ECTS

EUROPEAN CREDIT TRANSFER SYSTEM

Course information in english

General course information:

Course title:	Experimental Hydraulics	**Course code:**	ΥΔ0900
Credits:	5	**Work load (hours):**	114
Course level:	Undergraduate ☑	Graduate ☐	
Course type:	Mandatory ☑	Selective ☐	
Course category:	Basic ☐	Orientation ☑	
Semester:	8ο	**Hours per week:**	4 hours
Course objectives (capabilities pursued and learning results):			
The objective is the contact of the student with the experiment, i.e. with the experimental arrangement, the measurement and analysis of experimental data. The student becomes familiar with dimensional analysis and hydraulic similarity theory, so that he can design an experiment or a laboratory model. Also, he is introduced to measurement and data acquisition techniques, along with flow visualization methods, so that they can be used either in the modeling of complex flows for research purposes, or in the model design of applied research applications.			
Prerequisites:			
Fluid mechanics Applied Hydraulics			

Instructor's data:

Name:	Evangelos Keramaris
Level:	Assistant Professor
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Other tutors:	-

Specific course information:

Week No.	Course contents	Hours	
		Course attendance	Preparation
1	Introduction. Dimensional analysis, Buckingham Π-theorem.	4	
2	Non – dimensional Navier-Stokes equations, characteristic dimensionless numbers	4	4
3	Full (dynamic) and partial (kinematic or geometric) similarity. Reynolds and Froude similarity.	4	4
4	Theory and implementation of hydraulic laboratory models.	4	4
5	Measurement of density, kinematic viscosity and hydrostatic pressure of liquids. Static flow pressure measurement. Velocity measurements. Pilot tube. Discharge measurement in pipes and open channels	4	
6	Error analysis, experimental error estimates. Statistical analysis of experimental data.	4	4
7	Turbulence theory, response of measuring devices, spectra and data acquisition in turbulent flows, Nyquist theorem, measurements.	4	
8	Hot-wire anemometry. Optical techniques. Laser doppler anemometry, particle image velocimetry (PIV)	4	
9	Visit to hydraulics laboratory. Display of the use of measurement devices as well as experiments from Diploma and Masters Theses.	4	
10	Experiment on energy losses in pipe flow.	4	6
11	Experiment on the development of boundary layer in pipes, via Pitot tube velocimetry.	4	6
12	Measurement of the velocity distribution along the axis and across a turbulent air jet.	4	6
13	Experiment in a 5m. long open channel. Free surface profile and hydraulic jump measurement. Use of sharp crested weir and sluice gate for flow control	4	6
14	Experiment of the discharge time of a tank	4	6

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
20	2	10	

Suggested literature:

1. Experimental hydraulics, Notes by P. Papanicolaou
2. Handouts from Greek and international bibliography
3. Bergeles, G, Papantonis, D και Tsangaris, S, 1998. *Technical measurements of fluid* 630 *mechanics parameters.* Symeon Editions, Athens. (In Greek)
4. Bendat, JS, and Piersol, AG, 1971. *Random data: Analysis and measurement procedures.* Wiley.
5. Drain, LE, 1980. *The laser-Doppler technique.* Wiley.
6. Goldstein, RJ, Ed. 1996. *Fluid mechanics measurements.* Taylor and Francis.
7. Japan society of mechanical engineers, (Ed.) 1988. *Visualized flow.* Pergamon.
8. Perry, AE, 1982. Hot wire anemometry. Clarendon Press.
9. Raffel, M, Willert, C, and Kompenhans, J, 1997. *Particle image velocimetry.* Springer.
10. Sharp, JJ, 1981. *Hydraulic modeling.* Butterworths.

Teaching method *(select and describe if necessary -* **weight***):*		
Teaching	☑	.....40%
Seminars	☑	…….10%
Demonstrations	☐	…….%
Laboratory	☑	.....40%
Exercises	☑	.....10%
Visits at facilities	☐	…….%
Other *(describe):* …….	☐	…….%
Total		100%

Evaluation method *(select)*- **weight:**				
	written	*%*	*Oral*	*%*
Homework	☐		☐	
Class project	☑	20	☑	10
Interim examination	☑	20	☐	
Final examinations	☑	50	☐	
Other *(describe):* ……	☐		☐	