This course explores advanced topics in the design of reinforced concrete structures. Topics covered include: moment-curvature of beams, two-way slab systems, slender columns, strengthening using FRP reinforcement, and strut-and-tie models (3 credits). Pre-requisite: CE341

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Office Hours: Monday - Wednesday 11:15 - 12:00 am & 1:30 – 2:00 pm or by appointment (please e-mail to set-up meeting time)

Course Goals: I intend to assist you in further developing your understanding of the mechanics and design aspects of reinforced concrete. After this course you will be able to:
- Predict the moment-curvature for any type of RC beam
- Design the flexure strengthening system for a RC beam
- Analyze RC elements using strut-and-tie methodology
- Select the appropriate two-way slab system and design it.
- Understand the mechanics and design of spandrel beams.
- Determine the slenderness of a RC column and use this information for its design.
- Explore advanced topics in the area of reinforced concrete structures.

ACI 318-08 Building Code and Commentary (available at Engineering copy center)


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. No late assignments will be accepted. Topic and deadlines will be defined during class. A research assignment will be assigned the first week of class.

Exams: Three hourly exams will be held during the class period (no final exam). 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. September 24, 10:10 AM, 138 South Henderson
Exam 2. October 15, 10:10 AM, 138 South Henderson
Exam 3. November 19, 10:10 PM, 138 South Henderson

Evaluation Methods: 1. First exam 22%
                      2. Second exam 21%
                      2. Third exam 22%
                      3. Technical Assignments 20%
                      4. Research assignment 10%
                      5. Class participation 5%

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

**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/](http://www.psu.edu/ufs/policies/)

**Plagiarism:** All work developed in this course should comply with the PSU standards on Academic Integrity. Any plagiarism will be penalized severely. “Plagiarism is the act of passing off someone else’s work as your own. People who copy word-by-word – or who change a word here and there while copying–without enclosing the copied passage in quotation marks and identifying the author should know they are plagiarizing.” (the Penn State Teacher II, appendix C).

Some sources of information regarding plagiarism are listed below, please review them:

[http://tlit.its.psu.edu/suggestions/cyberplag/cyberplagexamples.html](http://tlit.its.psu.edu/suggestions/cyberplag/cyberplagexamples.html)

COURSE OUTLINE
(subjected to minor changes throughout the semester)

Week 1  Introduction.
Week 1-2  Moment-curvature relationship for beams
Week 3-4  Flexural strengthening of RC beams with composites laminates
Week 5-6  Strut-and-Tie models
Week 7-12  Two-way slab systems.
Design by Flexure
Shear, shear-moment transfer
Deflections
Week 12-13  Torsion and Shear in Reinforced Concrete Members.
Design of spandrel beams
Week 14  Thanksgiving break. No classes
Week 15-16  Design of slender columns