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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 | | | | | | | | | | **2019-20** | | | | | | |
| Department | | | | **Civil Engineering** | | | | | | | | | | | | | Semester | | | | | | | | | | **III** | | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | | |
| L | | T | | | P | C | | INT | | | MID | | | END | | | | Total | |
| **CE201** | | **Solid Mechanics** | | | | | | | | **Nil** | | | | **3** | | **1** | | | **0** | **4** | | **50** | | | **50** | | | **100** | | | | **200** | |
| Course  Objectives | | 1. To understand the basic concepts of solid mechanics | | | | | | | | | | Course Outcomes | | | | CO1 | | | To understand the theory of elasticity including strain/displacement and Hooke’s law relationships; | | | | | | | | | | | | | | |
| 1. To introduce the concept of stress strain and deformation due to internal actions. | | | | | | | | | | CO2 | | | To analyse solid mechanics problems using classical methods and energy methods; | | | | | | | | | | | | | | |
| 1. To analyze solid mechanics problems using classic methods and energy methods | | | | | | | | | | CO3 | | | To solve torsion problems in bars and thin walled members; | | | | | | | | | | | | | | |
| 1. To apply various failure criteria for general stress state at a point | | | | | | | | | | CO4 | | | To solve for stresses and deflections of beams under unsymmetrical loading; | | | | | | | | | | | | | | |
|  | | | | | | | | | | CO5 | | | To obtain stresses and deflections of beams on elastic foundations; | | | | | | | | | | | | | | |
| 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 | | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 0 |
| 2 | CO2 | | 3 | | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 0 |
| 3 | CO3 | | 3 | | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 0 |
| 4 | CO4 | | 3 | | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 0 |
| 5 | CO5 | | 3 | | 0 | 1 | 0 | 0 | 0 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 0 |
| SYLLABUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | | | | | | | | | | | | | | Hours | | | | | | | COs | | |
| I | **Stress**  Definition of stress, Stress at a point –matrix of stress / stress tensor, Symmetry of stress tensor, Equilibrium of a body –differential equations of equilibrium, Different states of stress –uniaxial, biaxial, plane stress, etc., Transformation of plane stress; extension to 3-D, Principal stresses and maximum shear stress, Mohr’s circle | | | | | | | | | | | | | | | | | | | | | | | **6** | | | | | | | **CO1** | | |
| II | **Strain**  Definition of strain –shear and normal strains, Strain at a point –matrix of strain / strain tensor, Symmetry of strain tensor, Different states of strain –uniaxial, plane strain, etc., Transformation of plane strain; extension to 3-D,Principal strains, Mohr’s circle for plane strain | | | | | | | | | | | | | | | | | | | | | | | **7** | | | | | | | **CO1** | | |
| III | **Mechanical properties**  Stress-strain diagrams, generalized Hooke’s law, Lame’s constant, elastic modulus, bulk modulus, Relationship between different elastic constants | | | | | | | | | | | | | | | | | | | | | | | **6** | | | | | | | **CO1, CO2** | | |
| IV | **Bending**  Relation between transverse loads, shear and bending moments, Shear and bending moment diagrams, Pure bending –beams with symmetric cross-sections, Beams with composite cross-section, Shear stresses in beams, Deflections in beams | | | | | | | | | | | | | | | | | | | | | | | **7** | | | | | | | **CO4, CO5** | | |
| V | **Torsion**  Torsional moment diagrams, Torsion formula for circular cross-sections, Maximum normal and shear stresses, Angle of twist | | | | | | | | | | | | | | | | | | | | | | | **6** | | | | | | | **CO3** | | |
| VI | **Energy methods**  Stored energy in elastic members –axial, torsional, bending, etc. Castigliano’s theorem, Application of Castigliano’s theorem to different classes of problems, Virtual work principles –the basis, Application of virtual work principles to classes of problems | | | | | | | | | | | | | | | | | | | | | | | **10** | | | | | | | **CO2** | | |
| VII | **Elastic stability**  Motion of stability of equilibrium, Euler buckling, Members with eccentric loading, etc. | | | | | | | | | | | | | | | | | | | | | | | **6** | | | | | | | **CO2** | | |
| Total Hours | | | | | | | | | | | | | | | | | | | | | | | | **48** | | | | | |  | | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Kazimi S.M.A., “Solid mechanics-First revised edition”, Tata McGraw Hill.; Twenty sixth edition, 2006 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Popov E. P., “Engineering Mechanics of Solids”, Dorling Kindersley (India) Pvt Ltd; Second edition, 1999 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Timoshenko, S.P. and Gere, J.M., Mechanics of Materials, Tata McGraw Hill, First edition, 1992. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Srinath L. S., “Advanced Solid Mechanics”, Tata McGraw Hill; Third edition, 2010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Pitarresi J.M., “Introduction to Solid Mechanics”, Prentice Hall of India; Third edition, 2000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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