Syllabus
CE 4302/7302: Prestressed/Advanced Reinforced Concrete
T/Th 9:30 to 11:00, Lafferre E2511
Fall 2010

Instructor: Dr. Sarah Orton
E2503 Lafferre Hall; Phone: 573-884-5089; OrtonS@missouri.edu
Office hours: TThu 2-3 pm, or Open, stop in any time; or call or email for appointment.

Course Description: This course will cover the basic prestressed concrete design. Principles of prestressing, constituent material, loading and allowable stresses, working and ultimate stress analysis and design, shear and torsion, deflections, prestress losses, continuous beams, composite beams, and compression members.

TEXT: Required

Recommended

PREREQUISITES: CV ENG 3300 (Structural Analysis), CE 3312 (Reinforced Concrete)

TOPICS
Chapter 1. Principles of Prestressing
- Introduction
- History of Prestressed Concrete
- Classification and Types of Prestressed Concrete Structures
- Prestressed Concrete Analysis
- Prestressed Concrete Design
- Prestressed Concrete versus Reinforced Concrete

- Reinforcing Steel
- Prestressing Steel
- Concrete

Chapter 3. The Philosophy of Design
- Strength Reduction Factors
- Overload Factors

Chapter 4. Flexure: Working Stress Analysis and Design
- Loading Stages
- Useful Section Properties and Notations
- Sign Conventions
- Flexural Analysis - Mathematical Basis
- Use of Stress-Inequality Conditions for the Design of Section Properties
- Limiting the Eccentricity along the Span
- Some Preliminary Design Hints
- Cracking Moment

Chapter 5. Flexure: Ultimate Strength Analysis and Design
- Load-Deflection Response
- Flexural Types of Failure
• Analysis of the Section at Ultimate
• Concept of Reinforcement Index
• Limiting Values of the Reinforcement Index
• Satisfying Ultimate Strength Requirements
• Design for Ultimate Strength
• Indeterminate Structures and Composite Elements - Ultimate Strength

Chapter 6. Design for Shear and Torsion
• Introduction
• Reinforced Versus Prestressed Concrete - Shear
• Diagonal Tension in Uncracked Sections
• Shear Stresses in Uncracked Sections
• Shear Cracking Behavior
• Shear Reinforcement after Cracking
• Design for Shear
• Torsion
• Torsional Stresses
• Post-Cracking Torsional Resistance
• Design for Pure Torsion
• Combined Shear and Torsion

Chapter 7. Deflections
• Background Information
• Short-Term Deflections
• Long-Term Deflections (Simplified Method)
• Long-Term Deflections (Incremental Time-Step Method)
• Deflection Limitations
• Deflection Control

Chapter 10. Continuous Beams and Indeterminate Structures
• Background Information
• Secondary Moments and Zero-Load C Line
• Linear Transformation
• Properties of Concordant Tendons
• Equivalent Loads
• Working Stress Analysis and Design
• Ultimate Strength Analysis

Additional topics that may be covered (subject to availability of time)

Chapter 13. Analysis and Design of Compression Members
• Types of Compression Members and Advantages
• Behavior of Columns
• Analysis of Short Columns
• Slender Columns
• ACI Code and Other Design Considerations

Chapter 8. Prestress Losses
• Total Losses in Pretensioned Members
• Total Losses in Post-Tensioned Members
• Methods for Estimating Prestress Losses
• Elastic Shortening
• Relaxation
• Shrinkage
• Creep
• Friction
• Anchorage Set
CREDIT DISTRIBUTION

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Advanced/Additional Work for Graduate Students

Students enrolled for Graduate credit (7302) will be required to complete a more rigorous final project. The student will develop a report and accompanying slide presentation detailing their work.

GRADING SCALE

**Undergraduate:**
92-100(A), 90-91(A-), 88-89(B+), 83-87(B), 80-82(B-), 78-79(C+), 73-77(C), 70-72(C-), 60-69(D), 59 or less (F)

**Graduate:**
90-100(A), 80-89(B), 70-79(C), 69 or less (F)

**Homework:** All homework will be completed in a neat and clear manner. Homework is due at the beginning of class on the due date. Late homework is not accepted except in special circumstances.

**Quizzes:** In class quizzes will be given unannounced throughout the semester. Students can use up to two “get out of quiz free” cards in the event that they miss class. Quizzes missed due to excused absences will also be excused.

**Questions:** Students will be called on in class to answer questions. Students are expected to attempt to answer the question. (No penalty is given for wrong answers)

**ADA Statement:** If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class, or at my office.

To request academic accommodations (for example, a notetaker), students must also register with the Office of Disability Services, SS Memorial Union, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and instructors, as needed and consistent with course requirements. For other MU resources for students with disabilities, click on "Disability Resources" on the MU homepage.

**Academic Integrity:** Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from The University. Since such dishonesty harms the individual, all students, and the integrity of The University, policies on scholastic dishonesty will be strictly enforced. Academic honesty is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person’s work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest, whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about collaboration, plagiarism, paraphrasing or quoting, please consult with me.

The University community welcomes intellectual diversity and respects student rights. Students who have questions concerning the quality of instruction in this class may address concerns to either the Departmental Chair or Divisional leader or Director of the Office of Students Rights and Responsibilities (http://osrr.missouri.edu/). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.
Grading Objectives
You grade will be determined through grading of homework and exams. In general the grading scale is as follows:
A – Able to solve all problems without mistakes
B - Able to solve all problems with few mistakes
C – Able solve most problems, some mistakes
D – Able to solve few problems, many mistakes
F – Unable to solve problems

Steps for achieving a high grade
- Don’t memorize procedures – there are too many
- Learn theory behind solution methods
- Do homework – exercise the brain
- Study for tests
- Ask questions when you don’t understand something