YEDİTEPE UNIVERSITY
FACULTY OF ENGINEERING

COURSE DESCRIPTION FORM

COVER PAGE

2023/2024-1

Course Code & Name	CE351 FLUID MECHANICS

Course Schedule	Friday, 13:00-16:00
Room	4E02
Instructor's Name **Phone** **E-mail** **Office Hours**	Asst. Prof. Dr. Günseli ERDEM ALTIN 0216-578 00 00 / 3212 gunseli.erdem@yeditepe.edu.tr Monday 14:30-16:30
Assistant's Name **Phone** **E-mail**	Asst. Ece GÜRKAN ece.gurkan@yeditepe.edu.tr
Midterm Dates	24.11.2023 13:00-15:00
Additional Information	

YEDİTEPE UNIVERSITY
FACULTY OF ENGINEERING

COURSE DESCRIPTION FORM

COURSE INFORMATON				
Course Code	**CE 351**	**Course Title**	**FLUID MECHANICS**	
Semester	*Credits*	*ECTS*	*C +P + L Hour*	Prerequisites
5	3	6	3 + 0 + 0	CE231

Language of Instruction	**Course Level**	**Course Type**
English	Undergraduate	Core

Course Coordinator	Günseli ERDEM ALTIN
Instructors	Günseli ERDEM ALTIN
Assistants	-
Goals	The aim of the course is to provide students with knowledge about the engineering properties of fluids, to derive, explain and apply the conservation and motion equations for fluids and to apply fluid properties and conservation equations to different flow cases.
Content	Dimensional analysis and dimensional homogeneity. Physical properties of fluids. Hydrostatics, pressure, manometers. Hydrostatic forces. Uplift force, center of buoyancy and balance of floating bodies. Fluid kinematics: Eulerian and Lagrangian approaches. Steady flow, uniform flow. Stream function, potential function, vorticity and circulation. Conservation equations in ideal fluids: Continuity Equation, flow rate and applications. Impulse-momentum equation and applications. Bernoulli Equation and applications. Flow of real fluids, viscousity and turbulence effects, Navier-Stokes equation. Energy loss in one-dimensional flow and applications. Wave motion basics. Diffusion and dispersion.
Contribution of the Course to the Professional Education	The course sets up the foundation for the undergraduate courses related to the discipline of hydraulics and water resources present in the curriculum. Based on theory, hydrostatic forces and their calculation methods, calculation principles for pipelines and principles of dynamic forces exerting on hydraulic structures are explained for ideal fluids. In the later weeks of the course, non-ideal fluids are also discussed. Following compulsory and restricted courses of the branch treat more specific hydraulic problems mainly based on engineering approaches and criteria.

Course Learning Outcomes	**Detailed Program Outcomes**	**Teaching Methods**	**Assessment Methods**
Ability to explain the fundamental mechanical properties of fluids and their effects in fluid mechanics	1a	1, 5, 7	A, E

Ability to solve problems containing hydrostatic pressure, piezometric height, manometers and other pressure gage types in stationary fluids.	1b,6c	1, 3	A, E
Ability to calculate hydrostatic forces on curved and planar surfaces and buoyancy and uplift force on immersed bodies.	1b,2a,6c	1, 3, 5	A, E
Ability to calculate flow characteristics and kinematics by using flow and potential functions	1b,2a,6c	1, 3, 5	A, E
Ability to carry out calculations for pipeline hydraulics and bends by assuming ideal fluid and using continuity, Bernoulli and impulse-momentum equations.	1b,2a,6c	1, 3, 5	A, E
Ability to calculate and plot energy and hydraulic grade lines.	1b,2a,6c	1, 3, 5	A, E
Ability to explain the energy loss and effects of boundary layer for real fluids	1a,6c	1, 3	A, E
Ability to solve one-dimensional flow of ideal fluid problems by using hydraulic gradient	1b,2a,6c	1, 3	A, E
Ability to use linear wave theory in order to calculate water particle kinematics	1b,2a,6c	1, 3, 5	A, E
Ability to explain diffusion and dispersion	1a	1, 3, 5	A, E

Teaching Methods:	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 4: Use of simulations, 5: Problem solving assignment, 6: Reading assignment, 7: Laboratory work, 8: Term research paper, 9: Presentation by guest speaker,10: Sample Project Review, 11: Interdisciplinary group working, 12: ...
Assessment Methods:	A: Written exam, B: Multiple-choice exam C:Take-home quiz, D: Experimentreport, E: Homework, F: Project, G: Presentation by student, H: Interactive application assignments

COURSE CONTENT

Week	Topics	Study Materials
1	Dimensional analysis, fundamental properties of fluids	Lecture notes and textbook
2	Pressure, manometers, hydrostatic forces	Lecture notes and textbook
3	Hydrostatic forces on planar and curved walls, center of flotation	Lecture notes and textbook
4	Fluid kinematics: Definitions, equation of motion, stream function, potential function.	Lecture notes and textbook

5	Continuity equation and applications	Lecture notes and textbook
6	Impulse-momentum equation and applications	Lecture notes and textbook
7	Bernoulli equation and applications	Lecture notes and textbook
8	Interm exam	Lecture notes and textbook
9	Flow of real fluids: Introduction, viscousity and turbulence	Lecture notes and textbook
10	Flow of real fluids: Navier-Stokes equation, friction losses	Lecture notes and textbook
11	Boundary layer theory	Lecture notes and textbook
12	One-dimensional flow of real fluids	Lecture notes and textbook
13	One-dimensional flow of real fluids, applications	Lecture notes and textbook
14	General problem section	Lecture notes and textbook

RECOMMENDED SOURCES	
Textbook	Massey, B. Ward-Smith, J, 2006. Mechanics of Fluids, 8th Edition, Taylor&Francis, London and New York. Electronic edition. Yunus A. Çengel, John M. Cimbala, 2015 Basics of Fluid Mechanics and Applications Bar-Meir, G. 2011. Basics of Fluid Mechanics, Internet edition
Additional Resources	Kırkgöz, M.S., 2018. Akışkanlar Mekaniği, Birsen Yayınevi.

MATERIAL SHARING	
Documents	Lecture notes and exercises are shared digitally
Assignments	Assignment solutions are shared digitally and discussed in the classroom
Exams	Exam problems are solved in class following the examination

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Interm Exam	1	30

Homeworks	4	20
Total		**50**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		50
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		50
Total		**100**

COURSE CATEGORY	Field Course

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES

No	Program Learning Outcomes	check √
1a	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline,	√
1b	Ability to use theoretical and applied knowledge in these areas in complex engineering problems.	√
2a	Ability to identify, formulate, and solve complex engineering problems,	√
2b	Ability to select and apply proper analysis and modeling methods for this purpose.	
3a	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,	
3b	Ability to apply modern design methods for this purpose.	
4a	Ability to devise, select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice.	
4b	Ability to employ information technologies effectively.	
5a	Ability to design experiments for investigating complex engineering problems or discipline specific research questions,	
5b	Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.	
6a	Ability to work efficiently in intra-disciplinary teams,	
6b	Ability to work efficiently in multi-disciplinary teams,	
6c	Ability to work individually.	√
7a	Ability to communicate effectively in Turkish, both orally and in writing,	
7b	Knowledge of a minimum of one foreign language,	

7c	Ability to write effective reports and comprehend written reports, prepare design and production reports,	
7d	Ability to make effective presentations,	
7e	Ability to give and receive clear and intelligible instructions.	
8a	Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology,	
8b	Ability to continue to educate him/herself.	
9a	Consciousness to behave according to ethical principles and professional and ethical responsibility.	
9b	Knowledge on standards used in engineering practice.	
10a	Knowledge about business life practices such as project management, risk management, change management.	
10b	Awareness in entrepreneurship and innovation.	
10c	Knowledge about sustainable development.	
11a	Knowledge about the global and social effects of engineering practices on health, environment, and safety,	
11b	Knowledge about contemporary issues of the century reflected into the field of engineering.	
11c	Awareness of the legal consequences of engineering solutions.	
12	Knowledge about project award mechanisms and tendering procedures.	
13	Knowledge about the interaction of designers and constructors.	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	4	56
Assignments	4	12	48
Final Exam	1	2	2
Total Work Load			148

Total Work Load / 25 (h)			6
ECTS Credit of the Course			6

Prepared by: Asst. Prof. Dr. Günseli Erdem Altın	Preparation date: 27.09.2023