

3022ENG

Concrete Structures

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:	Undergraduate
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:	12 June 2009

BRIEF COURSE DESCRIPTION

This course covers the analysis and design of reinforced and prestressed concrete structural elements, and an introduction to composite beam design. Both strength and serviceability design requirements are covered. Students are also expected to develop laboratory and written report skills and critically evaluate results. Assessment is by tutorial assignments and examinations.

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 analytical and design skills to the students.

The 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, serviceability and other design requirements, relevant Australian Standard provisions (and other international codes) are discussed in appropriate detail. The course has a strong emphasis on reinforced and prestressed concrete structures.

LEARNING OUTCOMES

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

1. ultimate strength analysis and design of reinforced concrete rectangular and flanged beams in bending, shear and torsion;
2. deflection analysis of reinforced concrete beams and practical design for crack control;
3. stress development analysis and design for bond strength between reinforcing bars and concrete;
4. ultimate strength analysis and design of reinforced concrete columns
5. design of reinforced concrete one-way and two-way slabs, as well as flat plate structures;
6. analysis and design of prestressed concrete beams of any cross-sectional shapes based on the critical stress state approach;
7. ultimate strength analysis of fully and partially prestressed concrete rectangular and flanged beams;
8. design of end blocks for prestressing anchorages.

CONTENT, ORGANISATION AND TEACHING STRATEGIES

Content

The course has two major components of reinforced and prestressed concrete. To aid learning, weekly to fortnightly design/tutorial tasks based on the topics covered are undertaken. These tasks reinforce the concepts taught and help develop analysis, design and problem solving skills.

Contact Summary

The contact hours in this course are:

ACTIVITY	HOURS
Lectures	39
Tutorials	26

These contact hours are delivered as a 3 hour lecture plus 2 hour tutorial per week.

Teaching Strategy

The lectures provide theoretical and practical understandings of the subject matters. Design/tutorial exercises elaborating on the lecture material are introduced in the tutorial classes. The tutorials also

provide practical design problems to be analysed and solved. The lectures and tutorials are devised to help students develop the skills that are essential for a competent civil engineer.

CONTENT SUMMARY

Topic	Lecture Content	Readings	Weighting
	REINFORCED CONCRETE	Prescribed Text by Y.C. Loo & S. Fragomeni	70%
1.	Introduction: design requirements; plain versus reinforced concrete, steel, working stress method	Prescribed Text Chapter: 1,2	
2.	Ultimate strength theory: actual and equivalent stress blocks; tension, compression and balanced failure.	Prescribed Text Chapter 3	
3.	Ultimate strength analysis and design of singly-reinforced and doubly-reinforced rectangular, T- and other flanged beams.	Prescribed Text Chapter 3	
4.	Flexural behaviour under service loading: deflection; crack control.	Prescribed Text Chapter 4	
5.	Shear failure; shear reinforcement, strength analysis and design; longitudinal shear.	Prescribed Text Chapter 5	
6.	Ultimate strength design for torsion.	Prescribed Text Chapter 6	
7.	Stress development and splicing of reinforcement.	Prescribed Text Chapter 7	
8.	Reinforced concrete columns; ultimate strength equations; interaction diagram; biaxial loading; slenderness effects.	Prescribed Text Chapter 8	
9.	Floor systems: beam and slab, one-way and two-way slab, and flat plate; simplified methods of analysis; design procedures.	Prescribed Text Chapter 9	
	PRESTRESSED CONCRETE	Prestressed Concrete Notes by Y.C. Loo	30%
10.	Fundamentals of prestressed concrete; pretensioning and post-tensioning; prestress; losses.	Prestressed Concrete Notes by Y.C. Loo.	
11.	Critical stress state approach of analysis and design of fully prestressed flexural members.	As above	
12.	Ultimate strength analysis of fully and partially prestressed beams; end-block design.	As above	

ASSESSMENT

Summary of Assessment

Item	Assessment Task	Duration	Weighting	Relevant Learning Outcomes	Due Day and Time
1.	Design/ Tutorial Questions	2-4 questions per submission	20%	1,2,3,4,5,6,7	Every Fortnight
2.	Mid-Semester test	1.5 hours	25%	1,2,3	Week 7 (during lecture time)
3.	Final Examination	3 hours	55%	1, 2,3,4,5,6,7,8	Exam week

Assessment Details

Assessment is based on the student's grasp of the underlying principles of the course contents and the ability to apply such principles to practical analysis and design problems. Correctness of calculations is an important assessment criterion. The tutorial assignments encourage the students to keep up to date with their work. They also provide continuous feedback to both the students and the teaching team regarding progress and conduct of the course. The design problems allow the students to apply the theory of reinforced and prestressed concrete to the design of typical structures. Such design tasks also help enhance their technical reporting skills. Open-book examinations are conducted to mimic design office environment. They provide an appropriate assessment of the ability and achievements of each student.

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 the final examination, and
- (3) gain an overall total mark of at least 50% for the entire course.

Return of Assessment Items

Tutorial/design assignments are to be submitted on a fortnightly basis with corrections and feedback occurring within two weeks of submission. There will be approximately a set of four questions per fortnight, and are either of an analysis or design nature. The mid-semester test will be marked within 2 weeks after the exam is conducted and the exam paper will be returned to the students during the lecture time.

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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information literacy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input 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 checked="" 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	Professor Yew-Chaye Loo
Email	Y.Loo@griffith.edu.au
Office Location	G06_3.28A
Phone	07 5552 8105
Fax	07 5552 8065
Consultation times	Indicated on the Noticeboard outside Convenor's office

Teaching Team Member Details	Gold Coast
Campus Teaching Team Member	Dr. Sanaul Chowdhury
Email	S.H.Chowdhury@griffith.edu.au
Office Location	G09_1.26
Phone	07 5552 8662
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 supplementary chapters 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 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.