COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Naval Architecture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NAOME1216	**SEMESTER**	3rd
COURSE TITLE	**FLUID MECHANICS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures	4	5
Laboratory		

COURSE TYPE *general background, specialbackground, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/NA192/

(2) COURSE GOALS / LEARNING OUTCOMES

The aim of the present course is to understand the basic principles and laws of hydrostatics, fluid kinematics and fluid dynamics, as well as the solution methodologies of relative technical problems with an emphasis on non-viscous flows. Also, main objective of the course is to understand the underlying physics of representative fluid flows, their mathematical modeling and finally solving the corresponding equations by use of proper simulation software.

Upon successful completion of the course, the student will be able to:

1. Describe and combine the basic physical properties of fluids.
2. Calculate pressure forces on surfaces of submerged bodies.
3. Distinguish between different types of flow and apply fluid mechanics equations to mathematically model flow problems.
4. Synthesize fundamental flows with velocity potential to calculate complex flows.
5. Solve fluid mechanics problems by applying scientific computing programming languages.

(3) COURSE CONTENT / SYLLABUS

Fluid properties

Basic principles of hydrostatics – pressure measurement, hydrostatic forces on surfaces, buoyancy, stability of floating bodies.

Fluid kinematics and dynamics – Langrangian and Eulerian flow, material derivatives, flow field description, mass and volume flow rate, streamlines, streaklines, and pathlines, one-, two- and three- dimensional flows, uniform and non-uniform flows, steady and unsteady flows. Equations of continuity, momentum and energy for macroscopic and differential control volumes, Euler equations, Bernoulli equation.
Potential flow – streamline equations, vorticity, irrotational flow, stream function, Bernoulli equation for irrotational flow, velocity potential.
Complex potential, Blasius and Kutta-Joukowski theorems, conformal mapping.
Basic two dimensional potential flows – uniform flow, sources and sinks, circulation – free vortices.
Superposition of basic two dimensional potential flows - source in a uniform stream—half-body, doublet of source and sink, flow past a cylinder, method of images.
Joukowski and airfoil transformation.

Use of scientific computing software to solve fluid mechanics problems.

(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	Use of programming languages for scientific calculations (Matlab, python, Julia) The learning process is supported by use of e-class platform
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*	Finally written examination (70%) including: 1. theory questions 2. problem solution Evaluation of personal assignments (30%); the latter include solution of groups of exercises.

Activity	*Workload (hours)*
Lectures	39
Exercises	13
Homework assignments	39
Study and preparation for exam	52
Course total	**143**

(5) ATTACHED BIBLIOGRAPHY

- Elger D., Williams B., Crowe C., Roberson J., Engineering Fluid Mechanics, 10th Edition, ISBN-13: 978-1118372203, 2012.
- Munson - Okooshi - Huensch – Rothmayer, Fundamentals of Fluid Mechanics, 7th Edition, ISBN-13: 978-1118116135, 2012.
- Hughes W.F., Brighton J.A., Schaum's Ouline of Theory and Problems of Fluid Dynamics.
- Pritchard P.J., Fox and McDonald's Introduction to Fluid Mechanics, 8th edition, Wiley, 2011.

- White, F.M., “Fluid Mechanics”, 5th edition, McGraw – Hill, 2003.

- Relative scientific journals:

Journal of Fluid Mechanics, ISSN: 0022-1120

European Journal of Mechanics - B/Fluids, ISSN: 0997-7546

Journal of Computational Physics, ISSN: 0021-9991

Journal of Fluids and Structures, ISSN: 0889-9746