



The University of Southern Queensland

Course Specification

Description: Advanced Operations Research

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
MAT	3201	10388	1, 2002	EXT	1.00	TWMBA

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

STAFFING

Examiner: Bruce Meakins

Moderator: Peter Dunn

OTHER-REQUISITES

Recommended pre-requisite: MAT1200

RATIONALE

Decision making under conditions of uncertainty, or in competitive environments, or in situations in which variables of interest evolve through time is enhanced by the application of specialised operations research techniques. This course emphasises the applications of deterministic, probabilistic and simulation techniques to problems which arise in complex decision making. The course is of special interest to those concerned with management, organizational systems, production/manufacturing systems and communication networks.

SYNOPSIS

This course requires students to be capable of applying managerial control techniques to the outputs of projects; to understand the implications of decision making under uncertainty; to formulate and solve dynamic programming models; to model and solve queueing and inventory problems. Concepts in simulation are developed through the design of probabilistic simulation models for inventory and queueing problems.

OBJECTIVES

On successful completion of this course students will be able to:

- demonstrate an understanding of deterministic, probabilistic and stochastic processes;
- develop models and apply the necessary analytical techniques for inventory, queueing and Markov process problems;

- understand and apply the technique of dynamic programming to various problems;
- recognize problems which may require simulation in their solution;
- demonstrate understanding of the key concepts and stages in simulation modelling;
- show increasing awareness of the consequence of decision making in complex systems.

TOPICS

Description	Weighting (%)
1. Deterministic Inventory Models - deterministic and probabilistic processes - structure of inventory systems - formulations of inventory models - the basic Economic Order Quantity Model - effect on optimality of discounts - continuous-rate EOQ Models - EOQ models with back orders allowed	16.00
2. Probabilistic Inventory Models - single period decision models - discrete and continuous demand models - EOQ models with uncertain demand	16.00
3. Markov Processes - stochastic processes and definition of a Markov chain - systems defined as Markov processes - formulation of Markov process model - transition probabilities - steady state probabilities - absorbing chains - queueing problems as Markov processes	16.00
4. Queueing Theory - the structure of queueing systems - modelling arrival and service processes - probability distributions in queueing models - single server queueing models - multi server queueing models - finite queue length models - finite source models	16.00
5. Dynamic Programming - elements of the DP model - system states - recursion - applications	16.00
6. Fundamentals of Systems Simulation - functions and classification of simulation models - structure of system models, simulation model formulation, implementation and performance appraisal - generation of random variates - model formulation and execution of inventory problems - model formulation and execution of a probabilistic queueing problem - validation and sensitivity analysis	16.00
7. Implementation - roles of manager and OR specialists in decision making - factors affecting successful implementation of OR recommendations - phases of implementation and review	4.00

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.

Ecker, J. & Kupferschmid, M. 1991 *Introduction to Operations Research*, John Wiley, New York.

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

Ravindran, A., Phillips, D. & Solberg, J. 1987 *Operations Research, Principles and Practice*, John Wiley, New York.

Taha, H.A. 1992 *Operations Research - an introduction*, 5th edn, Macmillan, New York.

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	15
Private Study	155

ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT 1	15.00	15.00	Y	04 Mar 2002 (see note 1)
ASSIGNMENT 2	15.00	15.00	Y	04 Mar 2002 (see note 2)
ASSIGNMENT 3	15.00	15.00	Y	04 Mar 2002 (see note 3)
3 HOUR RESTRICTED EXAMINATION	55.00	55.00	Y	END S1 (see note 4)

NOTES:

1. Further details about the due dates are detailed in the assessment section of the Course Specifications.
2. Further details about the due dates are detailed in the assessment section of the Course Specifications.
3. Further details about the due dates are detailed in the assessment section of the Course Specifications.
4. Examination dates will be available during the Semester. Please refer to Examination timetable when published.

OTHER REQUIREMENTS

- 1 Attendance: 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 certain of gaining a passing grade in this course, a student must gain at least 50% of the total assignment marks available and at least 50% in the final examination.
 - 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, and by considering the level of achievement of the objectives of the course.
 - 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 be held during the examination period at the end of the semester 3 following this unit offering.
 - 5 Assignments: 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. 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 the University's Policy on Assignments (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 new 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.
 - 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. Written materials, books, calculators and mathematics tables are permitted in the examination for this unit, but computers may not be used.
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