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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 | | | | | **II** | | |
| Course Code | | Course Name | | Pre-requisite | | Credit Structure | | | | Marks Distribution | | | | | |
| L | T | P | C | INT | | MID | END | | Total |
| **CE 526** | | **SOFT COMPUTING LAB II** | | **NIL** | | **0** | **0** | **2** | **1** |  | | | **100** | | **100** |
| Course Objectives | | To develop the student’s knowledge on understanding of writing codes on basics of Finite Element Method (FEM) and its implementation using commercial finite element software and MATLAB. | | | Course Outcomes | | CO1 | Possess a good understanding of the theoretical basis of the weighted residual Finite Element Method. | | | | | | | |
| CO2 | Be able to use the commercial Finite Element packages to build Finite Element models and solve a selected range of engineering problems. | | | | | | | |
| CO3 | Be able to validate a Finite Element model using a range of techniques. | | | | | | | |
| CO4 | Be able to communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained. | | | | | | | |
| CO5 | Be able to discuss the accuracy of the Finite Element solutions | | | | | | | |
| SYLLABUS | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | Hours | | | COs | |
| **I** | Bar element: Formulation of local and global stiffness matrix using linear and quadratic shape functions; Application in the field of structural mechanics (mechanical and thermal loading, etc.); Validation of the above formulation using any commercial finite element code. | | | | | | | | | | 2 | | | CO1 | |
| **II** | Trusses: Formulation of stiffness matrix in local and global coordinate system using shape functions; Calculating stress and deflection; Validation of the above formulation using any commercial finite element code. | | | | | | | | | | 2 | | | CO2 | |
| **III** | Beam element: Formulation of local and global stiffness matrix using shape functions; Application in the field of structural mechanics; Validation of the above formulation using any commercial finite element code. | | | | | | | | | | 2 | | | CO3 | |
| **IV** | Frames: Formulation of stiffness matrix in local and global coordinate system using shape functions; Application in the field of structural mechanics; Validation of the above formulation using any commercial finite element code. | | | | | | | | | | 2 | | | CO4 | |
| **V** | Linear triangular elements: Formulation of stiffness matrix using constant strain triangles, Formulations of axisymmetric problems using constant strain triangles; Validation of the above formulation using any commercial finite element code.  arrays | | | | | | | | | | 2 | | | CO5 | |
| **VI** | Isoparametric formulations: Formulation of stiffness matrix using 4-noded quadrilaterals, hexahedral and higher order elements; Application in the field of structural mechanics; Validation of the above formulation using any commercial finite element code. | | | | | | | | | | 1 | | | CO1 | |
| **VII** | Dynamic considerations: Formulation of mass matrix; Evaluation of Eigen values and Eigen vectors; Application in the field of structural mechanics; Validation of the above formulation using any commercial finite element code. | | | | | | | | | | 1 | | | CO2 | |
|  | Total Hours | | | | | | | | | | 12 | | |  | |
| **Essential Readings** | | | | | | | | | | | | | | | |
| 1. Smith, I.M., Griffits, D.V., Margetts, L., “*Programming the finite element method*”, Wiley. | | | | | | | | | | | | | | | |
| 2. Bang, H., Kwon, Y. W., “*The Finite Element Method Using MATLAB*”, CRC Press.. | | | | | | | | | | | | | | | |
| 3. Peter, K., “*Matlab Guide to Finite Elements: An Interactive Approach*”, Springer International. | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | |
| 1. Chandrupatla, T. R., Belegundu, A. D., “*Introduction to Finite Elements in Engineering*”, PHI. | | | | | | | | | | | | | | | |
| 2. Reddy, J. N., “*An Introduction to the Finite Element Method*”, Tata McGraw Hill, 2nd Ed, 2003. | | | | | | | | | | | | | | | |
| 3. Cook, R. D., Malkus, D. S., and Plesha, M. E., “*Concepts and Applications of Finite Element Analysis*”, John Wiley & Sons, 4th Ed, 2002. | | | | | | | | | | | | | | | |
| 4. Bathe, K. J., “*Finite Element Procedures*”, Prentice Hall of India Pvt. Ltd., 2002. | | | | | | | | | | | | | | | |