

7304ENG

Advanced Reinforced Concrete

Semester 2 2009

Academic Organisation:	Griffith School of Engineering
Faculty:	Science, Environment, Engineering and Technology
Credit point value:	10
Student Contribution Band:	Band 2
Course level:	Postgraduate
Campus/Location/Learning Mode:	Gold Coast / On Campus / In Person
Convenor/s:	Dr Sanaul Chowdhury (Gold Coast)
Enrolment Restrictions:	Nil
This document was last updated:	19 June 2009

BRIEF COURSE DESCRIPTION

The advanced analysis and design of reinforced and prestressed concrete members in flexure, shear, torsion and compression are taught at a professional level. Both strength and serviceability design requirements are covered. The concepts are applied to a design project involving a conventional concrete structure. The course also investigates advanced topics such as the design and analysis of deep beams, flat plates, non-rectangular sections and high strength concrete structures. Students are also expected to develop research and report writing skills and critically review literature search results on selected topics. Assessment is by literature study report, tutorial assignments and major design project

SECTION A – TEACHING, LEARNING AND ASSESSMENT

COURSE AIMS

The majority of civil engineering structures are constructed in concrete in one form or another. One of the essential skills of a civil engineer is the ability to analyse and design concrete structures. This prescribed course aims to impart the required problem solving and analysis skills to the students.

This course provides a thorough coverage of the fundamental principles underlying the methods of analysis for reinforced, prestressed and composite concrete structures. For the structures to meet practical strength and serviceability design requirements, relevant Australian Standard provisions are discussed in detail. The course also investigates advanced topics such as the design and analysis of flat plates, non-rectangular sections and high strength concrete structures. Literature Study Project is designed to enhance research and written communication skills.

LEARNING OUTCOMES

Upon successful completion of this course, the students should be able to:

1. analyse and design reinforced concrete members (such as beams, slabs, columns and walls) in bending, shear, torsion and compression, in both strength and serviceability states;
2. analyse fully and partially prestressed concrete beams;
3. understand simply supported composite beam analysis and design;
4. analyse and design non-rectangular sections, flat plates and high strength concrete structures; and
5. critically evaluating and reporting on selected topics for literature study project.

CONTENT, ORGANISATION AND TEACHING STRATEGIES

Content

The course has two major components. A problem-based approach is used where the students are required to undertake a major design project on a four-storey concrete structure. To aid learning, fortnightly problems based on the required design are undertaken. A complementary literature study project is undertaken to develop and enhance research and report writing skills.

Contact Summary

The contact hours in this course are:

ACTIVITY	CONTACT HOURS
Lectures (13 weeks, 3 hrs per week)	39
Tutorials/Design office/ Advanced topics discussion (13 weeks, 2 hrs per week)	26
Total	65

These contact hours are delivered as 1x3 hour lectures and 1x 2hour Tutorials/Design office each week. The advanced topics will be discussed during Tutorials/Design office hours.

Teaching Strategy

The lectures will provide theoretical and practical understandings of the content areas.

Design exercises elaborating the lecture material will be introduced during the tutorial time. The Design office provides students with an opportunity to apply their gained knowledge to the “real world” design being undertaken.

The literature study project will provide students with the opportunity to develop research and life-long learning skills, and to develop written communication skills.

CONTENT SUMMARY

Topic	Lecture Content	Tutorial/Design office Content	Readings
1.	Ultimate strength theory: actual and equivalent stress blocks; tension, compression and balanced failure.		Lecture Notes; Prescribed Text Book.
2.	Ultimate strength analysis and design of singly-reinforced and doubly-reinforced rectangular, non-rectangular and T-sections.		Lecture Notes; Prescribed Text Book.
3.	Flexural behaviour under service load; deflection; crack control.	Typical T-beams and Edge beams design for 4-storey block of units.	Lecture Notes; Prescribed Text Book.
4.	Floor systems: beam and slab; one-way and two-way slab; simplified methods of analysis; Design procedures on Flat Plates.	Typical Balcony and slab design (includes thickness and reinforcement layout) for 4-storey block of units	Lecture Notes; Prescribed Text Book; Supplementary reading materials.
5.	Shear failure; shear reinforcement, strength analysis and design; longitudinal shear.		Lecture Notes; Prescribed Text Book
6.	Ultimate strength design for torsion; Stress development and splicing of reinforcement.		Lecture Notes; Prescribed Text Book
7.	Reinforced concrete columns; ultimate strength equations; interaction diagram; biaxial loading; slenderness effects.	Columns design (includes middle, end and edge column calculations); Typical footing design for 4-storey block of units.	Lecture Notes; Prescribed Text Book; Supplementary reading materials.
8.	Theory of prestressed concrete; design of beams; ultimate strength of fully and partially prestressed beams.		Lecture Notes; Prescribed Text Book.
9.	Composite beams: analysis and design.		Lecture Notes; Prescribed Text Book.
10.	Analysis and Design of concrete walls (including deep beams)		Lecture Notes; Prescribed Text Book; Supplementary reading materials.
11.	High strength concrete structures	Columns design (includes middle, end and edge column calculations) for 4-storey block of units.	Lecture Notes; Prescribed Text Book; Supplementary reading materials.

ASSESSMENT

Summary of Assessment

Item	Assessment Task	Length	Weighting	Relevant Learning Outcomes	Due Day and Time
1.	Tutorial Questions (Prestressed concrete)	5 Questions	15%	2	5:00 pm Friday of Week 10
2.	Literature Study Project report (on a selected topic)	Approximately 3000 words	25%	5	5:00 pm Friday of Week 7
3.	Major Design Project	30-35 pages	60%	1, 3, 4	5:00 pm Friday of Week 13

Assessment Details

Assessment is based on the students' grasp of the underlying principles of the course content and the ability to apply such principles to a practical design situation. Correctness of design methodology is an important assessment criterion. The design project will enable the student to apply his/her acquired knowledge to a 'real life' problem where a variety of suitable solutions exist. The tutorial assignments on prestressed concrete encourage the students to keep up to date with their work on that topic area. The literature study project allows the students to gain an insight into the research and life-long learning aptitudes. It also helps enhance their written communication skills.

To be eligible for a passing or a higher grade for this course, students are required to:

- (1) satisfactorily attempt all items of assessment,
- (2) achieve at least 40% or better in Major Design Project, and
- (3) gain an overall total mark of at least 50% for the whole course.

Return of Assessment Items

The tutorial assignments will be returned to the students one week after submission. The Literature Study Project reports will be marked within two weeks after submission and the results will be discussed with the students during the tutorial/design office time. The Literature Study Project report marks and the tutorial assignment marks will be made available at Learning@Griffith resources.

GRADUATE SKILLS

Graduate Skills	Taught	Practised	Assessed
Effective communication (written)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Effective communication (oral)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effective communication (interpersonal)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Information literacy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Problem solving	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Critical evaluation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work autonomously	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work in teams	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Creativity and innovation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ethical behaviour in social / professional / work environments	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Responsible, effective citizenship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Professional Skills

Listed below are the discipline specific graduate skills:

- In-depth technical competence
- Problem identification, formulation and solution
- Research and life-long learning skills
- Professional responsibilities

TEACHING TEAM

Course Convenor

Convenor Details	Gold Coast
Campus Convenor	Dr. Sanaul Chowdhury
Email	S.H.Chowdhury@griffith.edu.au
Office Location	G09_1.26
Phone	5552 8662
Fax	5552 8065
Consultation times	Indicated on the Noticeboard outside Convenor's office

Teaching Team Member Details	Gold Coast
Campus Teaching Team Member	Professor Yew-Chaye Loo
Email	Y.Loo@griffith.edu.au
Office Location	G06_3.28A
Phone	07 5552 8105
Fax	07 5552 8065

Moderator Associate Professor Hong Guan, G09_1.20

COURSE COMMUNICATIONS

The Course Convenor is available for consultation at times indicated in the previous section. Queries may also be emailed to the Course Convenor. The students are required to check their email and Learning@Griffith website on a regular basis.

TEXTS AND SUPPORTING MATERIALS

Specified Texts

1. Australian Standards for Civil Engineering Students - SAA HB2.2 – 2003. Part 2: Structural Engineering, Standards Australia.
2. Loo, Y.C. Reinforced Concrete Analysis and Design. School of Engineering, Griffith University, Gold Coast Campus (Draft 2nd Ed. with additional contributions by S. Fragomeni).*

* Available from the bookstore on the Gold Coast Campus.

Recommended reading

1. Blicq, R.S., Technically-Write! - Communicating in a Technological Era, Prentice-Hall, N.J., 4th Edition, 1993.
2. Nilson, A.H., Darwin, D. and Dolan, C.W. Design of Concrete Structures, McGraw-Hill, 13th Edition, 2004.
3. Standards Association of Australia AS3600-2001 Concrete Structures, Sydney, 2001.
4. Warner, R.F. and Faulkes, K.A. Prestressed Concrete, Longman Cheshire, 2nd Ed., 1988.
5. Warner, R.F., Rangan, B.V. and Hall, A.S. Reinforced Concrete, Pitman, 3rd Ed., 1991.
6. Warner, R.F., Foster, S.J. and Kilpatrick, A.E. Reinforced Concrete Basics – Analysis and design of reinforced concrete structures, Pearson Education Australia, 2007.
7. Warner, R.F., Rangan, B.V., Hall, A.S. and Faulkes, K.A. Concrete Structures, Longman, 1998.

Supporting materials and other relevant materials are available at [Learning@Griffith](#) resources.

SECTION B – ADDITIONAL COURSE INFORMATION

Students should refer to the [Learning@Griffith](#) website for further information about this course.

Administration

Unless otherwise stated, the normal course administration policies and rules of the Griffith School of Engineering apply. See the Gold Coast campus Notice Board of Griffith School of Engineering for details.

Course Evaluation

A formal survey of the students in the form of evaluation of course and teaching will be undertaken towards the end of the semester. The results of survey will be discussed by the teaching team to undertake any necessary modifications to the course planned for the next offering.

SECTION C – KEY UNIVERSITY INFORMATION

ACADEMIC MISCONDUCT

Students must conduct their studies at the University honestly, ethically and in accordance with accepted standards of academic conduct. Any form of academic conduct that is contrary to these standards is academic misconduct and is unacceptable.

Some students engage deliberately in academic misconduct, with intent to deceive. This conscious, pre-mediated form of cheating is one of the worst forms of fraudulent academic behaviour, for which the University has zero tolerance and for which penalties, including exclusion from the University, will be applied.

However the University recognises many students commit academic misconduct without intent to deceive. These students may be required to undertake additional educational activities to remediate their behaviour.

Specifically it is academic misconduct for a student to:

- **Cheat in examinations and tests** by communicating, or attempting to communicate, with a fellow individual who is neither an invigilator or member of staff; by copying, or attempting to copy from a fellow candidate; attempting to introduce or consult during the examination, any unauthorised printed or written material, or electronic calculating or information storage device; or mobile phones or other communication device, or impersonates another.
- **Fabricate results** by claiming to have carried out tests, experiments or observations that have not taken place or by presenting results not supported by the evidence with the object of obtaining an unfair advantage.
- **Misrepresent themselves** by presenting an untrue statement or not disclosing where there is a duty to disclose in order to create a false appearance or identity.
- **Plagiarise** by representing the work of another as their own original work, without appropriate acknowledgement of the author or the source. This category of cheating includes the following:
 1. collusion, where a piece of work prepared by a group is represented as if it were the student's own;
 2. acquiring or commissioning a piece of work, which is not his/her own and representing it as if it were, by
 - purchasing a paper from a commercial service, including internet sites, whether pre-written or specially prepared for the student concerned
 - submitting a paper written by another person, either by a fellow student or a person who is not a member of the University;
 3. duplication of the same or almost identical work for more than one assessment item;
 4. copying ideas, concepts, research data, images, sounds or text;
 5. paraphrasing a paper from a source text, whether in manuscript, printed or electronic form, without appropriate acknowledgement;
 6. cutting or pasting statements from multiple sources or piecing together work of others and representing them as original work;
 7. submitting, as one own work, all or part of another student's work, even with the student's knowledge or consent.

A student who willingly assists another student to plagiarise (for example by willingly giving them their own work to copy from) is also breaching academic integrity, and may be subject to disciplinary action.

Visit the following web sites for further details:

[Institutional Framework for Promoting Academic Integrity among Students](#)
[Academic integrity for students](#)

PLAGIARISM DETECTION SOFTWARE

The University uses plagiarism detection software. Students should be aware that your Course Convenor may use this software to check submitted assignments. If this is the case your Course Convenor will provide more detailed information about how the detection software will be used for individual assessment items.

HEALTH AND SAFETY

Griffith University is committed to providing a safe work and study environment, however all students, staff and visitors have an obligation to ensure the safety of themselves and those whose safety may be affected by their actions. Staff in control of learning activities will ensure as far as reasonably practical, that those activities are safe and that all safety obligations are being met. Students are required to comply with all safety instructions and are requested to report safety concerns to the University.

General health and safety information can be obtained from

http://www.griffith.edu.au/hrm/health_and_safety/

Information about Laboratory safety can be obtained from

http://www.griffith.edu.au/ots/secure/health/content_labsafety.html

KEY STUDENT-RELATED POLICIES

All University policy documents are accessible to students via the University's Policy Library website at: www.griffith.edu.au/policylibrary. Links to key policy documents are included below for easy reference:

[Academic Calendar](#)

[Academic Standing, Progression and Exclusion Policy](#)

[Assessment Policy](#)

[Examinations Timetabling Policy and Procedures](#)

[Guideline on Student E-Mail](#)

[Health and Safety Policy](#)

[Institutional Framework for Promoting Academic Integrity Among Students](#)

[Policy on Student Grievances and Appeals](#)

[Student Administration Policy](#)

[Student Charter](#)

UNIVERSITY SUPPORT RESOURCES

The University provides many facilities and support services to assist students in their studies. Links to information about University support resources available to students are included below for easy reference:

[Learning Centres](#) - the University provides access to common use computing facilities for educational purposes. For details visit www.griffith.edu.au/cuse

[Learning@Griffith](#) - there is a dedicated website for this course via the Learning@Griffith student portal.

[Student Services](#) facilitate student access to and success at their academic studies. Student Services includes: Careers and Employment Service; Chaplaincy; Counselling Service; Health Service; Student Equity Services (incorporating the Disabilities Service); and the Welfare Office.

[Learning Services](#) within the Division of Information Services provides learning support in three skill areas: computing skills; library skills; and academic skills. The study skills resources on the website include self-help tasks focusing on critical thinking, exam skills, note taking, preparing presentations, referencing, writing, proof reading, and time management.