



Marine Coastal and Delta Sustainability for Southeast Asia

610327-EPP-1-2019-1-DE-EPPKA2-CBHE-JP



COURSE PRESENTATION

ENVIRONMENTAL MODELLING

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OVERVIEW



- This is for course ENVIRONMENTAL MODELLING
- Site URL: <https://elearning.ctu.edu.vn/course/view.php?id=2447>
- Language: Vietnamese + English
- Modules:
 - Basics
 - Surface water quality model
 - Groundwater Quality Model
 - Hydrometeorological Models
 - Air quality models






MAIN PAGE



Main page


Lecturer: Dr. Huynh Vuong Thu Minh


Email: hvtminh@ctu.edu.vn

 Summary



 Slide

 Syllabus

 Link khảo sát khi kết thúc khóa học

Topic 1 - Basic concept

1.1. Some basic concepts of modelling

1.2. The role of modelling in environmental management

Summary

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.





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ENVIRONMENTAL MODELLING (3 ECTS)

Fall semester, 2021-2022

Coordinator	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

Summary

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Authentic Tasks:

Desired learning outcomes:

By the end of the course, successful students will:

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The screenshot shows the course content page for 'ENVIRONMENTAL MODELLING'. At the top, it features logos for MARE, CTU, and the European Union, along with the text 'Co-funded by the Erasmus Programme of the European Union'. The title 'ENVIRONMENTAL MODELLING' is prominently displayed. Below the title, the lecturer's name 'Dr. Huynh Vuong Thu Minh' is shown next to a map of Vietnam. A red arrow from the 'Slide' link in the main page points to this section. A disclaimer states: '*The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.' The 'CONTENTS' section is titled 'Part 1' and lists six items: 1. Model definition, 2. The necessity of model, 3. Purpose of environmental modelling, 4. Scale of model, 5. Model classification, and 6. Environmental modelling.

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Topic 1 - Basic concept

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End of Course Survey(MARE Courses)

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* **Biểu thị câu hỏi bắt buộc**

Email *

Email của bạn

Program *

- Bachelor of Engineering
- Master of Science
- Master of Engineering

Attended MARE Course

- Fundamentals of climate change and natural disaster





LESSON PLAN



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

be G





TOPIC



Topic 1 - Basic concept

- 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

- 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

- 3.1. Groundwater flow equation
- 3.2. Mathematical model of transport of pollutants
- 3.3. Boundary conditions in the model



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INTRODUCTION Part 1

1. Model definition

Models might be specific objects (mathematics or equations), systems, or concepts (thoughts) that replace the original (Claude Shannon, 1948).

E=mc²

MIKE by DHI

Seamlessly analyze the groundwater & surface water relationship.

Hydrological system

Hydrological concept modelling

STEPS FOR MODEL DEVELOPMENT Part 2

2.1. data collection) – Input model

- Types of data (Water level, discharge, parameters,...)
- Determine the time step (daily, hourly,...)
- Determine the period of the data series simulate (hours/day/month/year or tens of years,...)
- Determine time to collect/measure data
- Assess the level of reliability, assess the possibility of frequently of the collected data.

Remember: The quality of output data is no better than the quality of input data.

Part 2

2.1. data collection) – Input model

Data collection for:

- Điều kiện ban đầu (initial data);
- Dữ liệu cho điều kiện biên (boundaries data);
- Hiệu chỉnh mô hình (calibration);
- Kiểm định mô hình (verification).

The input data requirements vary according on the type of model

MODEL-PERFORMANCE MEASURES Part 3

presenting measures are useful for the evaluation of the overall performance of a calibrated, vivificated, predicted model.

The measures may be applied for several purposes, including:

- model evaluation: how good the model is, i.e., how reliable are the model's predictions (how frequent and how large errors may we expect)?;
- model comparison: compare two or more models in order to choose between them;
- out-of-sample and out-of-time comparisons: to check a model's performance when applied to new data to evaluate if performance has not worsened.

Part 3

3.1. Efficiency Index or Coefficient of Efficiency (EI) (Nash-Sutcliffe Efficiency (NSE))

$$EI = \frac{\sum_{i=1}^n (X_i - \bar{X})^2 - \sum_{i=1}^n (X_i - Y_i)^2}{\sum_{i=1}^n (X_i - \bar{X})^2}$$

X is observed data, Y is simulated data

Criteria of Nash-Sutcliffe Efficiency (NSE) Value NSE Value Interpretation

- NSE > 0.75 → Good
- 0.36 < NSE < 0.75 → Qualified
- NSE < 0.36 → Not qualified

Wardlaw, I.C., Griggs, J., England, E., & Butler, A. (2000). Validation of a Distributed Hydrological Model Against Spatial Observations. *Environ. Agricultural and Water Meteorology*, 91, 147-177.



Survey

Result



End of Course Survey(MARE Courses)

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Program *

- Bachelor of Engineering
- Master of Science
- Master of Engineering

<https://wrd.ctu.edu.vn/projects/mare-project/end-of-course-survey-mare-courses.html>

End of Course Survey(MARE Courses)

1. Program

Attended MARE Course	Program	COUNTA of Program
		0
Total		0
Environmental modeling	Bachelor of Engineering	1

Environmental modeling Total

Fundamentals of climate change and natural disaster

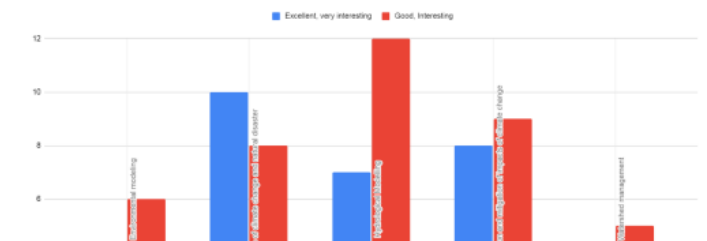
Fundamentals of climate change and natural disaster Total

Hydrological Modelling

3. Your overall assessment of the attended courses. Was the course was attractive and exciting to you?

Your overall assessment of the attended courses. Was the course was attractive and exciting to you?	Fundamentals of climate change and natural disaster					Grand Total	
	Environmental modeling	Fundamentals of climate change and natural disaster	Hydrological Modelling	Principles of adaptation and mitigation of impacts of climate change	Watershed management		
Excellent, very interesting	0	3	10	7	8	2	30
Good, Interesting	0	6	8	12	9	5	40
Grand Total	0	9	18	19	17	7	70

Your overall assessment of the attended courses. Was the course was attractive and exciting to you?



https://wrd.ctu.edu.vn/images/mare-project/feedback-survey/End_of_Course_Survey_final.pdf

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List participant of course



<input type="checkbox"/>	Tên đệm và tên / Họ	Tên đăng nhập	Địa chỉ thư điện tử	Mã số ID	Vai trò	Nhóm	Thời lượng cuối vào khóa học	Trạng thái
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<input type="checkbox"/>	 Nhat Giap Minh	m2923003	nhatM2923003@gstudent.ctu.edu.vn	M2923003	Sinh viên	Không phân nhóm	50 Các ngày 4 giờ	Đang hoạt động ⚙️ ✖️
<input type="checkbox"/>	 Khanh Le	b2001733	khanhB2001733@student.ctu.edu.vn	B2001733	Sinh viên	Không phân nhóm	12 Các ngày 7 giờ	Đang hoạt động ⚙️ ✖️
<input type="checkbox"/>	 Huynh Vuong Thu Minh	001423	hvtminh@ctu.edu.vn	001423	Giảng viên, Giảng viên	Không phân nhóm	Chưa lần nào	Đang hoạt động ⚙️ ✖️
<input type="checkbox"/>	 Linh Ngo My	m2923002	linhM2923002@gstudent.ctu.edu.vn	M2923002	Sinh viên	Không phân nhóm	49 Các ngày 6 giờ	Đang hoạt động ⚙️ ✖️
<input type="checkbox"/>	 Tuyen Nguyen Thi Mong	m2923005	tuyenM2923005@gstudent.ctu.edu.vn	M2923005	Sinh viên	Không phân nhóm	49 Các ngày 3 giờ	Đang hoạt động ⚙️ ✖️
<input type="checkbox"/>	 Van Nieu Phan	002473	pvnhiu@ctu.edu.vn	002473	Giảng viên, Giảng viên	Không phân nhóm	hiện thời	Đang hoạt động ⚙️ ✖️
<input type="checkbox"/>	 Chau Trung Thi Ngoc	m2923001	chauM2923001@gstudent.ctu.edu.vn	M2923001	Sinh viên	Không phân nhóm	50 Các ngày 6 giờ	Đang hoạt động ⚙️ ✖️

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