MECH2001

Engineering Dynamics

Session 2, Special circumstance, North Ryde 2020

School of Engineering

Contents

Disclaimer

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Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and ot her small group learning activities on campus for the second half-year, while keeping an online ver sion available for those students unable to return or those who choose to continue their studies onli ne.

To check the availability of face-to-face and onlin e activities for your unit, please go to timetable vi ewer. To check detailed information on unit asses sments visit your unit's iLearn space or consult yo ur unit convenor.

General Information

Unit convenor and teaching staff
Dr Nazmul Huda
nazmul.huda@mq.edu.au
Contact via +61-2-9850-2249
44 Waterloo Road, Room 118
Consultation time: 1.00 - 3.00 pm Monday

Credit points
10

Prerequisites
(MECH1001 or ENGG150 or ENGG1050) and (MATH1020 or MATH1025 or MATH136 or MATH133)

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:

ULO1: Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications

ULO2: Apply mathematical skills to solve engineering dynamics problems

ULO3: Build problem-solving skills for a range of real-world engineering dynamics applications

ULO4: 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 a week 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). Submissions will undergo plagiarism checkers using the turnitin software and any work deemed to have 30% or higher similarity score may incur 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 typed set 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 of the assessment tasks 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 in the policies and procedures section.

In order to pass this unit, a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

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
Final Exam	40%	No	During Final Examination Period
Lab report	18%	No	Week 5, Week 8, Week 13
Practice-based task on weekly tutorials	22%	No	From Week 3 to Week 13
Assignments	20%	No	Week 7 and Week 12

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 35 hours
Due: **During Final Examination Period**
Weighting: **40%**

Final Examination to be conducted at the end of 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

Lab report

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 19 hours
Due: **Week 5, Week 8, Week 13**
Weighting: **18%**

Lab report for each laboratory-based activity on week 4, 7 and 12

On successful completion you will be able to:

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

Practice-based task on weekly tutorials

Assessment Type [1]: Participatory task
Indicative Time on Task [2]: 15 hours
Due: **From Week 3 to Week 13**
Weighting: **22%**

Practice-based task on weekly tutorials

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

Assignments

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 20 hours
Due: **Week 7 and Week 12**
Weighting: **20%**

Two assignments on problem-solving activity, 10% 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

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment

- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

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 only	
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 and lab session	
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	Lab 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	Tutorial and lab session	Assignment 1 due
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	
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 2 due
13	Mechanical Vibrations	Forced Vibration, Damped Free and Forced Vibrations, Application of Forced Vibration to Engineering problems. Review of the unit.	Tutorial Only	Lab Report 3 due

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.)*

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 published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

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

If you are a Global MBA student contact globalmba.support@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.