MATH396

Engineering Mathematics III

S1 Day 2015

Dept of Statistics

Contents

General Information

Unit convenor and teaching staff
Convenor
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Credit points
3

Prerequisites
MATH235(P)

Corequisites

Co-badged status

Unit description
This unit develops techniques and skills that are fundamental in the study and application of mathematics and statistics to engineering problems at an advanced level. In any successful application, two contrasting but complementary skills must be developed: the ability to formulate a given real-world problem in appropriate mathematical or statistical terms; and sufficient knowledge to obtain useful information and testable predictions from that model, by analytical and numerical means. The unit shows how to solve differential and other equations that arise as mathematical models of real phenomena in engineering by appropriate numerical methods on a computer, as well as how to use stochastic process modelling for a variety of engineering scenarios.

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:

Understand and work with probability density functions, expectations, moment generating functions.
Understand the concept of the stationarity of a stochastic process, autocorrelations and spectral density.

Be able to compute the likelihood and maximum likelihood estimators.

Be able to compute and understand the significance of the Cramer-Rao lower bound.

Assessment Tasks

Name	Weighting	Due
Assignment 1	10%	Friday 20th March
Assignment 2	10%	Friday 1st May
Assignment 3	10%	Friday 29th May
Tutorial Participation	10%	Week 2 to 13
Final Examination	60%	TBA

Assignment 1

Due: **Friday 20th March**
Weighting: **10%**

Submit to Prof Barry Quinn by 11am on the due date. There is no “group work” assessment in this unit. All work is to be the student’s own. No extensions will be granted. Students who have not submitted the assignment prior to the deadline will be awarded a mark of 0 for the assignment, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Understand and work with probability density functions, expectations, moment generating functions.

Assignment 2

Due: **Friday 1st May**
Weighting: **10%**

Submit to Prof Barry Quinn by 11am on the due date. There is no “group work” assessment in this unit. All work is to be the student’s own. No extensions will be granted. Students who have not submitted the assignment prior to the deadline will be awarded a mark of 0 for the assignment, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Understand the concept of the stationarity of a stochastic process, autocorrelations and spectral density.

Assignment 3

Due: **Friday 29th May**
Weighting: **10%**

Submit to Prof Barry Quinn by 11am on the due date. There is no “group work” assessment in this unit. All work is to be the student’s own. No extensions will be granted. Students who have not submitted the assignment prior to the deadline will be awarded a mark of 0 for the assignment, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Be able to compute the likelihood and maximum likelihood estimators.
- Be able to compute and understand the significance of the Cramer-Rao lower bound.

Tutorial Participation

Due: **Week 2 to 13**
Weighting: **10%**

To obtain full marks you must participate in every tutorial.

On successful completion you will be able to:

- Understand and work with probability density functions, expectations, moment generating functions.
- Understand the concept of the stationarity of a stochastic process, autocorrelations and spectral density.
- Be able to compute the likelihood and maximum likelihood estimators.
- Be able to compute and understand the significance of the Cramer-Rao lower bound.

Final Examination

Due: **TBA**
Weighting: **60%**

The final Examination will be held during the mid-year Examination period. The final Examination is 3 hours long (with an additional 10 minutes’ reading time). It will cover all topics in the unit. The final examination is closed book. Students may take into the final Exam **TWO** A4 pages of notes **handwritten (not typed)** on **BOTH** sides. Calculators will be needed but must not be of the text/ programmable type.

Students MUST perform satisfactorily in the final examination in order to pass the unit regardless of their performance throughout the semester.

The University Examination timetable will be available in Draft form approximately 8 weeks before the commencement of the examinations and in Final form approximately 4 weeks before

the commencement of the examinations at: http://www.timetables.mq.edu.au/exam

The only exception to not sitting an examination on the designated date is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for special consideration.

Your final grade in MATH396 will be based on your work during the semester and in the final examination. You need to achieve the same standards both during the semester assessments and the final exam to be awarded a particular grade as set out in the Grading Policy (http://www.mq.edu.au/policy/docs/grading/policy.html).

On successful completion you will be able to:

- Understand and work with probability density functions, expectations, moment generating functions.
- Understand the concept of the stationarity of a stochastic process, autocorrelations and spectral density.
- Be able to compute the likelihood and maximum likelihood estimators.
- Be able to compute and understand the significance of the Cramer-Rao lower bound.

Delivery and Resources

There are four contact hours per week, comprised of three lectures and one tutorial. Check the timetable for the times and locations of classes.

Please consult iLearn or the Unit webpage for details of consultation hours.

Learning and Teaching Activities

Lecture

Three hours per week

Tutorial

One hour 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

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

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

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.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://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Grading in this unit

Your final SNG and grade in MATH396 will be based on your work during semester and in the final examination as specified in the 'Assessment' section. The determination of your final SNG and Grade will be based on an assessment of your performance on individual assessment tasks against identified criteria and standards as set out in the section titled 'Assessment Criteria', and an assessment of overall performance in the unit. Final grades will be awarded on the basis of your overall performance and the extent to which you demonstrate fulfilment of the learning outcomes listed for this unit.

The relationship between SNGs and Final Grades is shown in the table below:

SNG.Range	Grade	Standard
85 - 100	High Distinction (HD)	Provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying,generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application as appropriate to the discipline.
75 - 84	Distinction (D)	Provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
65 - 74	Credit (Cr)	Provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; convincing argumentation with appropriate coherent justification; communication of ideas fluently and clearly in terms of the conventions of the discipline.
50 - 64	Pass (P)	Provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the ield of study; routine argumentation with acceptable justification;communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
0 - 49	Fail (F)	Does not provide evidence of attainment of learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; missing, undeveloped, inappropriate or confusing argumentation; incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.

Please note that a student must meet the performance standard outlined above in **both** the coursework **and** the examination sections of this unit in order to be awarded a particular grade.

Textbooks and other reference material

The prescribed textbook is

Richard H. Williams, *Probability, Statistics, and Random Processes for Engineers*, Cengage Learning, 2003.

Other good references are

A. Leon-Garcia, *Probability, Statistics, and Random Processes for Electrical Engineering*, 3 ed. Upper Saddle River, New Jersey: Prentice-Hall, 2008

and

A. Papoulis, *Probability, Random Variables, and Stochastic Processes*. New York: McGraw-Hill, 2002.

There are many introductory mathematical statistics and/or random (stochastic) processes books, and many are suitable references.

The notes in iLearn will be fairly exhaustive, and will be put up approximately one week in advance of their delivery.