

LECTURE

MODELLING THE MARINE ENVIRONMENT

Lecturer: Prof. Nguyen Ky Phung
MSc. Dang Thi Thanh Le





Co-funded by the
Erasmus+ Programme
of the European Union

LECTURE NOTE

MODELLING THE MARINE ENVIRONMENT

COURSE SYLLABUS

Lecturer: Prof. Nguyen Ky Phung
MSc. Dang Thi Thanh Le

GENERAL INFORMATION

Vietnamese subject name:	Mô hình hóa môi trường biển
English subject name:	Modelling the Marine Environment
Code subject:	
Knowledge block:	Specialized
Number of credits:	4,5 ETCs
Number of theoretical periods / sessions:	45 periods
Number of practice periods / sessions:	No
Prerequisite subject:	No



COURSE DESCRIPTION

The course provides basic knowledge of modeling pollutant transmission processes in marine environments. In addition, the course introduces basic applications of modeling pollution processes in solving practical problems of marine pollution.



COURSE GOALS

Students are equipped with knowledge of:

- The processes of the transmission of substances to the marine and ocean environment.
- Determine the marine environment problem and find a suitable solution.
- Skills to use basic modeling in the simulation of substance transmission processes.

Work at the individual level and team collaboration to communicate, discuss among individuals in groups to study and report.



LEARNING OUTCOMES

By the end of the course, successful students will:

Knowledge	<ul style="list-style-type: none">• Understanding the role of marine environment modeling• Presenting the basic knowledge of flow dynamics and hydrography, the basic knowledge of modeling of substance transmission in marine environment.• Simulating the processes of substance transmission in marine environment.• Analysis of natural systems and design of numerical models• Using basic models in simulating contaminants transmission processes in marine environment.
Comprehensive	<ul style="list-style-type: none">• Presenting the basic knowledge of flow dynamics and hydrography, the basic knowledge of modeling of substance transmission in marine environment.
Application	<ul style="list-style-type: none">• Simulating the processes of substance transmission in water
Analysis	<ul style="list-style-type: none">• Analysis of natural systems and design of numerical models
Synthesis	<ul style="list-style-type: none">• Using basic models in simulating contaminants transmission processes in marine environment.

COURSE ASSESSMENT

Course assignments will constitute a multi-part project:

- Assignment #1 -(in-class) : will help students understand the basic knowledge of dynamics currents and tides.
- Assignment #2 - (home work): will help students understand the basic knowledge of flow dynamics and hydrography
- Assignment #3 –(home work): will help students understand the processes of the transmission of substances to the marine and ocean environment
- Assignment #4 (mostly in-class): Understanding the basic knowledge of flow dynamics and hydrography, the basic knowledge of modelling of substance transmission in marine environment.

Grading

- | | |
|------------|---|
| Assessment | <ul style="list-style-type: none">• Progress assessment (40%):<ul style="list-style-type: none">- Exercise (15%):- Homework (15%):• Semi- Final examination (10%)• Final examination (50%) |
|------------|---|

- | | |
|------------|--|
| Evaluation | <ul style="list-style-type: none">A (8,5 – 10)B (7,0 – 8,4)C (5,5 - 6,9)D (4.0 – 5.4) |
|------------|--|

REFERENCES

Literature

Compulsory

[1]. Lecture of Modeling of the marine environment.

Recommended:

[1] Chapta S.C. Surface water-quality modeling. Waveland Press Inc., 2008

[2] Visscher A.D. Air dispersion modeling – Foundations and Applications.
Wiley Publishing, 2014.

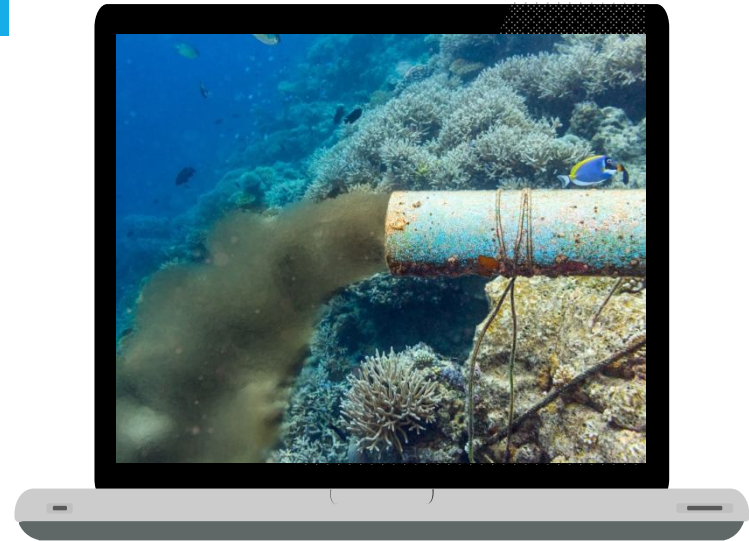
[3] Nihoul J.C.J., Modeles mathematiques et Dynamiques de l'environnement,
Ele, Liege, 1977.

[4] Mooers C.N.K., (editor), Coastal Ocean Prediction, AGU, Washington,
1999.

[5] Stewart R., Introduction to Physical Oceanography, Texas A&M
University, 2002.

COURSE CONTENTS

- 01 Introduction to the Modelling and application
- 02 Dynamics of currents and tides.
- 03 Process of substance transmission.
- 04 Modeling the marine and ocean environment
- 05 An introduction to model used in simulation marine and ocean process



COURSE CONTENTS

CHAPTER 1 - INTRODUCTION TO MODELING AND APPLICATION

1.1. Introduction to the Modelling and application

1.2. Mathematical model



COURSE CONTENTS

CHAPTER 2 – DYNAMICS CURRENT AND TIDES

2.1. Hydrodynamic Equation

2.2. Some approximations in marine and ocean studies

2.3. Theory of flow

2.4. Ocean tides

COURSE CONTENTS

CHAPTER 3 - PROCESS OF SUBSTANCE TRANSMISSION

- 3.1. Equation of substance transmission
- 3.2. Analytical solutions for some cases
- 3.3. Advection and Diffusion
- 3.4. The process of substance transmission for non-conservative substance

COURSE CONTENTS

CHAPTER 4 - MODELING OF MARINE AND OCEAN ENVIRONMENT

4.1. Computation method

4.2. Application of the Finite Difference Method in some specific cases

COURSE CONTENTS

CHAPTER 5 - AN INTRODUCTION TO MODEL USED IN SIMULATION MARINE AND OCEAN PROCESS

5.1. Fundamental

5.2. Several modeling applications in the simulation of substance
transmission in marine and ocean environments

