MECH201

Engineering Dynamics

S2 Day 2017

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
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Contact via 02 9850 9598
E6B 143
Tuesday 2.00 - 4.00

Credit points
3

Prerequisites
(ENGG150 or ENGG170 or ELEC170(P)) and (MATH133 or MATH136(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

Student Responsibilities

Be familiar with University policy and College procedures and act in accordance with those policies 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. The 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 one week before their submission date. Assignment solutions will be posted within 7 working days after the submission date. Submissions will not be accepted once the solution is posted.

Assignment submissions and plagiarism policies

All assignments and reports must be submitted electronically through iLearn (in pdf format) in the appropriate space provided for submissions in ilearn. Submissions will undergo plagiarism checkers using the turnitin software and any work deemed to have 30% or higher similarity score may incur an academic penalty. For more details on the policies of academic penalties relating to academic honesty, please refer to the policies and procedures section below. Submissions are expected to be either hand written or typed in a logical layout and sequence. 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 made at least one week before the submission date. 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 to the policies and procedures section. In order to pass the unit satisfactorily, the students need to fulfill the following criteria:

1. At least 50% marks overall

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

ASSESSMENT GRADES AND STATUS

GRADE	RANGE	STATUS ('Standard Grade' in AMIS)	DESCRIPTION
HD	85-100	Pass	Provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality, insight or creativity in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application as appropriate to the program.
D	75-84	Pass	Provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality or creativity in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the program and the audience.
CR	65-74	Pass	Provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; convincing argumentation with appropriate coherent justification; communication of ideas fluently and clearly in terms of the conventions of the program.
P	50-64	Pass	Provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the program; routine argumentation with acceptable justification; communication of information and ideas adequately in terms of the conventions of the program. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
F	0-49	Fail	Does not provide evidence of attainment of learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; missing, undeveloped, inappropriate or confusing argumentation; incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the program.

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

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignments	15%	No	Week 5, Week 9, Week 12
Midterm test	20%	No	14th September 2017
Lab reports	9%	No	Week 4, Week 8, Week 13
Participation Engagement	6%	No	Week 1 to Week 13
Final Examination	50%	No	During Exam Period

Assignments

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

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

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

Midterm test

Due: **14th September 2017**
Weighting: **20%**

Midterm test will be held in week 7 during the lecture time.

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

Lab reports

Due: **Week 4, Week 8, Week 13**
Weighting: **9%**

3 Laboratory Reports x 3 marks each to achieve learning outcome 4

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

Participation Engagement

Due: **Week 1 to Week 13**
Weighting: **6%**

Active engagement marks throughout the semester

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 Exam Period**
Weighting: **50%**

Final examination to testify achievements of the desired learning outcomes.

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

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.

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	Lab report 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	Assignment 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	Tutorial and lab session	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	Lab report 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	Assignment 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	
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	Tutorial and Lab session	Assignment 3 due
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

Practical schedule:

Practical Classes will be held in F9C 110 only in week 3, week 7 and week 12 during scheduled practical hours. Students are required to attend their registered practical classes during those three weeks in F9C 110.

Week	Name of the experiments	Report due

3	Centrifugal force measurement and verification	Week 4 (Friday)
7	Conservation of linear momentum	Week 8 (Friday)
12	Spring Mass vibration system	Week 13 (Friday)

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_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

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://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

- 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
- Lab reports
- Final Examination

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:

Learning outcome

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

Assessment tasks

- Lab reports
- 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:

Learning outcomes

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

- Assignments
- Midterm test
- Lab 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
- Lab reports
- Participation Engagement

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 tasks

- Assignments
- Participation Engagement

Changes in Response to Student Feedback

No specific change request was made by the students in previous offerings. Hence no specific change is made in the current offering as compared to any of the previous offerings.