Description: Numerical Computing

<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>2403</td>
<td>24393</td>
<td>2, 2003</td>
<td>ONC</td>
<td>1.00</td>
<td>TWMBA</td>
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Academic Group: FOSCI
Academic Org: FOS003
HECS Band: 2
ASCED Code: 010101

STAFFING
Examiner: Walter Spunde
Moderator: Harry Butler

PRE-REQUISITES
Pre-requisite: CSC1401 or CSC1402 or ENG1000 Co-requisite: MAT2100

SYNOPSIS
The course includes the study of numerical solutions of linear and non-linear algebraic equations, numerical interpolation and curve fitting, the numerical solution of ordinary differential equations, and Monte Carlo simulation. To apply these numerical techniques the methodology of procedural and structured programming in MATLAB is introduced and developed. Additional interactive and graphical features of MATLAB are exploited.

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

- demonstrate programming proficiency using structured programming techniques in MATLAB;
- demonstrate an understanding of a variety of computer-based methods and their errors, used in the solution of numerical problems;
- use flexibility in choosing appropriate techniques (including graphics) for particular applications and solutions;
- implement numerical solutions using computer-based techniques.
### TOPICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
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<tbody>
<tr>
<td>1. MATLAB Programming: Elementary MATLAB syntax Control flow in MATLAB Problem modelling and structured program design Program documentation Effects of errors Debugging techniques Scripts and function M-files.</td>
<td>30.00</td>
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<tr>
<td>2. Solving Linear and Nonlinear Equations Newton's method and other fixed point iteration Newton's method for nonlinear systems Linear systems Condition numbers Singular value decomposition Jacobi's iterative solution of linear systems.</td>
<td>20.00</td>
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<tr>
<td>3. Numerical Interpolation and Curve Fitting Lagrange polynomial interpolation Trapezoidal and Simpson's rule for numerical integration Cubic splines Least squares.</td>
<td>20.00</td>
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<tr>
<td>4. Random Number Generation Monte Carlo Methods and simulation Monte Carlo integration Process simulation</td>
<td>15.00</td>
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<tr>
<td>5. Solution of initial value problems in ordinary differential equations Euler's method Modified Euler's method The Runge-Kutta RK4 method.</td>
<td>15.00</td>
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</table>

### 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.

Either the Professional or the Student Edition of MATLAB, The MathWorks, USQ Bookshop.

Department of Mathematics and Computing CDROM SET 1, 2003 (available from the USQ Bookshop). This CD set contains course material, Windows and Linux Software relevant to this course offering only. For more information about the CD sets and their use, please refer to http://www.sci.usq.edu.au/cdrom.

Introductory Book 2003, Course CSC2403 Numerical Computing, USQ Distance Education Centre, Toowoomba.

Selected Readings 2003, Course CSC2403 Numerical Computing, USQ Distance Education Centre, Toowoomba.

Study Book 2003, Course CSC2403 Numerical Computing, USQ Distance Education Centre, Toowoomba.

### 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.

Electronic resources for this course will be available via its home page: http://www.sci.usq.edu.au/courses/CSC2403.


**STUDENT WORKLOAD REQUIREMENTS**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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<tbody>
<tr>
<td>Assessment</td>
<td>40</td>
</tr>
<tr>
<td>Examinations</td>
<td>3</td>
</tr>
<tr>
<td>Lectures</td>
<td>39</td>
</tr>
<tr>
<td>Private Study</td>
<td>61</td>
</tr>
<tr>
<td>Tutorial</td>
<td>26</td>
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**ASSESSMENT DETAILS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks Out of</th>
<th>Wtg(%)</th>
<th>Required</th>
<th>Due Date</th>
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<tr>
<td>MATLAB SCRIPT SUBMISSION 1</td>
<td>5.00</td>
<td>5.00</td>
<td>Y</td>
<td>06 Aug 2003</td>
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<tr>
<td>MATLAB SCRIPT SUBMISSION 2</td>
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<tr>
<td>MATLAB SCRIPT SUBMISSION 3</td>
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<td>MATLAB SCRIPT SUBMISSION 5</td>
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<td>5.00</td>
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<td>08 Oct 2003</td>
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<tr>
<td>MATLAB SCRIPT SUBMISSION 6</td>
<td>5.00</td>
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<td>Y</td>
<td>22 Oct 2003</td>
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<td>3 HOUR OPEN EXAMINATION</td>
<td>100.00</td>
<td>70.00</td>
<td>Y</td>
<td>END S2 (see note )</td>
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**NOTES:**

- Examination dates will be available during the Semester. Please refer to the examination timetable when published.
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 for each assessment item. To complete the
   examination satisfactorily, students must obtain at least 50% of the marks available
   for the examination.

3 Penalties for late submission of required work:
   Not applicable.

4 Requirements for student to be awarded a passing grade in the course:
   To be assured of receiving a passing grade a student must submit all of the
   summative assessment items and achieve at least 50% of the available weighted
   marks for those items. Students who do not qualify for a Passing grade may, at the
   discretion of the Examiner, be awarded a Supplementary Examination and/or
   assigned additional work to demonstrate to the Examiner that they have achieved
   the required standard. It is expected that such students will have gained at least 45
   % of the total marks available for 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 aggregate of the
   weighted marks 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 Summer Term 2003/2004.

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/SECARIAT/calendar/Part5/ or in the printed version of the
   current USQ Handbook.

ASSESSMENT NOTES

9 Matlab scripts must be submitted electronically by the due date and time in the
   manner prescribed in the Introductory Book or as modified on the course website.
   Late submissions will not normally be accepted.
10 Tutorial exercises will be submitted electronically by the due date and time and students must maintain an appropriate filing system on the Department's computer network to obtain credit. No late submission of tutorial submissions is permitted.