# STAT2579

## Operations Research I

Session 1, In person-scheduled-weekday, North Ryde 2024

*School of Mathematical and Physical Sciences*

## Contents

# General Information

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| Unit convenor and teaching staff<br>Nino Kordzakhia<br>nino.kordzakhia@mq.edu.au |
| Credit points<br>10 |
| Prerequisites<br>FOSE1015 or STAT170(P) or STAT1170 or STAT171 or STAT1371 or STAT150 or STAT1250 |
| Corequisites |
| Co-badged status |
| Unit description<br>This unit surveys the field of operations research, which is the practical application of a scientific method to the operational, organisational and economic problems of business and industry. An elementary knowledge of algebra is assumed. Students are expected to use Microsoft Excel to find solutions to formulated problems. Topics are model construction; linear programming; transportation and assignment problems; network analysis (critical path and PERT); inventory analysis and waiting lines. |

## 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:

**ULO1:** Apply mathematical modelling principles to real and simulated business scenarios.

**ULO2:** Use Excel Solver to find solutions to linear programming, transportation and assignment problems and interpret the output.

**ULO3:** Use the Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) for optimal project scheduling.

**ULO4:** Formulate an inventory policy which will control the stock of goods at a minimum total cost in inventory models.

**ULO5:** Evaluate probabilities of various queue lengths, average queue length and the average time spent waiting in a queue.

# General Assessment Information

**Requirements to Pass this Unit**: To pass this unit you must:

1. Attempt all assessments and
2. Achieve a total mark equal to or greater than 50%

**Hurdle Assessments**: None of the above assessment tasks is a hurdle

**Late Assessment Submission Penalty:** Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day the assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical concern. For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration via ask.mq.edu.au

**Assignments 1 and 2: YES, Standard Late Penalty applies**

**Quizzes: NO, unless Special Consideration is Granted**

**Final Examination: NO, unless Special Consideration is Granted**

**Special Considerations:** The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable, and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au

# Assessment Tasks

| Name | Weighting | Hurdle | Due |
|---|---|---|---|
| iLearn Quizzes | 20% | No | Week 3, 6, 9,11 |
| Assignment 1 | 10% | No | Week 4 |
| Assignment 2 | 10% | No | Week 8 |
| Final Examination | 60% | No | University Examination Period |

## iLearn Quizzes

Assessment Type [1]: Quiz/Test

Indicative Time on Task [2]: 15 hours
Due: **Week 3, 6, 9,11**
Weighting: **20%**

iLearn quizzes may be attempted multiple times. Reinforce and apply skills learned in lectures

On successful completion you will be able to:

- Use Excel Solver to find solutions to linear programming, transportation and assignment problems and interpret the output.
- Use the Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) for optimal project scheduling.
- Formulate an inventory policy which will control the stock of goods at a minimum total cost in inventory models.

## Assignment 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 8 hours
Due: **Week 4**
Weighting: **10%**

Reinforce and apply skills learned in lectures and SGTAs. Apply linear programming principles to business scenarios.

On successful completion you will be able to:

- Apply mathematical modelling principles to real and simulated business scenarios.

## Assignment 2

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 8 hours
Due: **Week 8**
Weighting: **10%**

Reinforce and apply skills learned in lectures and SGTAs. Apply mathematical models to simulated business scenarios.

On successful completion you will be able to:

- Apply mathematical modelling principles to real and simulated business scenarios.
- Use Excel Solver to find solutions to linear programming, transportation and assignment problems and interpret the output.
- Formulate an inventory policy which will control the stock of goods at a minimum total cost in inventory models.

## Final Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 2 hours
Due: **University Examination Period**
Weighting: **60%**

Formal invigilated examination testing the learning outcomes of the unit.

On successful completion you will be able to:

- Apply mathematical modelling principles to real and simulated business scenarios.
- Use Excel Solver to find solutions to linear programming, transportation and assignment problems and interpret the output.
- Use the Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) for optimal project scheduling.
- Formulate an inventory policy which will control the stock of goods at a minimum total cost in inventory models.
- Evaluate probabilities of various queue lengths, average queue length and the average time spent waiting in a queue.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

# Delivery and Resources

## Classes:

### 1. The lectures begin in Week 1 and

### 2. The SGTAs (1- hour per week) begin in Week 2

The timetable for classes can be found on the University website at: https://timetables.mq.edu.au/2023/

## Required and Recommended Texts and/or Materials:

- The lecture slides and SGTA material will be made available via *iLearn*.
- Reference books:

1. *Quantitative Decision Making with Spreadsheet Applications* (7th Ed) by Lawrence L. Lapin, William D. Whisler, 2002
2. *Operations Research Applications and Algorithms* (4th Ed), 2004 by Winston W. L. (PWS Kent)
3. *Operations Research: An Introduction* (8th edition), 2007 by Hamdy A. Taha (Pearson/ Prentice Hall)

**Technology Used and Required:** *Microsoft Excel*

## Methods of Communication:

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can be sent through direct email to the unit convenor.

Students can access the *iLearn* page by logging on at https://ilearn.mq.edu.au. Students must log in regularly to read the Announcements and access the teaching material.

## COVID Information:

For the latest information on the University's response to COVID, please refer to the Coronavirus infection page on the Macquarie University website: https://www.mq.edu.au/about/coronavirus-faqs. Remember to check this page regularly in case the information and requirements change during the semester. If there are any changes to this unit in relation to COVID, these will be communicated via *iLearn*.

# Unit Schedule

| Study Week | Lecture topic | Assessment Due |
|---|---|---|
| **1** | Introduction; LP formulation | |
| **2** | LP formulation; graphical solution | |
| **3** | Solving LPs | **Electronic Quiz** |
| **4** | Sensitivity Analysis | **Assignment 1** |
| **5** | Simulation | |
| **6** | Inventory | **Electronic Quiz** |
| **7** | Project management | |
| **8** | Project management cont. | **Assignment 2** |
| ***Mid - Session Break*** | | |
| **9** | Transportation | **Electronic Quiz** |
| **10** | Transportation cont. | |
| **11** | Queuing | **Electronic Quiz** |
| **12** | Queuing cont. | |
| **13** | Revision | |

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). 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
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

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

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/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

# Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

# Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

## The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

## Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

## 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.

# Changes from Previous Offering

No major changes have been planned for the current offering of the unit. We value student feedback to be able to continually improve the way we offer our units. We encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link on iLearn.

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Unit information based on version 2024.01R of the Handbook