University of Texas at Arlington
Department of Civil Engineering
CE 4361: Advanced Reinforced Concrete Design
Fall, 2011

Catalog Data	CE 4361: Advanced Reinforced Concrete Design
Credits	3
Catalog Description (2010-2011)	Includes structural design of slender columns, walls, truss model for shear and torsion; structural systems such as continuous beams, two-way slabs, yield-line theory and shear friction. Behavior of reinforced concrete structures, with emphasis on ductility and detailing of frames, slabs, and detailing for seismic loads will be covered. Building codes, American Concrete Institute (ACI) specifications, material specifications, test methods, and recommended practice documents.
Prerequisites	Passing grade in CE 4347 Reinforced Concrete Design. The prerequisite will not be waived.
Class Schedule	***Lecture:*** T - Th 2:00 PM – 3:20 PM Room 111 NH ***Tutorial:*** ***TBD***
Instructor	Nur Yazdani, Ph.D., P.E., CE Professor and Chairman. Office: 425 NH Office hours: M - W: 2 PM – 4 PM I am also usually available in my office at other times, except before class periods. Alternately, you may schedule an appointment by phone or e-mail with Sara Ridenour, my secretary. Phone: (817) 272-5055 (Office) FAX: (817) 272-0661 E-mail: Yazdani@uta.edu
Teaching Assistant	Ahsan Shabbir, Graduate Assistant Office: Room 240 NH Office hours: TBD Phone: 817-272-5736 FAX: TBD E-mail:
Course Material	***Required Material:*** • Reinforced Concrete: Mechanics and Design, 5/E, James K. Wight, James G. MacGregor, 2009, ISBN-10: 0132281414; ISBN-13: 9780132281416 • *Building Code Requirements for Reinforced Concrete*, ACI 318-11, American Concrete Institute, Farmington Hills, MI, 2011. • *LRFD Specifications for Highway Bridges.* Washington, D.C.: American Association of State Highway and Transportation Officials, 2010. • International Building Code, 2009 Ed., International Code Council. • Lecture notes: available on Blackboard (http://www.uta.edu/blackboard) ***Optional Reference Material:***

	• *Theory and Problems of Reinforced Concrete Design*, by N. J. Everard, Schaum's Outline Series, McGraw-Hill Book Company. This is a classic problem solving reference with numerous detailed worked out examples. A copy will be held as a reference in the Engineering Library. • *Notes on ACI 318-11 Code for Concrete Design*, by the Portland Cement Association (PCA), Chicago, Illinois. This fine reference demonstrates many of the latest ACI 318 Code specification applications through explanations and examples. It contains many user-friendly design aids. Students will be supplied with a copy. ***Online Resources****:* A variety of on-line resources are available for the enhancement of your concrete design learning experience: www.cement.org www.pci.org www.concrete.org.uk www.concrete.org www.crsi.org There are many others. Please feel free to explore.
Computer Accounts	• Class e-mail will be sent to your UTA account through the Blackboard course web site. If you use another primary e-mail account, you need to regularly check your UTA e-mail for important information. • Lecture notes, lecture slides, this syllabus, assignments, assignment solutions, term project details, grades, etc. will be available on Blackboard (http://www.uta.edu/blackboard/).
Course Rationale	In your previous courses, you have acquired proficiency in various areas such as mechanics of materials (finding stresses and strains in structures), structural analysis (finding reactions, moments, shears and deflections) and concrete design. The previous courses laid the groundwork for your transformation into a structural/concrete designer. In the basic concrete design course (CE 4347), the elements of reinforced concrete design were introduced, together with the basics of reinforcements, strength design and serviceability. However, advanced topics needed for practical concrete design were not covered due to time limitation. The course will build upon your knowledge base from your previous courses, and will provide you with the skills needed to analyze and design real life advanced concrete structural elements. Reinforced concrete is one of the most widely used materials in modern buildings, bridges, highways, tanks, walls, dams, etc. The versatility, adaptability, durability, appearance and cost of modern concrete are unparalleled. This course will enable you to become familiar with the advanced techniques needed to design real life structures using latest specifications, methods and software for concrete design. The course instruction will be heavily practice and technology oriented, with broad emphasis on practical applications and methodology. Material you learn in this course is critical to your becoming a successful and valued concrete engineer in today's marketplace.
Student Responsibility	***Deadlines and Instructions:*** Following professional conduct that you will encounter in practice, the course contains strict deadlines and instructions. Please read instructions carefully and schedule your

activities accordingly to meet schedules. You should check your e-mail and the Blackboard course web page regularly, and note other announcements, on-line and in class.

Class Participation:

Class participation can be achieved in two ways. I shall ask you questions in class on the previous lectures, and on the material currently being discussed. You should be prepared to answer these questions, and should also participate by asking questions, suggesting ideas, and performing in-class group activities that I assign. I prefer an interactive class-room where the instructor and the students freely participate in active learning. Of course, you cannot participate in class unless you attend it!

Group Work:

You must work in groups of three for the following activities: homework, lecture projects and term project. The groups should represent diversity in terms of student background and academic performance. You should participate in all group activities and make a fair contribution to the group effort.

Homework:

Required homework will be due at the beginning of the period on the due date - one solution set per group. Use engineering paper if possible, one side of each paper, and box the solution. On the inside, put the name of the group leader, all other participating group members, the date, and the assignment number. If a student's name appears on a solution set, it certifies that he/she has participated in solving some of the problems and understands all the solutions. If this turns out not to be the case, both the student in question and the group leader will be considered to have cheated and will be dealt with accordingly. Please keep a copy of your homework before it is submitted in case the homework is lost or misplaced. Late homework will be accepted for up to two weeks after the due date. A penalty of 20% for each 24 hours will be assessed on late homework. However, if a group abuses this privilege on a regular basis, it will be withdrawn. One group member should be designated the leader for each homework. The leader will be responsible for coordinating the work and making sure everyone in the group understands all the problem solutions before they are handed in (Hint: Try to set up each problem individually, then get together to work out the details). After being a group leader, an individual may not be leader again until everyone else in the group has held the position.

Tutorial Class Attendance:

Two tutorial sessions per week will be arranged outside the regularly scheduled class period. Although the tutorial class is not mandatory, it is highly recommended. The tutor will provide you with helpful hints on the homework, solve additional problems, help you with your term project and software usage.

Term Project:

A group term project is required as a part of this class. The topic will be practice oriented, will require code usage, latest design software and drafting applications. The instructor will supply the class with the project concept during the second week of

	classes. A written proposal, interim progress report, oral final presentation and written final report are required. The project grade will be determined as follows: Proposal: 28% Progress report: 16% Oral presentation: 28% Final report: 28% You must be able to understand, explain and execute your group project work. About half of the group project grade will be based on group activities, and the other half based on your individual contribution. Therefore, when asked, you should be able to explain and clearly identify your own contribution.
Professional Component of the Course	The course will teach graduate level civil engineering students how to efficiently analyze and design real life complex buildings and bridges made of reinforced concrete, using the latest available professional codes, methods and tools. Professional level group term projects are also involved.
Course Outcomes	At the end of this course, you should be able to accomplish the outcomes shown in the following. Furthermore, because every concrete engineer is expected to be conversant in these tasks, it is important that you learn them well so that you have a permanent working knowledge of the materials.

Student Outcomes	**Extent of Coverage***
(a) An ability to apply knowledge of mathematics, science, and engineering	C_E
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	T_I
(e) An ability to identify, formulate and solve engineering problems	T_I
(f) An understanding of professional and ethical responsibility	C_I
(g) An ability to communicate effectively	C_E
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context	C_I
(i) A recognition of the need for, and an ability to engage in life-long learning	C_I
(j) A knowledge of contemporary issues	C_I
(k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	T_I

*Covered Implicitly (**C_I**): The outcome is implicitly covered
Covered Explicitly (**C_E**): The outcome is explicitly covered
Tested Implicitly (**T_I**): The outcome is covered and implicitly assessed for by one or more means (assignments, test questions, essay questions, presentation evaluations, lab reports, etc.)
Tested Explicitly (**T_E**): The outcome is explicitly assessed for by one or more means

Topics/ Tentative Time Schedule/ No. of Sessions	**Course Topics**	**Dates, Tentative (2011)**	**Sessions**
	Introduction	08/25	1
	Length effects on column: buckling of concentric columns, moment magnification, braced vs. unbraced frames, ACI design approach	08/30 – 09/01	2
	Two way floor systems: general design concept from ACI, slab thickness, edge beams, column capitals, direct design method	09/06 – 09/22	6
	Project proposals due	09/15	---
	TEST 1	09/27	1
	Torsional design, torsional stress and stiffness, strength of concrete sections in torsion, strength in combined shear and torsion, torsional strength and hoop reinforcement	09/29 – 10/11	4
	Deep flexural members, stress distribution, brackets and corbels, horizontal and vertical steel placement	10/13 – 10/18	2
	Guest Lecture (tentative)	10/20	1
	Project Interim Report due	10/25	---
	Test 2	10/25	1
	Modified compression field theory, strut and tie model, interaction of shear, moment and torsion, LRFD AASHTO and ACI design approach.	10/27 – 11/08	4
	Field Trip (tentative)	11/10	1
	Shear walls in multi-story buildings, cantilever walls, interaction of shear walls-rigid frames.	11/15 – 11/17	2
	Cantilever retaining walls, forces and stability of retaining walls, proportioning of walls	11/22 – 12/01	3
	Test 3	12/06	1
	Project Presentations	12/08	1

	Optional Final Test (comprehensive)	TBD	1
Grading Criteria	The overall course grade will be based on the performance of each student in the following categories: homework, tests, term project, and lecture participation. The following is the published grade percentage distributions: Homework: 15% Three tests: 25%, 25%, 10%, respectively Term project: 15% Class participation: 10% A weighted grade of 90 or above overall is guaranteed an A, 80 or above at least a B, 70 or above at least a C, and 60 or above at least a D.		

COURSE POLICIES

Examinations: There will be three regular tests during the semester and one optional final examination. The instructor understands that students may have a down day once in a while, which may affect their test grades. As a compensation for extenuating circumstances affecting your test grades, you may take the optional comprehensive final examination, which will be scheduled during the final examination week. If you take this optional test, the grade from this test will substitute the grade from one of the regularly scheduled tests. If you miss any test for emergency reasons, a cumulative make-up test will be scheduled during the last week of classes. All students missing any test will be given the opportunity to take this make-up test. The student must submit admissible evidence of emergencies that prevented them from taking the regularly scheduled examination.

Attendance: The universities require attendance in all classes, and it is very important to your learning. It is important that you make every effort to attend all lectures, if possible. The instructor may cover material from outside the text-book which will be useful supplementary material. The instructor will also use visual aids, practical cases, class interaction and thoroughly worked out example problems to enhance classroom learning. In the instructor's opinion, keeping attendance record is a poor and inefficient practice. However, students attending lectures will be indirectly credited through group activities (see grading policy and group activities). In emergency situations, absence may be excused with appropriate documentation. You should let me know in advance, when possible, and submit the documentation. You should make up any materials missed due to absence.

Drop Policy: Please see university drop policy and deadlines.

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 – The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled *Americans with Disabilities Act (ADA)*, pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same

opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.uta.edu/disability. Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

Academic Integrity: It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, and submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Series 50101, Section 2.2)

Student Support Services Available: The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

Final Review Week: A period of five class days prior to the first day of final examinations is designated as Final Review Week. During this week, no new assignments will be given; however, previously assigned work may have a completion date during this week. In addition, no portion of the final examination shall be administered during the Final Review Week. Classes are held as scheduled during this week and materials covered in lectures during this week may be included in the final examination.

Librarian to Contact: Sylvia George-Williams (Sylvia@uta.edu), Science and Technology Library.

E-Culture Policy: The University of Texas at Arlington has adopted the University email address as an official means of communication with students. Through the use of email, UT-Arlington is able to provide students with relevant and timely information, designed to facilitate student success. In particular, important information concerning registration, financial aid, payment of bills, and graduation may be sent to students through email. All students are assigned an email account and information about activating and using it is available at www.uta.edu/email. New students (first semester at UTA) are able to activate their email account 24 hours after registering for courses. There is no additional charge to students for using this account, and it remains active as long as a student is enrolled at UT-Arlington. Students are

responsible for checking their email regularly.

Grade Grievance Policy: Grade grievances will be handled according to the policy described in the College of Engineering portion of the Catalog.

"X" Grade: Excerpts from UTA Undergraduate Catalog: " A grade of X (incomplete) may be assigned for a course if, in the opinion of the instructor, there are extenuating circumstances which prevent the student from completing the required work within the semester of enrollment for the course. The incomplete must be removed by the end of the final examination period of the following semester, excluding the summer session, for the student to receive credit for the course. If the incomplete is not removed during the allotted time period, it will revert automatically to an F. As long as the grade is carried as an X, it will not be used in the calculation of the student's grade point average. Consistent with these policies, an incomplete grade will only be assigned at the instructor's discretion only under the following circumstances:

- The optional final test is missed with an accepted excuse. In this case, you must make up the final test during the first two weeks of the following semester.
- Due to an extended illness or other extraordinary circumstances, with accepted documentation, the student is unable to participate in class for an extended time. In this case, arrangements must be made to make up the missed work prior to the end of the following semester.

An 'X' grade will not be given as a remedy for poor work.

Professional Ethics: You will gain confidence in your ability to design and analyze advanced reinforced concrete structures only when you do the work yourself. However, you will also learn a lot through discussions with your peers. In order to balance the two goals, the following guideline is provided:

- *Things you may not do*: You should not copy work from others. This includes directly copying homework, tests, project materials, etc, and submitting it as your own work. Furthermore, you should assure that others cannot copy your work. Allowing copying of your material will only hinder the learning of the parties involved.
- *Things you may do*: You may discuss specific problems related to analysis/design steps, Code usage, efficient design, and project issues with others.

Plagiarism: Plagiarism is representing another's work or any part thereof, be it published or unpublished, as ones own. For example, plagiarism includes failure to use quotation marks or other conventional markings around material quoted from any source. Failure to document properly is also considered plagiarism. Copying someone else's work and turning it in as if it was your own work, is also considered plagiarism.

Technology and Practice: The course work will be heavily geared towards technology and practice. Students will be asked to contact outside sources such as design/construction industry and concrete vendors in order to obtain information. Problems in the class and homework will be designed to utilize this information. Commercial concrete design software similar to the ones

used by industry design offices will be demonstrated in the classroom. Students will be able to use the software from the college computer labs. In addition, students will be supplied with spreadsheet programs, and will be asked to write their own. It is expected that at least one field trip to concrete construction sites will be arranged during the semester, where you can obtain valuable practice oriented knowledge as complementary to the classroom knowledge. Guest speakers from the industry will be invited to speak to the students.

Syllabus Change Policy: This syllabus is a guide for the course and is subject to change with advance notice.