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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 | | | | | | | | | | **VIII** | | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | | |
| L | | T | | | P | C | | INT | | | MID | | | END | | | | Total | |
| **CE 414** | | **Industrial Pollution Prevention** | | | | | | | | **Nil** | | | | **3** | | **0** | | | **0** | **3** | | **50** | | | **50** | | | **100** | | | | **200** | |
| Course  Objectives | | 1. To understand the important issues and their abatement principles of industrial pollution | | | | | | | | | | Course Outcomes | | | | CO1 | | | Able to analyze pollution load, characteristics of hazardous solid waste and its handling & management. | | | | | | | | | | | | | | |
| 1. To Treatment methods of specific pollutant arising out of industrial process | | | | | | | | | | CO2 | | | Able to design of suitable treatment for industrial wastewater for reduce pollution. | | | | | | | | | | | | | | |
| 1. To train practical, efficient and cost effective solutions on problems and challenges on environmental Industrial Pollution | | | | | | | | | | CO3 | | | Able to assess risks posing threats to the environment and select the most appropriate technique to control and treat industrial air pollution | | | | | | | | | | | | | | |
|  | | | | | | | | | | CO4 | | | Able to design of air pollution control devices and model the atmospheric dispersion of air pollutants. | | | | | | | | | | | | | | |
|  | | | | | | | | | | CO5 | | | Able to apply environmental management systems (EMS) to an industrial activity | | | | | | | | | | | | | | |
| 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 | **Introduction:**  Introduction to waste production in different sectors such as domestic, industrial and agriculture sectors; Industrial symbiosis and estate planning, effluent/emission trading, | | | | | | | | | | | | | | | | | | | | | | | **04** | | | | | | | **CO1, CO2, CO3** | | |
| II | **Industrial Solid Waste Management:**  Waste classification, Risk assessment; Environmental Legislation in solid waste; Reuse recycle and recovery of waste; Waste minimization and resource recovery; Hazardous wastes management techniques; Ground water contamination | | | | | | | | | | | | | | | | | | | | | | | **05** | | | | | | | **CO3, CO5** | | |
| III | **Industrial wastewater treatment processes:**  Magnitude of industrial pollution, their characteristics, and impacts; Physical, chemical and biological methods of industrial wastewater treatment; Industrial wastewater versus municipal wastewater; Bioassay test; Sampling techniques; Zero discharge concepts; Removal of specific pollutants in industrial effluents e.g. oil & grease, phenol, cyanide, toxic organics, heavy metals; Characteristics and treatment of various industrial effluents; Specific treatment methods- Design of equalization and neutralization tank; Waste reduction and treatment methods for industries- pulp and paper, sugar, distillery, tannery, dairy, textile. Planning- Small-scale industries and pollution issues, concept of CETPs. | | | | | | | | | | | | | | | | | | | | | | | **09** | | | | | | | **CO3, CO5** | | |
| IV | **Industrial Air Pollution treatment:**  Classification of air pollutants, Sources and effects; Monitoring techniques: Sampling methods and measurements of air pollutants and meteorological parameters, Source monitoring of gaseous and particulate matter, analytical techniques; Meteorological parameters and their effects on urban air pollution, Wind rose; Atmospheric stability; Global air pollution: Acid rain, Ozone layer depletion, Global warming, Green house effect and Trans-boundary pollution Legislations and regulations: Ambient air quality standards, Emission standards, emission inventory, and Acts; | | | | | | | | | | | | | | | | | | | | | | | **05** | | | | | | | **CO4, CO5** | | |
| V | **Air Quality Modelling:**  Air pollution meteorology: Transport, dilution, modification and removal of pollutants; Wind velocity profiles, Atmospheric stability; Inversions; Potential temperature gradient; Plume behavior; Mixing heights; Kinetics of air pollutants: Atmospheric advection-diffusion of pollutants; Fick’s law of diffusion; No-flow boundary effect; Models for no-flow boundary conditions; Reynolds theory of turbulence; Atmospheric boundary layer; Modeling: Classification of air quality models, Gaussian plume model for a point source, Plume rise, Brigg’s and Holand’s equations for estimating plume rise; Dispersion coefficients; Buoyancy and flux parameters for plume rise; Gaussian approach to special cases of point, area and line sources of pollution; Pollutant concentration in the wake of building; Box model; Special application of dispersion models. | | | | | | | | | | | | | | | | | | | | | | | **09** | | | | | | | **CO4, CO5** | | |
| VI | **Industrial Noise Pollution treatment:**  Noise: Definition, Sources, Effects, Noise scales, Decibels and levels, and Noise level monitoring techniques; Room Acoustics & Silencers; Vibration isolation & Case Studies | | | | | | | | | | | | | | | | | | | | | | | **04** | | | | | | | **CO5** | | |
| **Total Hours** | | | | | | | | | | | | | | | | | | | | | | | | **36** | | | | | |  | | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Nevers, N. D., Air pollution and control engineering, McGraw Hills Publications, 2003. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Barratt, R., Atmospheric Dispersion Modeling, Earthscan Publication Ltd, 2003. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Eckenfelder, W. W., Industrial Water Pollution Control, McGraw-Hill, 2000. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Metcalf and Eddy Inc, Wastewater Engineering: Treatment and Reuse, TMH publication, 4th Edition, 2003 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Nemerow, N. L., Zero Pollution for Industry: Waste Minimization through Industrial Complexes, John Wiley & Sons, 1995. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Rau J. G. and Wooten D. C., Environmental Impact Analysis: Handbook, McGraw Hill Publications, 1985 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Khare, M. and Sharma P., Modeling the Vehicular Exhausts Emission, WIT press, UK, 2002. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |