

CE 577 Advanced Concrete Technology

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)												
Required, or Elective	Required												
Course Description	Microstructure of cement paste; Elasticity of concrete, Temperature effects in concrete; Concrete-environment interactions, Time-dependent deformations of concrete: Creep and shrinkage; Special cements, fiber reinforced concrete and polymer concrete systems.												
Prerequisites or Co-requisites	None												
Course Learning Outcomes	<p>Students completing this course successfully will be able to:</p> <table> <thead> <tr> <th>Course Learning Outcomes (CLOs)</th><th>Related Student Outcomes (SO)</th></tr> </thead> <tbody> <tr> <td>CLO1. Identify the effects of various environments on properties of concrete and steel reinforcement. K1</td><td>SO1</td></tr> <tr> <td>CLO2. Explain different types and properties of special cements, fiber reinforced concrete and polymer concrete systems. K1</td><td>SO1</td></tr> <tr> <td>CLO3. Evaluate the long-term performance of concrete as affected by shrinkage and creep. S1</td><td>SO2</td></tr> <tr> <td>CLO4. Analyze the microstructure of cement paste and determine its effect on strength and elasticity of concrete. S1</td><td>SO2</td></tr> <tr> <td>CLO5. Demonstrate professional engineering and ethical values through selecting state of the art topics in concrete technology for the term projects and assignments. V1</td><td>SO6</td></tr> </tbody> </table>	Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)	CLO1. Identify the effects of various environments on properties of concrete and steel reinforcement. K1	SO1	CLO2. Explain different types and properties of special cements, fiber reinforced concrete and polymer concrete systems. K1	SO1	CLO3. Evaluate the long-term performance of concrete as affected by shrinkage and creep. S1	SO2	CLO4. Analyze the microstructure of cement paste and determine its effect on strength and elasticity of concrete. S1	SO2	CLO5. Demonstrate professional engineering and ethical values through selecting state of the art topics in concrete technology for the term projects and assignments. V1	SO6
Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)												
CLO1. Identify the effects of various environments on properties of concrete and steel reinforcement. K1	SO1												
CLO2. Explain different types and properties of special cements, fiber reinforced concrete and polymer concrete systems. K1	SO1												
CLO3. Evaluate the long-term performance of concrete as affected by shrinkage and creep. S1	SO2												
CLO4. Analyze the microstructure of cement paste and determine its effect on strength and elasticity of concrete. S1	SO2												
CLO5. Demonstrate professional engineering and ethical values through selecting state of the art topics in concrete technology for the term projects and assignments. V1	SO6												
Student Outcomes related to this Course	<p>SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.</p> <p>SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.</p> <p>SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.</p>												
Topics Covered	<table> <thead> <tr> <th>List of Topics</th><th>Related CLOs</th></tr> </thead> <tbody> <tr> <td>1. Introduction to concrete technology.</td><td>CLO 1, CLO 2, CLO 3, CLO 4</td></tr> <tr> <td>2. Microstructure of cement paste.</td><td>CLO 4, CLO5</td></tr> <tr> <td>3. Elasticity of concrete</td><td>CLO 4, CLO5</td></tr> <tr> <td>4. Temperature effects in concrete.</td><td>CLO 1, CLO5</td></tr> </tbody> </table>	List of Topics	Related CLOs	1. Introduction to concrete technology.	CLO 1, CLO 2, CLO 3, CLO 4	2. Microstructure of cement paste.	CLO 4, CLO5	3. Elasticity of concrete	CLO 4, CLO5	4. Temperature effects in concrete.	CLO 1, CLO5		
List of Topics	Related CLOs												
1. Introduction to concrete technology.	CLO 1, CLO 2, CLO 3, CLO 4												
2. Microstructure of cement paste.	CLO 4, CLO5												
3. Elasticity of concrete	CLO 4, CLO5												
4. Temperature effects in concrete.	CLO 1, CLO5												

	5. Concrete environment interactions.	CLO 1, CLO5
	6. Time-dependent deformations of concrete.	CLO 3, CLO5, CLO1
	7. Special cements.	CLO 2, CLO5
	8. Fiber reinforced concrete.	CLO 2, CLO5
	9. Polymers and polymer concrete systems.	CLO 2, CLO5
Textbook(s) and Other Required Material	<ul style="list-style-type: none"> • Mindess, S., and Young, F.J., Concrete, 2nd Edition, 2002. 	
Grading System	Assignments	10%
	Lecture Attendance	--
	Project Work	20%
	Mid-term exam	30%
	Final Exam	40%
Instructors	Prof. Dr. Mohammad Alshannag; Office 2A31; email: mjshanag@ksu.edu.sa	
Date of Review	November, 2024	