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| Image result for nit meghalaya logo | | | | **National Institute of Technology Meghalaya**  An Institute of National Importance | | | | | | | | | | | | | | | | | | | | | | | **CURRICULUM** | | | | | | |
| Programme | | | | **Bachelor of Technology in Civil Engineering** | | | | | | | | | | | | | Year of Regulation | | | | | | | | | | **2020** | | | | | | |
| Department | | | | **Civil Engineering** | | | | | | | | | | | | | Semester | | | | | | | | | | **V** | | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | | |
| L | | T | | | P | C | | INT | | | MID | | | END | | | | Total | |
| **CE321** | | **Matrix Methods of Structural Analysis** | | | | | | | | **Nil** | | | | **3** | | **0** | | | **0** | **3** | | **50** | | | **50** | | | **100** | | | | **200** | |
| Course  Objectives | | 1. **To understand the underlying philosophy of Matrix Methods of Structural Analysis.** | | | | | | | | | | Course Outcomes | | | | CO1 | | | **Able to understand the underlying philosophy of Matrix Methods of Structural Analysis.** | | | | | | | | | | | | | | |
| 1. **To develop the stiffness matrix for plane trusses.** | | | | | | | | | | CO2 | | | **Able to develop the stiffness matrix for plane trusses.** | | | | | | | | | | | | | | |
| 1. **To develop the stiffness matrix for prismatic beams and plane frames.** | | | | | | | | | | CO3 | | | **Able to develop the stiffness matrix for prismatic beams and plane frames.** | | | | | | | | | | | | | | |
| 1. **To understand and modify the stiffness matrix according to various member releases and secondary effects.** | | | | | | | | | | CO4 | | | **Able to understand and modify the stiffness matrix according to various member releases and secondary effects.** | | | | | | | | | | | | | | |
| 1. **To develop stiffness matrix and related formulations for 3D framed structures.** | | | | | | | | | | CO5 | | | **Able to develop stiffness matrix and related formulations for 3D framed structures.** | | | | | | | | | | | | | | |
| No. | COs | | Mapping with Program Outcomes (POs) | | | | | | | | | | | | | | | | | | | | | | | Mapping with PSOs | | | | | | | |
| PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | | PO8 | | PO9 | | | PO10 | | | PO11 | | PO12 | | | PSO1 | | | PSO2 | | | | PSO3 |
| 1 | CO1 | | **3** | | **3** | **0** | **1** | **0** | **0** | | **0** | | **0** | | **2** | | | **0** | | | **0** | | **0** | | | **2** | | | **0** | | | | **2** |
| 2 | CO2 | | **3** | | **3** | **0** | **1** | **0** | **0** | | **0** | | **0** | | **2** | | | **0** | | | **0** | | **0** | | | **2** | | | **0** | | | | **2** |
| 3 | CO3 | | **2** | | **3** | **3** | **1** | **2** | **0** | | **0** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **2** | | | **2** | | | | **2** |
| 4 | CO4 | | **2** | | **2** | **3** | **0** | **2** | **2** | | **3** | | **0** | | **2** | | | **0** | | | **0** | | **1** | | | **2** | | | **2** | | | | **2** |
| 5 | CO5 | | **2** | | **2** | **3** | **0** | **2** | **2** | | **3** | | **0** | | **2** | | | **0** | | | **0** | | **1** | | | **2** | | | **2** | | | | **2** |
| 6 | CO6 | | **0** | | **0** | **0** | **0** | **0** | **0** | | **0** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **0** | | | | **0** |
| 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. | | | | | | | | | | | | | | | | | | | | | | | **05** | | | | | | | **CO1** | | |
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| 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. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO1** | | |
| **CO2** | | |
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| 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. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO1** | | |
| **CO3** | | |
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| 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. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO1** | | |
| **CO3** | | |
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| V | **Member releases and secondary Effects**  Member releases in Plane frames and Beams; Support displacements; Temperature changes and Fabrication errors. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO1** | | |
| **CO4** | | |
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| VI | **Three dimensional framed structures**  Space Trusses; Grids; Space frames. | | | | | | | | | | | | | | | | | | | | | | | **07** | | | | | | | **CO1** | | |
| **CO5** | | |
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| Total Hours | | | | | | | | | | | | | | | | | | | | | | | | **36** | | | | | |  | | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Kassimali A., “Matrix Analysis of Structures”, Cengage Learning, 2nd edition 2011. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Singh P. K., “Matrix Analysis of Structures”, Cengage, 1st edition 2013. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Rajasekaran S, “Computational Structural Mechanics”, Prentice Hall of India, 1st edition 2001. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Meek, J. L., “Matrix Structural Analysis”, Mc-Graw Hill Book Company, 1st edition 1971. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. McGuire, W., and Gallagher, R.H., “Matrix Structural Analysis”, John Wiley and Sons, 2 nd edition 2000. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |