

COURSE INFORMATION				
Course Code	221	Course Title	CONSTRUCTION MATERIALS	
Semester	Credits	ECTS	C + P + L Hour	Prerequisites
3	3	6	3+0+1	CE 162: Materials Science

Language of Instruction	Course Level	Course Type
English	Bachelor's Degree (First Cycle Programmes)	Core
Course Coordinator	Asist. Prof. M. Adil Akgül	
Instructors	Prof. Dr. Turan Özturan	
Assistants	Ar. Gör. Şükrü Efe Ölgün, Ar. Gör. Emin Gazi Kaşıkçı, Lab. Sor. Hülya Özyurt	
Goals	The goal of this course is to provide students the basic knowledge and properties for construction materials such as portland cement and bituminous concretes, masonry, polymer and cement based composites as well as timber and metals in regard to their engineering behavior and performance in civil engineering constructions.	
Content	Portland cements, aggregates, admixtures, mix design of Portland cement concrete, bitumen and bituminous concretes, masonry design and construction, polymer and cement based composites.	
Contribution of the Course to the Professional Education	Almost all civil engineering structures are built of reinforced concrete. Properties of concrete making materials and mechanics as well as durability of concrete should thus be well understood to construct strong and durable structures. This course adds a significant contribution to the Civil Engineering Professional education by teaching the students properties and mechanics of concrete as well as other construction materials such as asphalt concrete, masonry, composites, timber and metals.	

Course Learning Outcomes	Detailed Program Outcomes	Teaching Methods	Assessment Methods
1) Ability to perceive the connection between empiricism, craft and science in understanding of construction materials and of their treatment in practice.	1a, 1b	1,2,3	A,D
2) Ability to assess the fundamentals of durability, strength and failure of concrete in relation to development of the microstructure due to hydration process of cement.	1a, 1b, 5b, 9b	1,2,3	A,D
3) Ability to assess the properties of cement and aggregates in relation to the property-composition relations for portland cement concrete mix design.	1b, 5b, 7c, 7e, 9b	1,2,3,7	A,D

4) Ability to assess the properties of bitumen and aggregates in relation to the property-composition relations for bituminous concrete mix design of flexible pavements	1a, 1b	1,2,3	A
5) Ability to assess materials of masonry construction for the allowable stress approach design method of masonry elements.	1a, 1b	1,2,3	A
6) Ability to understand the structure and design principles of polymer and cement based fiber composites regarding their end use examples.	1a, 1b	1,2,3	A
7) Ability to develop laboratory testing skills for construction materials.	5a, 5b, 7c, 7e, 9b	1,3,7	D

Teaching Methods:	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 7: Laboratory work,
Assessment Methods:	A: Written (essay/problems) exam, D: Experiment report

COURSE CONTENT		
Week	Topics	Course Topics and Objectives
1	Introduction	Describe the structure of materials on different dimensional scales.
2	Concrete	Describe the hydration process of cement.
3		Introduce chemical and mineral admixtures.
4		Describe properties and role of aggregates in concrete.
5		Fresh and early age properties of concrete.
6		Fundamentals of deformation of concrete.
7		Basics of stress-strain behavior.
8	Bituminous materials	Fundamentals of strength and failure of concrete.
9	Masonry	Fundamentals of durability of concrete.
10		Principles of statistical quality control of concrete.
		Property-composition relations and basics of concrete mix design.
		Properties of bitumen and aggregates.
		Basics of strength and failure of flexible pavements. Property-composition relations for bituminous concrete mix design.
		Materials for masonry.
		Introduction to masonry construction.
		Basics of structural behavior and failure of masonry.
		Allowable stress approach for masonry design.
		Introduction to reinforced masonry.

11	Polymers and Polymer Composites	Introduce types of polymers and fibers. Structure and design principles of polymer based fiber composites. Examples of end use of polymer composites.
12		
13	Cement Based Fiber Composites	Properties of fibers. Principles of design of cement based fiber composites.
14	Metals and Timber	Iron-carbon alloys for structural use. Metal alloys in civil engineering. Introduction of nature made composite: wood. Structural Properties of timber.

RECOMMENDED SOURCES

Textbook	None
Additional Resources	<p>Materials for Civil and Construction Engineers, Michael S. Mamlouk, John P. Zaniewski, 3rd Edition, Pearson.</p> <p>Construction Materials Editors: Domone and Illstone, 3rd Edition, Kindle Edition</p>

MATERIAL SHARING

Documents	Lecture Notes Slides uploaded on Moodle
Exams	Exams in class (time will be announced).

ASSESSMENT

IN-TERM STUDIES	NUMBER	PERCENTAGE
Midterm Exam	2	55
Laboratory Experiments	4	45
Total		100
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		45
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		55
Total		100

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 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	3	42
Experiments	4	1	4
Lab reports	4	3	12
Midterm Examination	2	2	4
Preparation for Midterms	2	10	20
Final Examination	1	2	2
Preparation for Final	1	15	15
Total Work Load			141
Total Work Load / 25 (h)			5.64
ECTS Credit of the Course			6

Prepared by: Prof. Turan Özturan	Preparation date: 12/09/2022
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