Fluid Mechanics Laboratory

Course Code:

ME 333

Course Period:

Autumn

Course Type:

Core

Credits:

2

Theoric:

1

Practice:

0

Laboratory Hour:

0

ECTS:

3

Prerequisite Courses:

Thermodynamics I [1]
Fluid Mechanics [2]
Course Language:

English

Courses given by:

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Course Objectives:

Goals are that the students gain a hands-on experience in fluid mechanics, adequate knowledge on the fundamental concepts of measurement techniques and numerical analysis, experimental data analysis, technical report writing and work in teams.

Course Content:

Laboratory demostrations of basic types of flows. Various fluid mechanics experiments. A brief overview of the Computational Fluid Dynamics approach. Virtual experimentation via (CFD) software.

Prerequisite(s): ME 331 (co-requisite)

Course Methodology:

1: Lecture, 5: Laboratory, 7: Team work

Course Evaluation Methods:

A: Midterm and final exams, B: Quiz, D: Report

Learning Outcomes	Program Outcomes	Teaching Methods	Assessment Methods
1) Adequate knowledge on pressure, flow rate and velocity measurement techniques	5	1	A,B
2) Ability to measure pressure, velocity and flow rate	5,6	5	A,D
3) Ability to perform flow simulations for laminar, turbulent and time-dependent flows	5	5	A,D
4) Ability to compare experimental and numerical flow data	15	1,5	A,D
5) Ability to select the appropriate measurement or simulation technique for various flow problems	5	1,5	A,B
6) Ability to work in teams	7	5,7	D
7) Ability to present experimental or numerical results in form of a written report	9	1	D

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Basic concepts of measurement systems	Textbook
2	Cont'd.	Textbook

3	Pressure Measurement Devices	Textbook
4	Velocity Measurement Devices	Textbook
5	Cont'd.	Textbook
6	Introduction to Computational Fluid Dynamics (CFD)	Textbook
7	Mesh preperation for CFD	Textbook
8	Numerical methods in CFD	Textbook
9	Post-processing in CFD	Textbook
10	Flow rate measurement	Textbook
11	Cont'd	Textbook
12	Modern velocity measurement techniques	Lecture notes
13	Particle image velocimetry	Lecture notes
14	Particle image velocimetry	Lecture notes

RECOMMENDED SOURCES	
Textbook	
Additional Resources	Figliola, R.S. and Beasley D.E., Theory and Design for Mechanical Measurements, 4th ed., Wiley, 2006 (text book)

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Midterms	1	20
Lab reports	7	40
Quizzes	7	10
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM								
No	Program Learning Outcomes		Contribution					
		NA	1	2	3	4	5	
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems.	**X**						
2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.	**X**						
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.	**X**						
4	Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively.						**X**	
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.						**X**	
6	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.				**X**			
7	Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions.					**X**		
8	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	**X**						
9	Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice.	**X**						

10	Knowledge about business life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development.	**X**						
11	Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.	**X**						
12	Ability to work professionally in both thermal and mechanical systems areas, including design and realization.	**X**						
13	Ability to verify and validate numerical solutions to engineering problems.					**X**		

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding exam weeks: 13x Total course hours)	13	1	13
Hours for off-the-classroom study (Pre-study, practice)	14	1	14
Midterms	1	3	3
Laboratory	7	2	14
Report writing	7	3	21
Quiz	7	1	7
Final examination	1	10	10
Total Work Load			82
Total Work Load / 25 (h)			3.3
ECTS Credit of the Course			3