This course explores the design and behavior of prestressed concrete structures: materials and systems (including specifics for pre-tensioned and post-tensioned members), losses, flexure, shear, bond, deflections, continuous beams. Prerequisite: CE 341, AE 402, or approved equivalent.

Instructor: Dr. María López de Murphy  
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Office Hours: Monday 1-2 PM  
Wednesday 9-11 AM  
or by appointment (please e-mail to set-up meeting time)

Course Goals: I intend to assist you in developing your understanding of the principles governing the behavior of prestressed concrete members.

After this course you will be able to:  
- Understand the mechanics of prestressed concrete (PC) beams.  
- Check the state of stresses on a beam cross section at different loading stages.
- Design a PC beam based on allowable strength design (ASD), ultimate strength design (USD), and serviceability requirements.
- Estimate prestressed losses on a PC beam.
- Calculate deflections on a PC beam
- Explore advanced topics in the area of PC structures.


ACI 318-05 Building Code and Commentary (Available at Engineering copy center).

References: *PCI Design Handbook, Prestressed and Precast Concrete, 6th Edition*, Prestressed Concrete Institute (I will provide to you at no cost)

*Prestressed Concrete- a fundamental approach* by Edward G Navy, fifth edition


Field trip: A field trip to a precast/prestressed facility will be scheduled during the semester. Attendance is highly encouraged.

Written Assignments: The instructor will define the due date for assignments which are to be handled by the students at the beginning of the respective class. Late assignments will be penalized at 20% off per day. Topic and deadlines will be defined during class. A research assignment will be assigned the second week of class.

Exams: Two hourly exams will be held during the class period. Dates are indicated below; please plan your schedule accordingly. Make-up exams will NOT be given. Prior consent must be given for any missed exam, and will only be allowed in extreme cases.

Exam Schedule:

Exam 1. February 21, 2:30 PM, 110 Sackett
Exam 2. April 11, 2:30 PM, 110 Sackett
Final Exam. May 7-11 (see schedule online)
Evaluation Methods:
1. First exam  25%
2. Second exam  25%
3. Assignments  25%
4. Final exam  25%

Academic Integrity: This course will follow the University Faculty Senate Policy 49-20 on academic integrity. I encourage you to read it at http://www.psu.edu/ufs/policies/

ANGEL: General course information will be posted on Angel (https://cms.psu.edu/frameIndex.htm) along with homework and reading assignments, handouts, and announcements. Make a habit of checking your Angel account daily. I occasionally send announcements, reminders, and homework hints via email.

COURSE OUTLINE

This course outline is subjected to minor changes throughout the semester.

1. Introduction. Principles and Methods of Prestressing (Chapter 1, week 1)
2. Prestressing Materials, Steel, Concrete, FRP (Chapter 2, week 2)
3. Design philosophy, Introduction. (Chapter 3, weeks 3-4)
4. Flexure: Working Stress Analysis and Design (Chapter 4, weeks 5-7)
5. Flexure: Ultimate Strength Analysis and Design (Chapter 5, week 8)
6. Deflection Computation and Control (Chapter 7, week 9)
7. Design for Shear and Torsion (Chapter 6, weeks 10-11)
8. Postensioning Systems (Chapter 10, week 12)
9. Prestressed Losses (Chapter 8, week 13)
10. Composite Beams (Chapter 9, weeks 14-15)