COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	ENVIRONMENTAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE		**SEMESTER**	**4**
COURSE TITLE	PHYSICAL OCEANOGRAPHY		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g., lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures	3	
Exercises/Practicals	1	
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	BACKGROUND
PREREQUISITES:	R PROGRAMMING, MATHEMATICS, WATER CHEMISTRY, FLUID MECHANICS, REMOTE SENSING AND GIS, ENVIRONMENTAL GEOLOGY
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.duth.gr/modules/document/?course=TMC147

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

A) Knowledge-based

- Student introduction to the physical oceanic processes,
- Presentation of main physical-chemical parameters and their monitoring methods,
- Understanding the interactions between ocean and atmosphere,
- Introduction to the basic equations describing physical process and transports.

B) Skills/Competences acquired

- Capacity to produce and discuss oceanographic diagrams,
- Ability to design and solve heat, water and salt budgets,
- Capacity to solve barotropic and baroclinic geostrophic equations,
- Capacity to solve wind-induced equations and understand relevant processes.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
Decision making	*Sustainability*
Autonomous work	*Demonstration of social, professional and moral responsibility and*

Teamwork *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*
ICT use; Decision-making; Project design and management; critical thinking; autonomous work	

3. COURSE CONTENT

This course introduces the student to the basic principles of Oceanography, emphasizing on the physical processes of ocean systems. The course contains lectures on the physical properties of sea water and their spatio-temporal variability in the oceans, explains the methods and techniques of oceanographic monitoring and analyzes the thermal, salt and water budgets. Particular emphasis is given to the exchanges and interactions between oceans and atmosphere. The ocean dynamics are presented through the use of basic hydrodynamic equations (Momentum and Continuity Equations). At the second part, special chapters of physical oceanography are explained, as the geostrophic circulation, the wind-induced circulation, the generation and propagation of ocean waves, the nature of tides and the introduction to the numerical models. A special lecture on remote sensing and satellite oceanography and their application in the fields of Environmental Engineering takes place.
Exercises/Practicals:

1. Water Temperature – salinity profiles (using R programming),
2. Determination of density and potential temperature of sea water (using R programming),
3. Determination of water column eustatic parameters (using R programming),
4. Discussion of oceanographic diagrams,
5. Ocean heat budget determination,
6. Sea water and salt budget determination,
7. Vertical velocity magnitude and direction calculation (using R programming),
8. Barotropic geostrophic currents computation (using R programming),
9. Baroclinic geostrophic currents computation,
10. Tides and tidal waves,
11. Development of wind-induced currents (using R programming).

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Classroom lectures in using power-point overheads (uploaded in e-class) and blackboard-solved exercises. A book is distributed containing the theoretical part of the course. Personal course notes and weekly assignments are regularly updated on the e-class platform.
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Teaching algorithms for oceanographic data processing using R programming, weekly exercises developing algorithms for oceanographic data processing using R.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	26
Exercises	13
Weekly exercises	26
Semester Project	30
Seminar	3

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,*	Course evaluation is based on: a) weekly exercises, solved by the students, submitted through e-class to the lecturer and discussed in the class (30%), and b) the final written exam (70%). Assessment Language: Greek/English Multiple Choice Test and Short Answer Questions Problem Solving

Clinical examination of a patient, Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

1. «Physical Oceanography», Athanasios I. Theodorou, UNIBOOKS IKE, Athens, 716 p., ISBN 978-618-828-122-6.
2. «Physical Oceanography Online Notes», Sylaios Georgios, University Course Lectures.
3. "Ocean Mechanics", Papatheodorou, Ferentinos, Geraga, Publisher University of Patras, ISBN 978-960-530-142-2
4. "Dynamic Physical Oceanography", Athanasios I. Theodorou, UNIBOOKS IKE, 816 p., 978-ISBN 618-530-485-0

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	
Contact details:	
Supervisors: (1)	
Evaluation methods: (2)	
Implementation Instructions: (3)	

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises:** the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods:** the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.