CE 503: MATRIX METHODS OF STRUCTURAL ANALYSIS (3-0-0:3)

Introduction: Historical Background; Classical, Matrix, and Finite Element methods of Structural Analysis; Flexibility and Stiffness methods; Classification of Framed Structures; Analytical Models; Fundamental relationships for Structural Analysis; Linear versus Nonlinear Analysis.

Plane Trusses
Global and Local coordinate systems; Degrees of Freedom; Member Stiffness relations in the Local coordinate system; Calculation of member forces; Finite Element formulation using virtual work; Coordinate transformations; Member stiffness relations in the Global coordinate system; Structure Stiffness relations.

Beams
Analytical model; Member Stiffness relations; Finite Element formulation using virtual work; Member fixed end forces due to loads; Structure Stiffness relations; Structure fixed joint forces and equivalent joint loads.

Plane Frames
Analytical model; Member stiffness relations in the local coordinate system; Coordinate transformations; Member Stiffness relations in the Global coordinate system; Structure stiffness relations.

Member releases and secondary Effects
Member releases in Plane frames and Beams; Support displacements; Temperature changes and Fabrication errors.

Three dimensional framed structures
Space Trusses; Grids; Space frames.

Special topics and modelling techniques
Nonprismatic members; Solution of large systems of stiffness equations.

Text Books and References:
1. Kassimali A., "*Matrix Analysis of Structures*", Cengage Learning, 2nd edition 2011.
2. Singh P. K., "*Matrix Analysis of Structures*", Cengage, 1st edition 2013.
3. Rajasekaran S, "*Computational Structural Mechanics*", Prentice Hall of India, 1st edition 2001.
4. Meek, J. L., "*Matrix Structural Analysis*", Mc-Graw Hill Book Company, 1st edition 1971
5. McGuire, W., and Gallagher, R.H., "*Matrix Structural Analysis*", John Wiley and Sons, 2nd edition 2000.