COURSE OUTLINE

(1) GENERAL

SCHOOL	**UNIVERSITY OF THESSALY**		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΚ2100	**SEMESTER**	5th
COURSE TITLE	HYDRAULICS		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	Fluid Mechanics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/CIV_U_359/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Specific Knowledge

Upon completing the course, the student will have the ability to calculate steady flow in pressurized pipelines and open-channel flow using the fundamental equations of fluid mechanics. Additionally, they will gain knowledge of the methodology for solving pressurized flow and open-channel flow problems.

Skills

Upon completing the course, the student will acquire advanced skills with a strong theoretical foundation to tackle computational and simulation problems in subsequent applied courses, such as hydraulic structures, river hydraulics, etc.

Competencies

Upon completing the course, the student will possess significant theoretical knowledge essential for the study and design of hydraulic works and related structures.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking Working in an interdisciplinary environment*
Production of new research ideas	*……*
	Others…
	…….

- Research, analysis, and synthesis of data and information, utilizing the necessary technologies
- Adaptation to new situations
- Decision-making
- Independent work
- Working in an international environment
- Project planning
- Respect for the natural environment
- Promotion of free, creative, and inductive thinking

(3) SYLLABUS

Week No. – Course contents

1 - Steady Flow in Pipes: Introduction, boundary layer theory, boundary shear stress.
2 - Energy losses in pipes, linear energy losses, Moody diagram.
3 - Three fundamental problems in pipes, Energy grade line, pressure line.
4 - Local energy losses (contraction, expansion, curves, angles). Energy losses in non-circular conduits.
5 - Pipes in line and parallel pipes. Three-tank problem.
6 - Turbines and pumps in pipes networks. Pumps in a row and parallel pump connection. Cavitation. NPSH, Siphons.
7 - Laboratory exercise for energy losses in pipes.
8 - Steady flow in open channels: Introduction, definitions, equations. Specific energy. Critical depth.
9 - Specific momentum. Discharge diagram. Applications of critical depth theory (smooth bottom elevation and/or contraction), use of sluice gates for flow control.
10 - Hydraulic jump. Uniform flow, definitions and equations.
11 - Uniform flow in complex channel sections. Design of natural and paved channels for uniform flow.
12 - Gradually varying flow. General characteristics. Types of free surface profiles.
13 - Control sections in open channels. Computation of gradually varying flow
14 - Laboratory exercise at the 5m long lab channel. Hydraulic jump, gradually varying flow, sluice gate and thin crested weir.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Power-point, notes, tutorials, exercises, and announcements in e-class.
TEACHING METHODS *The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop,*	

Activity	*Semester workload*
Lectures	14*4=56 hours
Study	14*4=56 hours
Project	13 hours
Final examinations	3 hours
Study for exams	24 hours
Educational visit	2 hours (excluded from

interactive teaching, educational visits, project, essay writing, artistic creativity, etc. *The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS*		lectures)
	Course total	**150**

STUDENT PERFORMANCE EVALUATION ***Description of the evaluation procedure*** *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	**Language of Evaluation** Greek **Methods of evaluation** 80% - Final written examinations 20 % - Homework

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

- Chow, VT, 1973. *Open-channel hydraulics*. McGraw-Hill.
- Brater, E.F. and King, H.W. Handbook of Hydraulics, 6th edition, McGarw-Hill, 1976.
- Chanson H. The hydraulics of open channel flows: an introduction. 1st ed. London: Edward Arnold, 1999.
- Chaudhry M. Open-channel Flow. Prentice-Hall, 1993.
- Chow VT. Open-channel hydraulics. New York: McGraw-Hill Inc., 1959.
- French RH. Open-channel hydraulics. New York: McGraw-Hill Book Co., 1985.
- Henderson FM. Open-channel Flow. New York: Prentice-Hall, 1966.
- Liggett JA. Fluid mechanics. New York: McGraw-Hill Inc., 1994.
- Marchi E., Rubatta A. Meccanica dei fluidi, principi e applicazioni indrailiche. UNET, 1981.
- Subramanya K. Flow in open channels. New Delhi, India: Tata McGraw-Hill, 1986.
- Sturm, T.W. Open channel hydraulics. McGraw-Hill, 2001.
- A. Osman Akan: "Open Channel Hydraulics" Butterworth-Heineman, 2006.
- Subhash C. Jain: "Open Channel Flow" Wiley, 2001.
- Chadwick, A. and Morfett, J.: "Hydraulics in Civil and Environmental Engineering" E & FN SPON.
- Terry W. Sturm: "Open channel Hydraulics", McGraw Hill, 2001.
- Hamill, L. "Understanding Hydraulics" Mc Millan, 1995.
- Demetriou, JD, 1995. Applied hydraulics, Volume A - Introduction. Athens. (in greek)
- Demetriou, JD, 1995. *Applied hydraulics, Volume B - Applications.* Athens. (in greek)
- Noutsopoulos, G, 1973. *Theoretical and applied hydraulics lectures, Volume B. Flow in pressure pipes.* Athens. (in greek)
- Noutsopoulos, G, 1976. *Flow with free surface, open channel flow.* NTU Athens. (in greek)
- Liakopoulos A. 2014. "Hydraulics. Flow in closed conduits. Hydraulic Machinery", Tziolas Publications, (2nd edition). ISBN 978-960-418-450-7 (in greek)
- Papanicolaou, PN, 2003. *Steady flow in pipes and open channels*. Typed notes, University of Thessaly. (in greek)

- Related academic journals:

- Journal of Hydraulic Research
- Journal of Hydraulic Engineering
- Journal of Hydraulics