National Centre for Maritime Engineering & Hydrodynamics

Australian Maritime College

JEE104
MATHEMATICS II

Semester 2, 2020
Unit Outline

Dr Christopher Chin
CONTACT DETAILS

Unit coordinator

Unit coordinator: Dr Christopher Chin
Campus: Newnham
Email: c.chin@utas.edu.au
Phone: 03 6324 9441
Room location and number: Swanson Building, G62
Consultation hours: via appointment

Other teaching staff

Tutor: Dr Nigel Minchin
Campus: Devonport
Email: nigelminchin@gmail.com
CONTENTS

WHAT IS THE UNIT ABOUT? 2
UNIT DESCRIPTION 2
INTENDED LEARNING OUTCOMES 2
GRADUATE STATEMENT 3
ALTERATIONS TO THE UNIT AS A RESULT OF STUDENT FEEDBACK 3
PRIOR KNOWLEDGE &/OR SKILLS 3
HOW WILL I BE ASSESSED? 4
ASSESSMENT SCHEDULE 4
ASSESSMENT DETAILS 4
HOW YOUR FINAL RESULT IS DETERMINED 6
SUBMISSION OF ASSIGNMENTS 6
ACADEMIC INTEGRITY 7
WHAT LEARNING OPPORTUNITIES ARE THERE? 9
MyLO 9
RESOURCES 9
ACTIVITIES 10
UNIT SCHEDULE 11
COMMUNICATION 13
CONCERNS AND COMPLAINTS 13
LEARNING SUPPORT 13
FURTHER INFORMATION AND ASSISTANCE 13
WHAT IS THE UNIT ABOUT?

Unit description

This first year mathematics unit builds on the fundamentals learnt in Mathematics I and provides students of science and engineering an introduction to those areas of mathematics which are most important in connection with practical problems. We will initiate the themes of mathematical modelling beginning with direct applications of theory and methods (complex numbers, matrices, differential equations, series and probability and statistics). You will develop numerical techniques where appropriate and use modern mathematical software packages such as MAPLE to investigate less tractable problems in calculus, linear algebra and modelling. This unit lays a solid foundation for more advanced mathematics undertaken in higher years.

Intended Learning Outcomes

On completion of this unit, you will be able to:

1. Explain the algebra and geometry of complex numbers and carry out calculations involving complex numbers in polar and exponential form.
2. Use matrix algebra, especially in solving systems of linear equations and calculating eigenvalues and eigenvectors.
3. Solve first order differential equations and second order linear differential equations and see how they can be applied to modelling of simple physical phenomena.
4. Explain the basic properties of sequences and series, and the role of series in the estimation of functions and the calculation of Taylor series.
5. Apply probability distributions, statistical tests and confidence intervals for designing and analysing experimental data. Understand statistical methodology and apply it to the solution of science and engineering problems.
Graduate Statement

Successful completion of this unit supports your development of course learning outcomes, which describe what a graduate of a course knows, understands and is able to do. Course learning outcomes are published in the Bachelor of Engineering (Specialisation) with Honours Course Rules. This document is available at http://www.amc.edu.au/ncmeh-course-information.

Course learning outcomes are developed with reference to national discipline standards, Australian Qualifications Framework (AQF), any professional accreditation requirements and the University of Tasmania’s Graduate Statement.

The University of Tasmania experience unlocks the potential of individuals. Our graduates are equipped and inspired to shape and respond to the opportunities and challenges of the future as accomplished communicators, highly regarded professionals and culturally competent citizens in local, national, and global society. University of Tasmania graduates acquire subject and multidisciplinary knowledge and skills, and develop critical and creative literacies and numeracies and skills of inquiry. They demonstrate the ability to apply this knowledge in changing circumstances. Our graduates recognise and critically evaluate issues of social responsibility, ethical conduct and sustainability, are entrepreneurial and creative, and are mindful of their own wellbeing and that of the community. Through respect for diversity and by working in collaborative ways, our graduates reflect the values of the University of Tasmania.

Alterations to the unit as a result of student feedback

None

Prior knowledge &/or skills

1. Basic skills in algebra: expansion, factorisation and division of polynomials, algebraic manipulation of rational functions, index and logarithmic laws;

2. Trigonometry: angular measurements, trigonometric ratios, identities, functions and their graphs;

3. Knowledge of basic concepts in differential and integral calculus;

4. Basic skills in vectors;

5. Written communication skills in presenting a mathematical idea (eg. a solution to a mathematical problem) as a logical sequence of reasoning.
HOW WILL I BE ASSESSED?

Assessment schedule

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>Date due</th>
<th>Percent weighting</th>
<th>Links to Intended Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment Task 1: Class Test</td>
<td>Week 8</td>
<td>10%</td>
<td>1, 2 and 3</td>
</tr>
<tr>
<td>Assessment Task 2: Tutorials</td>
<td>As scheduled</td>
<td>30%</td>
<td>ALL</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Exam period</td>
<td>60%</td>
<td>ALL</td>
</tr>
</tbody>
</table>

IMPORTANT NOTE: due to the ongoing changes in restrictions brought about by COVID-19, please be aware that the assessment tasks and requirements for this unit may change. Students will be notified in writing at the earliest opportunity should changes be necessary; please check your emails and/or the MyLO site regularly.

Assessment details

Assessment task 1

<table>
<thead>
<tr>
<th>Task description</th>
<th>Criterion</th>
<th>Measures Intended Learning Outcome:</th>
</tr>
</thead>
<tbody>
<tr>
<td>One open book class test is scheduled throughout the semester. This is assessed individually. The open book class test will cover at least half of the material covered during the semester. Students are to submit the class test at the end of the allocated time for assessment. The completed class test will be returned as soon as they are graded. The primary emphasis will be based on the ability to understand problem identification, formulation and solution.</td>
<td>Although correct answers are important, clear communication of what you did and how you did it is equally important. Our interest lies in the path you took to arrive at the answer, which means that we want to see your working in its entirety. Your working • shows your ability to read a question and percolate out of it the relevant information and formulae, • is a reflection of your thought processes and strategy, and • shows your mathematical skill and your grasp of mathematical syntax and grammar.</td>
<td>1, 2 and 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task length</th>
<th>Due date</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBC</td>
<td>Wednesday 9 September 2020</td>
</tr>
</tbody>
</table>
### Assessment task 2

#### Task description
Ten tutorials are scheduled throughout the semester. Each of these tutorials are designed to address the learning outcomes, starting with the basic skills that students must first acquire through online lectures and out-of-class practice in order to be competent to solve more complicated problems in the later stage of the unit. Although correct answers are important, clear communication of what you did and how you did it is equally important.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Measures Intended Learning Outcome:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ten tutorial grades will be considered in the final assessment (each of the 10 tutorial marks contributes 3% towards the final assessment). This is assessed individually. Students are expected to submit their tutorials via MyLO on Wednesdays by 12 noon for assessment. The completed tutorials will be graded and then returned as soon as possible. Students who miss a tutorial class may be allowed late submission by arrangement with their lecturer, provided they can provide a valid medical certificate or justification for the lateness.</td>
<td>ALL</td>
</tr>
</tbody>
</table>

#### Task length
50 minutes per tutorial

#### Due date
Wednesdays 12 noon

### Final Exam

#### Description / conditions
Students are responsible for material from lectures and tutorials. A 3-hour closed book exam will cover all aspects of the unit. This is assessed individually. The exam is designed to address all the learning outcomes.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Measures Intended Learning Outcome:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Although correct answers are important, clear communication of what you did and how you did it is equally important. Our interest lies in the path you took to arrive at the answer, which means that we want to see your working in its entirety. Your working • shows your ability to read a question and percolate out of it the relevant information and formulae, • is a reflection of your thought processes and strategy, and • shows your mathematical skill and your grasp of mathematical syntax and grammar.</td>
<td>ALL</td>
</tr>
</tbody>
</table>

#### Duration
3 hours

#### Date
The final exam is conducted by the Student Centre in the formal examination period. See the Examinations and Results page on the University’s website, or access your personal exams timetable by logging into the eStudent Centre - Personal Exams Timetable for specific date, time and location closer to the examination period.
How your final result is determined

Your final result in this unit is determined according to Academic Senate Rule 6 – Admission, Assessment and Student Progress and the College of Sciences and Engineering Procedure for Processing of Results.

To achieve a full pass in this unit, you must meet all the following:

1. Attain all the Intended Learning Outcomes.
2. Achieve an overall mark of 50%.
3. Your mark for your examination must be at or above 35%.

You will Fail (NN) the unit if your overall mark is less than 40%.

Submission of assignments

All assignments, reports, etc. must be completed using the template provided on the AMC website, unless otherwise specified by the lecturer. All coursework must have the AMC-NCMEH Assignment Cover Sheet attached which can be downloaded here: http://amc.edu.au/ncmeh-course-information

All assignments and reports must be typed and completed using Word, Excel, approved Engineering drawing software and include the relevant theory, illustrations, results, analysis, and conclusion.

Group reports must be signed by all participants.

Assignments and reports must be placed in the lecturer’s assignment box by the due dates (ground floor in the Swanson Building).

Electronic submissions are not acceptable (unless otherwise instructed by the lecturer). The assessed work will be returned during lecture or as agreed between the students and the lecturer.

Please remember that you are responsible for lodging your coursework on or before the due date. We strongly recommend that you keep a copy; even in the most ‘perfect’ of systems, items sometimes go astray.

Requests for extensions

Extensions will only be granted on medical or compassionate grounds. Requests for extensions should be made via email to the lecturer prior to the due date. Medical certificates or other evidence must be included (electronically or the hard copy mailed) and must contain information which justifies the extension sought.

Penalties

Non-attendance or non-participation of any of the scheduled tutorial sessions and class test will result in a zero mark for that assessment.
Failure to adhere with the WH&S standards whilst taking part in any assessed activity that involves field trips and/or that requires the use of UTAS or AMC facilities will result in the following penalties:

- **first offense**: 5% penalty (applicable to the whole team in team projects);
- **second offense by student (or another member of the same team in team projects)**: 20% penalty (applicable to the whole team in team projects); and
- **third offense**: a fail grade in the assessment.

**Review of results and appeals**

If you have questions about, or problems with, your assessment you should discuss this with the following people:

(1) The person who marked the assessment.

(2) Unit Coordinator.

(3) Course Coordinator.

(4) Director, NCMEH.

If this does not resolve the issue, you may file a formal review of assessment. The procedure is given at: [http://www.utas.edu.au/exams/results](http://www.utas.edu.au/exams/results)

**Academic integrity**

**What is academic integrity?**

The University community is committed to upholding the Statement on Academic Integrity. A breach of academic integrity is defined as being when a student:

a) fails to meet the expectations of academic integrity; or
b) seeks to gain, for themselves or for any other person, any academic advantage or advancement to which they or that other person is not entitled; or

- improperly disadvantages any other member of the University community.

Breaches of academic integrity such as plagiarism, contract cheating, collusion and so on are counter to the fundamental values of the University and can result in a range of penalties. These penalties are outlined in Ordinance 9: Student Academic Integrity.

More information is available from the [Academic Integrity for Students webpage](http://www.utas.edu.au/exams/results).

The University and any persons authorised by the University may submit your assessable works to a text matching service, to obtain a report on possible instances of plagiarism or contract cheating.
**Academic Integrity Training Module**

As part of the University’s educative approach to academic integrity, there is a short Academic Integrity Training Module that all students are required to complete.

Completion of the module allows you to demonstrate your understanding of what constitutes academic misconduct.

The Academic Integrity Training Module is available for all students through MyLO.

If you do not complete this module your final unit results will be withheld.

You should aim to complete the module within the first few weeks of commencing study at the University.

**Academic referencing**

In your written work you will need to support your ideas by referring to scholarly literature, works of art and/or inventions. It is important that you understand how to correctly refer to the work of others and maintain academic integrity.

Failure to appropriately acknowledge the ideas of others constitutes a breach of academic integrity, a matter considered by the University of Tasmania as a serious offence.

The appropriate referencing style for this unit is APA.

The University library provides information on presentation of assignments, including referencing styles and should be referred to when completing tasks in this unit.

For further information, see the Academic Integrity for Students webpage.
WHAT LEARNING OPPORTUNITIES ARE THERE?

MyLO

MyLO is the online learning environment at the University of Tasmania. This is the system that will host the online learning materials and activities for this unit.

Lecture notes, tutorials, online quizzes, assessments, past exam papers, selected solutions and lecture recordings can be downloaded via MyLO. News and announcements may be posted to MyLO News and students are expected to be aware of the content of such posts within 48 hours of them being posted.

Getting help with MyLO

It is important that you are able to access and use MyLO as part of your study in this unit. To find out more about the features and functions of MyLO, and to practice using them, visit the Getting Started in MyLO unit.

For access to information about MyLO and a range of step-by-step guides in pdf, word and video format, visit the MyLO Student Support page on the University website.

If something is not working as it should, contact the Service Desk (Service.Desk@utas.edu.au, phone 6226 1818), or Request IT Help Online.

Resources

Required readings

You may need the following text:


It is important that you have ongoing access to these required readings, so they may be available for a limited loan period from the University of Tasmania Library collection. You are, however, strongly encouraged to buy these texts as they may be useful resources throughout your study.

Recommended readings


MAPLE 2018 Student Edition.

*These materials may be useful to your developing knowledge and understanding of the content in this unit, but you are not required to purchase them. When seeking sources of evidence to support your assignment work, you may find these a useful starting point. These materials may be available for a limited loan period from the University Library collection.*

**Equipment, materials, software, accounts**

*MATERIALS TO BE PROVIDED BY THE STUDENT*

- A non-programmable scientific calculator (Casio fx-82AU PLUS II) is required at all times.

*Extra costs*


**Activities**

*Learning expectations*

The University is committed to high standards of professional conduct in all activities, and holds its commitment and responsibilities to its students as being of paramount importance. Likewise, it holds expectations about the responsibilities students have as they pursue their studies within the special environment the University offers.

**Students are expected to participate actively and positively in the teaching/learning environment. They must attend classes when and as required, strive to maintain steady progress within the subject or unit framework, comply with workload expectations, and submit required work on time.**

**Details of teaching arrangements**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>DAY</th>
<th>TIME</th>
<th>LOCATION</th>
<th>GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Classes</td>
<td>Wednesday</td>
<td>1PM – 2:50PM</td>
<td>MyLO – Web Conferencing</td>
<td>ALL</td>
</tr>
</tbody>
</table>
## Unit Schedule

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DATE BEGINNING</th>
<th>TOPIC</th>
<th>ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13 July</td>
<td>Complex Numbers</td>
<td>No tutorials this week</td>
</tr>
<tr>
<td>2</td>
<td>20 July</td>
<td>Complex Numbers</td>
<td>No tutorials this week</td>
</tr>
<tr>
<td>3</td>
<td>27 July</td>
<td>Linear Algebra</td>
<td>Calculus Tutorial 1 Complex Numbers</td>
</tr>
<tr>
<td>4</td>
<td>3 August</td>
<td>Linear Algebra</td>
<td>Calculus Tutorial 2 Complex Numbers</td>
</tr>
<tr>
<td>5</td>
<td>10 August</td>
<td>Differential Equations</td>
<td>Calculus Tutorial 3 Linear Algebra</td>
</tr>
<tr>
<td></td>
<td>(Census Date: 10 August 2020)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>17 August</td>
<td>Differential Equations</td>
<td>Calculus Tutorial 4 Linear Algebra</td>
</tr>
<tr>
<td>7</td>
<td>24 August</td>
<td>Series</td>
<td>Calculus Tutorial 5 Differential Equations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mid semester break: 31 August – 4 September</td>
</tr>
<tr>
<td>8</td>
<td>7 September</td>
<td><strong>CLASS TEST</strong></td>
<td>No tutorials this week</td>
</tr>
<tr>
<td>9</td>
<td>14 September</td>
<td>Series</td>
<td>Calculus Tutorial 6 Differential Equations</td>
</tr>
<tr>
<td>10</td>
<td>21 September</td>
<td>Probability Discrete and Continuous Random Variables</td>
<td>Calculus Tutorial 7 Differential Equations</td>
</tr>
<tr>
<td>11</td>
<td>28 September</td>
<td>Discrete and Continuous Random Variables</td>
<td>Calculus Tutorial 8 Series</td>
</tr>
<tr>
<td>12</td>
<td>5 October</td>
<td>Hypothesis Testing</td>
<td>Statistics Tutorial 1 Probability and Discrete and Continuous Random Variables</td>
</tr>
<tr>
<td>13</td>
<td>12 October</td>
<td>TBA</td>
<td>Statistics Tutorial 2 Discrete and Continuous Random Variables and Hypothesis Testing</td>
</tr>
</tbody>
</table>
Topics covered

Complex Numbers


Linear Algebra

Solution of systems of linear equations using elementary row operations. Solutions to inconsistent systems, non-unique solutions, solutions in terms of parameters. Matrix algebra, inverse using row operations, determinants, minors, co-factors, the adjoint and Cramer’s rule, eigenvalues and eigenvectors.

Differential Equations


Series

Tests for convergence for an infinite series, alternating series and test for divergence, ratio test, radius of convergence; Taylor polynomials, power series and operations with power series, i.e. manipulation of standard series in tables.

Basic Probability and Statistics

Probability, discrete random variables and their probability distributions (Binomial and Poisson). Continuous random variables and the Normal distribution. Sampling distributions, variance, confidence intervals, deviation of the mean and central limit theorem. Hypothesis tests and their applications.

Specific attendance/performance requirements

Attendance at all assigned class times is expected. You are responsible for all information (both academic and administrative) presented during class times. Should you miss a class for whatever reason it is your responsibility to obtain information and content that was missed. Attendance at all tutorials, laboratory and practical sessions (including any project work) is compulsory.

In this unit, your active engagement will be monitored in the following way:

1. Completion and submission of tutorial in Week 3
2. Completion and submission of tutorial in Week 4

If you do not demonstrate evidence of having engaged actively with this unit by completing these two activities by Week 4 of semester, your enrolment may be cancelled or you may be withdrawn from the unit.
Teaching and learning strategies

This unit will be offered in a blended format incorporating learning and teaching activities using the UTAS online learning management system MyLO. Materials such as pre-recorded lectures and assessments will be provided through the JEE104 MyLO site and it is expected that you have access to the internet.

Work Health and Safety (WHS)

The University is committed to providing a safe and secure teaching and learning environment. In addition to specific requirements of this unit you should refer to the University’s Safety and Wellbeing webpage and policy.

Communication

News and announcements may be posted to MyLO News, and students will be expected to be aware of the content of such posts within 48 hours of them being posted.

Students are also expected to check their UTAS email very regularly (once a day) for important announcements.

Concerns and complaints

The University is committed to providing an environment in which any concerns and complaints will be treated seriously, impartially and resolved as quickly as possible. We are also committed to ensuring that a student may lodge a complaint without fear of disadvantage. If you have a concern, information about who to contact for assistance is available on the ‘How to resolve a student complaint’ page.

Learning support

The University provides a range of face-to-face and online services to help equip students with the academic and literacy skills that they need to undertake their study. These services are in addition to the support you receive in each unit from unit coordinators, lecturers and tutors. For details of these additional services such as workshops, individual consultation for learning advice, and peer assisted learning opportunities, please visit https://www.utas.edu.au/students/learning.

The University also provides free access to Studiosity, 24/7 online study help for all UTAS students, enabling them to get feedback on written work within 24 hours or chat live with a subject specialist anywhere and anytime.

All direct assessment-based feedback is provided only from the staff teaching you the unit.

Further information and assistance

More information with regard to content, assessments, grading, GPA etc. is found in the Course Rules Document, available on the AMC website: http://amc.edu.au/ncmeh-course-information

AMC
Australian Maritime College
If you are experiencing difficulties with your studies or assignments, have personal or life-planning issues, disability or illness which may affect your course of study, you are advised to raise these with the unit coordinator in the first instance.

In addition to Learning Support, there is a range of University-wide support services available to you including Student Advisers, Disability Services, and more which can be found on the Study Support and Resources and Safety, Health and Wellbeing pages from the Current Students portal of the University website.

Should you require assistance in accessing the Library, visit their website for more information.