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|  | **National Institute of Technology Meghalaya**An Institute of National Importance | **CURRICULUM** |
| Programme | **Master of Technology (Structural Engineering)** | Year of Regulation | **2018** |
| Department | **Civil Engineering** | Semester | **I** |
| Course Code | Course Name | Pre-requisite | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE503** | **Matrix Method of Structural Analysis** | **NIL** | **3** | **0** | **0** | **3** | **50** | **50** | **100** | **200** |
| Course Objectives | To develop the student’s knowledge on understanding of linear and non-linear analysis of structures. | Course Outcomes | CO1 | Student will be able to have a solid foundation on concepts and notations of matrix algebra can be applied to arriving at general systematic approach to structural analysis |
| To provide some knowledge on the principal features being matrix methods of structural analysis focusing on the stiffness approach | CO2 | Student will be able to possess the analytical and design related to trusses, beams and framed structures. |
|  | CO3 | Student will be able to use these solutions and its importance in direct application to various computer programming |
| SYLLABUS |
| No. | Content | Hours | COs |
| I | **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. | 6 | CO1 |
| II | **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. | 5 | CO2 |
| III | **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. | 5 | CO2 |
| IV | **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. | 5 | CO2 |
| V | **Member releases and secondary Effects** Member releases in Plane frames and Beams; Support displacements; Temperature changes and Fabrication errors. | 5 | CO1, CO2 |
| VI | **Three dimensional framed structures** Space Trusses; Grids; Space frames. | 5 | CO2 |
| VII | **Special topics and modelling techniques** Nonprismatic members; Solution of large systems of stiffness equations. | 5 | CO3 |
| **Total Hours** | **36** |  |
| **Essential Readings** |
| 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. |
| **Supplementary Readings** |
| 1. Meek, J. L., “Matrix Structural Analysis”, Mc-Graw Hill Book Company, 1st edition 1971 |
| 2. McGuire, W., and Gallagher, R.H., “Matrix Structural Analysis”, John Wiley and Sons, 2nd edition 2000 |
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