MECH3004

Applied Numerical Engineering

Session 2, Special circumstance 2020

School of Engineering

Contents

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
Lecturer
Fatemeh Salehi
fatemeh.salehi@mq.edu.au
Contact via email
Room 121, 44 Waterloo Rd
Tuesday 1-3 pm

Credit points
10

Prerequisites
(MECH202 or MECH2002) and (MECH204 or MECH2004) and (COMP115 or COMP1000)

Corequisites

Co-badged status

Unit description
This unit examines the applications of mathematical equations commonly used in engineering practices, such as computational fluid dynamics (CFD) and finite element analysis (FEA). This unit covers a broad range of topics, such as numerical differentiation and integration of differential equations, and partial differential equations. At the end of the unit, students are expected to be proficient with the procedures and in-depth concepts required to solve problems using CFD.

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: Apply advanced mathematical and numerical theories in the discipline of numerical simulations to solve real-world engineering problems.

ULO2: Analyse and produce innovative design solutions with a clear demonstration of critical thinking abilities using computational techniques

ULO3: Demonstrate competencies in the used of CFD tools fundamental to the discipline of computational modelling

ULO4: Develop effective communication skills through written reports and group work activity

General Assessment Information

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.

Assignment Tasks

Assignment Problems will be posted on iLearn at least two weeks before their submission date. Assignment solutions will be demonstrated by the tutor within a week after the submission date in the tutorial class. Submissions will not be accepted once the solution is given.

All assignments must be submitted electronically through iLearn (in pdf format). Submissions are expected to be typed set in a logical layout and sequence. Markers WILL NOT grade poorly organised or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams.

In the event that an assessment task is submitted late, the following penalties will apply; 0 to 24 hours -25%, 24 hours to 48 hours -50%, greater than 48 hours will result in no mark being awarded.

Special Consideration

If you experience events or conditions that adversely affect your academic performance and you require an extension to complete the assessment tasks, you should apply for "Special Consideration". More information can be found here

Grading and passing requirement for unit

In order to pass this unit, a student must obtain a mark of 50 or more for the unit. For further details about grading, please refer below in the policies and procedures section.

Supplementary Final Exam

If you receive special consideration for the final exam, a supplementary exam will be scheduled by the faculty during a supplementary exam period, typically about 3 to 4 weeks after the normal exam period. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Midterm and Final Exams

Due to the COVID-19, both midterm and final exams will be likely online. More information if

there will be open- or closed-book exams will be provided on iLearn.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment I	20%	No	Week 7
Assignment II	25%	No	Week 13
Participation and Management	5%	No	Week 1-13
Mid-session Exam	10%	No	Week 7 Note: It may change to a closed-book exam
Final exam	40%	No	TBA Note: It may change to a closed-book exam

Assignment I

Assessment Type [1]: Project
Indicative Time on Task [2]: 15 hours
Due: **Week 7**
Weighting: **20%**

The assignment requires the student to perform numerical simulations for an engineering problem using Matlab, analyse the results and submit a technical report on the results.

On successful completion you will be able to:

- Apply advanced mathematical and numerical theories in the discipline of numerical simulations to solve real-world engineering problems.
- Analyse and produce innovative design solutions with a clear demonstration of critical thinking abilities using computational techniques
- Develop effective communication skills through written reports and group work activity

Assignment II

Assessment Type [1]: Project
Indicative Time on Task [2]: 25 hours
Due: **Week 13**
Weighting: **25%**

The assignment requires the student to perform CFD simulations for a complex fluid mechanics engineering problem with relevant software, analyse the results and submit a technical report on the results.

On successful completion you will be able to:

- Apply advanced mathematical and numerical theories in the discipline of numerical simulations to solve real-world engineering problems.
- Analyse and produce innovative design solutions with a clear demonstration of critical thinking abilities using computational techniques
- Demonstrate competencies in the used of CFD tools fundamental to the discipline of computational modelling
- Develop effective communication skills through written reports and group work activity

Participation and Management

Assessment Type [1]: Demonstration
Indicative Time on Task [2]: 5 hours
Due: **Week 1-13**
Weighting: **5%**

Participation in tutorial sessions counts toward this mark. Grading will take into consideration level of participation as evidenced by attendance and demeanor in the classes. High marks will be awarded for initiative, approach to self-learning and self management. Students are expected to participate in the learning activities with a developing level of independence as well as team work.

On successful completion you will be able to:

- Demonstrate competencies in the used of CFD tools fundamental to the discipline of computational modelling
- Develop effective communication skills through written reports and group work activity

Mid-session Exam

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 10 hours
Due: **Week 7 Note: It may change to a closed-book exam**
Weighting: **10%**

This is an open-book online exam.

On successful completion you will be able to:

- Apply advanced mathematical and numerical theories in the discipline of numerical simulations to solve real-world engineering problems.
- Analyse and produce innovative design solutions with a clear demonstration of critical thinking abilities using computational techniques
- Demonstrate competencies in the used of CFD tools fundamental to the discipline of computational modelling

Final exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **TBA Note: It may change to a closed-book exam**
Weighting: **40%**

This is an open-book online exam.

On successful completion you will be able to:

- Apply advanced mathematical and numerical theories in the discipline of numerical simulations to solve real-world engineering problems.
- Analyse and produce innovative design solutions with a clear demonstration of critical thinking abilities using computational techniques
- Demonstrate competencies in the used of CFD tools fundamental to the discipline of computational modelling

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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

There is no single core text for this course. However, the following texts are recommended:

1- "Applied Numerical Methods for Engineers and Scientists" by Singiresu S. Rao

2- "Computational Fluid Dynamics- A Practical Approach by Jiyuan Tu, Guan Heng Yeoh and Chaoqun Liu

3- "Computational Methods for Fluid Dynamics" by Joel H. Ferziger, Milovan Perić, Robert L. Street

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

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.

Changes from Previous Offering

"Changes in Response to Student Feedback"

(1) The topics on finite element method (FEM) and computational fluid dynamic (CFD) are significantly extended to provide essential knowledge to solve real-world engineering problems

using numerical simulations.

(2) A new CFD assignment is included to help students develop skills in creating CFD models. Students will also be trained to interpret and communicate CFD results to stakeholders.

Changes since First Published

Date	Description
27/ 07/ 2020	Hi, One of the tutors for this unit has changed. I removed tutors' information to avoid any confusion. Their contact details will be given in iLearn.