Description: Complex Systems Simulation

<table>
<thead>
<tr>
<th>Subject</th>
<th>Cat-nbr</th>
<th>Class</th>
<th>Term</th>
<th>Mode</th>
<th>Units</th>
<th>Campus</th>
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<tr>
<td>CSC</td>
<td>8412</td>
<td>41037</td>
<td>1, 2005</td>
<td>ONC</td>
<td>1.00</td>
<td>Toowoomba</td>
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Academic group: FOSCI
Academic org: FOS003
Student contribution band: 2
ASCED code: 020307

STAFFING
Examiner: Mike McFarlane
Moderator: David Mason

REQUISITES
Pre-requisite: CSC3409 and Students must be enrolled in one of the following Programs: BINH or GCAC or GCPC or GDAC or GDPC or MCOP or MPIT or MPCP

RATIONALE
Systems simulation is commonly regarded as an essential component of the development, modification, and understanding of significant complex industrial and commercial processes and practices, as well as in the design and analysis of complex information systems. Consequently, there is a need for Honours graduates to have highly developed skills in the design, development, and analysis of models of complex systems and be able to do so in ways which support both exploratory approaches and statistical experiments.

SYNOPSIS
This course enables students to explore advanced systems modelling strategies commonly used in the development, modification, and understanding of complex industrial and business processes and practices. Emphasis is placed upon the representation and modelling of stochastic processes using discrete event, continuous, and dynamic methodologies. The major focus of the course will be placed upon validation, and interpretation of the outputs of systems simulation models. Students may use high level languages such as ARENA and SIMSCRIPT in their investigations. This course is normally offered only in even years.

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

1. apply advanced knowledge and skills to the specification, design, development, and interpretation of simulation models of complex systems;
2. demonstrate familiarity with current developments and literature in systems simulation;
3. identify and fit appropriate distributions to empirical data;
4. apply principles of precision control to the estimation of parameters;
5. utilise Markov methods in systems simulation;
6. design, develop, and interpret simulation models of large complex systems using high level software.
7. interpret the outcomes process modelling to formulate recommendations and improvements.
8. use animated techniques to demonstrate expected differences between the 'as is' and 'ought to be' systems.
9. Using animated techniques demonstrate expected differences between the 'as is' and 'ought to be' systems.

**TOPICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
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<tbody>
<tr>
<td>1. Stochastic processes: Queuing Theory, Distributions Parameter Estimation</td>
<td>10.00</td>
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<tr>
<td>2. Markov methods in simulation</td>
<td>5.00</td>
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<td>3. Precision control: general principles</td>
<td>5.00</td>
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<td>4. Variation reduction techniques</td>
<td>5.00</td>
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<td>5. Sensitivity analysis and importance sampling</td>
<td>5.00</td>
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<td>6. Pitfalls in systems modelling</td>
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<tr>
<td>7. Contemporary developments in systems simulation</td>
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<td>8. Development and interpretation of simulation models</td>
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**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](http://bookshop.usq.edu.au) click 'Semester', then enter your 'Course Code' (no spaces).


**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.

Banks, J 2000, *Discrete-Event Systems Simulation*, 3rd edn, Prentice-Hall,


Law, AM & Larmey, CS 1984, *An Introduction to Simulation using Simscript 11.5*, CACI Products Co, La Jolla.


**STUDENT WORKLOAD REQUIREMENTS**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>28.00</td>
</tr>
<tr>
<td>Private Study</td>
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<tr>
<td>Project Work</td>
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<td>Seminars</td>
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**ASSESSMENT DETAILS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks out of</th>
<th>Wtg(%)</th>
<th>Due date</th>
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<tbody>
<tr>
<td>ASSIGNMENT 1</td>
<td>10.00</td>
<td>5.00</td>
<td>01 Mar 2005</td>
</tr>
<tr>
<td>PROJECT PROPOSAL</td>
<td>10.00</td>
<td>5.00</td>
<td>01 Mar 2005</td>
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<tr>
<td>ASSIGNMENT 2</td>
<td>10.00</td>
<td>15.00</td>
<td>01 Mar 2005</td>
</tr>
<tr>
<td>PROJECT</td>
<td>100.00</td>
<td>75.00</td>
<td>01 Mar 2005</td>
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**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 an assessment item satisfactorily, students must obtain at least 50% of the marks available for that assessment item.

3. Penalties for late submission of required work:
   If students submit assignments after the due date without adequate reason then a penalty of 10% of the total marks available 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 a passing grade, students must demonstrate, via the summative assessment items, that they have achieved the required minimum standards in relation to the objectives of the course by satisfactorily completing all 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 obtained for each of the summative assessment items in the course.
6 Examination information:
   There is no examination in this course.
7 Examination period when Deferred/Supplementary examinations will be held:
   There will be no Deferred or Supplementary examinations in 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

9 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.
10 Students may be required to provide a copy of assignments submitted for assessment purposes. Such copies should be despatched to the USQ within 24 hours of receipt of a request to do so.
11 in accordance with University policy, the Examiner may grant an extension of the due date of an assignment in extenuating circumstances.
12 The Faculty will NOT accept submission of assignments by facsimile.

OTHER REQUIREMENTS

1 Students will be required to have access to ARENA software - supplied with Text.