MATH335

Mathematical Methods

S1 Day 2017

Dept of Mathematics

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General Information

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Credit points
3

Prerequisites
MATH235 and (MATH232 or MATH236)

Corequisites

Co-badged status

Unit description
This unit develops the ideas and techniques of analysis important in many branches of pure and applied mathematics. Topics include the theory of ordinary differential equations, including linear and nonlinear systems and their stability. Some special functions are also discussed, together with important applications in various branches of mathematics.

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:

Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.

Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.

Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.

Expressing yourself clearly and logically in writing.

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

Name	Weighting	Hurdle	Due
3 assignments	30%	No	See the iLearn for details
One Test	20%	No	week 9
Exam	50%	No	University Examination Period

3 assignments

Due: **See the iLearn for details**
Weighting: **30%**

Assignments on Ordinary differential equations and Special functions

On successful completion you will be able to:

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments

incorporating deductive reasoning.
- Expressing yourself clearly and logically in writing.

One Test

Due: **week 9**
Weighting: **20%**

Supervised in class test.

On successful completion you will be able to:

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- Expressing yourself clearly and logically in writing.

Exam

Due: **University Examination Period**
Weighting: **50%**

Final exam

On successful completion you will be able to:

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- Expressing yourself clearly and logically in writing.

Delivery and Resources

Classes

Lectures: you should attend two hours of each lecture stream each week, making a total of four hours.

Required and Recommended Texts and/or Materials

ORDINARY DIFFERENTIAL EQUATIONS

- *Ordinary Differential Equations and Stability Theory* David A. Sanchez, Dover
- *Ordinary Differential Equations and Stability Theory* V.I. Arnold

SPECIAL FUNCTIONS

No single textbook is entirely satisfactory for this part of the course. Attendance of the lectures is strongly recommended.

- *Advanced Engineering Mathematics* Erwin Kreyszig, John Wiley&Sons, various editions. QA401.K7
- *Partial differential Equations. An Introduction* Walter A. Strauss, John Wiley&Sons, 1992. QA374.S86/1992
- *Equations of Mathematical Physics* A.N. Tikhonov & A.A. Samarskii, Oxford University Press (also reprinted by Dover). QA401.T512/1963

Technology Used and Required

Students are expected to have access to an internet enabled computer with a web browser and Adobe Reader software. Several areas of the university provide wireless access for portable computers. There are computers for student use in the Library and in the Numeracy Centre (C5A 255).

Difficulties with your home computer or internet connection do not constitute a reasonable excuse for lateness of, or failure to submit, assessment tasks.

Unit Schedule

See on iLearn a weekly schedule of topics to be covered in the unit.

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

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.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 (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disr

uption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

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

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 outcomes

- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.

Assessment tasks

- 3 assignments
- One Test
- Exam

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:

Assessment tasks

- 3 assignments
- One Test
- Exam

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 outcomes

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- Expressing yourself clearly and logically in writing.

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

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
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Assessment tasks

- 3 assignments
- One Test
- Exam

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

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- Expressing yourself clearly and logically in writing.

Assessment tasks

- 3 assignments
- One Test
- Exam

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

- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.

Assessment tasks

- 3 assignments
- One Test

- Exam

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

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in science and in engineering.
- Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- Expressing yourself clearly and logically in writing.

Assessment tasks

- 3 assignments
- One Test
- Exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Ability to use the ideas and techniques of the theory of Ordinary Differential Equations and the theory of the Special Functions to model a broad range of phenomena in

science and in engineering.

- Expressing yourself clearly and logically in writing.

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Knowledge of the principles and concepts of a basic theory of Ordinary Differential Equations and the theory of Special Functions.
- Expressing yourself clearly and logically in writing.