COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Technology		
ACADEMIC UNIT	Department of Environmental Sciences		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	AE807	SEMESTER	8th
COURSE TITLE	LIMNOLOGY		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Teaching Hours	3	3

COURSE TYPE	Specialised general knowledge
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/ENV_U_177/

(2) LEARNING OUTCOMES

Learning outcomes

The course aims to help students acquire knowledge and develop skills regarding the subject of Limnology, which is the combination of hydraulics, an engineering discipline, with ecology and the environment. It focuses on the aquatic environment and the interaction of hydrodynamics principles with water quality and the survival of aquatic organisms.

Upon successful completion of the course, students will have acquired the necessary knowledge, skills and competence, and will be able to:

- Apply the knowledge acquired in a mechanical and ecological project.
- Comprehend how the design of water systems, with the necessary anthropogenic interventions, can be sustainable for aquatic organisms.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Respect for the natural environment
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Introduction: Introductory elements, definitions, notations, basic properties, units. The discipline of fluid mechanics, closed-pipe hydraulics and open-pipe hydraulics. Types of open ducts. Prismatic and non-prismatic conductors.
- Supercritical, critical and subcritical flow. Critical depth, critical slope, hydraulic jump. The wording of S.Venant's fundamental equations. Uniform depth and slope.
- Hydraulic constructions for passage of fish fauna and restoration of retrograde movement in high and low barriers and steps.
- Morphometric analysis of watershed. Valleys and ridges. The hydrocrit and the watershed. The concept of isosceles curves. The flow of water in a hydrographic network. Types of hydrographic network. Branch numbering. Horton's Laws
- Principles of sedimentology. Grain formation. Porosity and hydraulic conductivity. The action of currents.
- Hjulstrom's diagram. Deposition processes in river and lake environments. Types of rivers: Straight,

Plexoid, Meander.

- The alluvial ripples. Deposition processes in deltaic environments. The deltaic model of sedimentation. Calculation of the deposits of transported materials in natural and artificial lakes.
- Reservoir trapping capacity. Brune's diagram. Management of the transported materials of deposits. Examples from small and transboundary catchments.
- Introduction to water quality. Sources of pollution. Differentiation of sources according to a) origin, b) the way of drainage to the recipients and c) their degradability. Basic principles of mass balances and cases for conservative and non-conservative pollutants in stable and unstable flow.
- Institutional framework for water quality and management principles. Organoleptic and physicochemical parameters. Temperature and stratification in lakes (epilimnion, thermoclines, hypolimnion). The dissolved oxygen (DO). Oxygen saturation, biochemical oxygen demand (BOD), re-aeration of the water of aquatic systems, the oxygen balance, the quantitative relations of change, the curve degradation and the critical level of dissolved oxygen (DO).
- Nutrients in water systems. Carbon, nitrogen and phosphorus. Procedures conversion and quantitative relationships of nitrogen and phosphorus. Water quality indicators. Biological parameters. Eutrophication and indicators. Measures to deal with eutrophication problems in lakes (inside lakes, outside lakes).
- Introduction to mathematical models used in limnology. Temporal models: Analysis trends, ARIMA models and Artificial Neural Networks. Spatial models: deterministic and stochastic water quality parameter distribution models (Splines, IDW, Kriging).

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>• Use of PowerPoint slides
• View material in video
• Communication with students via e-mail
• Use of asynchronous distance learning (e-class)</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory practice</td><td>13</td></tr>
<tr><td>Study and analysis of bibliography</td><td>23</td></tr>
<tr><td>Essay writing</td><td>13</td></tr>
<tr><td>Course total
(25 hours workload per credit)</td><td>75</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Students' performance is evaluated in the Greek language. The final grade is determined by:
• A written exam (at the end of the semester) that contributes 70% to the final grade, applying one or more of the following evaluation methods: Multiple choice questions, short-answer questions, problem solving.
• Students' participation in laboratory practice activities and the preparation and delivery of related assignments (during the semester) that contribute 30% to the final grade.
Final Grade = 70% Exam Grade + 30% Assignments Grade</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- Antonopoulos, V. (2009) *Environmental Hydraulics & Surface Water Quality.* Thessaloniki: TZIOLA Publications. (in Greek)
- Psilovikos, A. (2010) *Sedimentology.* Thessaloniki: TZIOLA Publications. (in Greek)
- Psilovikos, A. (2016) *Ecohydraulics.* Thessaloniki: TZIOLA Publications. (in Greek)