ENEM14015 *Dynamic System Modelling and Control*

Term 2 - 2017

Profile information current as at 01/05/2024 03:21 am

General Information

Overview

This project based learning unit examines the behaviour of mechanical systems. You will apply knowledge of engineering science and mathematics to model and analyse mechanical systems and consider the nature of engineering assumptions and the effects of uncertainty on analysis and modelling. You will apply control and vibration theory, design and analyse linear and non-linear mathematical models and use simulation software to predict the behaviour of mechanical systems. You will be expected to apply the modelling and analysis of mechanical systems to industrial problems and contexts. You will have opportunities to work individually and in teams to complete projects and to develop interpersonal and technical communication skills. You will prepare professional documentation of problem solutions and project reports. Distance education students are required to have access to a computer, to make frequent use of the Internet, and are required to participate in Residential School activities.

Details

Career Level: *Undergraduate*
Unit Level: *Level 4*
Credit Points: *12*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites

Prerequisite: ENEM12007 Statics and Dynamics or ENEM12010 Engineering Dynamics
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 2 - 2017

- Bundaberg
- Distance
- Gladstone
- Mackay
- Melbourne
- Perth
- Rockhampton

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Residential Schools

This unit has a Compulsory Residential School for distance mode students and the details are:
Click here to see your Residential School Timetable.

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 12-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 25 hours of study per week, making a total of 300 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Portfolio**
Weighting: 100%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Student feedback

Feedback
To help understanding the labs might be better done earlier in the term.

Recommendation
In 2017 will trial running the labs earlier where lab technician availability permits.

Feedback from Teaching staff reflection

Feedback
Online tutorial and live streaming of lectures still needs improving in areas of audio and video transmission.

Recommendation
New online tutorial and live lecture streaming will be used in 2017. Will request wireless microphone be made available for the teaching staff to improve audio.

Feedback from Student feedback

Feedback
Projects focused on only one area in mechanical engineering.

Recommendation
Provide more tutorial exercises and examples of applications in other areas of mechanical engineering to give students an insight in where and how the unit material could be useful and applicable in the future.

Feedback from Student feedback

Feedback
Basic theory and understanding could be explained better.

Recommendation
Will improve general introductions to material, particularly in the area of modelling so students get a better overall understanding and how it could be useful and applicable in the future.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Design mathematical models that analyse and evaluate mechanical systems
2. Explain and apply control theory and control system approaches to mechanical systems
3. Explain the role of engineering assumptions in building mathematical models of mechanical systems
4. Relate theory to problems of introducing, operating and maintaining mechanical systems in the industrial context
5. Identify and evaluate engineering uncertainty and the limitations of mathematical models
6. Work collaboratively in a team to produce high quality outputs
7. Create professional documentation using mechanical systems terminology, symbols and diagrams

The learning outcomes are linked to Engineers Australia Stage 1 Competencies.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level
• Introductory Level
• Intermediate Level
• Graduate Level
◦ Professional Level
◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes						
	1	2	3	4	5	6	7
1 - Portfolio - 100%	•	•	•	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
1 - Communication		•	•	•		•	•
2 - Problem Solving	•	•	•	•	•	•	
3 - Critical Thinking	•	•	•	•	•	•	
4 - Information Literacy	•	•	•	•	•	•	
5 - Team Work						•	
6 - Information Technology Competence	•	•	•	•	•	•	
7 - Cross Cultural Competence						•	
8 - Ethical practice						•	•
9 - Social Innovation							
10 - Aboriginal and Torres Strait Islander Cultures							

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Portfolio - 100%	•	•	•	•	•	•	•	•		

Textbooks and Resources

Textbooks

ENEM14015

Prescribed

Modelling and analysis of dynamic systems
Edition: 3rd (2001)
Authors: Close, CM, Frederick, DK & Newell, JC
John Wiley & Sons
US
Binding: Hardcover
ENEM14015

Prescribed

Theory of Vibrations with Applications
Edition: 5th (2014)
Authors: Thomson, W & Dahleh, M
Pearson
England
Binding: Paperback

Additional Textbook Information
It is not mandatory to purchase the unit textbooks but these are referred during the unit. Recommended chapter readings and tutorial questions are referred to from these textbooks. Any tutorial questions sourced from the textbooks are provided to students so they can use alternative textbooks and resources for the theory resources. In particular the mechanical vibration textbook (Thomson, W & Dahleh, M 2014) is used the most in the unit. Also a low cost e-book version of (Close, CM, Frederick, DK & Newell, JC 2001) is available from the publisher's website.
Currently distance students will be required to purchase MATLAB and Simulink Student Suite to undertake the unit, which is available from http://au.mathworks.com. Please contact the Engineering course coordinator Dr Aruna Jayasuriya (**a.jayasuriya@cqu.edu.au)** for the latest availability of software for distance students.

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- A4 scanner required for Distance students to scan any written work into their final portfolio submission

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Nur Hassan Unit Coordinator
n.hassan@cqu.edu.au

Schedule

Week 1 - 10 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic

Review of Mechanical Vibrations	Close: Ch: 1, 2, 3, 4, 8, 9, 14 ; Thomas: Ch: 1, 2, 3, 4	**ISL/Zoom Lecture:** Introduction, Review of Mechanical Vibrations No Tutorial or computer lab.

Week 2 - 17 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic
Analysis of Vibratory Systems – Mathematical Theories and Modelling Approaches	As above	**ISL/Zoom Lecture:** Analysis of Vibratory Systems **ISL Tutorials and Computer labs:** Start in Week 2 and run to Week 12, every week.

Week 3 - 24 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #1 - Mathematical Models	As above	**ISL/Zoom Lecture:** Project 1 Introduction

Week 4 - 31 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #2 Single degree of freedom systems	Close: Ch: 2, 3, 4, 7, 8, 9, 14, Thomas: Ch: 1, 2, 3, 4	**ISL/Zoom Lecture:** Project 2 Introduction Project #1 - Mathematical Models Report Due Tuesday Residential School (FLEX) & Rockhampton Labs (For other campuses please check with your campus contact on the date and location for your laboratory program)

Week 5 - 07 Aug 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #2 Single degree of freedom systems	As above	**No ISL/Zoom Lecture this week**

Vacation Week - 14 Aug 2017

Module/Topic	Chapter	Events and Submissions/Topic
Vacation Week		**No ISL/Zoom Lecture, Computer lab or ISL Tutorials this week** Project #2 - Single DOF Systems Report Due Tuesday

Week 6 - 21 Aug 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #3 Multiple degree of freedom systems	Close: Ch: 2, 3, 4, 7, 8, 9, 14 , Thomas: Ch: 4, 5, 6, 8.	**ISL/Zoom Lecture:** Project 3 Introduction

Week 7 - 28 Aug 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #3 Multiple degree of freedom systems	As above	**No ISL/Zoom Lecture this week**

Week 8 - 04 Sep 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #4 Real data modelling, system commissioning, control.	Close: Ch: 5, 7, 8, 9, 14, 15 , Thomas: Ch: 4, 5, 6, 8	**ISL/Zoom Lecture:** Project 4 Introduction Project #3 - MDOF Systems Report Due Tuesday

Week 9 - 11 Sep 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #4 Real data modelling, system commissioning, control.	As above	**ISL/Zoom Lecture:** Demonstration Problems Introduction

Week 10 - 18 Sep 2017

Module/Topic	Chapter	Events and Submissions/Topic
Project #4 Real data modelling, system commissioning, control.	As above	**No ISL/Zoom Lecture this week**

Week 11 - 25 Sep 2017

Module/Topic	Chapter	Events and Submissions/Topic
Portfolio finalisation	Portfolio finalisation	**No ISL/Zoom Lecture this week** Project #4 - Control Systems Report Due Tuesday

Week 12 - 02 Oct 2017

Module/Topic	Chapter	Events and Submissions/Topic
Portfolio finalisation	Portfolio finalisation	**No ISL/Zoom Lecture this week** Lab Book Due Tuesday

Review/Exam Week - 09 Oct 2017

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 16 Oct 2017

Module/Topic	Chapter	Events and Submissions/Topic
		Portfolio Due: Exam Week Tuesday (17 Oct 2017) 11:45 pm AEST

Term Specific Information

Note: It is not mandatory to purchase the unit textbooks but these are referred during the unit. Recommended chapter readings and tutorial questions are referred to from these textbooks. Any tutorial questions sourced from the textbooks are provided to students so they can use alternative textbooks and resources for the theory resources. In particular the mechanical vibration textbook (Thomson, W & Dahleh, M 2014) is used the most in the unit. Also a low cost e-book version of (Close, CM, Frederick, DK & Newell, JC 2001) is available from the publisher's website.
Currently distance students will be required to purchase MATLAB and Simulink Student Suite to undertake the unit, which is available from http://au.mathworks.com. Please contact the Engineering course coordinator Dr Aruna Jayasuriya (**a.jayasuriya@cqu.edu.au)** for the latest availability of software for distance students.

Assessment Tasks

1 Portfolio

Assessment Type
Portfolio

Task Description
The final assessment for the unit will be 100% on the individual student's portfolio submission. In general, students must demonstrate in their portfolio how the learning outcomes have been achieved through their individual contribution to four group projects, laboratory program, textbook problems, demonstration problems and any additional questions the students wish to submit. Students must demonstrate their contribution to the projects, what they have learnt from the technical content of projects and the processes involved in completing the projects. The project details, laboratory program and demonstration problems will be provided via the Moodle unit website in alignment with the unit schedule. The portfolio is the full record of your journey through this unit. It should include all notes, theory development, worked examples, demonstration problems, laboratory notes and workings, explorations in design, management and team issues and reflective journal. The portfolio should only contain portions of project work which you completed or made substantial contributions to. Any contributions by others should be clearly indicated. Brief descriptions of the major parts of the portfolio are listed below.
- Reflective Journal
In the reflective journal section of the portfolio students will reflect on what they have set out to learn, how they have approached their learning, what they have achieved, where they could apply what they have learnt and what they would

do differently in future to improve their learning effectiveness. The journal will also include reflections on social and contractual responsibilities that arise from the unit content.

- Projects

Four projects will be completed by teams during the term. Each team shall submit a report per project. Feedback will be provided on the project submissions. Project grades are not directly used in the student's individual grade however poor project results and poor project participation makes it more difficult for the student to demonstrate their competency in the unit learning outcomes and complete any additional textbook and demonstration problems.

- Compulsory Laboratories

There is a compulsory hands-on laboratory program in the unit to aid your understanding. All students, Internal and Distance, will complete a full laboratory program. The Rockhampton laboratory program & Residential School, is in Week 4 for the Rockhampton students and the Distance students. Distance students may request to attend the laboratory sessions at other campuses (however these may be over a couple of weeks depending on the campus). Internal students at other campuses will be advised of the date of your laboratory program early in the term. Formal laboratory reports are not requested however students are requested to record results, calculations, discussion and conclusions in their individual lab book as indicated in the provided lab sheets on the moodle site. The lab book will help by providing evidence for parts of the required portfolio assessment criteria. The lab book is to scanned and submitted online on Tuesday in Week 12 (however it can be submitted earlier). Feedback will be given on the submitted lab book to enable student to determine the appropriateness of it for use as evidence in their final portfolio. A satisfactory Lab Book Submission is required to Pass the unit.

- Demonstration Problems

A selection of optional demonstration problems will be made available on the Moodle for students to complete and include in their final portfolio. Completing these problems will assist students to demonstrate their individual achievement of the Learning Outcomes. The demonstration problems are closely related to the projects, so a high involvement in the projects will help with the demonstration problems. Students are not limited or confined to the demonstration problems but are free to include their own exploration of the unit content by individually extending (or correcting) the group projects or choosing other questions to demonstrate the Learning Outcomes.

A Distinction or High Distinction Level will require a demonstration of a high individual achievement of the Learning Outcomes and the demonstration problems and other individual work will assist the student in creating the necessary evidence for this. Without any Demonstration Problems or other individual questions it will be very difficult to attain a High Distinction, unless you can demonstrate an exception level of involvement in the projects. Direct transcribing of any provided worked tutorial solutions cannot be used as evidence.

- Viva Voce

Following the grading of the Final Portfolio, students may be requested to attend a 10 minute Viva Voce to discuss their Final Portfolio. If required the viva will be conducted either face-face, by video conferencing or via telephone.

Assessment Due Date

Exam Week Tuesday (17 Oct 2017) 11:45 pm AEST

Return Date to Students

Assessment will be returned after CQU Certification of Grades

Weighting

100%

Assessment Criteria

The portfolio will be used to assess your increase in knowledge, effective management of yourself and others, team work, communication, commitment and learning processes. Students are expected to nominate a grade that they consider should be awarded. This must be clearly substantiated with evidences of individual work in support of such claims. These claims will be assessed based on the how well the material presented in the portfolio demonstrates the attainment of the unit learning outcomes.

The award of grade will depend the student’s demonstrated individual achievement of the learning outcomes of the unit, the student’s involvement in the team projects and the holistic development of each student. A detailed Portfolio Assessment Criteria Matrix is available on the Moodle unit site indicating the requirements for acceptable, good and excellent levels for each Learning Outcome. The final grading rubric (shown below) is based on the attainment levels of the Learning Outcomes.

Fail	Unacceptable in one or more learning outcomes
Pass	A minimum of Acceptable in all learning outcomes
Credit	A minimum of Good in 3 learning outcomes
Distinction	A minimum of Excellent in 2 learning outcomes and a maximum of 2 learning outcomes at Acceptable

High Distinction	A minimum of Excellent in 5 learning outcomes and a maximum of 1 learning outcome at Acceptable orA minimum of Excellent in 4 learning outcomes and the remainder at Good

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Scan your portfolio and submit it with any other supporting electronic files online via the moodle unit website

Learning Outcomes Assessed

- Design mathematical models that analyse and evaluate mechanical systems
- Explain and apply control theory and control system approaches to mechanical systems
- Explain the role of engineering assumptions in building mathematical models of mechanical systems
- Relate theory to problems of introducing, operating and maintaining mechanical systems in the industrial context
- Identify and evaluate engineering uncertainty and the limitations of mathematical models
- Work collaboratively in a team to produce high quality outputs
- Create professional documentation using mechanical systems terminology, symbols and diagrams

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem