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|  | | | **National Institute of Technology Meghalaya**  An Institute of National Importance | | | | | | | | | | **CURRICULUM** | | |
| Programme | | | **Master of Technology** | | | | | Year of Regulation | | | | | **2018-19** | | |
| Department | | | **Civil Engineering** | | | | | Semester | | | | | **II** | | |
| Course Code | | Course Name | | Pre-requisite | | Credit Structure | | | | Marks Distribution | | | | | |
| L | T | P | C | INT | | MID | END | | Total |
| **CE 582** | | **Air Quality Modelling** | | **NIL** | | **3** | **0** | **0** | **3** | **50** | | **50** | **100** | | **200** |
| Course Objectives | | 1. Study of air pollution episodes. Reasoning of the entire episode, identification of the parameters, conditions, mechanisms. 2. Study of sampling types and methods for ambient air and stack 3. Study of macro and micro meteorology for understanding the dispersion of pollutants. 4. Simple and complex modeling for point source, line source and area source. 5. The cycle of air pollution will enable the student to first identify the pollutants and their sources and then the transport mechanisms of the pollutants followed by the affected population and there control mechanisms. | | | Course Outcomes | | CO1 | Able to monitor the ambient air quality | | | | | | | |
| CO2 | Ability to identify air pollution problems and interpret criteria air quality data | | | | | | | |
| CO3 | Ability to recognize various environmental transformation processes of pollutants under extreme weather condition. | | | | | | | |
| CO4 | Ability to interpret meteorological data and develop capability to assessment of project proposal, air quality pollution index for any region | | | | | | | |
| CO5 | Ability to justify the use of pollution control equipment and their design | | | | | | | |
| SYLLABUS | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | Hours | | | COs | |
| I | **Introduction:**  Introduction; Laws & Regulations; National Ambient Air Quality Standards, Air Pollution Meteorology | | | | | | | | | | 8 | | | CO1, CO 2 | |
| II | **Basics of Air Pollution Modelling:**  Transport, dilution, modification, and removal of pollutants; Wind velocity profiles, Atmospheric stability; Pasquill-Gifford stability classes; Inversions; temperature gradient; Plume behavior; Mixing heights | | | | | | | | | | 8 | | | CO2, CO3, CO4 | |
| III | **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; Modelling: 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; Complex terrain effect; | | | | | | | | | | 10 | | | CO2, CO3, CO4 | |
| IV | **Dispersion Models:**  Deterministic models; Puff model; Box model; Special application of dispersion models; Advanced techniques in air quality modeling: Artificial Neural Networks (ANN), Hybrid modeling approach, Fuzzy logic theory (FLT), and Environmental wind tunnel (physical) models. | | | | | | | | | | 10 | | | CO4, CO5, | |
| Total Hours | | | | | | | | | | | **36** | | |  | |
| **Essential Readings** | | | | | | | | | | | | | | | |
| 1. Nevers, N. D., Air pollution and control engineering, McGraw Hills Publications, 2003. | | | | | | | | | | | | | | | |
| 1. Zannetti, P., Air Pollution Modeling, Computational Mechanics Publications, outhampton, Boston, 1990. | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | |
| 1. Barratt, R., Atmospheric Dispersion Modeling, Earthscan Publication Ltd, 2003. | | | | | | | | | | | | | | | |
| 1. Khare, M. and Sharma P., Modeling the Vehicular Exhausts Emission, WIT press, UK, 2002. | | | | | | | | | | | | | | | |