



ENVIRONMENTAL MODELLING (3 ECTS)

Cooordinator	College of Environment and Natural Resources
Credits	3 ECTS
Lecturers	Huỳnh Vương Thu Minh
Level	Master
Host institution	College of Environment and Natural Resources
Course duration	30 hours

Fall semester, 2021-2022

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.

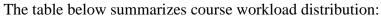
[2] Beven, K.J. (2008). Rainfall – runoff modelling: The primer. John Wiley and Sons. Chichester, England.Mo

[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 workload

Activities Assessment Learning outcomes Estimated workload (hours) In-class activities (25 hours of theory and 5 hours of group presentations) Lectures Understand theories, concepts, Join the class 20 hours/ 5 methodologies and tools Topic Moderated in-class Discuss each case of the lesson Class 2 hours discussions participation and preparedness









		for discussions	
In-class assignments,	Plenary discussion	Class	2 hours
homework assignment		participation	
		and	
		preparedness	
		for assignments	
Reading and discussion		Class	1 hours
of assigned papers for		participation,	
preparation for lectures		creative and	
		active	
		contribution to	
		discussion	
Presentation group	Depending on the number of	Quality group	5 hours
	academies and topics, it will be	exercises and	
	classified into appropriate groups	individual	
		presentations	
Independent work (10	hours)		
Working group:		Quality group	5 hours
- Contribution to group		exercises and	
case studies projects		individual	
- Contribute to the		presentations	
preparation and			
delivery of			
personalized			
presentations			
- Contribute to web			
application			
Course group exercises			
Presentation group		Quality group	5 hours
		exercises and	
		individual	
		presentations	
Total			

Course outline

Week	Topics
Week 1	Topic 1: Basics
Week 2	Topic 2: Surface water quality model
Week 3	Topic 3: Groundwater Quality Model
Week 4	Topic 4: Hydrometeorological Models
Week 5	Topic 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 modelling1.2. The role of modelling in environmental management1.3. Basic processes in modelling		
Topic 2- Surfac	e 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 - Grou	indwater 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: Hydro	meteorological 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 		



 $_{\mathsf{Page}}\mathsf{4}$





 Processing and application of model outputs Develop a map of pollutant concentration distribution for the area or for the urban area
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)



Page **5**