



MECH201

Engineering Dynamics

S2 Day 2015

Dept of Engineering

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	2
<u>General Assessment Information</u>	3
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	5
<u>Unit Schedule</u>	5
<u>Policies and Procedures</u>	6
<u>Graduate Capabilities</u>	7

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General Information

Unit convenor and teaching staff

Dr Nazmul Huda

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Contact via 02 9850 9598

E6B 108

Wednesday 11.00 - 12 / Friday 11.00 - 12.00 / Otherwise by prior appointment

Credit points

3

Prerequisites

(ENGG150(P) or ENGG170(P) or ELEC170(P)) and (MATH132 or MATH135(P)) and ((PHYS106 and PHYS107) or (PHYS140(P) and PHYS143(P)))

Corequisites

Co-badged status

Unit description

The unit examines Newton's laws in the context of engineering dynamics. The unit leads students to an understanding of Newton's laws as applied to the effect of force on solids in engineering. The unit initially examines the issues of work and energy, with a focus on impulse, momentum and impact. The unit assesses the roles of particle kinematics, particle kinetics, rigid body dynamics, plane kinematics and plane kinetics.

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:

Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications

Apply mathematical skills to solve engineering dynamics problems

Build problem solving skills for a range of real world engineering dynamics applications

Develop effective communication skills through written reports and group work activity

General Assessment Information

In order to pass the unit satisfactorily, the students need to fulfill the following criteria:

1. At least 50% marks overall
2. Must submit at least 2 assignments and 2 lab reports
3. Late submissions of any assignments and lab reports will not be marked.

The unit will be graded according to the Macquarie University Grading policy. The following grades will be used according to the listed numerical range:

HD	High Distinction	85-100
D	Distinction	75-84
Cr	Credit	65-74
P	Pass	50-64
F	Fail	0-49

Assessment Tasks

Name	Weighting	Due
<u>Assignments</u>	15%	Week 4, Week 8, Week 11
<u>Midterm test</u>	20%	Week 7 (09/09/2015)
<u>Laboratory reports</u>	15%	Week 5, Week 9, Week 13
<u>Final Examination</u>	50%	During Final Exam Period

Assignments

Due: **Week 4, Week 8, Week 11**

Weighting: **15%**

3 Assignments x 5 marks each

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications

- Develop effective communication skills through written reports and group work activity

Midterm test

Due: **Week 7 (09/09/2015)**

Weighting: **20%**

Mid-Semester Examination

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications

Laboratory reports

Due: **Week 5, Week 9, Week 13**

Weighting: **15%**

3 Laboratory Reports x 3 marks each

6 marks for active engagement in all the lab and tutorial sessions

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications
- Develop effective communication skills through written reports and group work activity

Final Examination

Due: **During Final Exam Period**

Weighting: **50%**

Final Examination

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications

Delivery and Resources

Primary Text: Vector Mechanics for Engineers: Dynamics - 10th Edition in SI Units by Beer, Johnston and Cornwell.

Supporting Text: Mechanics for Engineers: Dynamics - 13th Edition by R. C. Hibbeler and K. B. Yap

Unit Schedule

Week	Lecture Topic	Key topics to be covered	Tutorial/ Lab session	Assessments
1	Kinematics of Particles	Introduction and some unit related information, Position, Velocity and Acceleration of Rectilinear Motion	No Tutorial and lab	
2	Kinematics of Particles	Position, Velocity and Acceleration of Curvilinear Motion, Radial and Transverse Components in Curvilinear Motion	Tutorial only	
3	Kinematics of Particles: Newton's Second Law	Newton's 2nd Law of motion, Linear Momentum, Angular momentum, Equations of motion in terms of Radial and Transverse components, Newton's law of Gravitation.	Tutorial and lab session	
4	Kinetics of Particles: Energy and Momentum Methods	Principles of Work and Energy and Its applications, Power and Efficiency, Potential Energy, Conservation of Energy, Principles of Impulse and Momentum, Impact	Tutorial only	Assignment 1 due
5	Systems of Particles	Application of Newton's laws to the motion of a system of particles, Linear and Angular Momentum of a system of particles, Kinetic Energy of a system of particles, Work and energy principles of a system of particles	Tutorial Only	Report 1 due
6	Kinematics of Rigid Bodies	Equations defining the rotation of a rigid body, General Plane motion, Absolute and Relative velocity in Plane motion	Tutorial Only	
7	Midterm Test	Midterm Review of the Unit and Midterm Test	Lab session only	In class midterm test
8	Kinematics of Rigid Bodies	Absolute and relative acceleration in plane motion, Plane motion of particles relative to rotating frames, Coriolis Acceleration	Tutorial Only	Assignment 2 due
9	Plane Motion of Rigid Bodies: Forces and Accelerations	Equation of motion for a Rigid body, Angular momentum of a Rigid body, Systems of Rigid bodies, Solution of Problems Involving the motion of Rigid bodies	Tutorial Only	Report 2 due
10	Plane Motion of Rigid Bodies: Energy and Momentum Methods	Principles of Work and Energy for a Rigid body, Power, Principles of Impulse and Momentum for a Rigid body	Tutorial Only	

11	Kinetics of Rigid Bodies in Three Dimensions	Impulse and Momentum of Rigid body in Three Dimension, Kinetic Energy of Rigid Body in Three Dimension, Motion of a Gyroscope	Tutorial Only	Assignment 3 due
12	Mechanical Vibrations	Introduction to Vibration, Free vibrations of particles, Simple harmonic motion, Simple Pendulum, Free Vibration of Rigid bodies, Application of Principle of Conservation of Energy	Lab session only	
13	Mechanical Vibrations	Forced Vibration, Damped Free and Forced Vibrations, Application of Forced Vibration to Engineering problems. Review of the unit.	Tutorial Only	Report 3 due

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/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://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use 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

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications
- Develop effective communication skills through written reports and group work activity

Assessment tasks

- Assignments
- Laboratory reports

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement.

They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Assessment task

- Laboratory reports

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:

Learning outcomes

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
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Assessment tasks

- Assignments
- Midterm test
- Laboratory reports
- Final Examination

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 outcomes

- Develop an understanding of Newton's laws applied to the effect of force on solids in

engineering applications

- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications
- Develop effective communication skills through written reports and group work activity

Assessment tasks

- Assignments
- Midterm test
- Laboratory reports
- 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

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem solving skills for a range of real world engineering dynamics applications
- Develop effective communication skills through written reports and group work activity

Assessment tasks

- Assignments
- Midterm test
- Laboratory reports
- 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

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
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- Develop effective communication skills through written reports and group work activity

Assessment tasks

- Assignments
- Midterm test
- Laboratory reports
- 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:

Learning outcome

- Develop effective communication skills through written reports and group work activity

Assessment tasks

- Assignments
- Laboratory 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:

Learning outcome

- Develop effective communication skills through written reports and group work activity

Assessment task

- Laboratory reports