MECH320

Mechanical Engineering for Mechatronics Systems

S1 Day 2018

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
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Credit points
3

Prerequisites
ELEC260 and MECH203

Corequisites

Co-badged status

Unit description
A full analysis, model, or design of an electromechanical system must consider the engineering dynamics and deformations of components. This unit provides fundamental training in dynamics and mechanics of solids with a particular emphasis on mechatronic examples.The unit is a series of lectures and practicals that develop a fundamental understanding of dynamics and mechanics of solids. It also provides training in hand calculations, numerical approaches and experimental methods using laboratory apparatus.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

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

Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
Ability to analyse vibrations in mechanical components and mechanical design.

General Assessment Information

Student Responsibilities

Be familiar with University policy and College procedures and act in accordance with those policy and procedures. It is the responsibility of the student to retain a copy of any work submitted. Students must produce these documents upon request. Copies should be retained until the end of the grade appeal period each term. Student is to perform the required due diligent for their assessment grade and rectify as soon as possible upon finding any errors.

Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Report and Assignment Tasks

Assignment Problems will be posted on iLearn at least two weeks before their submission date.

Assignment submissions and plagiarism policies

All assignments and reports must be submitted electronically through iLearn (in pdf format). Submissions will undergo plagiarism checkers using the turnitin software. For more details on the policies of academic penalties relating to academic honesty, please refer to the policies and procedures section below. Markers WILL NOT grade poorly organized or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams.

Late submissions

Late submissions or absences from tutorials and laboratories will not be accepted without prior arrangement. Extenuating circumstances will be considered upon lodgement of a formal notice of disruption of studies.

Grading and passing requirement for unit

For further details about grading, please refer below in the policies and procedures section.

Final Examinations

Final examinations will typically take place at the end of the semester. For further information, please refer to the Examination Timetable website on www.mq.edu.au.

Assignments

Due: **Week 5, Week 9, Week 12**

Weighting: **15%**

Three Assignments x 5 marks each based on learning outcome 1, 2, 3, and 4.

This Assessment Task relates to the following Learning Outcomes:

1. Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
2. Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
3. Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
4. Ability to analyse vibrations in mechanical components and mechanical design.

Midterm test

Due: **Week 9**

Weighting: **15%**

Midterm test will be held in week 9 during the lecture time.

This Assessment Task relates to the following Learning Outcomes:

1. Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
2. Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.

Lab reports

Due: **Week 4, Week 8, Week 13**

Weighting: **10%**

3 Laboratory Reports x 3 marks each to achieve learning outcome 1, 2, 3 and 4.

This Assessment Task relates to the following Learning Outcomes:

1. Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
2. Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
3. Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
4. Ability to analyse vibrations in mechanical components and mechanical design.

Lab Assessment

Due: **Week 2 to Week 13**

Weighting: **10%**

The Lab assessment is based on the participation and enthusiasm in performing practical experiments, and the student's performance during lab sessions.

Participation Engagement

Due: **Week 1 to Week 13**

Weighting: **10%**

Active engagement marks throughout the semester including simple problems that given every session to help in better understanding of the material taught in each session as well as preparing the students for the next session. In addition, there are volunteer homeworks given in each session to help the students in understanding of the practical applications of the taught materials.

Final Examination

Due: **During Exam Period**

Weighting: **40%**

Final examination to testify achievements of the desired learning outcomes.

This Assessment Task relates to the following Learning Outcomes:

1. Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
2. Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
3. Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
4. Ability to analyse vibrations in mechanical components and mechanical design.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignments	15%	No	Week 5, Week 9, Week 12
Midterm test	15%	No	week 9
Lab reports	10%	No	Week 2 to Week 13
Lab assessment	10%	No	Week 2 to Week 13
Participation Engagement	10%	No	Week 1 to Week 13
Final Examination	40%	No	During Exam Period

Assignments

Due: **Week 5, Week 9, Week 12**
Weighting: **15%**

There will be three assignments for this unit

On successful completion you will be able to:

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Midterm test

Due: **week 9**
Weighting: **15%**

2 hours close book exam.

Students can bring a formula sheet.

On successful completion you will be able to:

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Lab reports

Due: **Week 2 to Week 13**
Weighting: **10%**

Practical report

On successful completion you will be able to:

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Lab assessment

Due: **Week 2 to Week 13**
Weighting: **10%**

Practical evaluation

On successful completion you will be able to:

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that

knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Participation Engagement

Due: **Week 1 to Week 13**
Weighting: **10%**

- Maximum twelve exercises, 5%

- Two volunteer homework presentations, 5%

Each volunteer homework presentation is 3 to 5min PowerPoint presentation on a practical application of the course material which is presented during the session with one week notice.

On successful completion you will be able to:
- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Final Examination

Due: **During Exam Period**
Weighting: **40%**

3 hours close book exam.

Students can bring a formula sheet.

On successful completion you will be able to:
- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Delivery and Resources

Primary Text:

Ferdinand Beer et al., "Mechanics of Materials" McGraw-Hill, 7th edition.

J.L. Meriam L.G. Kraige, "Engineering Mechanics - Dynamics" John Wiley & Sons, Inc., 7th edition.

Supporting Text:

J.L. Meriam L.G. Kraige,"Engineering Mechanics - Statics" John Wiley & Sons, Inc., 7th edition.

R.C. Hibbeler, "Mechanics of Materials" Pearson, 9th edition.

R.C. Hibbeler and K.B. Yap, “Mechanics for Engineers: Dynamics”, 13th Edition

Technology used and required: All course related materials, lecture slides, tutorial problems, assignments will be posted in ilearn. Students are required to check ilearn on a regular basis.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Assessment tasks

- Lab assessment
- Participation Engagement

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Assessment task

- Lab assessment

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcome

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.

Assessment tasks

- Participation Engagement
- Final Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate

and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that knowledge in design of mechanical systems.
- Ability to analyse vibrations in mechanical components and mechanical design.

Assessment tasks

- Assignments
- Midterm test
- Lab reports
- Lab assessment
- Participation Engagement
- Final Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Demonstrate understanding of basic concepts relating to the strength of materials, and use that knowledge in design of mechanical components.
- Analyse stresses and deformations in mechanical structures and machines, as well as parameters that effect the strength of materials including fatigue, environmental conditions, and heat treatment processes.
- Analyse the motion in mechanical mechanisms and robotic systems, and employ that

knowledge in design of mechanical systems.

- Ability to analyse vibrations in mechanical components and mechanical design.

Assessment tasks

- Assignments
- Midterm test
- Lab assessment
- Participation Engagement
- Final Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Assessment tasks

- Assignments
- Lab reports

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Assessment task

- Lab reports