

**Course wise Teaching Plan for Session : Summer 2019****Course : FINITE ELEMENT ANALYSIS Faculty : nagareddy.gadlegaonkar@raisoni.net - NAGAREDDY GADLEGAONKAR**

| Unit | Topic Code | Topic Covered | Date | Course | Section |
|------|------------|--|------------|---------|---------|
| 1 | 1 | Introduction– Brief History of FEM, Finite Element Terminology, General FEM procedure | 03/12/2018 | MCDL508 | A |
| 1 | 2 | Applications of FEM in various fields, P & h formulation, Advantages and disadvantages of FEM | 07/12/2018 | MCDL508 | A |
| 1 | 1 | Numericals on-Strain-Displacement equations, Stress-Strain Temperature Relations | 08/12/2018 | MCDL508 | A |
| 1 | 3 | Consistent units system. Review of Solid Mechanics Stress equilibrium equations | 08/12/2018 | MCDL508 | A |
| 1 | 4 | Strain-Displacement equations, Stress-Strain Temperature Relations | 10/12/2018 | MCDL508 | A |
| 1 | 5 | Plane stress, plane strain and axi-symmetric problems, Strain energy | 14/12/2018 | MCDL508 | A |
| 1 | 2 | Numericals on-Plane stress, plane strain and axi-symmetric problems, Strain energy | 15/12/2018 | MCDL508 | A |
| 1 | 6 | Total potential energy. Essential and natural boundary conditions Review of Matrix Algebra | 15/12/2018 | MCDL508 | A |
| 2 | 7 | Types of 1D element. Displacement function, Global and local coordinate systems, Order of element | 17/12/2018 | MCDL508 | A |
| 2 | 8 | primary and secondary variables, shape functions and its properties | 21/12/2018 | MCDL508 | A |
| 2 | 3 | Numericals on-Formulation of elemental stiffness matrix and load vector for spring, bar, beam, truss and Plane frame | 22/12/2018 | MCDL508 | A |
| 2 | 9 | Formulation of elemental stiffness matrix and load vector for spring, bar, beam, truss and Plane frame | 22/12/2018 | MCDL508 | A |
| 2 | 10 | Transformation matrix for truss and plane frame, Assembly of global stiffness matrix and load vector | 24/12/2018 | MCDL508 | A |
| 2 | 11 | Properties of stiffness matrix, Boundary conditions elimination method and penalty approach | 04/01/2019 | MCDL508 | A |
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|-------------|-------------------|---|-------------|---------------|----------------|
| 2 | 4 | Numericals on-Boundary conditions elimination method and penalty approach, Symmetric boundary conditions, Stress calculations | 05/01/2019 | MCDL508 | A |
| 2 | 12 | Symmetric boundary conditions, Stress calculations | 05/01/2019 | MCDL508 | A |
| 3 | 13 | Types of 2D elements, Formulation of elemental stiffness matrix | 07/01/2019 | MCDL508 | A |
| 3 | 14 | load vector for Plane stress/strain such as Linear Strain Rectangle (LSR) | 11/01/2019 | MCDL508 | A |
| 3 | 5 | Numericals on-Linear Strain Rectangle (LSR), Constant Strain Triangles (CST) | 12/01/2019 | MCDL508 | A |
| 3 | 15 | Constant Strain Triangles (CST), Pascal's triangle , primary and secondary variables | 12/01/2019 | MCDL508 | A |
| 3 | 16 | properties of shape functions. Assembly of global stiffness matrix and load vector | 14/01/2019 | MCDL508 | A |
| 3 | 17 | Boundary conditions, solving for primary variables (displacement) | 18/01/2019 | MCDL508 | A |
| 3 | 6 | Numericals on-Assembly of global stiffness matrix and load vector, Boundary conditions, solving for primary variables | 19/01/2019 | MCDL508 | A |
| 3 | 18 | Overview of axi-symmetric elements | 19/01/2019 | MCDL508 | A |
| 4 | 19 | Concept of isoparametric elements, super parametric and sub parametric | 21/01/2019 | MCDL508 | A |
| 4 | 20 | Isoparmetric formulation of bar element. Coordinate mapping - Natural coordinates | 25/01/2019 | MCDL508 | A |
| 4 | 21 | Area coordinates (for triangular elements), higher order elements (Lagrangean and serendipity elements). | 28/01/2019 | MCDL508 | A |
| 4 | 22 | Convergence requirements- patch test, Uniqueness of mapping - Jacobian matrix | 01/02/2019 | MCDL508 | A |
| 4 | 7 | Numericals on-formulation of bar element. Coordinate mapping - Natural coordinates | 02/02/2019 | MCDL508 | A |
| 4 | 23 | Numerical integration – 2 and 3 point Gauss Quadrature | 02/02/2019 | MCDL508 | A |



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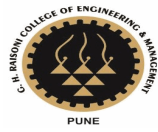
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|------|------------|---|------------|---------|---------|
| 4 | 24 | full and reduced integration. Sub-modeling, sub-structuring | 04/02/2019 | MCDL508 | A |
| 5 | 25 | Introduction, Governing differential equation | 08/02/2019 | MCDL508 | A |
| 4 | 8 | Numericals on-Numerical integration – 2 and 3 point Gauss Quadrature | 09/02/2019 | MCDL508 | A |
| 5 | 26 | steady-state heat transfer formulation of 1D element for conduction | 09/02/2019 | MCDL508 | A |
| 5 | 27 | Numericals | 11/02/2019 | MCDL508 | A |
| 5 | 28 | steady-state heat transfer formulation of 1D element for convection problem | 15/02/2019 | MCDL508 | A |
| 5 | 9 | Numericals on-steady-state heat transfer formulation of 1D element for conduction | 16/02/2019 | MCDL508 | A |
| 5 | 29 | Numericals | 16/02/2019 | MCDL508 | A |
| 5 | 30 | boundary conditions | 18/02/2019 | MCDL508 | A |
| 5 | 31 | solving for temperature distribution | 22/02/2019 | MCDL508 | A |
| 5 | 10 | Numericals on-steady-state heat transfer formulation of 1D element for convection problem, | 23/02/2019 | MCDL508 | A |
| 5 | 32 | Numericals | 23/02/2019 | MCDL508 | A |
| 6 | 33 | Types of dynamic analysis, General dynamic equation of motion | 25/02/2019 | MCDL508 | A |
| 6 | 34 | point and distributed mass | 01/03/2019 | MCDL508 | A |
| 6 | 11 | Numericals on-point and distributed mass, lumped and Consistent mass | 02/03/2019 | MCDL508 | A |
| 6 | 35 | lumped and Consistent mass | 02/03/2019 | MCDL508 | A |
| 6 | 36 | Mass matrices formulation of bar and beam element | 05/03/2019 | MCDL508 | A |
| 6 | 37 | Undamped-free vibration | 08/03/2019 | MCDL508 | A |
| 6 | 12 | Numericals on-Undamped-free vibration- Eigenvalue problem, Evaluation of eigenvalues and eigenvectors | 09/03/2019 | MCDL508 | A |
| 6 | 38 | Eigenvalue problem | 09/03/2019 | MCDL508 | A |



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|------|------------|---------------------------|------------|---------|---------|
| 6 | 39 | Evaluation of eigenvalues | 11/03/2019 | MCDL508 | A |
| 6 | 40 | eigenvectors | 15/03/2019 | MCDL508 | A |