College of Engineering

Department of Civil Engineering

CE 577 Advanced Concrete Technology

Credit and Contact hours	3/ 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Required for a MSCE degree
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; Term Project.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to

Course Learning Outcomes	*Related Program Outcomes*
CLO1: Recognize the effects of temperature and various environments on properties of concrete and steel reinforcement.	**K1**
CLO2: Determine the long-term performance of concrete as affected by shrinkage and creep.	**S1**
CLO3: Analyze the microstructure of cement paste and determine its effect on strength and elasticity of concrete.	**S1**
CLO4: Explain different types and properties of special cements, fiber reinforced concrete and polymer concrete systems.	**S1**
CLO5: Evaluate the state of the art topics in concrete technology leading towards solving engineering problems.	**C1**

Student Outcomes related to this Course	**K1**. Recognize advanced engineering knowledge, concepts and techniques to identify, interpret and analyze complex and real-life engineering problems.

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<tr><td></td><td>S1. Provide solution for complex and real-life engineering problems through critical thinking and using modern engineering tools and identify its impact on social and ethical issues.

C1. Criticize and discuss scientific research reports /papers related to Civil Engineering issues with high level of ethics and proficiency, independently, or as a team work.</td></tr>
<tr><td>Topics Covered</td><td>
<table>
<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Microstructure of cement paste</td><td>CLO3</td></tr>
<tr><td>2. Elasticity of concrete</td><td>CLO3</td></tr>
<tr><td>3. Temperature effects in concrete.</td><td>CLO1</td></tr>
<tr><td>4. Concrete environment interactions.</td><td>CLO1</td></tr>
<tr><td>5. Time-dependent deformations of concrete.</td><td>CLO2</td></tr>
<tr><td>6. Special cements.</td><td>CLO4</td></tr>
<tr><td>7. Fiber reinforced concrete.</td><td>CLO4</td></tr>
<tr><td>8. Polymers and polymer concrete systems.</td><td>CLO4</td></tr>
<tr><td>9. Term Project</td><td>CLO5</td></tr>
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<tr><td>Textbook(s) and Other Required Material</td><td>

Sidney Mindess, and J. Francis Young, and David Darwin, Concrete, 2nd Edition, 2003.
P. K. Mehta, Concrete (Structure, Properties and Materials), 1986.
A. M. Neville, Properties of Concrete, Fourth Edition, 1996.
Design and control of concrete mixtures, by S. H. Kosmatka, and M. L. Wilson, Portland Cement Association, Latest Edition.

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<tr><td>Grading System</td><td>
Assignments 10%
Project Work 20%
Midterm Exam 30%
Final Exam 40%
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<tr><td>Instructors</td><td>Prof. Dr. Mohammad Alshannag; Office 2A31; email: mjshanag@ksu,edu.sa</td></tr>
<tr><td>Date of Review</td><td>February, 2021 (updated: March, 2021)</td></tr>
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