COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	GRADUATE		
COURSE CODE	EM4	**SEMESTER**	2nd Semester
COURSE TITLE	Fluid Mechanics		

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**
	3	7,5
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, specialised general knowledge, skills development*	Specialized background
PREREQUISITE COURSES:	Methods of Applied Mathematics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(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*

The objectives of the course are:

- Development of the theoretical background of the graduate student in matters relating to Fluid Mechanics and ability of the student to apply analytical, approximate and numerical methods in Fluid Mechanics problems.
- Upon completion of the course the graduate student will be able to solve problems with analytical, approximate or numerical methods and further deepen the understanding of such methods.

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

The course aims to enable the graduate student to develop the ability to analyze and synthesize basic knowledge of Fluid Mechanis. This will give to the students the opportunity to work in an international multidisciplinary environment.

(3) SYLLABUS

Kinematics of Fluids, Fluid flow analysis, Equation of continuity and stream function, motion equations for Ideal and real fluids, laminar and turbulent flow, Boundary layer flows with adverse pressure gradient, Numerical Methods in Fluid Mechanics, Classification of fluid dynamics problems and relevant equations that describe basic numerical schemes, method of finite differences, compatibility, stability and convergence of numerical shemes, finite volume method, Introduction to the method of weighted residues, finite element method. The course includes practical application in the computer laboratory.

(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*	
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, 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*	
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.*	Written examination at the end of the semester (obligatory), Homework and / or midterm exam (optional).

Activity	***Semester workload***
Lectures	39 hrsς
Study of theory	78 hrs
Home exercises	44,5 hrs
Total	**187,5** hrs

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Fluid Mechanics, Volume 1, A. Papaioanou, 2nd Edition, 2001 (in Greek).
- Computational Fluid Mechanics, I. Soulis, 1st Edition, 2008 (in Greek).
- Numerical heat transfer and fluid flow, S.V. Patankar, McGraw-Hill, New York, 1980.
- The Finite Element Method, Vol. 1, The Basis, O.C. Zienkiewicz, R.L. Taylor, 5th Ed.,

Butterworth-Heinemann, Oxford, 2000.

- Computational Techniques for fluid Dynamics, C.A.J. Fletcher Volumes I and II, 2nd Ed. Springer-Verlag, Berlin, 1991.