The University of Southern Queensland

Course Specification

Description: Operations Research 1						
Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
MAT	1200	14389	2, 2002	EXT	1.00	TWMBA

Academic Group: FOSCI
Academic Org: FOS003
HECS Band: 2
ASCED Code: 010101

STAFFING

Examiner: Bruce Meakins
Moderator: Peter Dunn

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.	
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.

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
Private Study	142

ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT 1	24.00	12.00	Y	19 Aug 2002
ASSIGNMENT 2	32.00	16.00	Y	23 Sep 2002
ASSIGNMENT 3	24.00	12.00	Y	25 Oct 2002
3 HR RESTRICTED EXAMINATION	100.00	60.00	Y	END S2 (see note 4)

NOTES:

4. Examination dates will be available during the Semester. Please refer to Examination timetable when published.

OTHER REQUIREMENTS

1 Attendance Requirements: It is the students' responsibility to actively participate in all classes scheduled for them, and to study all material provided to them or required to be accessed by them to maximize their chance of meeting the objectives of the course and to be informed of course-related activities and administration.

2 Minimum Requirements to Pass the Course: To be assured of a pass in this course, students must obtain at least 50% of the marks available in the examination and obtain an overall mark of at least 50% in the assignments.

3 Grading: Final grades for students will be determined by the addition of the marks obtained in each assessment item, weighted as in the Assessment Details.

4 Supplementary and Deferred Examinations: Students who obtain an overall passing mark, but who do not perform satisfactorily in the examination, may, at the discretion of the examiner, be granted a supplementary examination. Students will be granted a deferred examination only if they perform satisfactorily in the assignments. Any supplementary or deferred examinations for this course will normally be held during the examination period at the end of semester 3.

5 Assignments: The due date for an assignment is the date by which a student must despatch it to USQ. The onus is on the student to provide proof of the despatch date, if requested by the examiner. Students must retain a copy of each item submitted for assessment. This must be produced within 24 hours if required by the examiner. In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances. This policy may be found in the USQ Handbook, the Distance Education Student Guide and the Faculty of Sciences' Orientation Handbook for on-campus students. All students are advised to study and follow the guidelines associated with this policy. An assignment submitted after the due date without an extension approved by the examiner, will attract a penalty of up to 20 percent of the assigned mark for each day (or part thereof) that the assignment is late. No further assignments will be accepted for assessment purposes after marked assignments or model solutions have been released, except in extenuating circumstances.

6 Examinations: Candidates should be aware that the University has policies and regulations (Regulation 5.6.2.2) about the use of unfair means and electronic devices in an examination and they should refer to them to determine whether or not actions they intend to take are acceptable to the University. Restricted Examination: Candidates will be allowed access only to specific materials in a restricted examination. The only materials that candidates may use in the restricted examination for this course (MAT1200) are: written material, books, calculators and mathematical tables. A list of the materials candidates may access in the restricted examination will be on the frontispiece of the examination paper.
