



The University of Southern Queensland

## Course specification

The current and official versions of the course specifications are available on the web at  
<<http://www.usq.edu.au/coursespecification/current>>.  
Please consult the web for updates that may occur during the year.

### Description: Linear Systems and Control

| Subject | Cat-nbr | Class | Term    | Mode | Units | Campus    |
|---------|---------|-------|---------|------|-------|-----------|
| ELE     | 2103    | 90296 | 2, 2009 | ONC  | 1.00  | Toowoomba |

|                                   |        |
|-----------------------------------|--------|
| <b>Academic group:</b>            | FOENS  |
| <b>Academic org:</b>              | FOES04 |
| <b>Student contribution band:</b> | 2      |
| <b>ASCED code:</b>                | 031399 |

### STAFFING

Examiner: Paul Wen  
Moderator: Mark Phythian

### OTHER REQUISITES

Recommended prior or concurrent study: MAT1502

### 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

The course objectives define the student learning outcomes for a course. The assessment item(s) that may be used to assess student achievement of an objective are shown in parenthesis. On completion of this course, students should be able to:

1. 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 (Assignment 1 and Exam);
2. predict the behaviour of a system from its linear model (Assignment 1, Assignment 2 and Exam);
3. exploit the analogous behaviour of different types of physical components and systems which are described by similar models (Assignment 1, Assignment 2 and Exam);
4. select and apply time domain, s-domain and/or frequency domain analysis and design techniques as appropriate (Assignment 1, Assignment 2 and Exam);

5. use the classical methods for design of basic feedback control system (Assignment 2 and Exam).

## TOPICS

|    | Description                          | Weighting (%) |
|----|--------------------------------------|---------------|
| 1. | Physical system modelling            | 25.00         |
| 2. | Time domain analysis and design      | 20.00         |
| 3. | S-domain analysis and design         | 20.00         |
| 4. | Frequency domain analysis and design | 20.00         |
| 5. | Typical controllers and design       | 15.00         |

## 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).

*ELE2103 Linear Systems and Control External Study Package*, USQ Publication, Nise, NS 2008, *Control systems engineering*, 5th edn, John Wiley & Sons Inc, New York.

## 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 6.0 (or later) + Control Toolbox.

Dorf, RC & Bishop, RH 2004, *Modern control systems*, 10th edn, Pearson Education, Upper Saddle River, NJ.

(NHT Requested)

Katsuhiko, O 2001, *Modern control engineering*, 4th edn, Upper Saddle River, NJ.

(NHT Requested)

Kuo, BC & Golnaraghi, F 2002, *Automatic control systems*, 8th edn, John Wiley, New York.

(NHT Requested)

## STUDENT WORKLOAD REQUIREMENTS

| ACTIVITY      | HOURS |
|---------------|-------|
| Assessments   | 45.00 |
| Examinations  | 2.00  |
| Lectures      | 26.00 |
| Private Study | 56.00 |
| Tutorials     | 26.00 |

## ASSESSMENT DETAILS

| Description                   | Marks out of | Wtg (%) | Due date               |
|-------------------------------|--------------|---------|------------------------|
| ASSIGNMENT 1                  | 200.00       | 20.00   | 04 Sep 2009            |
| ASSIGNMENT 2                  | 100.00       | 10.00   | 23 Oct 2009            |
| 2 HOUR RESTRICTED EXAMINATION | 700.00       | 70.00   | END S2<br>(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 satisfactorily complete an individual assessment item a student must achieve at least 50% of the marks or a grade of at least C-. (Depending upon the requirements in Statement 4 below, students may not have to satisfactorily complete each assessment item to receive a passing grade in this course.)
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without extenuating circumstances then a penalty of 5% of the assigned mark may apply for each working day late up to a maximum of ten working days at which time a mark of zero can be recorded for that assignment.
- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade in a course a student must obtain at least 50% of the total weighted marks for the course.
- 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/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 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 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).

10 A minimum standard of communication skills must be demonstrated in order for a passing grade to be achieved.