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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 | | | | | | | | | | **VI** | | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | | |
| L | | T | | | P | C | | INT | | | MID | | | END | | | | Total | |
| **CE318** | | **Fluid Dynamics and Fluid machines** | | | | | | | | **Nil** | | | | **3** | | **0** | | | **0** | **3** | | **50** | | | **50** | | | **100** | | | | **200** | |
| Course  Objectives | | To introduce the student to the fundamentals of fluid dynamics giving emphasis on the different laws and principles of viscous flow and turbulent flow. | | | | | | | | | | Course Outcomes | | | | CO1 | | | Students will be able to develop the basic competence in viscous flow dynamics. | | | | | | | | | | | | | | |
| To understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines. | | | | | | | | | | CO2 | | | Students will be able to analyse the turbulent flow behaviour of fluids. | | | | | | | | | | | | | | |
| To formulate and analyze problems related to calculation of forces in fluid structure interaction. | | | | | | | | | | CO3 | | | Students will be able to understand the concept of boundary layer theory. | | | | | | | | | | | | | | |
| CO4 | | | Students will be able to calculate the forces on submerged bodies. | | | | | | | | | | | | | | |
| CO5 | | | Students will be able to analyze and design various hydraulic machines. | | | | | | | | | | | | | | |
| 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 | | 3 | 0 | 0 | 0 | 0 | | 3 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 1 |
| 2 | CO2 | | 3 | | 3 | 0 | 0 | 0 | 0 | | 3 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 1 | | | 3 | | | | 3 |
| 3 | CO3 | | 3 | | 3 | 0 | 0 | 0 | 0 | | 3 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 1 |
| 4 | CO4 | | 3 | | 3 | 0 | 0 | 0 | 0 | | 3 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 1 | | | 3 | | | | 1 |
| 5 | CO5 | | 3 | | 3 | 3 | 0 | 0 | 0 | | 3 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 1 | | | 3 | | | | 3 |
| SYLLABUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | | | | | | | | | | | | | | Hours | | | | | | | COs | | |
| I | **Dynamics of Viscous Flows**  Viscosity- dynamic and kinematic, Navier Stoke equation, plane Poiseuille flow and its application, Couette flow, Hagen Poiseuille flow, kinetic energy and momentum correction factor, determination of co-efficient of viscosity. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO1, CO2, CO3** | | |
| II | **Turbulent Flow**  Classification of turbulence, Reynolds stresses, Eddy viscosity, Prandtl mixing length theory,velocity distribution over smooth and rough surfaces, continuity equation for turbulence flow, Reynolds Navier-stockes equation. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO3** | | |
| III | **Boundary Layer Theory**  Boundary layer thickness-displacement, momentum and energy thickness, laminar sub-layer, Von-Karman integral momentum equation, turbulent boundary layer over a flat plate, separation of boundary layer. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO3** | | |
| IV | **Forces on Submerged Bodies**  Force exerted by flowing fluid on a stationary body-drag and lift, drag on a sphere, terminal velocity, lift on a circular cylinder, stagnation point, magnus effect, lift on an airofoil. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO4** | | |
| V | **Impact of Jet and Hydraulic Machines – Turbines**  Impact of jet on stationary plane and curved surface, impact of jet on hinged surface, impact of jet on moving surface, jet propulsion.  Classification of turbines, head and efficiency of a turbine, Pelton wheel, radial flow impulse turbine, Kaplan turbine, mixed flow turbine, surge tank, performance of hydraulic turbine, unit quantities, specific speed. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO5** | | |
| VI | **Centrifugal and ReciprocatingPumps**  Working principle of centrifugal pump, efficiency, minimum starting speed, multi stage pump, characteristic curve, maximum suction lift, cavitation.  Working principle of reciprocal pump, slip of reciprocating pump, variation of velocity and acceleration, maximum speed of the rotating crank, air vessels. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | | **CO5** | | |
| **Total Hours** | | | | | | | | | | | | | | | | | | | | | | | | **36** | | | | | |  | | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. S. K. Sam, G. Biswas and S. Chakraborty, “Introduction to Fluid Mechanics and Fluid Machines”, McGraw Hill Education. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. C. S. P. Ojha, R. Berndtsson and P. N. Chandramouli, “Fluid Mechanics and machinery”, Oxford University Press. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. C. Pozrikidis, “Introduction to Theoretical and Computational Fluid Dynamics”, Oxford University Press. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. B. F. White, “Fluid Mechanics”, McGraw Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. J. Frabzini, “Fluid Mechanics with Engineering Applications”, McGraw Hill Education. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |