CE 5351 Mechanistic Pavement Design and Analysis

MW 6:00 pm - 7:20 pm
Liberal Arts Building 206
Spring 2017

Instructor: Carlos M. Chang, Ph.D., P.E.      Office: A-205
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Office Hours: Students are always welcome

Papagiannakis, T. and Masad E., Pavement Design and Materials (2007), Wiley
Mallick, R, and El-Korchi, T., Pavement Engineering (2009), CRC Press
Additional handouts will be provided to the students during the development of the course.

OBJECTIVES

The objective of this course is to learn the principles of pavement design with an emphasis on mechanistic methods. The two primary purposes of this course are:

1. To learn fundamental principles of mechanistic pavement design
2. To apply the latest pavement design methods.

Overall, this course will cover the concepts, methods, and tools to perform pavement analysis and design. Pavement mechanistic theories of stress distribution in all types of pavements, the effects of static and moving loads on these stresses and the development of traffic analyses and equivalency factors are main topics in the course. Also the nature of materials used in pavements and methods used for material characterization, in situ and in the laboratory. Empirical methods for pavement design are also explained in this course as an introduction to mechanistic methods. The American Association of State Highways and Transportation Officials (AASHTO) recommended the incorporation of mechanistic design methodology in routine pavement design and rehabilitation. Mechanistic design procedures are based upon the assumption that a pavement can be modeled as a multi-layered elastic or visco-elastic structure on an elastic or visco-elastic foundation. With this model, it is possible to calculate stress, strain, or deflection due to traffic loads and environmental effects at any point within the pavement structure and evaluate the pavement performance over time.

TOPICS

1. Introduction (Sections 1.2-1.5)
2. Stresses and Strains in Flexible Pavements (Sections 2.1-2.3)
3. Stresses and Deflections in Rigid Pavements (Sections 4.1-4.4)
4. Traffic Loading and Volume (Sections 6.1-6.4)
5. Material Characterization (Section 7.1-7.5)
6. Drainage Design (Section 8.1-8.3)
7. Pavement Performance (Section 9.1-9.3)
8. Reliability (Section 10.1-10.5)
9. Flexible Pavement Design (Sections 11.1-11.4)
10. Rigid Pavement Design (Sections 12.1-12.3)
GRADING

Your grade for this course will be determined on the basis of 100 points as follows:

- Midterm Exam: 30 points
- Final Exam: 40 points
- Assignments and Quizzes: 30 points

Final grades are based on the normal distribution of points as shown below:

- A: 100 - 90
- B: 89 - 80
- C: 79 - 70
- D: 69 - 60
- F: < 60

The instructor reserves the right to revise this grading plan. However, students will be informed of any changes during the semester.

In accordance with University regulations, students who miss examinations will receive grades of zero. Exceptions to this rule will be made only on a carefully considered individual basis under extraordinary circumstances and only if the student contacts the instructor one week before the exam. If you know in advance that you are going to miss an exam, it is your responsibility to inform the instructor before the exam.

Any discrepancies with your grades in homework, quizzes, or exams need to be resolved no later than 7 calendar days after you have received your grade.

ATTENDANCE

Students are expected to attend all class periods. Those who fail to attend class regularly are inviting scholastic difficulty and, with the approval of the Dean of the College of Engineering, may be dropped from the course with a grade of F for repeated (4 or more) unexcused absences.

TEACHING METHODOLOGY

The teaching methodology is learner-centered based on active learning techniques. Read in your textbook the topic to be discussed prior to the class and review the subject thoroughly after the class. Students will also be assigned topics to investigate in order to present in the class. In addition, state-of-the-art software tools will be provided to the students for pavement analysis and design.

EXAMS

A Midterm and Final Exam will be given in the course. Exams are comprehensive and cover all topics up to that date. The exam dates will be announced at least one week in advance.
ASSIGNMENTS AND QUIZZES

Homework will be assigned nearly for every class module. The student must turn in on the assignment in time. Homework problems up to one week late will earn a maximum of 50% of the total grade. Past one week, the homework will not be accepted. You should expect a quiz once a topic is completed. The quiz will cover theoretical aspects and/or problem solving skills. Length of the quizzes may vary depending on the topic. The quizzes will be closed book and closed notes unless told otherwise. No make-up quizzes will be given. The two lowest scores will be eliminated. If you miss a quiz, that quiz counts toward the two lowest scores to be eliminated. Quizzes are focused on latest lectures but you should expect some questions related to previous topics to reinforce your learning process. The purpose of the assignments and quizzes is to monitor your learning progress.

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DISABILITIES

Students with disabilities will be accommodated. Students are required to notify the instructor of any disability at least one week before the start of class.

POLICY ON CHEATING

Students are expected to be above reproach in all scholastic activities. Students who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the university. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student, or the attempt to commit such acts (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22). Scholastic dishonesty harms the individual, all students, and the integrity of the university. Policies on scholastic dishonesty will be strictly enforced.

COURSE/INSTRUCTOR EVALUATION

A course/instructor evaluation will be conducted in class near the end of the semester.

FINAL COMMENT

The instructor expects all the students to succeed in learning the course subjects. It is critical for your success to establish a good studying habit in order to do very well in the class. If you feel that you are not understanding a subject, please do not hesitate to ask questions in class, or if necessary, to see your instructor or teaching assistant outside of class. Any specific comments that students have on how the course might be improved are particularly welcome.