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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 Respective Programme** | Year of Regulation | **2019-20** |
| Department | **Civil Engineering** | Semester | **VI** |
| CourseCode | Course Name | **Pre requisite** | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE372** | **Introduction to Finite Element Method** | **Nil** | **2** | **0** | **0** | **2** | **50** | **50** | **100** | **200** |
| CourseObjectives | 1. To understand the basic concept of finite element analysis and the steps involved.
 | **Course Outcomes** | **CO1** | The students will be able to describe different steps in finite element analysis and understand basic concepts involved. |
| 1. To have the knowledge of finite element formulation techniques
 |
| **CO2** | The students will be able to outline the types of finite element formulation techniques. |
| 1. To understand the types of element and its formulation, and numerical integration
 |
| iv. To understand the FEM for two dimensional solids. |
| **CO3** | The students will be able to understand and develop discretization of physical model and their associated element properties. |
| **CO4** | The students will be able to solve two dimensional problems. |
| 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 | **2** | **2** | **3** | **2** | **3** | **3** | **3** | **2** | **1** | **2** | **2** | **2** | **As per the respective Programme** |
| 2 | CO2 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **1** | **1** | **1** | **3** | **2** |
| 3 | CO3 | **3** | **3** | **3** | **3** | **2** | **3** | **3** | **1** | **1** | **2** | **3** | **2** |
| 4 | CO4 | **2** | **2** | **2** | **2** | **1** | **3** | **3** | **1** | **1** | **2** | **2** | **2** |
| SYLLABUS |
| No. | Content | Hours | COs |
| I | Introduction:Introduction; Basic Concepts of Finite Element Analysis; Introduction to Elasticity; Steps in Finite Element Analysis. | **03** | **CO1** |
| **CO2** |
| II | Finite Element Formulation Techniques:Virtual Work and Variational Principle; Galerkin Method; Finite Element Method: Displacement Approach; Stiffness Matrix and Boundary Conditions. | **03** | **CO2** |
| **CO3** |
| III | Element Properties: Natural Coordinates; Triangular Elements; Rectangular Elements; Lagrange and Serendipity Elements; Solid Elements; Isoparametric Formulation; Stiffness Matrix of Isoparametric Elements; | **09** | **CO3** |
| **CO4** |
| IV | Numerical Techniques:Numerical Integration: One and two Dimensional problems. | **04** | **CO3** |
| **CO4** |
| V | FEM for Two and Three Dimensional Solids: Constant Strain Triangle; Linear Strain Triangle; Rectangular Elements; Numerical Evaluation of Element Stiffness; Computation of Stresses. | **05** | **CO3** |
| **CO4** |
| Total Hours | **24** |  |
| **Essential Readings** |
| 1. J.N. Reddy, J. N., “An Introduction to the Finite Element Method”, Tata McGraw Hill, 2nd Ed,2003.
 |
| 1. Krishnamoorthy, C. S., “Finite Elements Analysis: Theory and Programming”, Tata McGrawHill, 2nd Ed, 1994.
 |
| 1. Cook, R. D., Malkus, D. S., and Plesha, M. E., “Concepts and Applications of Finite Element Analysis”, John Wiley & Sons, 4th Ed, 2002.
 |
| **Supplementary Readings** |
| 1. Zienkiewicz, O. C., Taylor, R. L., and Zhu, J. Z., “Finite Element Method Its Basis andFundamentals”, Elsevier, 6th Ed, 2005.
 |
| 1. Rao, S. S., “Finite Element Method in Engineering”, Butterworth Heinemann, 3rd Ed, 1999.
 |
| 1. Kanchi, M. B., “Matrix Method of Structural Analysis”, Wiley Eastern Limited, 2nd Ed, 1993.
 |
| 1. Bathe, K. J., “Finite Element Procedures”, Prentice Hall of India Pvt. Ltd., 2002.
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