MATH236

Mathematics IIB

S2 Day 2016

Dept of Mathematics

Contents

General Information

Unit convenor and teaching staff
Ji Li
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AHH L2
Thur 3:00pm--5:00pm

Steve Lack
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Credit points
3

Prerequisites
MATH235

Corequisites

Co-badged status

Unit description
This unit deals with two of the most fundamental concepts in analysis – complex analysis and vector analysis. Complex analysis is the study of complex-valued functions of complex variables. Two approaches to the study of complex-valued functions of one complex variable are discussed. The first of these, usually attributed to Riemann, is based on differentiation and involves pairs of partial differential equations called the Cauchy-Riemann equations. The second approach, usually attributed to Cauchy, is based on integration and depends on a fundamental theorem known nowadays as Cauchy's integral theorem. The concept of vector analysis provides the tools for modelling physical phenomena such as fluid flow, electromagnetic and other field-based theories. We consider vector fields and integrals over paths and surfaces, and develop an understanding of the famous integration theorems of Green, Stokes and Gauss. These theorems transform physical laws expressed in differential form to integral form.

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:

Demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in vector calculus and complex analysis.
Understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences.
Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
Ability to formulate and model practical and abstract problems in mathematical terms using a variety of methods from vector calculus and complex analysis.
Application of mathematical principles, concepts, techniques and technology to solve practical and abstract problems.
Appropriate interpretation of information communicated in mathematical form.
Appropriate presentation of information, reasoning and conclusions in a variety of modes to diverse audiences (expert and non-expert).
Demonstrate an understanding of ethical issues relating to professional mathematical work, identify and address ethical issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
Ability to work effectively, responsibly and safely in an individual or team context.

Assessment Tasks

Name	Weighting	Due
Three assignments	30%	week 4, week 8 week 12
One Test	20%	week 8
Final examination	50%	exam period

Three assignments

Due: **week 4, week 8 week 12**
Weighting: **30%**

Problem based assignments

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in vector calculus and complex analysis.
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One Test

Due: **week 8**
Weighting: **20%**

Mid Semester test

On successful completion you will be able to:

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- Ability to work effectively, responsibly and safely in an individual or team context.

Final examination

Due: **exam period**
Weighting: **50%**

The final exam contains two parts.

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Delivery and Resources

Classes

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

Tutorials: you should attend one tutorial each week.

Required and Recommended Texts and/or Materials

The online notes are intended primarily as a source of reference. These are not intended to be treated as the only source for learning.

The following texts provide useful references for various sections of the course:

- Churchill and Brown; *Complex variables and applications*, (McGraw–Hill) library call number QA331 .C524
- Marsden and Tromba; *Vector Calculus*, (Wiley) library call number QA303 .M338

Other similar texts are available in the Library.

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

WEEK	COMPLEX ANALYSIS	VECTOR CALCULUS	TASK DUE
1	Complex numbers, polar representation, polynomials, functions	Paths	
2	Sequences and limits, series		
3	Series and convergence tests	Vector Fields	
4	Exponential, logarithm and trigonometric functions		Assignment 1
5	Continuity and differentiation, Cauchy-Riemann equations	Integrals over paths	
6	Harmonic functions, power series		Assignment 2
7	Contours and contour integrals, path independence	Parametrised surfaces	
	MID-SEMESTER BREAK		
8	Cauchy's Theorem, Cauchy's Integral Formula	Integrals over surfaces	Test
9	Applications, Liouville's Theorem, Fundamental Theorem of Algebra		Assignment 3
10	Singularities, residues, Taylor and Laurent series	Integration theorems: Green's theorem, Stokes' thorem and Gauss' theorem	

11	Evaluation of trigonometric integrals		Assignment 4
12	Further evaluation of real integrals		
13	Revision	Revision	Assignment 5

Learning and Teaching Activities

Lectures

2 two hour lectures per week

Tutorial

1 one hour tutorial per week

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

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

- Demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in vector calculus and complex analysis.
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Assessment tasks

- Three assignments
- One Test
- Final examination

Learning and teaching activities

- 2 two hour lectures per week
- 1 one hour tutorial per week

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.

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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.

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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.

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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.

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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.

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Learning and teaching activities

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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:

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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.

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Learning and teaching activities

- 2 two hour lectures per week
- 1 one hour tutorial per week

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.

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Learning outcomes

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Changes from Previous Offering

Three assignments instead of five.