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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** |
| CourseCode | 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** |
| CourseObjectives | 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.
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