# MATH111

Quantitative Methods for Science

S1 Day 2016

Dept of Mathematics

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General Information

Unit convenor and teaching staff
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AHH 2.617
By appointment

Lecturer
David Bulger
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Contact via david.bulger@mq.edu.au
AHH 2.361
From Week 9: Monday 12-1, Wednesday 10-11 or by appointment

Credit points
3

Prerequisites

Corequisites

Co-badged status

Unit description
This unit provides an introduction to the basic quantitative methods and techniques common to much of Science. In this unit, you will learn how to formulate scientific problems using mathematical and statistical language; be equipped with a range of techniques to analyse and solve these problems, and gain an understanding of how to interpret the solutions obtained. Amongst other topics, this unit will cover rates of change, graphical display and interpretation of data, logarithmic and exponential scales, basic statistical ideas; all in the context of scientific measurement and analysis.

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:
Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
Identify the mathematical/statistical principles underlying basic discipline-specific problems
Able to model and interpret scientific data at an introductory level
Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
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</thead>
<tbody>
<tr>
<td>Weekly exercises</td>
<td>20%</td>
<td>Weekly</td>
</tr>
<tr>
<td>Assignment 1</td>
<td>20%</td>
<td>Week 7</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>20%</td>
<td>Week 11</td>
</tr>
<tr>
<td>Final Examination</td>
<td>40%</td>
<td>Exam period</td>
</tr>
</tbody>
</table>

**Weekly exercises**

Due: **Weekly**
Weighting: **20%**

Each week’s tutorial will include a number of problems to be handed in for marking

On successful completion you will be able to:

- Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
- Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
- Identify the mathematical/statistical principles underlying basic discipline-specific problems
- Able to model and interpret scientific data at an introductory level
- Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

Assignment 1
Due: Week 7
Weighting: 20%
Assignment related to topics covered before the session break

On successful completion you will be able to:
• Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
• Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
• Identify the mathematical/statistical principles underlying basic discipline-specific problems
• Able to model and interpret scientific data at an introductory level
• Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
• Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

Assignment 2
Due: Week 11
Weighting: 20%
Assignment covering later topics

On successful completion you will be able to:
• Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
• Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
• Identify the mathematical/statistical principles underlying basic discipline-specific problems
• Able to model and interpret scientific data at an introductory level
• Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
• Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

Final Examination
Due: Exam period
Weighting: 40%

2 hour written examination

On successful completion you will be able to:
• Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
• Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
• Identify the mathematical/statistical principles underlying basic discipline-specific problems
• Able to model and interpret scientific data at an introductory level
• Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
• Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

Delivery and Resources
• 3 hours of lectures per week
• one 2-hour tutorial per week

Unit Schedule

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Computation and Measurement in Science</th>
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<tr>
<td>Week 2</td>
<td>Predictions and theories in Science</td>
</tr>
<tr>
<td>Week 3</td>
<td>Displaying data and interpreting graphs in Science</td>
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<tr>
<td>Week 4</td>
<td>Oscillations, growth and decay in Science</td>
</tr>
<tr>
<td>Week 5</td>
<td>Measuring rates of change in Science</td>
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<tr>
<td>Week 6</td>
<td>Optimisation in Science</td>
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<tr>
<td>Week 7</td>
<td>Accumulation of change in Science</td>
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<tr>
<td>Week 8</td>
<td>Predicting outcomes based on theories relating to change in Science</td>
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Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. 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 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 email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

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/)
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

- Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
- Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
- Identify the mathematical/statistical principles underlying basic discipline-specific...
Able to model and interpret scientific data at an introductory level

Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software

Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

**Assessment tasks**

- Weekly exercises
- Assignment 1
- Assignment 2
- Final Examination

**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 systemically 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**

- Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
- Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
- Identify the mathematical/statistical principles underlying basic discipline-specific problems
- Able to model and interpret scientific data at an introductory level
- Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
- Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

**Assessment tasks**

- Weekly exercises
- Assignment 1
- Assignment 2
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**

- Able to demonstrate knowledge of basic principles and concepts of fundamental mathematical and statistical techniques
- Apply introductory statistical/mathematical concepts to problems in multiple science disciplines
- Identify the mathematical/statistical principles underlying basic discipline-specific problems
- Able to model and interpret scientific data at an introductory level
- Extract and present qualitative information from a model and/or data set, including the use of graphical methods and appropriate software
- Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

**Assessment tasks**

- Weekly exercises
- Assignment 1
- Assignment 2
- Final Examination

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**

- Extract and present qualitative information from a model and/or data set, including the
use of graphical methods and appropriate software
• Able to present and explain simple examples of the role of mathematics/statistics in multiple science disciplines

Assessment tasks
• Weekly exercises
• Assignment 1
• Assignment 2
• Final Examination