

Course Code	Course Title	Credit Hours
ENE-812	Modelling of Environmental Systems	3 (3+0)

Course Description

Computer based models are extensively used in various areas of engineering and applied sciences, particularly in environmental engineering. This course will emphasize on the development and application of models in the context of solving environmental problems. The course will emphasize on understanding the dynamics of environmental systems by introducing systems thinking and utilizing it in developing models for solving problems related to Environmental Engineering.

Course Outline

Model and Model Building: Types of models, Environmental System, Purpose of Models, Model Structure and Formulation

Overview of Environmental Systems: System & its Components, Difference equations, Systems thinking. Dynamic systems models, Feedback and steady-state behavior

Modeling Concepts in Environmental Systems Modeling: System Behavior patterns, Systems diagram, Mathematical relationships and Conditions for steady state for each behavior pattern

Strategies for Analyzing and Using Environmental Systems Models: Outline of the strategy, purpose statement for using the model, Structural and predictive validity of the model, Exploratory analysis.

Modeling Mobile Source Air Pollution Inventories: Role of mobile sources in urban air quality, Identifying the major variables affecting mobile source inventories, Cohort model and its applications

Modeling Surface Water Contamination: Types of surface water pollution, sources and impacts, Mass balance, Oxygen Solubility in surface water, Biological and Chemical oxygen demand

Recommended Books

1. Hannon, Bruce, Matthias Ruth, Bruce Hannon, and Matthias Ruth. "Modeling dynamic systems." *Dynamic Modeling* (2001): 3-23
2. Wainwright J. and Mulligan M. (2004) *Environmental Modeling; finding simplicity in complexity*
3. Ford A. (2000) *Modeling the Environment; An Introduction to system dynamics (Models of environmental systems)*