(B) Course information in english

General course information:

Course title:	Numerical Methods in Hydraulics & Hydraulic Works	**Course code:**	CE07_H05
Credits:	5	**Work load (hours):**	150

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

Semester:	7th	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

The course objective is to familiarize the students with the application of computational algorithms to the solution of fluid mechanics and hydraulics problems as well as the use of hydrologic and hydraulics modeling in the design of hydraulic works. The students are exposed to the development of elementary algorithms, programming in FORTRAN or MATLAB and the use of commercially available computer programs for fluid dynamics applications, hydraulics and hydrology.

Prerequisites:

- Fluid mechanics
- Hydraulics
- Open channel flow
- Groundwater
- Numerical methods

Instructor's data:

Name:	Antonios Liakopoulos
Level:	Professor
Office:	104- Department of Civil Engineering, Civil Engineering Faculty University of Thessaly Pedion Areos, 38334 Volos, Greece Office 104
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Other tutors:	Antonios Liakopoulos

Specific course information:

Week No.	Course contents	Hours	
		Course attendance	Preparation
1	Data Analysis I. Statistical Methods	4	4
2	Data Analysis II. Spectral Methods	4	4
3	The finite difference method.	4	4
4	Numerical diffusion and dispersion.	4	4
5	Parabolic flow equations - examples.	4	4
6	Hyperbolic flow equations - examples.	4	4
7	Elliptic flow equations - examples.	4	4
8	Application to open channel flows.	4	4
9	Application to duct and pipe flows.	4	4
10	Flow in pipe networks.	4	3
11	Application to groundwater flows.	4	3
12	Review/use of programs for the numerical modeling of fluid flows.	4	3
13	Introduction to the Finite Element method.	4	3
14	Introduction to the spectral element method.	4	2

Additional hours for:			
Class project	Examinations	Preparation for examinations	Educational visit
		44	

Suggested literature:

- C. Koutitas, «Computational Hydraulics», Xanthi, (in greek), 1982
- C.B. Vreugdentil “Computational Hydraulics, An Introduction”, Springer-Verlag 1989.
- G.F. Pinder and W.G. Gray, “Finite Element and Simulation in Surface and

Subsurface Hydrology", Nelson, London, 1977.

- Chung, T.J. (1978) Finite Element Analysis in Fluid Dynamics. McGraw-Hill, New York.
- Fischer, H.B., E.J. List and R.C.Y. Kon (1979) Mixing in Inland and Coastal Waters. Academic Press.
- Gear, C.W. (1971) Numerical Initial Value Problems in Ordinary Differential Equations. Prentice Hall.
- Peyret, R. and T.D. Taylor (1983) Computational Methods for Fluid Flow. Springer, New York.

Teaching method *(select and describe if necessary -* **weight***):*		
Teaching	☑	60%
Seminars	☐	…….%
Demonstrations	☐	…….%
Laboratory	☑	30%
Exercises	☑	10%
Visits at facilities	☐	…….%
Other *(describe):* ……	☐	…….%
Total		100%

Evaluation method *(select)-* **weight:**				
	written	*%*	*Oral*	*%*
Homework	☑	10	☑	10
Class project	☑	20	☐	
Interim examination	☐		☐	
Final examinations	☑	60	☐	
Other *(describe):* ……	☐		☐	