

THE PENNSYLVANIA STATE UNIVERSITY
Department of Architectural Engineering

AE 431 – STRUCTURAL DESIGN OF BUILDINGS

- Semester:** Fall 2009
- Meeting Time/
Location:** MWF 9:05-9:55 12 Walker
- Instructor:** Dr. Ali M. Memari
213 Engineering A Bldg.
Phone: 865-3367, E-mail: amm7@psu.edu
- Office Hours:** MW 10:15-11:45 or by Appointment
- Prerequisites:** AE 402, AE 430
- Grading:**
- | | |
|--------------------------------|-----|
| Exam 1 (evening exam date TBD) | 30% |
| Exam 2 (evening exam date TBD) | 30% |
| Final Exam | 20% |
| Homework | 20% |
- Objectives/Scope:** This course is the continuation of AE 402. While in that course students learn the material properties of reinforced concrete (R/C) and mechanical behavior of R/C members and develop basic skills in designing simple beams and slabs and short columns, in AE 431, more advanced topics are discussed. Although in this course the emphasis is on design, where necessary, specialized analysis techniques are also discussed to facilitate design force calculations. In this course, students will develop skills to design structural members with various boundary conditions. The treatment of continuous beams and slabs, two-way slab systems, shear walls, frame columns with various heights, and prestressed concrete are considered of this course. An important part of R/C design is detailing of reinforcement, which will be treated as well. Other issues necessary for students to be exposed to are design for torsion and serviceability.
- Lecture Topics:** There will be three 50-minute lectures per week. A tentative outline of the topics is listed below:

1. Design of continuous slabs
2. Design of shear walls
3. Design of two-way slabs (Direct Design Method and Equivalent Frame Method)
4. Design of beams for torsion
5. Bond, development length, anchorage, and splicing of reinforcement
6. Serviceability and deflection calculations
7. Introduction to prestressed concrete design and design of post-tensioned slab systems
8. Design of short columns (including biaxially loaded)
9. Design of slender columns
10. Use of commercial software for design of slab systems

Textbook: Reinforced Concrete – Mechanics & Design, 5th Ed. by James K. Eight and James G. MacGregor, Pearson Prentice Hall, 2009.

Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary (ACI 318R-08), American Concrete Institute, 2008.

Homework: Homework problems will be assigned regularly. Each homework set will usually be due a week after it is assigned. All hand calculations should be done observing the guidelines listed below:

- Use engineering paper;
- Write on one side only;
- Start each problem on a new page;
- Use straight edge to draw figures;
- Show the final answers in a box or clearly underline;
- Put your name on all pages;
- Staple all pages together.

Each homework set is graded based on the following criteria:

- Problems in a set may weigh differently depending on the solution effort needed;
- Solutions will not be graded only based on the final answer – any reasonable work can get some credit;
- The solution should look professional. Points may be taken off if the work is not legible or looks unprofessional;
- For late HW there will be a penalty: 30% off if one day late, 60% off if two days late, and no credit will be given after three days.