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| Image result for nit meghalaya logo | | | **National Institute of Technology Meghalaya**  An Institute of National Importance | | | | | | | | | | | **CURRICULUM** | | | |
| Programme | | | **Master of Technology** | | | | | Year of Regulation | | | | | | **2018-19** | | | |
| Department | | | **Civil Engineering** | | | | | Semester | | | | | | **I** | | | |
| Course  Code | | Course Name | | Pre requisites | | Credit Structure | | | | | Marks Distribution | | | | | | |
| L | T | | P | C | INT | | MID | | END | | Total |
| **CE511** | | **Advance Fluid Mechanics** | | **None** | | **3** | **0** | | **0** | **3** | **50** | | **50** | | **100** | | **100** |
| Course  Objectives | | 1. To enable students deriving the partial differential equations governing the conservation of mass, momentum, and energy of an incompressible fluid, exact solution of Navier stokes equation for simple cases. 2. To solve boundary layer and closed conduit real life flow problems. | | | Course Outcomes | | CO1 | | Able to formulate and solve problems involving partial differential equations governing the conservation of mass, momentum, and energy of an incompressible fluid | | | | | | | | |
| CO2 | | Able to obtain dimensionless form of Navier stokes equations | | | | | | | | |
| CO3 | | Able to apply integral form of the boundary layer equations to derive expressions for boundary layer thickness, displacement thickness, momentum thickness and overall drag | | | | | | | | |
| CO4 | | Able to solve pipe flow problems | | | | | | | | |
| CO5 | |  | | | | | | | | |
| SYLLABUS | | | | | | | | | | | | | | | | | |
| **No.** | **Content** | | | | | | | | | | | **Hours** | | | | **COs** | |
| I | **Introduction**  Introduction to Cartesian tensors and tensor operations, Spatial (Eulerian) and Material (Lagrangian) approach. | | | | | | | | | | | 06 | | | | CO1 | |
| II | **Body motion**  Description of motion of deformable bodies, Rotation and vorticity, Strain rate tensor, Time rate of change of volume and line integrals, Reynold’s transport theorem, Stress tensor, Continuity and equilibrium equations, Constitutive equations. | | | | | | | | | | | 06 | | | | CO2 | |
| III | **Fluid dynamics**  Derivation of Navier-Stoke’s equation and its applications, Introduction to laminar flow, Blasius equation, Karman  momentum equation | | | | | | | | | | | 06 | | | | CO3 | |
| IV | **Turbulent flow**  Description of turbulent flow, Kelvin-Helmholtz instability, Mean flow equations, Prandtl’s mixing length, Turbulent  Poiseuille flow, Jets and wakes. | | | | | | | | | | | 08 | | | | CO4 | |
| V | **Flow of Ideal Fluids**  Analysis of Incompressible Flow, Vortex Flow, Flow About a Cylinder without Circulation, Flow Past a Source, Flow about a Rotating Cylinder | | | | | | | | | | | 10 | | | | CO4 | |
| **Total Hours** | | | | | | | | | | | | **36** | | | |  | |
| **Essential Readings** | | | | | | | | | | | | | | | | | |
| 1. Ligett, J. A., “Fluid Mechanics”, McGraw-Hill International Editions. | | | | | | | | | | | | | | | | | |
| 1. Batchelor, G. K., “An Introduction to Fluid Mechanics”, Cambridge University Press. | | | | | | | | | | | | | | | | | |
| 1. Shames, L. H., “Mechanics of Fluids”, McGraw-Hill. | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | |
| 1. Chatterjee, R., “Mathematical Theory of Continuum Mechanics”, Narosa Publishing House | | | | | | | | | | | | | | | | | |
| 1. Chung, T. J., “Continuum Mechanics”, Prentice Hall. | | | | | | | | | | | | | | | | | |