COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	TECHNOLOGY			
DEPARTMENT	ENVIRONMENTAL SCIENCES			
LEVEL OF STUDY	*Undergraduate*			
COURSE UNIT CODE	NEW **COURSE**	**SEMESTER**	8th	
COURSE TITLE	LIMNOLOGY			
INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits			**WEEKLY TEACHNG HOURS**	**CREDITS**
THEORETICAL BACKGROUND			3	3
LABORATORY PRACTICE			-	-
TOTAL			3	3
COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	Scientific area: environmental management and restoration			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION &EXAMINATION/ASSESSMENT:	Greek			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)				

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.
It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

The aim of the course is to acquire knowledge and develop skills in the field of limnology, which is the combination of a mechanical science, hydraulics, with the science of ecology and the environment. It is aimed at the aquatic environment and the interaction of the principles of hydrodynamics with the state of water quality and the living of aquatic organisms. Upon completion of the course, the student will be able to combine the knowledge gained in a mechanical and ecological subject, so that he can

understand that the design of water systems with the necessary anthropogenic interventions is viable for aquatic organisms.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

- *Search for, analysis and synthesis of data and information by the use of appropriate technologies,*
- *Decision-making*
- *Individual/Independent work*
- *Group/Team work*
- *Environmental awareness*
- *Critical thinking*
- *Development of free, creative and inductive thinking*

(3) COURSE CONTENT

1. Introduction: Introductory elements, definitions, symbolisms, basic properties, units. The science of mechanical fluid, hydraulic closed conductors and hydraulic open conductors. Types of open ducts. Prismatic and non-prismatic conductors.
2. Excessive, critical and critical flow. Critical depth, critical slope, hydraulic jump. The formulation of the fundamental equations of S. Venant. Uniform depth and inclination.
3. Hydraulic structures for fish fauna and restoration of retrograde movement on high and low dams and descents
4. Morphometric basin analysis. Valleys and ridges. The hydrochloride and the drain basin. The concept of isosceles curves. The flow of water in a hydrographic network. Types of hydrographic network. Branch numbering. Horton Laws
5. Principles of sedimentology. Grain formation. Porous and hydraulic conductivity. The action of currents. The Hjulstrom diagram. Deposit processes in rivers and lake environments. Types of rivers: Straight, Plexiglas, Meander.
6. The alluvial ripids. Deposit processes in Delta environments. The Delta sedimentation model. Calculation of the deposits of the carried materials in natural and artificial lakes. Trading reserve capacity. Brune's diagram. Management of portable materials of deposits. Examples of small and cross-border catchments.
7. Introduction to water quality. Sources of pollution. Distinguish the sources according to a) the origin, b) the way of drainage to the recipients and c) their deconstruction. Basic principles of mass balances and cases for conservative and non-conservative pollutants in a steady and

unstable flow.

8. Institutional framework for water quality and management principles. Organoleptic and physicochemical parameters. Temperature and stratification in lakes (epilimni, thermoclinic, sublimni). Dissolved oxygen (DO). Saturation oxygen, biochemical oxygen demand (BOD), water system water regeneration, oxygen balance, quantitative change ratios, downsizing curve and critical level (DO)
9. The nutrients in water systems. Carbon, nitrogen and phosphorus. Conversion processes and quantitative relationships of nitrogen and phosphorus. Water quality indicators. Biological parameters. Eutrophication and indicators. Measures to address eutrophication problems in lakes (esolimnia, exolimnia).
10. Introduction to mathematical models used in limnology. Time models: Voltage analysis, ARIMA models and Artificial Neural Networks. Spatial models: deterministic and contemplative models of water quality parameters (Splines, IDW, Kriging).

(4) TEACHING METHODS-ASSESSMENT

<table>
<tr><td>MODES OF DELIVERY
Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td><td>• Lectures
• Semester projects - homework</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, Communication with students</td><td>• Powerpoint presentation.
• e-mail communication.
• e-class theory and exercises</td></tr>
<tr><td>COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</td><td>
<table>
<tr><th>Activity/Method</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>24</td></tr>
<tr><td>Workshop</td><td>13</td></tr>
<tr><td>Laboratory work</td><td>-</td></tr>
<tr><td>Theory study</td><td>25</td></tr>
<tr><td>Weekly individual evaluation reports for laboratory exercises</td><td>13</td></tr>
<tr><td>Course total
(25 hours of workload per credit unit)</td><td>75</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS
Detailed description of the evaluation procedures:

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.

Specifically, defined evaluation</td><td>• Final examinations
• Students should watch at least half seminars
• Work will be given during the semester to be assessed at a rate of 30% on the final grade.

<u>Final Grade</u>
70% in Final Exams + 30% in the semester projects</td></tr>
</table>

criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography

-Psilovikos A. (2016). Household. Tziola Publications, Thessaloniki. (in Greek)
- Psilovikos A. & Psilovikos A. (2010). Sedimentology. Tziola Publications, Thessaloniki. (in Greek)
- Terzidis G. (1985). Plumbing Courses: 1. General Plumbing, p. 318. Ziti Publications, Thessaloniki. (in Greek)
- Terzidis G. (1982). Plumbing Courses: 3. Open Hoods, p. 383. Ziti Publications, Thessaloniki. (in Greek)
- Antonopoulos V. (2009). Hydraulic environment & surface water quality. Tziola Publications, Thessaloniki. (in Greek)
- Psilovikos A. (2010). Notes on theory and exercises (given in pdf format) (in Greek)

-Complementary bibliography

Teacher's notes and the full lecture material, which are available through the asynchronous education platform