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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 | **V** |
| CourseCode | Course Name | **Pre requisite** | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE 311** | **Environmental Engineering – II** | **Nil** | **3** | **0** | **0** | **3** | **50** | **50** | **100** | **200** |
| CourseObjectives | 1. To analyze the Waste water sources and waste water characteristics and to develop various waste water treatment process.
 | Course Outcomes | CO1 | Able to gain an experience in the implementation of environmental Engineering on engineering concepts which are applied in field. |
| 1. To train the students on developing practical, efficient and cost effective solutions on problems and challenges on environmental sciences and engineering.
 | CO2 | Able to get a diverse knowledge of environmental engineering practices applied to real life problems. |
| 1. To give an experience in the implementation of engineering concepts which are applied in field of waste Water treatment process.
 | CO3 | Able to learn to understand the theoretical and practical aspects of environmental engineering along with the design and management applications. |
| 1. To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.
 | CO4 | Able to identify environmental problems and solutions. |
|  | CO5 | Able to designing various physico-chemical unit processes and operations to achieve the desired water quality in water and wastewater systems. |
| 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 | **Sanitary Engineering**Definition of sullage, sewage, sewerage, sewer, refuge, garbage, sewage treatment/Disposal system and waste water management. | **04** | **CO1, CO2, CO3** |
| II | **Sewage Systems, Collection and Conveyance** Strength of Sewage, Sampling of Sewage to analyze for Physical, Chemical and Biological Parameters; Decomposition of sewage, comparison, Design of Sewer; Domestic and industrial sewage, volume of domestic sewage, variability of flow, limiting velocities-Self cleansing and Maximum velocities of sewer; Types of Sewers. | **06** | **CO3** |
| III | **Waste Water Flow**Estimation of Dry Weather Flow and Storm Water, Variation of flow, Estimation of design discharge. | **04** | **CO3** |
| IV | **Waste Water Characteristics**Physical, chemical, and Biological characteristics of sewage and wastewater, effluent standards | **04** | **CO4** |
| V | **Waste Water Disposal and Treatment** Treatment Methods – Principles; Dilution, self-purification, Flow diagram of conventional sewage treatment plant, Primary treatment – screens, Grit Chambers, detritus tank, skimming tank, Type – III and Type – IV settling, Design of secondary sedimentation tank. Secondary treatment – Trickling fitters, Biological contractor, Activated sludge process, Sequencing Batch Reactor (SBR); Membrane Bioreactor (UASB); Waste Stabilization Ponds; oxidation pond and ditches, aerated lagoon; Tertiary Treatment of Sewage; Decentralised Sewage Treatment & Reuse.  | **10** | **CO5** |
| VI | **Treatment and Disposal of Sludge**Sludge characterization; Thickening; Design of gravity thickener; Aerobic and anaerobic digestion; Standard rate and High rate digester design; Biogas recovery; Sludge Conditioning and Dewatering; Sludge drying beds; Standards for Disposal Methods; dilution; Mass balance principle; Self purification of river; Oxygen sag curve. | **08** | **CO5** |
| **Total Hours** | **36** |  |
| **Essential Readings** |
| 1. Environmental Engineering, Peavy H. S., Rowe D. R. and George Tchobanoglous, McGraw-Hill International.
 |
| 1. Water Supply and Sewerage, McGhee T. J ., McGraw-Hill Inc.,
 |
| 1. Garg, S.K., "Environmental Engineering", Vol. 1 & II Khanna Publishers, New Delhi, 2005.
 |
| **Supplementary Readings** |
| 1. Introduction to Environmental Engineering, Davis M. L and Cornwell D. A McGraw-Hill, Inc.
 |
| 1. Wastewater Engineering- Treatment and Reuse, Metcalf & Eddy (Revised by G. Tchobanoglous, F. L. Burton and H. D. Stensel), Tata McGraw Hill.
 |
| 1. Chemistry for Environmental Engineers, Sawyer C. N., McCarty P. L and Parkin G. F., McGraw- Hill.
 |
| 1. APHA, Standard Methods Examination of Water and Wastewater, American Public Health Association, Washington DC, 1995.
 |
| 1. Manual for water supply and treatment, Central Public Health & Environmental Engineering Organization, Ministry of Housing and Urban Development, Govt. of India, 1999.
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