ENVIRONTAL MODELLING (3 ECTS)

Fall semester, 2021-2022

Cooordinator	College of Environment and Natural Resources
Credits	3 ECTS
Lecturers	**Huỳnh Vương Thu Minh**
Level	Doctor
Host institution	College of Environment and Natural Resources
Course duration	8 weeks

Summary

This course belongs to the specialized knowledge block, providing students with in-depth knowledge about environmental modelling, application of modeling tools and computer models, forecasting of service pollution. for the assessment of environmental impacts and control, prevention of pollution and environmental protection. To apply knowledge of the model in the process of developing a decision support system in the management of environment and natural resources.

Target student audiences

Environment and Natural resources field

Prerequisites

Required courses (or equivalents): NO

Aims and objectives

The main course objective is to equip students with knowledge of:

- To apply the modelling in order to management of pollutant dispersion;

- To have skills in using modeling and applied modelling in environmental management and protection;

- To have teamwork and presentation skills;

- To have the professional attitude to study and work.

Authentic Tasks:

Desired learning outcomes:

By the end of the course, successful students will:

Knowledge	• This course will help students understand the knowledge of mathematical models, methods, correction, testing and analysis of mathematical models.

Comprehensive	• Help students grasp and apply the main steps in the study of mathematical models
Application	• Use and application of surface water quality models and air quality models.
Analysis	• Analyze the selection of use and verify the results of the water quality and air quality models applied in the field of technology and environmental management.
Synthesis	• Can identify and describe a number of important processes in a number of environmental and resource management related issues.

Overview of sessions and teaching methods

The course will make most of interactive and self-reflective methods of teaching and learning and, where possible, avoid standing lectures and presentations.

Learning methods

- Presentation method;
- Intuitive method
- Learning by case study and projects methods
- Group discussion method
- Literature review method
- And other skill methods.

Literature

Compulsory

[1]. Lecture of Modelling of environment.

Recommended:

[1] Ngo Ngoc Hung (2008), Principles and applications of mathematical models in biological, agricultural and environmental research. NXB Nông nghiệp. TP Hồ Chí Minh.

[2] Beven, K.J. (2008). Rainfall – runoff modelling: The primer. John Wiley and Sons. Chichester, England.Mo

[3] Massei, G., Rocchi, L., Paolotti, L., Greco, S., & Boggia, A. (2014). Decision Support Systems for environmental management: A case study on wastewater from agriculture. Journal of Environmenttal. 146, 491-504.

[4] Modeling chemical transport in soils: Natural and applied contaminants

Course outline

Week	Topics
Week 1	Basics
Week 2	Surface water quality model
Week 3	Groundwater Quality Model
Week 4	Hydrometeorological Models
Week 5	Air quality models
Week 6	Group Presentation
Week 7	Final exam

Course Schedule

Topic 1 - Basic concept	
Outline	1.1. Some basic concepts of modelling 1.2. The role of modelling in environmental management 1.3. Basic processes in modelling
Topic 2- Surface water quality model	
Outline	2.1. Overview of the surface water quality modelling 2.2. Introduction of mathematical modelling software that can simulate water quality 2.3. Surface water quality modeling (hydrodynamics modelling, pollutant transport and diffusion, pathogenic organism variation modelling) 2.4. Lake water quality model (water balance, thermal stratification, eutrophication and nutrient loading such as, N and P) 2.5. Estuary water quality modelling (estuarine hydrodynamics modelling, diffusion coefficient and estuary stratification) 2.6. Introduction several modelling (WASP, BASIN, MIKE 11)
Topic 3 - Groundwater quality model	
Outline	3.1. Groundwater flow equation 3.2. Mathematical model of transport of pollutants 3.3. Boundary conditions in the model 3.4. Solution method 3.5. Introduction and application of software PMWIN, MODFLOW
Topic 4: Hydrometeorological model	
Outline	4.1. Introduction to the application of meteorological modelling in the field of environment 4.2. Overview of the meteorological modelling 4.3. Evaluation of meteorological models (Evaluation criteria: Evaluation based on number theory, Evaluation based on observation data, Evaluation based on synoptic maps) 4.4. Meteorological model mesoscale MM5 - Introduction of model MM5 - Input data of the model - Run model MM5 - Exploiting and using the outputs of the model.
Topic 5- Air quality model	
Outline	5.1. Air quality and air quality parameters 5.2. Atmospheric chemistry and chemical mechanisms in air quality modelling 5.3. Classification of air quality models - Dispersion model - Photochemial model Introduction and application of air quality modelling system MM5-CMAQ, MM5-CAMx

	- Input data of the model - Run the model - Processing and application of model outputs - Develop a map of pollutant concentration distribution for the area or for the urban area.

Course Assignments

Course assignments will constitute a multi-part project:

- Assignment #1 - Practice introducing some environmental modelling on the computer
- Assignment #2 - Air quality modelling and application of environmental management model
- Assignment #3 - Water quality modelling

Grading

The students' performance will be based on the following:

Assessment	• Mid semester examination (40%) • Final semester examination (60%)
Evaluation	A (8,5 – 10) B (7,0 – 8,4) C (5,5 - 6,9) D (4,0 – 5,4)