هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification

(Bachelor)

Course Title:	Construction Materials
Course Code:	COE 3302
Program:	Bachelor of Construction Engineering
Department:	Civil and Environmental Engineering Department
College:	College of Engineering and Computing in Al-Qunfudhah
Institution:	Umm Al-Qura University
Version:	4.0
Last Revision Date:	14 January 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: 3.0					
2. Course type					
A.	☐University	☐ College	☒ Department	☐Track	Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Third Year / Level 5)					
4. Course General Description:					
This course provides an in-depth understanding of the composition and properties of hydraulic cements, with a focus on local aggregates and water used in concrete mixes. Key topics include the properties of fresh and hardened concrete, production, handling, and placement techniques for cement and fresh concrete. The course also covers concrete mix design principles and the durability of concrete in the Gulf region's harsh environmental conditions. Special emphasis is placed on addressing hot weather concreting challenges. Additionally, the course examines the structural use of alternative materials such as steel, aluminum, timber, glass, and plastics. Laboratory sessions will complement theoretical knowledge through practical tests, including assessments of concrete constituents, aggregate gradation, and the evaluation of fresh and hardened concrete properties.					
5. Pre-requirements for this course (if any)**:**					
Mechanics of Materials (COE2104)					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The main objective of this course is to equip students with a comprehensive understanding of the properties of concrete and other construction materials. Students will gain the knowledge and skills required to design concrete mixes and conduct essential tests on various civil engineering materials, ensuring their suitability for construction applications.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**75**	**100%**
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**45**
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		**75**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Explain the constituents of concrete, fresh concrete, and their specific properties.**	**K1**	**Lecture, Problem-solving sessions.** **Worked examples, assignments** **Group exercises.**	**Assignments, Quizzes, Midterm exam, Final exam**
1.2	**Describe the properties and applications of structural construction materials, including steel, timber, and other materials.**	**K1**		
1.3	**Identify and describe the issues related to the durability of concrete and the challenges associated with hot weather concreting.**	**K2**		

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	**Calculate the fineness modulus of aggregates**	**S1**	**Interactive learning Self-directed learning**	**Assignments , Quizze, Midterm exam, Final exam**
2.2	**Design concrete mixes for compression tests of concrete.**	**S2**		
2.3	**Demonstrate the different properties and uses of various construction materials**	**S2**		
2.4	**Evaluate experimental results from testing structural materials**	**S3**		**Lab exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**NA**			

C. Course Content

No	List of Topics	Contact Hours
1.	**Cement**	**13**
1.1	Portland cement	
1.2	Manufacturing process	
1.3	Special cements	
1.4	Hydration of cement	
1.5	Tests of cement: fineness, soundness, consistency, setting time, compressive strength	
1.6	Storage of cement	
1.7	Laboratory tests on setting time of cement	
2.	**Aggregate**	**13**
2.1	Sources and types of fine and coarse aggregate	
2.2	Grading of fine and coarse aggregate	
2.3	Tests of aggregates: bulk density, relative density, absorption, and surface moisture	
2.4	Laboratory tests on sieve analysis of fine aggregates, coarse aggregates, and silt content	
3.	**Concrete**	**14**
3.1	Paste and aggregate requirements for concrete making	
3.2	Water-cement ratio	

3.3	Mixing and consolidation requirements, curing, freeze-thaw resistance, concrete shrinkage	
3.4	Mixture proportioning: selection of mix characteristics, proportioning methods	
3.5	Design mix: workability of concrete (slump test, temperature test, air content, chloride content, strength test)	
3.6	Laboratory tests on workability of concrete, preparation of cubes and beams	
4.	**Admixtures**	**9**
4.1	Introduction	
4.2	Classification by function	
4.3	Reasons for using admixtures	
4.4	Laboratory tests on compressive strength of concrete cubes and cement mortar cubes (7 days)	
5.	Supplementary Cementing Materials	**8**
5.1	Pozzolan, fly ash, silica fume, slag, natural pozzolan, metakaoline	
5.2	Effects of fly ash, silica fume, slag, and metakaoline on freshly mixed concrete	
5.3	Laboratory tests on compressive strength of concrete cubes, cement mortar cubes, and beams (14 days)	
6.	**Durability of Concrete**	**5**
6.1	Durability issues: sulphate attack, reinforcement corrosion, alkali-silica reactivity	
6.2	Problems of hot weather concreting	
7.	**Iron and Steel**	**8**
7.1	Introduction to structural steel: advantages and shapes	
7.2	Mechanical testing of steel	
7.3	Corrosion of steel	
7.4	Reinforced concrete	
7.5	Laboratory tests on compressive strength of concrete cubes, cement mortar cubes, and beams (28 days)	
8.	**Wood / Timber**	**5**
8.1	Introduction to wood and timber: uses, advantages, types, and properties	
8.2	Seasoning and defects of timber	
8.3	Review of all laboratory experiments	
Total		**75**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	4	10%
2.	Assignments	3,6,9,13	10%
3.	Midterm Exam	9	20%
4.	Lab Exam	15	20%
3.	Final Exam	16 or 17	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Wilson, M. L., & Tennis, P. D. (2021). Design and control of concrete mixtures (17th ed.). Portland Cement Association.
Supportive References	ASTM Standards (American Society for Testing and Materials) AASHTO Standards (American Association of State Highway and Transportation Officials)
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom:** Minimum capacity of 30 students, equipped with: whiteboard, computer and projector
Technology equipment (projector, smart board, software)	**Projector and smart board**
Other equipment (depending on the nature of the specialty)	**Laboratory:** Equipped with the latest equipment for testing building materials, including: - Equipment for testing cement properties (e.g., Vicat apparatus for setting time, compressive strength testing machine) -Aggregate testing equipment (e.g., sieve sets for gradation analysis, bulk density containers, moisture measurement devices) -Concrete mixing and curing equipment (e.g., concrete mixers, molds for cubes and beams, curing tanks) -Admixture testing setup

Items	Resources
	-Compression and flexural testing machines for hardened concrete samples

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Lecturer / Students	Direct / Indirect (Grades, surveys)
Effectiveness of Students assessment	Faculty	Indirect (Barriers to understand successor course)
Quality of learning resources	Lecturer	Direct (Grades)
The extent to which CLOs have been achieved	Lecturer / Faculty	Direct (Grades)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Civil and Environmental Engineering Department Council in Al-Qunfudah
REFERENCE NO.	The fifteenth session of the academic year 1446
DATE	01/05/2025