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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** | | | | | | | | | | | | | 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 | |
| **CE302** | | **Hydraulics and Hydraulic structures** | | | | | | | | **CE 305** | | | | **3** | | **1** | | | **0** | **4** | | **50** | | | **50** | | | **100** | | | | **200** | |
| Course  Objectives | | To develop the student’s knowledge on basics of open channel flow. | | | | | | | | | | Course Outcomes | | | | CO1 | | | Student will be able to understand the basics of open channel flow including types, velocity distribution and pressure distribution. | | | | | | | | | | | | | | |
| To provide some knowledge about various methods for calculating critical flow depths in open channel flow. | | | | | | | | | | CO2 | | | Student will demonstrate the ability to perform analysis of critical flow. | | | | | | | | | | | | | | |
| To develop understanding of uniform flow concept in hydraulics. | | | | | | | | | | CO3 | | | Student will be able to understand the concept the uniformflow. | | | | | | | | | | | | | | |
| To make the student understand about the practical problems related with gradually varied flow. | | | | | | | | | | CO4 | | | Student will be able to compute gradually varied flow. | | | | | | | | | | | | | | |
| To provide knowledge about rapidly varied flow problems and hydraulic structures. | | | | | | | | | | CO5 | | | Student will be able to formulate and solve rapidly varied flow problems. | | | | | | | | | | | | | | |
|  | | | | | | | | | | CO6 | | | Student will be able to understand the concept of working and design principles of various hydraulic structures. | | | | | | | | | | | | | | |
| 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** | | **0** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **0** | | | | **0** |
| 2 | CO2 | | **3** | | **3** | **3** | **0** | **0** | **0** | | **0** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **0** | | | | **3** |
| 3 | CO3 | | **3** | | **3** | **3** | **0** | **0** | **0** | | **0** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **0** | | | | **3** |
| 4 | CO4 | | **3** | | **3** | **3** | **0** | **0** | **0** | | **0** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **0** | | | | **3** |
| 5 | CO5 | | **3** | | **3** | **3** | **0** | **0** | **0** | | **3** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **3** | | | | **3** |
| 6 | CO6 | | **3** | | **3** | **3** | **0** | **0** | **0** | | **3** | | **0** | | **0** | | | **0** | | | **0** | | **0** | | | **0** | | | **3** | | | | **3** |
| SYLLABUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | | | | | | | | | | | | | | Hours | | | | | | | COs | | |
| I | **Introduction**  Definition and classification of open channel flows, velocity and pressure distributions, energy and momentum coefficients in open channel flow and their needs. | | | | | | | | | | | | | | | | | | | | | | | 04 | | | | | | | CO1 | | |
| II | **Critical flow**  Conservation of mass, conservation of momentum and conservation of energy, specific energy and specific force concepts, introduction to critical flow and computation, various methods for critical depth estimation. | | | | | | | | | | | | | | | | | | | | | | | 08 | | | | | | | CO2 | | |
| III | **Uniform flow**  Introduction to uniform flow, flow resistance formulas, roughness coefficient, computation of uniform flow using different methods, hydraulically most efficient channel sections, most economical channel design. | | | | | | | | | | | | | | | | | | | | | | | 10 | | | | | | | CO3 | | |
| IV | **Gradually varied flow**  Introduction to gradually varied flow, governing equation of gradually varied flow, classification and characteristics of water-surface profiles, sketching of water-surface profiles, computation of gradually varied flow: direct-step method and standard step method, numerical methods for calculation of gradually varied flow. | | | | | | | | | | | | | | | | | | | | | | | 10 | | | | | | | CO4 | | |
| V | **Rapidly varied flow**  Introduction to rapidly varied flow, hydraulic jump, classification and practical application of hydraulic jump, ratio of sequent depths, height and length of jump, energy loss and jump location. | | | | | | | | | | | | | | | | | | | | | | | 06 | | | | | | | CO5 | | |
| VI | **Channel design**  Erodible and non-erodible channels, their design principles and various design methods. | | | | | | | | | | | | | | | | | | | | | | | 06 | | | | | | | CO6 | | |
| VII | **Hydraulic structures**  Introduction to hydraulic structures, different types of hydraulic structures, dam engineering, classification of dams, design of spillway, cross drainage structures. | | | | | | | | | | | | | | | | | | | | | | | 04 | | | | | | | CO6 | | |
| Total Hours | | | | | | | | | | | | | | | | | | | | | | | | **48** | | | | | |  | | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. M. H. Chaudhry, “Open Channel Flow”, Prentice Hall, 2nd Edition, 2008 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. K.G., RangaRaju, “Flow Through Open Channels”, Tata McGraw Hill, 2nd Edition 1993. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. K Subramanya, Flow in open channels, McGraw Hill, 3rd edition, 2009 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. F. M. Henderson, “Open Channel Flow”, Tata McGraw Hill, 1st Edition, 1992. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. V.T. Chow, “Open Channel Hydraulics”, Tata McGraw Hill, 3rdEdition, 2009. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. M M Das, Open channel flow, PHI, 3rd edition, 2011 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |