MATH707

Advanced Methods in Mathematics 1

S2 Day 2018

Dept of Mathematics

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General Information

Unit convenor and teaching staff Lecturer Justin Tzou justin.tzou@mq.edu.au Contact via email is preferred; office phone number is 02 9850 8925 Office 713, 12 Wally's Walk, Macquarie University I am in my office everyday; please email me to set up an appointment
Credit points 4
Prerequisites Admission to MRes
Corequisites
Co-badged status
Unit description A selection of topics in Mathematics which would provide tools for Mathematicians and researchers in other disciplines. Topics would be drawn from a variety of mathematical areas, and would be tailored to the current student cohort.

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:

Be able to express yourself clearly and logically in writing.

Be able to use tools to obtain qualitative and quantitative information of a solution of a differential equation.

Gain an idea of some ways in which asymptotic methods are used in current research in applied mathematics.

More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving, and creative thinking.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignments	40%	No	TBA
Final exam	60%	No	during final exam period

Assignments

Due: **TBA**
Weighting: **40%**

Written solutions, mostly involving the application of asymptotic methods learned in class to find approximate solutions of differential equations. Some computational problems (to be solved using software such as MATLAB or GNU Octave) may also be given.

On successful completion you will be able to:

- Be able to express yourself clearly and logically in writing.
- Be able to use tools to obtain qualitative and quantitative information of a solution of a differential equation.
- Gain an idea of some ways in which asymptotic methods are used in current research in applied mathematics.
- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving, and creative thinking.

Final exam

Due: **during final exam period**
Weighting: **60%**

Examination based on the material covered over the course of the semester.

On successful completion you will be able to:

- Be able to express yourself clearly and logically in writing.
- Be able to use tools to obtain qualitative and quantitative information of a solution of a differential equation.
- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving, and creative thinking.

Delivery and Resources

CLASSES

You should attend the two-hour lecture each week.

REQUIRED AND RECOMMENDED TEXTS AND MATERIALS

Lecture notes written during lecture time will be designed to be fully sufficient for the purposes of this course. However, the following references and resources may be useful:

- *Advanced Mathematical Methods for Scientists and Engineers*, C.M. Bender and S.A. Orszag, McGraw-Hill (1978).
- *Asymptotic Analysis*, J.D. Murray, Spring-Verlag (1984).
- *Multiple Scale and Singular Perturbation Methods*, J. Kevorkian and J.D. Cole, Springer-Verlag (1996).
- *Introduction to Perturbation Methods*, M.H. Holmes, Springer-Verlag (1998).

Not all of the material in the above texts will be covered; however, not all material covered in lectures will be contained in the texts.

TECHNOLOGY USED AND REQUIRED

You are expected to have access to an internet-enabled computer with a web browser and Adobe Reader software. Difficulties with your home computer or internet connection do not constitute a reasonable excuse for lateness of, or failure to submit, assessment tasks.

MATLAB, or a free alternative such as GNU Octave (https://www.gnu.org/software/octave/), may be required to complete some assignment problems. For Macquarie University students, MATLAB can be downloaded here: https://web.science.mq.edu.au/it/matlab/

Unit Schedule

Weekly lecture: Thursdays 10am-12pm

Learning and Teaching Activities

Lecture

2 hours per week

Assignments

Two assignments to be completed outside of class time.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcome

- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving, and creative thinking.

Assessment task

- Assignments

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Be able to use tools to obtain qualitative and quantitative information of a solution of a differential equation.
- Gain an idea of some ways in which asymptotic methods are used in current research in applied mathematics.

Assessment tasks

- Assignments
- Final exam

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Be able to express yourself clearly and logically in writing.
- Be able to use tools to obtain qualitative and quantitative information of a solution of a differential equation.
- Gain an idea of some ways in which asymptotic methods are used in current research in applied mathematics.

Assessment tasks

- Assignments
- Final exam

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Be able to express yourself clearly and logically in writing.
- Be able to use tools to obtain qualitative and quantitative information of a solution of a

differential equation.

- Gain an idea of some ways in which asymptotic methods are used in current research in applied mathematics.
- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving, and creative thinking.

Assessment tasks

- Assignments
- Final exam

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Be able to express yourself clearly and logically in writing.

Assessment tasks

- Assignments
- Final exam

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving, and creative thinking.