CE 306

Properties and Testing of Structural Materials

Department of Civil Engineering

King Saud University

Course Description: **CE 306 Properties and Testing of Structural Materials.** (Required for a BSCE degree)	Engineering materials (general properties, testing and specifications). Stress-strain behavior of concrete and reinforcing bars. Properties and testing of concrete making materials (cement, aggregates, mixing water and admixtures). Requirements and design of concrete mixes. Mixing, placing and curing of concrete. Quality control and statistical evaluation. 3 (2,0,2)
Prerequisite	CE 302 (Mechanics of Materials), Prerequisite by Topics: 1. Basic concepts: stress, strain, modulus of elasticity, etc. 2. Understanding stress-strain relationship – normal stresses. 3. Understanding beam behavior in flexure
Course Learning Outcomes	Students completing this course successfully will be able to 1. Investigate mechanical properties of steel and concrete using relevant standard tests to draw conclusions about quality and compliance with standard specifications. 2. Investigate properties of concrete constituents (cement, water and aggregates) using appropriate tests according to related standards and specifications to draw conclusions about quality and suitability for concrete manufacturing. 3. Develop different normal concrete mixtures that satisfies certain properties related to workability, strength and durability with the consideration of environmental and economic aspects. 4. Investigate different stages of concrete manufacturing including batching, mixing, transporting, placing, and curing of concrete, and assess its effects on quality of concrete mixtures.
Topics Covered	1. Introduction, Properties and Testing of Engineering Materials (**2 hours**). 2. Mechanical Behaviour (stress-strain diagram) (**3 hours**). 3. Standards and Specifications (**2 hours**). 4. Portland Cements: Manufacture, Chemical Composition, Types, Physical Properties, Special Cements (**4 hours**). 5. Aggregates: Types, Grading, Properties and Quality Tests (**3 hours**). 6. Mixing Water for Concrete (**2 hours**). 7. Workability of Concrete (**1 hour**). 8. Introduction to Admixtures (**2 hours**). 9. Designing and Proportioning Concrete Mixtures: Selecting Mix Characteristics (strength, durability, water-cement ratio, slump aggregates, cement content), Statistical Quality Control of Concrete Mixtures, and Examples of Mixture Proportioning (**6 hours**). 10. Batching, Mixing, Placing and Curing of Concrete (**3 hours**).

Class/ tutorial Schedule	Lecture is held twice a week 50-minute each session. Lab is held twice a week 50-minute each session.
Computer Applications	MS word and Excel
Project	None
Contribution of Course to Meeting the Professional Component	1. Students learn how to use engineering standards and codes. 2. Students learn how to select and design concrete mixtures according to international standards. 3. Students improve their technical writing and communication skills.
Relationship of Course to Program Outcomes	- An ability to apply knowledge of mathematics, science, and engineering - An ability to design and conduct experiments, as well as to analyze and interpret data - An ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, ethical, health and safety, and sustainability. - An ability to identify, formulate, and solve engineering problems including the ability to evaluate and synthesize information and develop alternative solutions - An understanding of professional and ethical responsibility
Textbook(s) and/or Other Required Material	Kosmatka, S. H. and Wilson, M. L., Design and control of concrete mixtures, Sixteen Edition, Portland Cement Association Skokie, IL.
Grade Distribution	1st Mid-Term Exam 20% 2nd Mid-Term Exam 20% Lab Reports and Attendance 20% Final Exam 40% Total 100%
Instructors	Prof. Abdulrahman Alhozaimy (Office 2A74) Prof. Abdulaziz Al-Negheimish (Office 2A74) Lab : Engr. Mohammed Saleem Shaik (Office AB 11)
Date of Preparation	30 Aug. 2020