ETE712 – Fluid Mechanics

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE712	**SEMESTER**	5
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**
Lectures / Case Studies	4	4
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Special background
PREREQUISITE COURSES:	Mathematics I-IV, Continuum Mechanics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	LECTURES IN GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://medlab.cc.uoi.gr/?page_id=8645

(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*

Fluid Mechanics is a compulsory course that deals with the statics, kinematics and dynamics of fluids. As an autonomous scientific discipline, it must be taught in the core of the Engineering sciences. Theoretical fluid mechanics deals with the mathematical formulation of fluid flow problems while technical fluid mechanics deals with the formulation of simple fluid-governed relations and equations with the aim of formulating technically acceptable solutions.

By completing the course, the students are expected to have acquired the following:

Knowledge:

- knows the basic concepts
- recognizes the quantities and units associated with the study of fluids
- distinguishes the relationships that govern the movement of fluids, the forces and the stresses, as well as the types of fluids
- describes the principles of dimensional analysis and similarity

Abilities:

- possesses advanced skills for solving complex and unpredictable fluid dynamics problems

Skills:

- can manage complex technical or professional activities in project design and management environments

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…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Team work in multi-disciplinary environment
- Production of new research ideas and projects
- Production of free, creative and inductive thinking

(3) SYLLABUS

The course presents the necessary principles that govern the study of fluids (liquids and gases). As a background course, it touches on many subjects related to the specialty of Materials Engineer, such as the rheology, mass transfer, fluid / structure interaction, etc. The content of the course is as follows:

• Basic concepts. Continuous medium, units, dimensions, fluid properties, flow types, fundamental laws, basic methods of analysis

• Kinematics. Flow field description methods, time derivatives, velocity, acceleration, mass and volume flow, flow representation, flow function

• Forces and fluid deformation. Nature and form of forces, viscous stresses, pressure, deformation

• Newtonian and non-Newtonian fluids. Material Relationship, Newton's Law, Stokes Viscosity Relationships, Non-Newtonian Fluids

• Macroscopic flow analysis. Transfer theorem, equations of continuity, momentum, energy, equation of mechanical energy.

• Differential flow analysis. Boundary and initial conditions, equations of continuity, momentum, mechanical energy.

• Dimensional analysis and similarity. Principles, theorem P, dimensionless groups, basic principles of similarity

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the class
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of PC for data and information, preparation of deliverables, communication of the team using email/social media/ecourse platform, Fluid mechanics simulation platforms
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*	

Activity	***Semester workload***
Lectures	39
Laboratory practice	13

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*	Homework: 48 Course total: 100
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 METHOD OF EVALUATION: Written exam (multiple choice) at the end of the semester based on the theory and exercises presented during the course.

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Μηχανική των ρευστών, Άγγελου Παπαϊωάννου
- Μηχανική ρευστών, Streeter/Wylie/Bedford
- F. M. White “Fluid Mechanics”, McGraw Hill, 7th Edition, 2009