



MATH111

Quantitative Methods for Science

S1 Day 2016

Dept of Mathematics

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General Information

Unit convenor and teaching staff

Lecturer

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AHH 2.617

By appointment

Lecturer

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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

Name	Weighting	Due
<u>Weekly exercises</u>	20%	Weekly
<u>Assignment 1</u>	20%	Week 7
<u>Assignment 2</u>	20%	Week 11
<u>Final Examination</u>	40%	Exam period

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

Week 1	Computation and Measurement in Science
Week 2	Predictions and theories in Science
Week 3	Displaying data and interpreting graphs in Science
Week 4	Oscillations, growth and decay in Science
Week 5	Measuring rates of change in Science
Week 6	Optimisation in Science
Week 7	Accumulation of change in Science
Week 8	Predicting outcomes based on theories relating to change in Science

Week 9	Describing collections of data in Science
Week 10	Random variation and chance in Science
Week 11	Using statistical tests to validate theories in Science
Week 12	Transforming data into a mathematical model in Science

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:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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/

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/>

Learning Skills

Learning Skills (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 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

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.

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

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

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
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Assessment tasks

- Weekly exercises
- Assignment 1
- Assignment 2

- Final Examination

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

- Weekly exercises
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- 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