

2101ENG

Mechanics of Material I

Semester 1 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 Erwin Oh (Gold Coast)
Enrolment Restrictions:	Nil
This document was last updated:	3 February 2009

BRIEF COURSE DESCRIPTION

Stress analysis (also known as solid mechanics) provides techniques by which engineers can predict stress and strain distributions resulting from known loading conditions, so that the stability and strength of structural members and machine components under load can be assessed. Stress analysis is an essential tool in the analysis and design of structures and machines under load.

SECTION A – TEACHING, LEARNING AND ASSESSMENT

COURSE AIMS

2101ENG Mechanics of Materials I: The central purpose of this course is to help students to develop their understanding of, and ability to apply, both theoretical and experimental stress analysis techniques to real world engineering design tasks. Specific objectives are to continue develop students' analytical and experimental stress analysis skills, teamwork and written presentation skills, in line with overall program objectives.

LEARNING OUTCOMES

In terms of technical content, upon successful completion of this course, the student should be able to:

1. Determine the centroid of an area, the centre of mass of a body, and the second moments of area of composite and compounds areas;
2. Construct shear force and bending moment diagrams for multi-span beams with a variety of loads and types of supports;
3. Evaluate deflections in beams.
4. Understand the concepts normal and shear stress;
5. Calculate stresses resulting from simple uniaxial loading and use these in design;
6. Understand the concepts of plane and complex stress at a point;
7. Perform the complex stress-strain transformations;
8. Calculate stresses in symmetrical and unsymmetrical members under eccentric loads;
9. Understand the theory and application of strain gauges and bridge configurations to isolate particular stresses;
10. Carry out laboratory investigations including the use of load cells, micrometers, verniers and strain gauges to measure static load, displacement and strain;
11. Present information clearly and concisely in written form.

CONTENT, ORGANISATION AND TEACHING STRATEGIES

The course content is presented in detail on the course website on Learning@Griffith and in the course notes (available from the campus bookstore). The development of the course material through the lectures will be problem based. The material will present "just in time" to tackle the problem posed through one design assignment.

The tutorial and laboratory sessions, with a group size of approximately 20 to 40, will assist students to develop competency in evaluating stress induced in a real-world element/structure. In weeks 5, 7, 9, 10, and 12, the laboratory session will be conducted in laboratory where there will be the opportunity to testify the theory learnt in lectures.

As the design assignment is based on tutorial/laboratory session, failure to attend a required lab session will result in significant loss of marks for an assignment and /or laboratory report.

The contact hours in this course are 5 hours per week for 13 weeks, in addition to the 2 hours laboratory session. Detail of the contact hours are given below.

<u>ACTIVITY</u>	<u>CONTACT HOURS</u>
1x3 hour Lecture (Week 1-13)	39
1x2 hour Tutorial (Week 1-13)	26
1x2 hour Laboratory Session (Week 5, 7, 9, 10, 12)	10
Total	75 hours

CONTENT SUMMARY

The basic principles of statics and stress analysis are covered in the lectures in a progressive sequence, and are consolidated by demonstrating practical examples in the tutorial classes. Laboratory sessions are designed to relate what they learnt in class to practical problems.

Week	Topics	Lecture Content	Tutorial/Laboratory Content	Readings
1	1	Geometric properties of composite and compounds area (Centroids and Moment of Inertia)	Tutorial on Topic 1	Loo, Y.C. and Guan, H.: Statics and Structures
2	2	Load, Shear Force and Bending Moment relationships	Tutorial on Topic 2	
3	3	Shear force and Bending Moment in beams (continuous beams, multi-span beams with internal hinges)	Tutorial on Topic 3	
4	4	Slope and deflection of beams	Tutorial on Topic 4	
5	5	Loads, load effects and stress (I)	Tutorial on Topic 5	
6	5	Loads, load effects and stress (II)	Tutorial on Topic 5	Kirke, B.K. and Guo, W.D.: Stress Analysis 2021ENG Study Guide. Beer, F.P., Johnston, E.R. and DeWolf, J. T. Mechanics of Materials. Gere, J.M. and Goodno, B.J.: Mechanics of Materials.
7		In-Semester Test 1 (Topics 1 to 5)		
7	6	Stress and Strain (Young's modulus, Poisson's ratio) I	Tutorial on Topic 6	
8.	6	Stress and Strain (Young's modulus, Poisson's ratio) II	Tutorial on Topic 6	
9.	7	Bending stress (including elastoplastic behaviour) I (Bending of beams)	Tutorial on Topic 7	
10.	7	Bending stress (including elastoplastic behaviour) II (Combined bending)	Tutorial on Topic 7	
11.		In-Semester Test 2 (Topics 6 to 7)		
11.	7	Bending stress (including elastoplastic behaviour) III	Tutorial on Topic 7	
12.	8	Torsion	Tutorial on Topic 8	
13.		Revision		

ASSESSMENT

Summary of Assessment

Item	Assessment Task	Length	Weighting	Relevant Learning Outcomes	Due Date and Time
1	In-Semester Test 1 (Closed Book)	50 minutes	15%	1-4	Week 7
2	In-Semester Test 2 (Closed Book)	50 minutes	15%	5-8	Week 11
3	One Design Assignment		5%	5-11	4PM, Friday of Week 12
4	Eight Tutorial Assignments		10%	1-8	
5	Three Laboratory Reports		10%	5-11	4PM, Friday of the Week 6, 8, 10, 11,13
6	Final Semester Exam (Closed Book)	180 minutes	45%	1-11	

Assessment Details

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

- Achieve a satisfactory standard (generally no less than 40%) in each of the assessment items.
- Gain an overall total mark of at least 50%.

The In-Semester Tests and Final Semester Exam

The in-semester (closed book) tests are both knowledge based and problem solving. They are designed to assess the ability of the student to bring together the topics recently covered and to develop the ability to apply that knowledge to the solution of practical problems. The tests 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 time allowed for the tests is sufficient to ensure that almost all students will not be time limited in their performance. The test will consist of approximately 4~6 questions. The test will normally be scheduled for the first and the second lectures of the week following the completion of the lectures for the module. Notification will be given during the last lecture of a module as to when the test will be held.

The final examination are to assess the student's knowledge and understanding of the basic topics covered in the course and the ability to apply that understanding to the solution of practical problems. Further, the examination paper is designed to test the students' computational skills.

The Design Assignments

The design assignment will assess the ability of the student to bring together various aspects of the course material and apply that knowledge to a particular problem. Assessment is based on the student's grasp of the underlying principles of the course matters and their ability to apply such principles to practical stress analysis problems. The instructions given with assignment should be followed when preparing the assignment submission.

The Tutorial Assignments

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 Laboratory Report

The laboratory reports assess the ability of the student to understand the testing procedures they are to perform during the laboratory sessions. The design assignments helps student to bring together the contents covered in the course. Through the analysis of the activity in the report and the design, students' problem solving skills and written communication skills will be assessed.

Notification of Availability of Feedback on Assessment and Return of Assessment Items

Marked assignments will be returned or explained to students at two weeks following the assignment deadline. Results (in-semester tests, tutorial assignments, design assignment and laboratory reports) will be posted on the course website on Learning@Griffith.

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

Responsible, effective citizenship	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
------------------------------------	-------------------------------------	--------------------------	--------------------------

TEACHING TEAM

Convenor Details	Gold Coast
Course Convenor	Dr. Erwin Oh
Email	y.oh@griffith.edu.au
Office Location	G09 Room 1.18
Phone	07-5552 9062
Fax	07-5552 8065
Consultation times	Will be posted on Learning@Griffith

Moderator Details	Gold Coast
Moderator	Mr. Mark Bolton
Email	m.bolton@griffith.edu.au
Office Location	G09 Room 1.21

COURSE COMMUNICATIONS

The Course Convenor will be available for face-to-face consultations at the times posted on Learning@Griffith. Queries may be addressed to the course convenor by email. Due to other commitments, turnaround times for emails may be several days.

The course site on Learning@Griffith will be the primary course communication method to students. The site contains an interactive version of the course material. Students can download from the site information required for the assignments. The course Announcements will be used to convey important information to students such as: assignment updates, time and place of Resit Tests, and availability of assessment results.

TEXTS AND SUPPORTING MATERIALS

Specified Texts and Support Materials Required

Loo, Y.C. and Guan, H. (2006). Statics and Structures. 3rd Edition, School of Engineering, Griffith University Gold Coast Campus.

Kirke, B.K. and Guo, W.D. (2004). Stress Analysis – Study Guide. Griffith University Gold Coast Campus.

Guo, W.D. (2006). Stress Analysis – Lecture Notes. Griffith University Gold Coast Campus.

Beer, F.P., Johnston, E.R. and DeWolf, J. T. (2004). Mechanics of Materials. 3rd Edition (SI Edition). McGraw Hill.

Gere, J.M. and Goodno, B.J. (2009). Mechanics of Materials. 7th Edition (SI Edition), Cengage Learning

Recommended Readings

Hibbeler, R.C. (2007). Engineering Mechanics – Statics. 11th Edition, Prentice-Hall, N.J.

Meriam, J.L. and Kraige, L.G. (2002). Engineering Mechanics, Vol. 1 Statics. 5th Edition, Wiley.

Beer, F.P., Johnston, E.R., DeWolf, J.T., and Mazurek, D.F. (2009). Mechanics of Materials. 5th Edition, McGraw Hill.

Philpot, T. (2008). Mechanics of Materials: An Integrated Learning System. 1st Edition, John Wiley & Sons.

SECTION B – ADDITIONAL COURSE INFORMATION

Students should refer to the Learning@Griffith website for further information about this course.

School of Engineering Course Administration Policy

Unless otherwise stated, the normal course administration policies and rules of the School of Engineering apply. For the policy, see School of Engineering Students Organisation on Learning@Griffith.

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 University's Institutional Framework for Promoting Academic Integrity Among Students for further details.

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.