	National Institute of Technology Meghalaya An Institute of National Importance	**CURRICULUM**

Programme	**Master of Technology**	Year of Regulation	**2025**
Department	**Civil Engineering**	Semester	**II**

Course Code	Course Name	Pre-requisite	Credit Structure				Marks Distribution			
			L	T	P	C	INT	MID	END	Total
CE 548	**Environmental Quality Modelling**	**NIL**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	Course Outcomes		
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.		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	9	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	9	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;	12	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.	12	CO4, CO5,
	Total Hours	**42**	

Essential Readings

1. J. W. Clark and R. C. Richter, Modeling of Environmental and Water Systems, 3rd ed., New York, NY, USA: Springer, 2023.
2. A. Z. Keller, M. M. Ghanbarian and A. G. Khalil, Environmental Modelling and Simulation, 2nd ed., Boca Raton, FL, USA: CRC Press, 2022.
3. M. Thynell, R. A. Falconer, and H. M. Apul, Water Quality Modelling: Understanding River Systems and Pollutant Behavior, London, U.K.: IWA Publishing, 2021.

Supplementary Readings

1. D. T. McKinney, Environmental Systems Modeling and Simulation, New York, NY, USA: Springer, 2024.
2. M. B. Beck and L. M. Smith, Environmental Quality Analysis: Theory and Practice for Pollution Control, Oxford, U.K.: Elsevier, 2021.
3. S. A. Socolofsky and G. H. Jirka, Environmental Fluid Mechanics: Theories and Applications, 2nd ed., Hoboken, NJ, USA: Wiley, 2020.