



The University of Southern Queensland

## Course specification

### Description: Computational Mechanics in Design

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
MEC	3302	40490	1, 2005	ONC	1.00	Toowoomba

<b>Academic group:</b>	FOENS
<b>Academic org:</b>	FOES02
<b>Student contribution band:</b>	2
<b>ASCED code:</b>	030701

### STAFFING

Examiner: Chris Snook

### REQUISITES

Pre-requisite: MEC2401 and MEC2402

### SYNOPSIS

This course will provide students with an understanding of the operation and limitations of computer aided engineering (CAE) and analysis systems, and provide opportunities to develop the basic skills required to operate such systems. Material presented will include the architecture of CAE systems, numerical methods, finite element methods, computer graphics, engineering methods of CAE, optimisation, solid feature based parametric modelling, and technical information management systems. The advantage of a CAE process is demonstrated by several engineering assignments that students must complete on a CAE facility throughout the semester. Considerable emphasis is placed on the appropriate use of the finite element method in the design process.

### OBJECTIVES

On completion of this course, students should be able to:

1. demonstrate proficiency in the use of a "parametric feature based" CAD system;
2. demonstrate proficiency in developing a solid model of an engineering artefact, exporting that model to an engineering analysis package and carrying out that analysis;
3. explain the concepts and principles used in the formulation and application of the finite element method (focussed on stress analysis of common mechanical devices);
4. demonstrate an ability to formulate, implement, and document solutions to solve simple engineering problems using the finite element method;
5. choose appropriate software packages to assist in the solution of a range of common engineering problems;
6. evaluate the performance of an existing design using computer aided engineering software, in particular, to evaluate the validity of the model and solution in relation to the original problem specification;

7. demonstrate an awareness of the potential areas of application of CAE tools, and to explain the advantages and disadvantages of such systems.

## TOPICS

	Description	Weighting (%)
1.	CAD and Solid Modelling Systems	20.00
2.	Finite Element Method - Basic Analysis	40.00
3.	Finite Element Method - Applications	30.00
4.	Case Studies and Future Directions	10.00

## TEXT and MATERIALS required to be PURCHASED or ACCESSED

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at <http://bookshop.usq.edu.au> click 'Semester', then enter your 'Course Code' (no spaces).

*MEC3302 Computational Mechanics in Design External Study Package*, USQ Publication, Toowoomba.

Adams, V & Askenazi, A 1999, *Building Better Products with Finite Element Analysis*, Onword Press, Santa Fe, NM.

## REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

1994, *A Finite Element Primer*, NAFEMS, Glasgow.

Cook, RD, Malkus, DS, Plesha, ME & Witt, RJ 2001, *Concepts and Applications of Finite Element Analysis*, 4th edn, Wiley,

Knight, CE 1993, *The Finite Element Method in Mechanical Design*, PWS-Kent,

Moaveni, A 1999, *Finite Element Analysis: Theory and Application with ANSYS*, Prentice Hall,

Shah, JJ & Mantyla, M 1995, *Parametric and Feature-Based CAD/CAM*, Wiley, New York.

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Examinations	2.00
Lectures	26.00
Private Study	26.00
Project Work	75.00
Tutorials	26.00

## ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
ASSIGNMENT 1	200.00	20.00	13 Apr 2005
ASSIGNMENT 2	200.00	20.00	04 May 2005
MAJOR DESIGN ASSIGNMENT	300.00	30.00	08 Jun 2005
2 HOUR OPEN EXAMINATION	300.00	30.00	END S1 (see note 1)

### NOTES

1. Student Administration will advise students of the dates of their examinations during the semester.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:  
It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements for students to complete each assessment item satisfactorily:  
To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for each assessment item.
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student for the assignment will apply for each working day late.
- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade a student must achieve at least 40% in each of the summative assessments and at least 50% of the available weighted marks for the summative assessment items.
- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course.
- 6 Examination information:  
In an Open Examination, candidates may have access to any material during the examination except the following: electronic communication devices, bulky materials, devices requiring mains power and material likely to disturb other students.
- 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.
- 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL

<http://www.usq.edu.au/corporateservices/calendar/part5.htm> or in the current USQ Handbook.

## **ASSESSMENT NOTES**

- 1 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner.
- 2 Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.
- 3 In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.
- 4 The Faculty will normally only accept assessments that have been written, typed or printed on paper-based media.
- 5 The Faculty will NOT accept submission of assignments by facsimile.
- 6 Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations may be given special consideration. They should contact the examiner of the course to negotiate such special arrangements.
- 7 In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.
- 8 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded one of the temporary grades: IM (Incomplete - Make up), IS (Incomplete - Supplementary Examination) or ISM (Incomplete -Supplementary Examination and Make up). A temporary grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non directed personal study.
- 9 Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).