

Prestressed Concrete Design

Instructor: M.O. Eberhard
Office: 233 More Hall, Box 352700
Phone #: 543-4815
E-mail: eberhard@u.washington.edu
Office Hours: after class or by appointment

This course is directed towards seniors and first-year graduate students in civil engineering who have taken a class in reinforced concrete design (e.g., CEE 452 or CEE 511), but who have not yet taken a class in prestressed concrete design.

At the end of this course, you should have a good understanding of the concepts and theory underlying the use of prestressed concrete, and the ability to analyze and design prestressed-concrete structures. This course will focus on statically determinate prestressed concrete beams, because these are commonly used in bridges and buildings. As time permits, we will also discuss the design of statically indeterminate (continuous) structures.

Course Outline

Reading

- | | |
|---|-------------------------|
| 1. Basic Concepts and Applications | Sec. 1.1, 1.2, 2.10 |
| - reinforced and prestressed concrete | |
| - one-dimensional example | |
| - applications (pre- and post-tensioning) | |
| 2. Materials | Sec. 2.1-2.7 |
| - desirable properties | |
| - steel | |
| - concrete | |
| 3. Flexural Analysis | Sec. 1.3, 1.4, 2.8, 2.9 |
| - flexural behavior | |
| - notation | |
| - superposition of stresses | |
| - pressure lines and kerns | |
| - equivalent loads | |
| - allowable stresses | |
| - spreadsheet example | |
| - in-class assignment | |
| - flexural strength | Sec. 4.9 - 4.12 |

- | | | |
|-----------|---|---------------------|
| 4. | Flexural Design | Ch. 4 |
| | Design, Given Beam Cross-Section | |
| | - Limiting stress states | |
| | - Maximum live-load capacity | |
| | - Load balancing | |
| | - Magnel diagrams | |
| | - Comprehensive example | |
| | Design, Proportioning Beam Size | |
| 5. | Serviceability | Ch. 7 |
| 6. | Shear | Sec. 5.1-5.6 |
| 7. | Composite Design | Sec. 4.6, 5.10-5.11 |
| 8. | Continuous Systems (as time permits) | Ch. 6 |

References

Nawy, E.G. *Prestressed Concrete: A Fundamental Approach*, Pearson Education, Inc., Upper Saddle River, New Jersey, 2003 (required).

Nilson, A. *Design of Prestressed Concrete*, John Wiley and Sons, New York, NY, 1987.

Precast /Prestressed Concrete Institute, *PCI Design Handbook*, 5th ed. Chicago, Illinois, 1999.

Notation

In general, we will use the same notation in lecture that is used in the text. However, the sign convention will be a bit different, so there will be some sign differences between the lecture equations and the equations in the text. This difference is unfortunate, but the notation used in lecture will make it much easier for you to solve homework problems with a spreadsheet or computer program.

Homework and Grading

Homework is an important part of this class. In general, I will ask each of you to submit your own solution. However, I encourage you to work with each other to understand concepts, and to check numerical and procedural accuracy of your solutions.

Late homework will be penalized 10% for each school day that it is late. No homework will be accepted after the solutions have been distributed to the class.

Homework	30%
Midterm	30%
Final Exam	40%

Important Dates

Monday,	Jan. 20, 2003	Martin Luther King, Jr's Holiday
Monday,	Feb. 17, 2003	President's Day Holiday
Friday,	Mar. 14, 2003	Last Class
Monday,	Mar. 17, 2003	Final Exam, 2:30-4:20 p.m.