UNSW Course Outline

ZEIT2700 Mechanics of Machines - 2024

Published on the 04 Jul 2024

General Course Information

Course Code : ZEIT2700
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Engineering and Technology
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course combines concepts learned in Statics and Dynamics in the context of mechanisms analysis and design. The students learn about the different types of links and joints that make up mechanisms. In the kinematics (how things move) part of the course, mechanisms are analysed

using loop equations. In the kinetics (how forces interact) part of the course, the static and dynamic forces are analysed using the superposition method. Special cases of balancing of rotating masses and the design of cams are also covered.

Course Aims

The aim of the course is to develop skills in:
The analysis of kinematics and kinetics of mechanisms
Analysis of mechanisms using Matlab Simulink
Inertia and external loads
Balancing of rotating and reciprocating masses, whirling of shafts, rotor dynamics
Cam design
Linear systems (gears).

Relationship to Other Courses

Prerequisites: Assumed knowledge from ZEIT1503

The Statics and Dynamics knowledge required in this course comes fom ZEIT1503 along with the level of Calculus required.

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Identify and classify the joints and links in a mechanism.	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline
CLO2 : Construct a vector loop equation representing a mechanism and determine position, velocity and accelerations of any point on the mechanism using analytical and graphical methods.	• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline
CLO3 : Calculate static and dynamic forces in a mechanism using analytical and graphical methods.	• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources
CLO4 : Use Matlab at a basic level to solve position, velocity, acceleration and force equations.	• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline
CLO5 : Present the results in a concise manner which demonstrates the quality of the solution	• PEE3.2 : Effective oral and written communication in professional and lay domains

Course Learning Outcomes	Assessment Item
CLO1 : Identify and classify the joints and links in a mechanism.	• Bi-weekly Class Quizzes (closed book) • Class Test • Final Exam
CLO2 : Construct a vector loop equation representing a mechanism and determine position, velocity and accelerations of any point on the mechanism using analytical and graphical methods.	• Bi-weekly Class Quizzes (closed book) • Class Test • Final Exam
CLO3 : Calculate static and dynamic forces in a mechanism using analytical and graphical methods.	• Lab Report • Bi-weekly Class Quizzes (closed book) • Final Exam
CLO4 : Use Matlab at a basic level to solve position, velocity, acceleration and force equations.	• Lab Report
CLO5 : Present the results in a concise manner which demonstrates the quality of the solution	• Lab Report • Class Test • Bi-weekly Class Quizzes (closed book) • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

The teaching of this course will comprise of lectures and tutorials. Students are expected to attend the weekly the tutorial sessions. There will be bi-weekly quizzes, a lab report and a closed book class test mid-session, and a closed book final exam.

The Learning Management System

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:

» Google Chrome 50+
» Safari 10+
** Internet Explorer is not recommended

** Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

Windows 7, 10, Mac OSX Sierra, iPad IOS10

For further details about system requirements click here.

Log in to Moodle here.

If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For all other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au
Phone: (02) 9385-3331
International: +61 2 938 53331

Opening hours:
Monday – Friday 7:30am – 9:30 pm
Saturday & Sunday 8:30 am – 4:30pm

Other Professional Outcomes

This course contributes to the following Program Learning Outcomes of the Bachelor of Engineering (Hons) (Mechanical Engineering)

PLO1: Students will be able to relate a quantitative, theory-based understanding of the sciences and engineering fundamentals of mechanical engineering (encompassing design, manufacture, kinematic, aerodynamic, thermal, and structural analysis, and instrumentation and control of mechanical systems).

PLO2: Students will be able to appropriately select and apply the mathematical, statistical, programming and computational tools, and techniques which underpin mechanical engineering.

PLO3: Students will demonstrate a comprehensive understanding of mechanical systems and sub-systems, and articulate directions of future research and knowledge development in mechanical engineering.

PLO4: Students will synthesise engineering design practice, contextual factors, norms and accountabilities in and the limitations on mechanical engineering.

PLO5: Students will define, conduct experiments on and analyse complex, open-ended problems and apply appropriate methods for their solution.

PLO6: Students will demonstrate proficiency in applying systematic engineering synthesis and design processes, and critically evaluating and effectively communicating the results and implications to all audiences.

PLO8: Students will demonstrate independence, creativity and ethical conduct, and explain the importance of user-focused and sustainable solutions.

Additional Course Information

Academic Integrity and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Plagiarism undermines academic integrity and is not tolerated at UNSW. *It is defined as using the words or ideas of others and passing them off as your own, and* can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

Study at UNSW Canberra

https://www.unsw.adfa.edu.au/study

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

Referencing

In this course, students are required to reference following the APA 7 referencing style.

Information about referencing styles is available at: https://guides.lib.unsw.adfa.edu.au/c.php?g=472948&p=3246720

CRICOS Provider no. 00098G

The University of New South Wales Canberra.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Engineers Australia - Professional Engineer (Stage 1)
Tutorial Attendance (Pro Rata) Assessment Format: Individual	5%	Start Date: Not Applicable Due Date: Not Applicable	• PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.6 : Effective team membership and team leadership • PEE3.2 : Effective oral and written communication in professional and lay domains
Bi-weekly Class Quizzes (closed book) Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Not Applicable	• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE3.2 : Effective oral and written communication in professional and lay domains
Lab Report Assessment Format: Group	15%	Start Date: 02/10/2024 10:00 AM Due Date: 04/10/2024 11:59 PM	• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE3.6 : Effective team membership and team leadership • PEE3.2 : Effective oral and written communication in professional and lay domains
Class Test Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Week 6: 19 August - 23 August	• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and

			computer and information sciences which underpin the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.2 : Effective oral and written communication in professional and lay domains
Final Exam Assessment Format: Individual	40%	Start Date: Exam week Due Date: Not Applicable	• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.2 : Effective oral and written communication in professional and lay domains

Assessment Details

Tutorial Attendance (Pro Rata)

Assessment Overview

n/a

Detailed Assessment Description

Tutorials attendence will be monitored with an attendance sheet.

Assessment Length

2 hours wekly

Assessment information

Weekly coverage of example questions with student participation. The students are expected to collaborate with each other in solving tutorial questions and to present their work during the tutorial.

Assignment submission Turnitin type

Not Applicable

Bi-weekly Class Quizzes (closed book)

Assessment Overview

Bi-weekly

Course Learning Outcomes

- CLO1 : Identify and classify the joints and links in a mechanism.
- CLO2 : Construct a vector loop equation representing a mechanism and determine position, velocity and accelerations of any point on the mechanism using analytical and graphical methods.
- CLO3 : Calculate static and dynamic forces in a mechanism using analytical and graphical methods.
- CLO5 : Present the results in a concise manner which demonstrates the quality of the solution

Detailed Assessment Description

Bi-weekly quizzes covering the lecture material up to the previous week will be held during the weekly lab sessions on Wednesdays, starting from week 2 (Wednesday 24/07/2024). There will be 7 quizzes and the best 6 will be counted. Therefore, each quiz will be worth 3.33% of the total grade.

Assessment Length

20 mins weekly

Assignment submission Turnitin type

Not Applicable

Lab Report

Assessment Overview

n/a

Course Learning Outcomes

- CLO3 : Calculate static and dynamic forces in a mechanism using analytical and graphical methods.
- CLO4 : Use Matlab at a basic level to solve position, velocity, acceleration and force equations.
- CLO5 : Present the results in a concise manner which demonstrates the quality of the solution

Detailed Assessment Description

Group report expected to be submitted after a lab experiment on the 2nd of October 2024, due

on the following Friday midnight.

Assessment Length

3 hours

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Class Test

Assessment Overview

Closed Book

Course Learning Outcomes

- CLO1 : Identify and classify the joints and links in a mechanism.
- CLO2 : Construct a vector loop equation representing a mechanism and determine position, velocity and accelerations of any point on the mechanism using analytical and graphical methods.
- CLO5 : Present the results in a concise manner which demonstrates the quality of the solution

Detailed Assessment Description

This closed book mid-term class test will include all topics covered so far. It will be an indication of what to expect in the final exam.

The class test will be held on the last Friday before semester break (23 August 2024).

Assessment Length

2 Hours

Assignment submission Turnitin type

Not Applicable

Final Exam

Assessment Overview

Closed Book

Course Learning Outcomes

- CLO1 : Identify and classify the joints and links in a mechanism.
- CLO2 : Construct a vector loop equation representing a mechanism and determine position,

velocity and accelerations of any point on the mechanism using analytical and graphical methods.
- CLO3 : Calculate static and dynamic forces in a mechanism using analytical and graphical methods.
- CLO5 : Present the results in a concise manner which demonstrates the quality of the solution

Detailed Assessment Description

The final exam will include all the material covered during the semester with more weight towards the later topics covered after the class test.

Assessment Length

3 hours

Assignment submission Turnitin type

Not Applicable

General Assessment Information

A class quiz will be held in week 2, grades and worked solutions will be given to students by week 3.

Late submission of assessment

Unless prior arrangement is made with the lecturer or a formal application for special consideration is submitted, a penalty of 5% of the total available mark for the assessment will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which an assessment can no longer be submitted and a grade of 0 will be applied.

Use of Generative AI

It is prohibited to use any software or service to search for or generate information or answers. If its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Requirements to pass course

50% of overall assessments.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	• Diagnostics Test • Maths revision (chain rule, vectors, complex numbers) • Degree of freedom of space
Week 2 : 22 July - 26 July	Lecture	• Degrees of freedom of mechanisms • Classification of a mechanisms
Week 3 : 29 July - 2 August	Lecture	• Kinematics of a particle • Kinematics of a rigid body in plane
Week 4 : 5 August - 9 August	Lecture	• Simple gear trains • Planetary gear trains
Week 5 : 12 August - 16 August	Lecture	• Complex solution • Four-Link Mechanisms
Week 6 : 19 August - 23 August	Lecture	• Velocity Analysis of mechanisms • Graphical Solution
	Assessment	Class test, closed book, 2 hours.
Week 7 : 9 September - 13 September	Lecture	• Centre of Zero Velocity • Graphical Solution
Week 8 : 16 September - 20 September	Lecture	• Static force analysis • Graphical Solution
Week 9 : 23 September - 27 September	Lecture	• Dynamic force analysis • Graphical Solution
Week 10 : 30 September - 4 October	Lecture	• Dynamic force analysis (cont.) • Matlab solution
	Laboratory	Lawnmower engine laboratory. A group report is due on Friday, midnight.
Week 11 : 7 October - 11 October	Lecture	• Balancing of rotating shafts (AZ)
Week 12 : 14 October - 18 October	Lecture	• Cam design (AZ)
	Assessment	Class test 2
Week 13 : 21 October - 25 October	Lecture	• Revision.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

Lectures:

Monday: 16.10 - 18.00, LTS01

Tuesday: 16.10 - 18.00, LTS05

Labs/quizzes:

Friday: 14.10 - 16.00, Z-21-241

Tutorials:

Wednesday: 10.00 - 11.50, Z-21-241

Missed classes:

- Friday 16/8/2024 Military Training Day.
  Compensation Day: Friday 16 August classes to be delivered on Tuesday 13 August. Tuesday 13 August lost.
- Wednesday 18/9/2024 Military Training Day. Wednesday lost.
- Monday 07/10/2024 Labour Day. Monday lost.
- Thursday 10/10/2024 Military Training Day. Thursday lost.
- Friday 11/10/2024 Military Training Day. Friday lost.

Course Resources

Prescribed Resources

Prescribed text:

- **Robert L. Norton,** Design of Machinery, 6th Edition, McGrawHill

It is highligh recommended that the students acquire this book, as tutorial and quiz questions will be referred.

Recommended Resources

Lecture notes, textbook and any online tutorial of interest.

Additional Costs

N/A

Course Evaluation and Development

We constantly feed back in previous year's comments where appropriate. This year, we are bringing back the bi-weekly quizzes and will be including an engine laboratory.

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the “On-going Student Feedback” link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct Policy

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Murat Tahtali		Bld17-R204	02 5114 5210	Appointment by Teams	No	Yes
Lecturer	Aleksandr Zinoviev				Appointment by Teams	No	No