(B) Course information in english

General course information:

Course title:	HYDRAULICS	**Course code:**	CE05_H03
Credits:	5	**Work load (hours):**	150

Course level:	Undergraduate ☑	Graduate	☐
Course type:	Mandatory ☑	Elective	☐
Course category:	Basic ☑	Orientation	☐

Semester:	5th	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

The course objective is the calculation of steady flows in pressure driven flow in pipes and in free surface flows, applying the principles of fluid mechanics. The student learns the methodology and gets the ability of building simple computational models for pipe flow and open channel flow problems. Some of these are shown in the hydraulics laboratory. Also, the student builds a theoretical background for the calculations in a series of courses that follow, such as in Hydraulic Works, River Training Techniques, etc. Knowledge of the course material, gives the engineer a strong, theoretical tool, for the analysis and design of hydraulic works.

Prerequisites:

Fluid mechanics

Instructor's data:

Name:	Antony Liakopoulos
Level:	Professor
Office:	104-Civil Engineering Faculty University of Thessaly Pedion Areos, 38334 Volos, Greece
Tel. – email:	2421074111, aliakop@uth.gr
Other tutors:	-

Specific course information:

Week No.	Course contents	Hours	
		Course attendance	Preparation
1	**Steady Flow in Pipes:** Introduction, boundary layer theory, boundary shear stress.	5	5
2	Energy losses in pipes, linear energy losses, Moody diagram.	5	4
3	Three fundamental problems in pipes, Energy grade line, pressure line.	5	4
4	Local energy losses (contraction, expansion, curves, angles). Energy losses in non-circular conduits.	5	5
5	Pipes in line and parallel pipes. Three-tank problem.	5	5
6	Turbines and pumps in pipes networks. Pumps in a row and parallel pump connection. Cavitation. NPSH, Siphons.	5	5
7	Laboratory exercise for energy losses in pipes.	5	5
8	**Steady flow in open channels:** Introduction, definitions, equations. Specific energy. Critical depth.	5	5
9	Specific momentum. Discharge diagram. Applications of critical depth theory (smooth bottom elevation and/or contraction), use of sluice gates for flow control.	5	5
10	Hydraulic jump. Uniform flow, definitions and equations.	5	5
11	Uniform flow in complex channel sections. Design of natural and paved channels for uniform flow.	5	5
12	Gradually varying flow. General characteristics. Types of free surface profiles.	5	5
13	Control sections in open channels. Computation of gradually varying flow	5	5
14	Laboratory exercise at the 5m long lab channel. Hydraulic jump, gradually varying flow, sluice gate and thin crested weir.	5	4

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
	3	10	

Suggested literature:

1. A. Liakopoulos: "Hydraulics. Flow in closed conduits. Hydraulic Machinery" (in greek), Tziolas Publications, (2nd edition) 2014. ISBN 978-960-418-450-7
2. Papanicolaou, PN, 2003. *Steady flow in pipes and open channels*. Typed notes, University of Thessaly. (in greek)
3. Demetriou, JD, 1995. *Applied hydraulics, Volume A - Introduction.* Athens. (in greek)
4. Demetriou, JD, 1995. *Applied hydraulics, Volume B - Applications.* Athens. (in greek)
5. Noutsopoulos, G, 1973. *Theoretical and applied hydraulics lectures, Volume B. Flow in pressure pipes.* Athens. (in greek)
6. Noutsopoulos, G, 1976. *Flow with free surface, open channel flow.* NTU Athens. (in greek)
7. Chow, VT, 1973. *Open-channel hydraulics*. McGraw-Hill.

Teaching method *(select and describe if necessary* - **weight***):*		
Teaching	☑	80 %
Seminars	☐	…….%
Demonstrations	☐	…….%
Laboratory	☑	10 %
Exercises	☑	10 %
Visits at facilities	☐	…….%
Other *(describe):* ……..	☐	…….%
Total		100%

Evaluation method *(select)*- **weight:**				
	written	*%*	*Oral*	*%*
Homework	☑	20	☐	
Class project	☐		☐	
Interim examination	☐		☐	
Final examinations	☑	80	☐	
Other *(describe):* ……	☐		☐	