



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: Control and Instrumentation

| Subject | Cat-nbr | Class | Term | Mode | Units | Campus |
|---------|---------|-------|---------|------|-------|-----------|
| ELE | 2101 | 90565 | 2, 2009 | EXT | 1.00 | Toowoomba |

| | |
|-----------------------------------|--------|
| Academic group: | FOENS |
| Academic org: | FOES04 |
| Student contribution band: | 2 |
| ASCED code: | 031399 |

STAFFING

Examiner: Gordon Hampson
Moderator: Paul Wen

REQUISITES

Pre-requisite: ENG1500 or MAT1500

SYNOPSIS

This course covers the elements of classical control. A good grounding in the understanding of the dynamic behaviour of systems is followed by a study of the elements that make up some control systems. Standard techniques for modifying the behaviour of control systems are examined. Particular studies of real world control systems are used to bring together the topics previously covered.

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. categorise and analyse the behaviour of a dynamic system; (CMAS1C, exam)
2. describe the characteristics of common control system components; (CMAS1C, CMAS2C, exam)
3. interpret controller characteristics; (CMAS1C, CMAS2C, exam)
4. analyse overall control system characteristics; (CMAS3C)
5. predict overall control system behaviour from the characteristics of the components which comprise the system; (CMAS2C, CMAS3C, exam)
6. analyse and trouble shoot control loop faults; (exam)
7. evaluate and tune a control system loop controller. (CMAS3C, exam)

TOPICS

| | Description | Weighting (%) |
|----|---|---------------|
| 1. | Introduction to control systems: open loop systems, closed loop systems, types of system behaviour, types of control systems. | 5.00 |
| 2. | Behaviour of simple systems: zero, first and second order, higher order, process systems, inputs other than step inputs, frequency response. | 13.00 |
| 3. | Feedback control: block diagrams, feedback options, transfer functions, steady state values. | 18.00 |
| 4. | Some control system hardware: transducers, amplifiers, actuators, motor speed control, DC servo system. | 10.00 |
| 5. | Frequency response of control systems: measurements, Bode plots, stability criteria, Nyquist diagrams. | 20.00 |
| 6. | Signal processing and transmission: amplifiers, noise, external interference, noise reduction techniques. | 2.00 |
| 7. | The compensation of system performance: effects of gain, effects of rate feedback, compensation techniques, controllers, controller settings | 20.00 |
| 8. | Further control system hardware: hydraulic control, pneumatic control systems and controllers, instrument servo mechanisms, digital control systems | 10.00 |
| 9. | Overview: the complete system, introduction to advanced control topics | 2.00 |

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).

A cheap protractor, scale ruler, dividers, HB pencil, eraser, drawing compass and flexi-curve drawing aid.

A pad of A4, 4-cycle, semi-log graph paper (available from the USQ Bookshop). Caution: 3-cycle, 5-cycle and log-log graph paper are unsuitable.

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.

The USQ produced video tape (also on DVD) "DC Servo-systems" for course ELE2101 Control and Instrumentation, available on loan from the USQ Library and local study centres.

In this course, the study book serves as the text book and main source of all assessable information - sufficient for students to meet all of the course objectives to a high level of achievement without recourse to the recommended reference materials.

Bissell, CC 1994, *Control engineering*, 2nd edn, Chapman and Hall, London.

(USQ Library Call No: 629.83 Bis)

Bolton, W 2000, *Newnes instrumentation and measurement pocket book*, 3rd edn, Newnes Butterworth Heinemann, Oxford.

(USQ Library Call No: 681.2 Bol)

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

(USQ Library Call No: 629.83 Dor)

Grantham, WJ & Vincent, TL 1993, *Modern control systems analysis and design*, John Wiley, New York.

(USQ Library Call No: 629.83 Gra)

Johnson, CD 2006, *Process control instrumentation technology*, 8th edn, Prentice Hall, New Jersey.

Nise, N 2008, *Control systems engineering*, 5th edn, Wiley, New Jersey.

(USQ Library Call No: 629.8 Nis)

Ogata, K 2002, *Modern control engineering*, 4th edn, Prentice Hall, New Jersey.

(USQ Library Call No: 629.8 Oga)

STUDENT WORKLOAD REQUIREMENTS

| ACTIVITY | HOURS |
|----------------|-------|
| Assessments | 20.00 |
| Directed Study | 72.00 |
| Examinations | 2.00 |
| Private Study | 61.00 |

ASSESSMENT DETAILS

| Description | Marks out of | Wtg (%) | Due date |
|------------------------------|--------------|---------|------------------------|
| CMA F1 | 100.00 | 0.00 | 07 Aug 2009 |
| CMA S1C | 100.00 | 10.00 | 14 Aug 2009 |
| CMA F2 | 100.00 | 0.00 | 04 Sep 2009 |
| CMA S2C | 100.00 | 10.00 | 11 Sep 2009 |
| CMA F3 | 100.00 | 0.00 | 16 Oct 2009 |
| CMA S3C | 150.00 | 15.00 | 23 Oct 2009 |
| PT A OF 2 HR RESTRICTED EXAM | 330.00 | 33.00 | END S2 (see note 1) |
| PT B OF 2 HR RESTRICTED EXAM | 320.00 | 32.00 | END S2 |

NOTES

1. The 2 hour examination is in two parts. Each part requires a barcode label. Part A requires an Examination Answer Sheet. Part B requires an Answer Booklet. Graph paper for Part B is integral with the examination paper. 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:
(i) To complete each of the assignments satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for each assignment. (ii) To complete the examination satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for the examination.
- 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:
The examination in this course has two parts. Part A is a restricted examination with 330 marks allocated. Part B is a restricted examination with 320 marks allocated. In a restricted examination, candidates are allowed access to specific materials during the examination. The materials that candidates may use in the restricted examination for this course are:

only writing and drawing instruments; only hand-held battery-operated programmable or non-programmable calculators are permitted. This examination is confidential and is printed on blue paper. Students may NOT retain the blue examination paper. All materials supplied MUST be returned, whether used or not.

- 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).

OTHER REQUIREMENTS

- 1 Students will require access to computer facilities as well as internet access to UConnect to complete CMA assignment tests for this course.
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