### Description: Linear Systems and Control

<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>ELE</td>
<td>2103</td>
<td>24578</td>
<td>2, 2003</td>
<td>EXT</td>
<td>1.00</td>
<td>TWMBA</td>
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**Academic Group:** FOENS  
**Academic Org:** FOES04  
**HECS Band:** 2  
**ASCED Code:** 031399

### STAFFING

Examiner: Paul Wen  
Moderator: John Leis

### PRE-REQUISITES

Co-requisite: MAT1102

### OTHER-REQUISITES

Co-requisites 64612

### SYNOPSIS

Given that all engineering processes are time varying in nature, it is highly desirable to be able to model and thence predict their behaviour in time. This course initiates the skills necessary for the analysis, modification and achievement of specific behaviour in dynamic engineering systems. At present, it is linear analysis which provides the most general and useful solutions to engineering problems. The ability to control the performance of dynamic systems is an essential part of most engineering tasks. The study of classical control techniques and hardware provides an introduction to many of the problems that face the control engineer. Attention will be restricted to single input single output systems.

### OBJECTIVES

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

- deduce a linear, lumped parameter, time variant model to describe the behaviour of engineering equipment which might include electrical, mechanical, thermal and hydraulic or pneumatic components;
- predict the behaviour of a system from its linear model;
- exploit the analogous behaviour of different types of physical components and systems which are described by similar models;
• select and apply time domain, s-domain and/or frequency domain analysis and
design techniques as appropriate;
• use the classical methods for design of basic feedback control system.

TOPICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
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<tbody>
<tr>
<td>1. Physical system modelling</td>
<td>25.00</td>
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<tr>
<td>2. Time domain analysis and design</td>
<td>20.00</td>
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<td>3. S-domain analysis and design</td>
<td>20.00</td>
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<tr>
<td>4. Frequency domain analysis and design</td>
<td>20.00</td>
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<tr>
<td>5. Typical controllers and design</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.


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.

MATLAB, Student Edition, Version 5.3 or later + Control Toolbox (prefer student purchase
this package).

Longman Inc, USA.


STUDENT WORKLOAD REQUIREMENTS

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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<tbody>
<tr>
<td>Assessment</td>
<td>45</td>
</tr>
<tr>
<td>Directed Study</td>
<td>52</td>
</tr>
<tr>
<td>Examinations</td>
<td>3</td>
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<tr>
<td>Private Study</td>
<td>55</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>ASSIGNMENT 1</td>
<td>200.00</td>
<td>20.00</td>
<td>Y</td>
<td>05 Sep 2003</td>
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<tr>
<td>ASSIGNMENT 2</td>
<td>200.00</td>
<td>20.00</td>
<td>Y</td>
<td>24 Oct 2003</td>
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<tr>
<td>3 HOUR RESTRICTED EXAMINATION</td>
<td>600.00</td>
<td>60.00</td>
<td>Y</td>
<td>END S2 (see note)</td>
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NOTES:
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Student Administration will advise students of the dates of their examinations during the semester.

IMPORTANT ASSESSMENT INFORMATION

1 Attendance requirements:
There are no attendance requirements for this course. However, it is the students' responsibility 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 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: (i) satisfactorily completing the examination and assignments; and (ii) obtaining at least 50% of the total weighted 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 weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course.

6 Examination information:
In a Restricted Examination, candidates are allowed access to specific materials during the examination. The only materials that candidates may use in the restricted examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination).
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/SECARIAT/calendar/Part5/ or in the printed version of 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 despatched to USQ within 24 hours 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 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.

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).