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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** | | | | | | |
| Course  Code | | | 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** | |
| Course  Objectives | | | 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |