IV (8 hours)

Computer Implementation

L34, L35: Analysis Packages - Description and data preparation

L36-38: Excercises on packages