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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 | **VII** |
| CourseCode | Course Name | **Pre requisite** | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE415** | **Ground water Hydrology** | **Nil** | **3** | **0** | **0** | **3** | **50** | **50** | **100** | **200** |
| CourseObjectives | To develop the student’s knowledge on basics of ground water flow. | Course Outcomes | CO1 | Student will be able to understand the basics of ground water flow. |
| To provide some knowledge about ground water flow in different types of aquifers. | CO2 | Student will be able to understand the concept of ground water movement. |
| To develop understanding of flows from wells. | CO3 | Student will be able to compute flow from different types of aquifers. |
| To make the student understand about management of ground water. | CO4 | Student will be able to understand the various processes of ground water management. |
| To provide knowledge about solute transport in ground water. | CO5 | Student will be able to computesolute transport in ground water flow. |
|  | CO6 |  |
| 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** | **0** | **0** | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** |
| 3 | CO3 | **3** | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **0** | **3** |
| 4 | CO4 | **3** | **3** | **3** | **0** | **0** | **0** | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** |
| 5 | CO5 | **3** | **3** | **3** | **0** | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **3** |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SYLLABUS |
| No. | Content | Hours | COs |
| I | **Introduction** Definition of ground water, ground water balance equation, Continuum approach and representative elementary volume approach in ground water. | 06 | CO1 |
| II | **Ground water movement**Darcy’s law and it’s extension, different types of aquifers, aquifer coefficients, Dupuit’s approximation, governing equations of ground water flow, ground water flow in confined aquifer, ground water flow in unconfined aquifer. | 08 | CO2 |
| III | **Well hydraulics**Wells in confined and unconfined aquifers, steady flow from a well in confined aquifer, steady flow from a well in unconfined aquifer, solution of unsteady ground water flow in confined aquifer, solution of unsteady ground water flow in unconfined aquifer. | 08 | CO3 |
| IV | **Management of Ground water**Introduction to ground water management models, management of potential aquifers, safe yield from aquifers, artificial recharge of aquifers, estimation of ground water recharge. | 08 | CO4 |
| V | **Ground water transport process**Source of ground water contamination, solute transport in porous media, diffusion equation for distributed and continuous source, retardation of solutes. | 06 | CO5 |
| Total Hours | **36** |  |
| **Essential Readings** |
| 1. D. K. Todd, “Groundwater Hydrology”, John Wiley & Sons, 3rdEdition, 2004.
 |
| 1. H. M.Raghunath, “Groundwater Hydrology”, John Wiley & Sons, 1stEdition, 1982.
 |
| 1. M Kasenow, Applied ground water hydrology and well hydraulics, Water Resources publication, 2nd edition, 2001
 |
| **Supplementary Readings** |
| 1. M. Akhbari, “Groundwater HydrologyEngineering, Planning, and Management”, CRC press, 1st Edition, 2011.
 |
| 1. K. R. Rushton, “Groundwater Hydrology: Conceptual and Computational Models”, John Wiley & Sons, 1stEdition, 2003.
 |
| 1. V C Agarwal Ground water hydrology, PHI, 1st edition, 2012
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