Description: Computational Mechanics in Design

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<th>Subject</th>
<th>Cat-Nbr</th>
<th>Class</th>
<th>Term</th>
<th>Mode</th>
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<td>10590</td>
<td>1, 2002</td>
<td>ONC</td>
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Academic Group: FOENS
Academic Org: FOES02
HECS Band: 2
ASCED Code: 030701

STAFFING
Examiner: Chris Snook
Moderator: Thanh Tran-Cong

PRE-REQUISITES
Pre-requisite: MEC 2401 and MEC 2402

SYNOPSIS
This course will provide students with an understanding of the operation and limitations of computer aided engineering (CAE) 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.

OBJECTIVES
On successful completion of this course students will be able to:

- Describe the basic features of CAD/CAE facilities, including computer hardware, graphical display and input devices, operating system and software capability, hardcopy devices and operator training and support requirements;
- Explain the concepts and demonstrate the principles used in the geometric description of lines, edges, surfaces and volumes to construct 2D, wire frame, surface and solid models;
- Demonstrate proficiency in the use of a "parametric feature based" CAD system;
- Explain the concepts and principles used in the formulation and application of the finite element method (focussed on stress analysis of common mechanical devices);
• Demonstrate an ability to formulate, implement, and document solutions to solve simple engineering problems using the finite element method;
• Choose appropriate software packages to assist in the solution of a range of common engineering problems;
• Undertake a systematic approach to the design of an engineering system using computer aided engineering software;
• Demonstrate proficiency in developing a solid model of an engineering artefact, exporting that model to an engineering analysis package and carrying out that analysis;
• 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;
• Demonstrate an awareness of the potential areas of application of CAE tools, and to explain the advantages and disadvantages of such systems.

**TOPICS**

<table>
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<tr>
<th>Description</th>
<th>Weighting (%)</th>
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<tr>
<td>1. Overview of CAE systems</td>
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<td>2. Computer Graphics</td>
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<td>3. CAD and Solid Modelling Systems</td>
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<td>4. Finite Element Method - Basic Analysis</td>
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<td>5. Finite Element Method - Applications</td>
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<td>6. Case Studies and Future Directions</td>
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**TEXT and MATERIALS required to be PURCHASED or ACCESSED:**

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at http://bookshop.usq.edu.au by entering the author or title of the text.

*MEC3302 CAD & Analysis, Study Package*, USQ Publication.


**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.


**STUDENT WORKLOAD REQUIREMENTS**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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<tr>
<td>Examinations</td>
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<tr>
<td>Lectures</td>
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<tr>
<td>Private Study</td>
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<td>Project Work</td>
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<td>Tutorial</td>
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**ASSESSMENT DETAILS**

<table>
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<tr>
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<th>Due Date</th>
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**NOTES:**

1. Further details about the due dates are detailed in the assessment section of the Course Specifications.
2. Further details about the due dates are detailed in the assessment section of the Course Specifications.
3. Further details about the due dates are detailed in the assessment section of the Course Specifications.
4. Further details about the due dates are detailed in the assessment section of the Course Specifications.
5. Further details about the due dates are detailed in the assessment section of the Course Specifications.

**OTHER REQUIREMENTS**

1. Students must achieve at least a 40% mark in each assessment and at least 50% overall mark for all assessments in order to complete the course successfully.
The final grades for students will be assigned on the basis of the aggregate of the marks obtained for each assessment. The cut off mark for higher grades will normally be 50% for C, 65% for B, 75% for A and 85% for HD.

Students MUST have ready access to a parametric feature based solid modelling package (contact examiner for further details).

Students MUST have access to computing facilities recommended in the university handbook. A minimum configuration is a Pentium 200MHz, 64M RAM and 8x cd rom or better.

The due date for an assignment is the date by which a student must submit the assignment to the USQ. The onus is on the student to provide proof of the submit date, if requested by the Examiner.

Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.

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.

If students submit assignments after the due date without prior approval then a penalty of up to 20% of the total marks for the assignment will apply for each working day late.

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.

The Faculty of Engineering and Surveying will NOT accept submission of hand written or typed assignments by facsimile, e-mail or computer diskette. Students in remote locations who do not have regular access to postal services may be given special consideration.

A closed examination is an examination where the candidates are allowed to bring only writing and drawing instruments into the examination.

A minimum standard of communication skills must be demonstrated in order for a passing grade to be achieved. All assignments must be typed or word processed and printed.

The Faculty of Engineering and Surveying does not offer supplementary examinations.

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 the temporary grade: IM (Incomplete - Make up). An IM 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.

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; IDSM (Incomplete Deferred Examination and Make-up).