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## Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.
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Credit points
3

Prerequisites
MATH132 or MATH135

Corequisites

Co-badged status

Unit description
The ideas related to systems of linear equations introduced in MATH135 are further
developed to study ideas related to linearity, including matrices, determinants, eigenvalues
and eigenvectors and diagonalisation in Euclidean spaces. Complex numbers, polynomials
and rational functions are covered in reasonable detail. The study of differential and integral
calculus is taken further by the discussion of additional techniques of integration and the study
of first-order and second-order ordinary differential equations, and the notion of a limit is
enhanced by the study of sequences and series and their convergence. Finally, we will
discuss some aspects relating to the continuity and differentiability of functions of two real
variables.
Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at [http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/](http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/)

Learning Outcomes

1. Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
2. Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
3. Understand the concepts of sequences and series and their convergence, and apply a range of convergence tests.
4. Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
5. Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.
6. Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

General Assessment Information

**HURDLES:** This unit has no hurdle requirements. This means that there are no second chance examinations and assessments if you happen to fail at your first attempt. Students should aim to get at least 60% for the course work in order to be reasonably confident of passing the unit.

**IMPORTANT:** If you apply for Disruption to Study for your final examination, you must make yourself available for the week of **July 24 – 28, 2017.** If you are not available at that time, there is no guarantee an additional examination time will be offered. Specific examination dates and times will be determined at a later date.

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>30%</td>
<td>See iLearn site</td>
</tr>
<tr>
<td>Tutorial Quizzes</td>
<td>20%</td>
<td>Weekly</td>
</tr>
<tr>
<td>Class Test</td>
<td>10%</td>
<td>See iLearn site</td>
</tr>
<tr>
<td>Final examination</td>
<td>40%</td>
<td>University Examination Period</td>
</tr>
</tbody>
</table>
Assignments
Due: See iLearn site
Weighting: 30%
Three assignments

This Assessment Task relates to the following Learning Outcomes:
- Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
- Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
- Understand the concepts of sequences and series and their convergence, and apply a range of convergence tests.
- Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
- Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.
- Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

Tutorial Quizzes
Due: Weekly
Weighting: 20%
Tutorial quizzes based on the previous tutorial class

This Assessment Task relates to the following Learning Outcomes:
- Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
- Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
- Understand the concepts of sequences and series and their convergence, and apply a range of convergence tests.
- Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
- Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.
• Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

Class Test
Due: See iLearn site
Weighting: 10%
Mid semester class test conducted in tutorials

This Assessment Task relates to the following Learning Outcomes:
• Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
• Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
• Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
• Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.
• Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

Final examination
Due: University Examination Period
Weighting: 40%
Final exam

This Assessment Task relates to the following Learning Outcomes:
• Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
• Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
• Understand the concepts of sequences and series and their convergence, and apply a range of convergence tests.
• Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
• Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.
• Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

Delivery and Resources

Classes

Lectures: You should attend all four lectures each week, making a total of four hours.

Tutorials: You should attend one tutorial each week.

Workshops: The Numeracy centre provides these for students wanting to see more examples and ask further questions. Attendance is strongly recommended. Registration is not required.

Required and Recommended Texts and/or Materials

The required texts for MATH136 are


Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complex Numbers</td>
</tr>
<tr>
<td>2</td>
<td>Matrices and matrix algebra</td>
</tr>
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<td>3</td>
<td>Determinants, eigenvalues and eigenvectors</td>
</tr>
<tr>
<td>4</td>
<td>Diagonalization and applications</td>
</tr>
<tr>
<td>5</td>
<td>Linear transformations in the plane</td>
</tr>
<tr>
<td>6</td>
<td>Polynomials and rational functions</td>
</tr>
<tr>
<td>7</td>
<td>Partial fractions</td>
</tr>
<tr>
<td>8</td>
<td>Ordinary differential equations - first and second order linear equations</td>
</tr>
<tr>
<td>9</td>
<td>Linear systems of differential equations</td>
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<tr>
<td>10</td>
<td>Sequences and series</td>
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</table>
## Learning and Teaching Activities

### Lectures
There will be four one hour lectures per week. During these the content of the unit will be explained and example problems will be solved and applications in other disciplines discussed.

### Tutorials
There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

### Workshop
There is a weekly optional workshop provided by the Numeracy Centre.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](http://mq.edu.au/policy/docs/). Students should be aware of the following policies in particular with regard to Learning and Teaching:


In addition, a number of other policies can be found in the [Learning and Teaching Category](http://mq.edu.au/policy/docs/) 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/](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 Support
Macquarie University provides a range of support services for students. For details, visit [http://students.mq.edu.au/support/](http://students.mq.edu.au/support/)

Learning Skills
Learning Skills ([mq.edu.au/learningskills](http://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 Enquiry Service
For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

Equity 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.

IT Help
For help with University computer systems and technology, visit [http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/](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](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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

• Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
• Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
• Understand the concepts of sequences and series and their convergence, and apply a range of convergence tests.
• Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
• Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.

Assessment tasks

• Assignments
• Tutorial Quizzes
• Class Test
• Final examination

Learning and teaching activities

• There will be four one hour lectures per week. During these the content of the unit will be explained and example problems will be solved and applications in other disciplines discussed.
• There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week’s lecture content and work through similar problems.
• There is a weekly optional workshop provided by the Numeracy Centre.

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

• Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
• Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
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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 outcomes
• Construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
• Express mathematical ideas clearly and logically, providing appropriate justification for conclusions.

• Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

**Assessment tasks**

• Assignments
• Tutorial Quizzes
• Class Test
• Final examination

**Learning and teaching activities**

• There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

**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**

• Apply the concepts and techniques studied in this unit to a range of applications, particularly drawn from Physics and Engineering.

**Assessment tasks**

• Assignments
• Tutorial Quizzes
• Class Test
• Final examination

**Learning and teaching activities**

• There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.
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 systematically 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

• Demonstrate a well-developed knowledge of the properties of matrices and the role of eigenvectors and eigenvalues in the study of linear systems.
• Demonstrate facility with a range of integration techniques and methods for solving ordinary differential equations.
• Understand the concepts of sequences and series and their convergence, and apply a range of convergence tests.
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Learning and teaching activities

• There will be four one hour lectures per week. During these the content of the unit will be explained and example problems will be solved and applications in other disciplines discussed.
• There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.
• There is a weekly optional workshop provided by the Numeracy Centre.
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 and teaching activities
- There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week’s lecture content and work through similar problems.

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 and teaching activities
- There is a two-hour tutorial class each week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

Changes from Previous Offering
No changes in content, but there will be two lecturers this session.

Extra requirements