



The University of Southern Queensland

## Course Specification

### Description: Operations Research 1

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
MAT	1200	24391	2, 2003	ONC	1.00	TWMBBA

<b>Academic Group:</b>	FOSCI
<b>Academic Org:</b>	FOS003
<b>HECS Band:</b>	2
<b>ASCED Code:</b>	010101

### STAFFING

Examiner: Bruce Meakins

Moderator: Harry Butler

### RATIONALE

Decision making in fields such as industry, business, marketing, government and environmental management is often difficult because of uncertainty and constraints, and the complex nature of the system under study. Operations research is the scientific approach to solving problems which arise in such complex systems, and hence is an aid to decision making in many areas.

### SYNOPSIS

This course focuses on the model development, analytical techniques and the background mathematics necessary for the solution and post- optimal analysis of linear programming, integer programming, transportation, assignment, network, and critical path problems.

### OBJECTIVES

On completion of this course students should be able to:

- formulate various problems that occur in decision making as mathematical models;
- understand the techniques used to investigate these models;
- apply these techniques to various problems
- use software to solve and analyse L.P. problems.

### TOPICS

Description	Weighting (%)
1. Introduction to Linear Programming History of OR, prototype problems, the systems approach to problem solving, methodology of OR. Linear	10.00

programming will be introduced through a variety of applications, leading to a general definition of an L.P. problem. Graphical solution of problems with 2 decision variables will be shown and the corner point method will be used for solving problems with a 2 or more decision variable. An elementary presentation of sensitivity analysis will be given.

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| 2. Simplex Method The canonical and standard forms of L.P. problems will be discussed and the concept of slack and surplus variables introduced. Basic and non-basic variables will be introduced via 2-dimensional problems, leading to a discussion of the general case. The simplex method will then be studied and applied to all cases. The cases of infeasible and unbounded problems, and problems with an infinite number of solutions will be examined. | 17.00 |
| 3. Duality The idea of the dual of an L.P. problem will be introduced, and the relationships between the primal and dual problems studied.   | 12.00 |
| 4. Sensitivity Analysis It will be emphasised that the solution obtained is dependent on the values of the parameters being known precisely, whereas in fact these parameters are only estimates and/or liable to change. The effect on the solution of changing the objective function or constraints will be studied along with the introduction of new constraints and variables.   | 12.00 |
| 5. Transportation and Assignment Problems The special case of L.P. problems which can be formulated as transportation or assignment problems will be studied, using more efficient methods of solving these problems. Transportation problems studied will include those requiring dummy sources and destinations, and a variety of starting procedures will be considered. The Hungarian method will be used in solving assignment problems                     | 20.00 |
| 6. Integer Programming Applications of pure and mixed integer programming will be introduced and the branch and bound method will be introduced.   | 9.00  |
| 7. Networks Elementary graph theory will be introduced to provide a basis for the use of networks to model a variety of problems. Critical path, shortest route, minimal spanning tree and maximal flow problems will be studied   | 20.00 |

**TEXT and MATERIALS required to be PURCHASED or ACCESSED:**

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at <http://bookshop.usq.edu.au> by entering the author or title of the text.

Introductory Book 2002, *Course MAT1200 Operations Research I*, USQ Distance Education Centre, Toowoomba.

Study Book 2002, *Course MAT1200 Operations Research I*, USQ Distance Education Centre, Toowoomba.

Winston, W.L. 1994, *Operations Research: Applications and Algorithms*, 3rd edn, Duxbury Press, Belmont, CA.

## REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Hillier, F. & Lieberman, G 1995, *Introduction to Operations Research*, 6th edition, McGraw-Hill, New York.

Kolman, B. & Beck, R 1995, *Elementary Linear Programming With Applications*, 2nd edition, Academic Press, San Diego.

Taha, H.A 1995, *Operations Research: An Introduction*, 5th edition, Prentice-Hall, Singapore.

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	20
Examinations	3
Lectures	39
Private Study	90
Tutorial	13

## ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT 1	24.00	12.00	Y	21 Jul 2003 (see note )
ASSIGNMENT 2	32.00	16.00	Y	21 Jul 2003 (see note )
ASSIGNMENT 3	24.00	12.00	Y	21 Jul 2003 (see note )
3 HR RESTRICTED EXAMINATION	100.00	60.00	Y	END S2 (see note )

### NOTES:

- . The examiner will advise students of the due dates for assignments.
- . See note 1
- . See note 1
- . Examination dates will be available during the Semester. Please refer to Examination timetable when published.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:

It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.

- 2 Requirements for students to complete each assessment item satisfactorily:  
To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available for each assessment item
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student for the assignment will apply for each working day late.
- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade a student must achieve at least 50% of the available weighted marks for the summative assessment items.
- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks obtained for each of the summative assessment items in the course.
- 6 Examination information:  
The only materials that candidates may use in the restricted examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); written material, books, calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination; mathematical tables. Students whose first language is not English, may, with the Examiner's approval, take an appropriate non-electronic translation dictionary into the examination. Students who wish to use a translation dictionary MUST request and receive written approval from the Examiner at least one week before the examination date. Translation dictionaries will be subject to perusal and may be removed from the candidate's possession until appropriate disciplinary action is completed if found to contain material that could give the candidate an unfair advantage. Computers may not be used.
- 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.
- 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/SECARIAT/calendar/Part5/> or in the printed version of the current USQ Handbook.

## **ASSESSMENT NOTES**

- 9 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. If requested, students will be required to provide

a copy of assignments submitted for assessment purposes. Such copies should be despatched to USQ within 24 hours of receipt of a request being made. The Faculty will NOT accept submission of assignments by facsimile. Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination); IDM (Incomplete Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).