STAT379

Operations Research II

S1 Day 2019

Dept of Mathematics and Statistics

Contents

General Information

Unit convenor and teaching staff
Unit Convenor & Lecturer
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Please see iLearn.

Credit points
3

Prerequisites
6cp at 200 level including STAT279(P)

Corequisites

Co-badged status

Unit description
This unit complements STAT279 with the main emphasis again being on application of techniques to problems which arise in business and industry. Students are expected to use a computer package to find solutions to formulated problems. Topics include integer programming (modelling, branch-and-bound), goal programming, inventory models, decision analysis, game theory, and Markov Processes.

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 determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.

Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.

Be able to identify a zero sum or constant sum game, set up a payoff matrix, if a saddle point exists find the optimal strategy and if a saddle point does not exist to determine the

mixed strategies either by formulating the game as a linear program or solving graphically.

Be able to formulate linear programming problems involving integers and indicator variables using a computer package as well as interpret the output and write up a conclusion.

Know about decision making under uncertainty and be able to provide an optimal solution for different situations.

Assessment Tasks

Name	Weighting	Hurdle	Due
Test 1	20%	No	Week 6 SGTA
Test 2	20%	No	Week 11 SGTA
Assignment	10%	No	2 pm Friday 31 May 2019
Final Examination	50%	No	Exam Period

Test 1

Due: **Week 6 SGTA**
Weighting: **20%**

This will be held in the week 6 SGTAs. Permitted materials for the class test are a calculator, lecture notes, homework solutions, and SGTA solutions. There is no computer access during the class test. No electronic devices are allowed (e.g. iPhones, iPads, tablets, laptops, mobile phones) apart from nonprogrammable calculators.

Failure to attend the test without relevant documentation to explain the absence (submitted as a Special Consideration request within 5 working days of the test) will result in zero marks being awarded for the test. The procedure for submitting a Special Consideration online can be obtained by visiting ask.mq.edu.au.

Class Test 1 will be of 50 minutes duration.

On successful completion you will be able to:

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.

Test 2

Due: **Week 11 SGTA**
Weighting: **20%**

This will be held in the week 11 SGTAs. Permitted materials for the class test are a calculator, lecture notes, homework solutions, and SGTA solutions. There is no computer access during the class test. No electronic devices are allowed (e.g. iPhones, iPads, tablets, laptops, mobile phones) apart from nonprogrammable calculators.

Failure to attend the test without relevant documentation to explain the absence (submitted as a Special Consideration request within 5 working days of the test) will result in zero marks being awarded for the test. The procedure for submitting a Special Consideration online can be obtained by visiting ask.mq.edu.au.

Class Test 2 will be of 50 minutes duration.

On successful completion you will be able to:

- Be able to identify a zero sum or constant sum game, set up a payoff matrix, if a saddle point exists find the optimal strategy and if a saddle point does not exist to determine the mixed strategies either by formulating the game as a linear program or solving graphically.
- Be able to formulate linear programming problems involving integers and indicator variables using a computer package as well as interpret the output and write up a conclusion.

Assignment

Due: **2 pm Friday 31 May 2019**
Weighting: **10%**

Assignments must be submitted in pdf format online via iLearn by 2pm on the due date. Word documents can be saved as PDF. There is no "group work" assessment in this unit. All work is to be the student's own.

Failure to submit this assessment by the due date without relevant documentation to explain the absence or lateness (submitted as a Special Consideration online within 5 working days of due date) will result in a mark of 0 being awarded for this assessment.

On successful completion you will be able to:

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible

calculate the steady state probabilities.

- Be able to identify a zero sum or constant sum game, set up a payoff matrix, if a saddle point exists find the optimal strategy and if a saddle point does not exist to determine the mixed strategies either by formulating the game as a linear program or solving graphically.
- Be able to formulate linear programming problems involving integers and indicator variables using a computer package as well as interpret the output and write up a conclusion.
- Know about decision making under uncertainty and be able to provide an optimal solution for different situations.

Final Examination

Due: **Exam Period**
Weighting: **50%**

The final examination will be held during the Examination period. The Final examination is 2 hours long (with an additional 10 minutes reading time).

The final examination covers all topics in the unit. Students may take into the final examination ONE A4 page of notes handwritten (not typed) on BOTH sides. Calculators will be needed but must be of the nonprogrammable type.

You are expected to present yourself for the examination at the time and place designated in the University Examination Timetable. The timetable will be available in draft form approximately eight weeks before the commencement of the examinations.

If documented illness or unavoidable disruption prevent you from sitting the examination you may wish to consider applying for a Special Consideration. Failure to sit the final examination without relevant documentation to explain the absence (submitted as a Special Consideration online within 5 working days of the final examination) will result in a mark of 0 being awarded for the final examination. Students need to apply for Special Consideration online at https://ask.mq.edu.au

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESupp) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

On successful completion you will be able to:

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
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- Know about decision making under uncertainty and be able to provide an optimal solution for different situations.

Delivery and Resources

There are 3 hours of lectures and 1 hour of SGTA each week in this unit. Lectures commence in Week 1 and SGTAs commence in Week 2. Lecture material will be put up on iLearn.

Technologies used and required

Lecture material will be placed on iLearn. Microsoft Excel and Microsoft Excel Add-in Solver will be used in some of the lectures. Students will need to use a calculator for the final examination and some of the other assessments. Students will need to use Microsoft Excel and the Microsoft Excel Add-in Solver. All assignments must be word processed and converted to PDF files for online submission (you can save a Word document as PDF).

Unit Schedule

Week	Topic	Assessment (Due)
1 (25 Feb)	Inventory Models	
2 (4 Mar)	Inventory Models	
3 (11 Mar)	Inventory Models	
4 (18 Mar)	Markov Processes	
5 (25 Mar)	Markov Processes / Game Theory	
6 (1 Apr)	Game Theory	Test 1 (held in SGTA)
7 (8 Apr)	Integer Programming	
	Two Week Recess	

8 (29 Apr)	Integer Programming	
9 (6 May)	Integer Programming	
10 (13 May)	Decision Making	
11 (20 May)	Decision Making	Test 2 (held in SGTA)
12 (27 May)	Decision Making	Assignment (2 pm Friday 31 May)
13 (3 Jun)	Revision	

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 published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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

If you are a Global MBA student contact globalmba.support@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

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible

calculate the steady state probabilities.

- Be able to identify a zero sum or constant sum game, set up a payoff matrix, if a saddle point exists find the optimal strategy and if a saddle point does not exist to determine the mixed strategies either by formulating the game as a linear program or solving graphically.
- Be able to formulate linear programming problems involving integers and indicator variables using a computer package as well as interpret the output and write up a conclusion.
- Know about decision making under uncertainty and be able to provide an optimal solution for different situations.

Assessment tasks

- Test 1
- Test 2
- Assignment
- Final Examination

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:

Learning outcomes

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.
- Be able to identify a zero sum or constant sum game, set up a payoff matrix, if a saddle point exists find the optimal strategy and if a saddle point does not exist to determine the mixed strategies either by formulating the game as a linear program or solving graphically.
- Know about decision making under uncertainty and be able to provide an optimal solution for different situations.

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- Test 2
- Assignment
- Final Examination

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

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.
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- Know about decision making under uncertainty and be able to provide an optimal solution for different situations.

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- Test 2
- Assignment
- 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

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.
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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.

This graduate capability is supported by:

Learning outcomes

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.
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- Test 1
- Test 2
- Assignment
- 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

- Be able to determine which inventory model to use, obtain the solution (by hand and Excel) and provide an inventory policy.
- Be able to set up a transition matrix, draw a state diagram, classify the states of a Markov Chain, calculate the state vector at future transitions, and when possible calculate the steady state probabilities.
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Assessment tasks

- Test 1
- Test 2
- Assignment
- Final Examination

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 outcome

- Be able to formulate linear programming problems involving integers and indicator variables using a computer package as well as interpret the output and write up a conclusion.