COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	EN0202	**SEMESTER**	6
COURSE TITLE	Fluid Mechanics II		

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	5	6
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, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	There are no prerequisite courses. It is recommended that students who are interested in attending the course have completed successfully following course: Fluid Mechanics I.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (tutoring)
COURSE WEBSITE (URL)	https://mie.uth.gr/?page_id=18341

(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 EducationArea*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B • Guidelines for writing LearningOutcomes*

After successful completion of the course the student will be able to

- Understand the Euler equation and the concepts of irrotational flow and flow potential
- Be able to do basic superposition of potential flows
- Understand the Navier Stokes equation
- Use the Navier Stokes equation to solve simple laminar real flows
- Know the basic non dimensional numbers in fluid mechanics
- Able to determine the non-dimensional numbers that define a flow by use of the Buckingham Π theorem and by observation
- Use non dimensional numbers to make flow models
- Understand the differences between laminar and turbulent flow
- Know the characteristics of laminar and turbulent boundary layers
- Calculate the entrance length of pipes
- Calculate pressure drop in pipes with bends, junctions, valves, contractions and expansions
- Understand the principles of operation of venturi, nozzle and float flow meters
- Understand the concepts of dynamic lift and drag
- Distinguish between form and friction drag
- Calculate the Dynamic lift and drag of a body in a flow

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

- Search for, analysis and synthesis of data and information with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

1. **Differential Analysis of Fluid Flow**
   Fluid Element Kinematics, Conservation of Mass, The Linear Momentum Equation, Inviscid Flow, Some Basic Plane Potential Flows, Superposition of Basic, Plane Potential Flows, Viscous Flow, Some Simple Solutions for Laminar, Viscous, Incompressible Flows
2. **Dimensional Analysis, Similitude, and Modelling**
   Buckingham Pi Theorem, Determination of Pi Terms, Determination of Pi Terms by Inspection, Common Dimensionless Groups in Fluid Mechanics, Correlation of Experimental Data, Modelling and Similitude, Some Typical Model Studies, Similitude Based on Governing Differential Equations

3. **Viscous Flow in Pipes**
   General Characteristics of Pipe Flow, Fully Developed Laminar Flow, Fully Developed Turbulent Flow, Dimensional Analysis of Pipe Flow, Pipe Flow Examples, Pipe Flowrate Measurement
4. **Flow Over Immersed Bodies**
   General External Flow Characteristics, Lift and Drag Concepts, Drag, Lift

- Suggested bibliography:

- Munson, B.R., Okiishi,T.H., Huebsch W.W., Rothmayer, A.P., "Fluid Mechanics", 8th edition
- Λιακόπουλος Α., "Μηχανική Ρευστών", 2η Έκδοση
- Elger, D.F., Williams, B.C., Crowe, C.T., Roberson, J.A., " Engineering Fluid Mechanics ", 12th edition
- Cengel, Y.A., Cimbala, J., " Fluid Mechanics Fundamentals and Applications ", 3rd edition -

Related academic journals:

- Annual review of fluid mechanics
- Environmental fluid mechanics
- European journal of mechanics b-fluids
- Experimental thermal and fluid science
- Experiments in fluids
- Journal of visualization
- Journal of fluid mechanics

(4)
- Physical review fluids
- Physics of fluids

(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*	PowerPoint Lecture slides, Teaching support through webpage and e-class, online revision quiz through MS Forms at the end of each chapter
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*	

Activity	*Semester workload*
Lectures	65
Self Study	85
Course total	150

STUDENT PERFORMANCE EVALUATION ***Description of the evaluation procedure*** *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, shortanswer 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 final exams (100%) Language of evaluation: Greek Evaluation type: Summative Exam format: Problem solving

(5) ATTACHED BIBLIOGRAPHY