



**MACQUARIE UNIVERSITY
DIVISION OF EFS**

UNIT OUTLINE

STAT279 Operations Research I

Offering: 2007 Semester 2

Lecturer-in-charge: David Bulger

Students in this unit should read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff in the unit.

About this unit

- Unit Value: Three (3) credit points
- This unit aims to introduce students to a variety of techniques and solution methods used for optimisation. The techniques require the formulation of problems, logical reasoning and interpretation of results. Linear programming, graphical solutions, the simplex method, transportation models, inventory, queuing, project planning and simulation are the topics covered. Use is made of a statistical package to analyse data, solve linear programming problems and produce reports.
- Unit rationale: The formulation of problems, their solution and analysis are integral parts of business decision making. This unit provides the background for making informed decisions about complex problems based on the principle of optimisation.

TEACHING STAFF

- Lecturer-in-charge David Bulger E4A 517 Phone 9850 8546
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- Other lecturers Ayse Bilgin E4A 515 Phone 9850 8509
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Leigh Wood E4A 714 Phone 9850 4756
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Students should initially direct all enquiries to David Bulger. All lecturers and tutors will be available for consultation at regular times, which will be announced early in the term at http://www.stat.mq.edu.au/ug/units/stat_units200/stat279/contact_info.

CLASSES

You will enrol in **one Lecture** (either the Monday Lecture or the Friday Lecture) and **one Practical**. Thus each week you will attend **one** three-hour Lecture and **one** one-hour Practical. Note that "Practicals" are sometimes called "tutorials".

<i>LECTURES</i>	
Monday 6–9pm E7B Mason	Friday 12–3pm C5C T2

<i>PRACTICALS</i>
Tuesday 4pm E7B T5
Tuesday 5pm E7B T5
Tuesday 6pm E7B T5
Tuesday 7pm E7B T5

- Students must attend the class in which they have enrolled.
- Attendance at Practicals is compulsory and will be monitored. Non-submission of Homework or poor attendance may jeopardise your final grade.

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

- The set text is *Quantitative Decision Making with Spreadsheet Applications* (7th Ed) by Lapin and Whisler.
- You should purchase the **Study Pack** (from the Co-op Bookshop) which includes Lecture slides and Practical material.
- Reference books available in the library are as follows:
 - Operations Research Applications and Algorithms (3d Ed)**
by Winston W. L. (PWS Kent)
 - Operations Research: An Introduction**
by H A Taha (Macmillan)

UNIT WEB PAGE

The web page for this unit is http://www.stat.mq.edu.au/ug/units/stat_units200/stat279.

WEBCT PAGE

STAT279 has a WebCT page, which you can access by logging on at <http://online.mq.edu.au>. Only the "Discussion" tool is activated. This is essentially an online chat between you, your classmates, your tutors and your lecturers. If you are confused by something in the Unit Outline or Study Pack, you may wish to ask a question here. It might then be answered by classmates, or by lecturers online. Alternatively, it may be answered in a subsequent lecture.

Also, your lecturers will occasionally make announcements via the WebCT. Accordingly, you should make sure you log in and read the posts at least twice a week.

STUDENT E-MAIL ADDRESSES

Students should at all times use their Macquarie University student e-mail accounts when contacting lecture staff. Furthermore, students should check and read their Macquarie University student e-mail on a regular basis.

LEARNING OUTCOMES

The learning outcomes of this unit are outlined at the beginning of each section of the printed notes. However, there are some overall outcomes which are listed below.

Students must be able to:

- formulate problems,
- use a computer package to find solutions to formulated problems,
- interpret output and write up conclusions based on the output, in the language of the original problem.

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students' generic skills in a range of areas. One of the aims of this unit is that students develop their skills in the areas of:

- literacy, numeracy and information technology,
- communication skills,
- critical analysis,
- problem-solving,
- creative thinking.

TEACHING AND LEARNING STRATEGY

- Students must attend one Lecture each week at which new material is introduced.
- Students are expected to attend one Practical class each week.
 - They should have solved the Homework problems that have been prescribed for that week and hand in a copy of their solutions.
 - During the Practical, new problems will be presented and solved under the guidance of the instructor.
- A week-by-week list of the topics to be covered is available at the end of this document.

RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES

Practicals

Practicals will commence in Week 2 of the semester. Note that these may be called tutorials in your timetable. The Practical classes are meant to be learning exercises. Participation in the Practical classes is essential for students' understanding of the course content and the solution of problems.

Attendance is compulsory and will be monitored. If a student misses more than two Practical classes he/she may be excluded from the unit resulting in a fail grade.

Before the Practical, each student should write a solution to the Homework problem(s) for that week (appearing in the STAT279 Homework Exercises Handout). Each student must hand in a photocopy of his or her solution during the Practical. The Practical demonstrator will go through some further problems (appearing in the back section of the Study Pack).

Homework

All Homework problems will be given in a handout in Week 1. Students must complete and hand in a COPY of their Homework solutions. These must be submitted to the demonstrator in the week they are due. Late submission will not be accepted. The submitted Homework will NOT be returned.

Each Homework task requires students to assimilate the procedures, content and methodology covered in the preceding weeks and apply them to solving the problems presented. If students have satisfied all the learning objectives for a topic they will be able to successfully complete the Homework based on that week's topic.

The feedback from the demonstrator during the Practical class and the model solution provided on the web should be used to remediate any part of the subject matter with which students are having difficulty. This solution will be available a few days after the last Practical class each week.

Examination and Electronic Quizzes

Electronic Quizzes:

Electronic Quizzes will be provided for practice of new skills acquired during the course. These will be available via the web. They can be found on the STAT279 web site: go to <http://www.stat.mq.edu.au/units/stat279/index.htm> , then click on E_Quiz.

There are four electronic quizzes. The closing dates for the Quizzes are as follows:

Quiz 1: Assumed knowledge questions:
Must be completed by Friday 17 August (Week 3).

Quiz 2: Questions on linear programming:
Must be completed by Friday 31 August (Week 5).

Quiz 3: Questions on sensitivity analysis, project planning and simulation:
Must be completed by Friday 12 October (Week 9).

Quiz 4: Questions on inventory and queuing:
Must be completed by Friday 9 November (Week 13).

Your Quiz solution must be submitted by 5pm on the due date.

The Quizzes may be attempted as many times as you wish before the due date. (A different Quiz will be generated for each attempt.) A Quiz is considered to be “passed” if at most two parts are wrong.

Altogether, the quizzes are worth **15% of your unit grade** (though read the **Grading** section on the following page). Because you can have as many attempts as you wish, you should be able to pass all of the quizzes, and get the whole 15%. We strongly reward this, via "Pac-Man" scoring for the quizzes:

Number of quizzes passed	Contribution to unit grade
0	0 / 15
1	1 / 15
2	3 / 15
3	7 / 15
4	15 / 15

If you are having trouble passing a quiz by the due date, you should consult the lecturers for advice. There are two reasons for this. Firstly, as shown in the above table, it is very much in your interest to complete all of the quizzes. Secondly, if you cannot pass the quiz, it indicates a gap in your learning, which may snowball if not addressed early.

The quizzes are online, and therefore may be attempted from home or on campus, in the Library, the Numeracy Centre or the various computing labs. Some configurations of operating system or browser plug-in are incompatible with the quiz system, so you *might* find that the Quizzes cannot be completed at home—in that case, please complete them on campus. Waiting until the due date and then having technical problems does *not* constitute a reasonable excuse for not completing a quiz on time. Students are advised to start work early.

Final Examination:

The Final Exam will be **closed book** and held during the end-of-year exam period. It will be worth 85% of the total assessment (or 100%; read the **Grading** section below) and will cover the whole semester’s work. In the exam, students will be provided with copies of the z-table and formula sheet appearing in the study pack. Students may bring into the Final Exam any additional formulae, notes and diagrams they might think necessary on

one A4 sheet of paper handwritten on both sides. It must be written by hand, **not typed**. You may write in any language and use any combination of colours you wish.

Students are expected to present themselves for 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 and in Final form approximately four weeks before the commencement of the examinations. The timetable can be found at

<http://www.timetables.mq.edu.au/exam>.

The only exceptions to sitting an examination at the designated time are because of documented illness or unavoidable disruption. In these circumstances students may wish to consider applying for Special Consideration.

Special Consideration will only be granted to students whose performance in all parts of the coursework is satisfactory. In particular, **you must complete all four online Quizzes to be eligible for Special Consideration.** Information about unavoidable disruption and the Special Consideration process is available at

<http://www.reg.mq.edu.au/Forms/APSCons.pdf>

If a Supplementary Examination is granted as a result of the Special Consideration process, the examination will be scheduled after the conclusion of the official examination period.

Students are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period.

Grading:

The process of calculating student grades in STAT279 is explained here.

- The two assessment marks are combined in the following ratios to produce a *raw overall mark*:

<i>Raw overall mark ratios</i>	
Electronic Quizzes	15%
Final Exam	85%

- Your *raw overall mark* and your *raw exam mark* are compared, and whichever is lower is used as your *raw unit mark*.
- The *raw unit marks* of all students will be scaled up or down, to compensate for unavoidable differences in assessment task difficulty between semesters, resulting in *standardised numerical grades* (SNGs). These translate directly into grades, as explained on page 42 of the 2007 Handbook of Undergraduate Studies.

The majority of students will pass all four Quizzes. These students' SNGs will be entirely determined by their Final Exam marks.

UNIVERSITY POLICY ON GRADING

Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG).

On occasion your raw mark for a unit (i.e., the total of your marks for each assessment item) may not be the same as the SNG which you receive. Under the Senate guidelines, results may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.

It is important that you realise that the policy does not require that a minimum number of students are to be failed in any unit. In fact it does something like the opposite, in requiring examiners to explain their actions if more than 20% of students fail in a unit.

The process of scaling does not change the order of marks among students. A student who receives a higher raw mark than another will also receive a higher final scaled mark.

For an explanation of the policy see

<http://www.mq.edu.au/senate/MQUonly/Issues/Guidelines2003.doc>

or

<http://www.mq.edu.au/senate/MQUonly/Issues/detailedguidelines.doc>.

PLAGIARISM

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at:

<http://www.student.mq.edu.au/plagiarism/>

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at

<http://www.student.mq.edu.au>.

SCHEDULE for Monday Lecture Stream

	Week	Commences	Topic	Chapter	Due
Lecturer: Nino Kordzakhia	1	30 July	Introduction LP Formulation	1, 8.1-6	
	2	6 August	LP Formulation Graphical Solutions	8.7-12	Homework Exercise for Week 2 due.
	3	13 August	QuickQuant Simplex Method	9.1-4	Homework Exercise for Week 3 due. Electronic Quiz 1 due.
	4	20 August	Sensitivity & Duality	10.1-10.5	Homework Exercise for Week 4 due.
	5	27 August	Project Planning	14.1-5, 7	Homework Exercise for Week 5 due. Electronic Quiz 2 due.
	6	3 September	Simulation	18.1, 3, 8, 9	Homework Exercise for Week 6 due.
	7	10 September	<i>NO LECTURE</i>		Homework Exercise for Week 7 due.
	Semester Break 15th September–1st October				
	8	2 October	<i>NO LECTURE</i>		<i>NO PRACTICAL</i>
Lecturer: David Bulger	9	8 October	Transportation, Transshipment & Assignment	12.1, 2, 4–7	Homework Exercise for Week 9 due. Electronic Quiz 3 due.
	10	15 October	Inventory	15.1–4	Homework Exercise for Week 10 due.
	11	22 October	Queuing	17.1-3	Homework Exercise for Week 11 due.
	12	29 October	Queuing	17.4 17.6, 17.9	Homework Exercise for Week 12 due.
	13	5 November	Revision		No Homework due, however there <u>is</u> a practical session this week. Electronic Quiz 4 due.

SCHEDULE for Friday Lecture Stream

	Week	Commences	Topic	Chapter	Due
Lecturer: Leigh Wood	1	30 July	Introduction LP Formulation	1, 8.1-6	
	2	6 August	LP Formulation Graphical Solutions	8.7-12	Homework Exercise for Week 2 due.
	3	13 August	QuickQuant Simplex Method	9.1-4	Homework Exercise for Week 3 due. Electronic Quiz 1 due.
	4	20 August	Sensitivity & Duality	10.1-10.5	Homework Exercise for Week 4 due.
	5	27 August	Project Planning	14.1-5, 7	Homework Exercise for Week 5 due. Electronic Quiz 2 due.
	6	3 September	<i>NO LECTURE</i>		Homework Exercise for Week 6 due.
	7	10 September	<i>NO LECTURE</i>		Homework Exercise for Week 7 due.
	Semester Break 15th September–1st October				
	8	2 October	Simulation	18.1, 3, 8, 9	<i>NO PRACTICAL</i>
Lecturer: Ayse Bilgin	9	8 October	Transportation, Transshipment & Assignment	12.1, 2, 4–7	Homework Exercise for Week 9 due. Electronic Quiz 3 due.
	10	15 October	Inventory	15.1–4	Homework Exercise for Week 10 due.
	11	22 October	Queuing	17.1-3	Homework Exercise for Week 11 due.
	12	29 October	Queuing	17.4 17.6, 17.9	Homework Exercise for Week 12 due.
	13	5 November	Revision		No Homework due, however there <u>is</u> a practical session this week. Electronic Quiz 4 due.