DEREE COLLEGE SYLLABUS FOR: MG 4246 MANAGEMENT SCIENCE	
(Updated Spring 2021)	**UK LEVEL: 6** **UK CREDITS: 15** **US CREDITS: 3/0/3**

PREREQUISITES:	MA 1008 College Algebra MA 2021 Applied Statistics
CATALOG DESCRIPTION:	Quantitative techniques used to provide insight into business decisions. Topics include linear programming, sensitivity analysis, networks, decision analysis, waiting lines, Markov analysis and simulation.
RATIONALE:	The complexity of modern business has given rise to complex managerial problems. Expressing these problems quantitatively facilitates their solution through the application of the proper model. Knowledge of management science enables managers, consultants and auditors to obtain a documented approach to managerial problems solutions. In addition, modern business concepts, like customer relationships management and business analytics, require a basic understanding of quantitative methods. This course also provides an analytical framework to better comprehend the functional areas of management (accounting, finance, personnel, marketing, operations and information systems).
LEARNING OUTCOMES:	As a result of taking this course, the student should be able to: 1. Analyze and evaluate important management science theories and models, and explain their impact on managerial decision making. 2. Analyze real life managerial problems in order to select, adjust and assess the mathematical model that best suits the challenges faced. 3. Apply management science models, analyze their outputs and implications, and recommend an appropriate course of action.
METHOD OF TEACHING AND LEARNING:	In congruence with the learning and teaching strategy of the college, the following tools are used: ➢ Lectures, problem solving exercises, model applications, small case studies, the carrying out of a research project and in-class presentation. ➢ Office hours held by the instructor to provide further assistance to students. ➢ Use of the Blackboard Learning platform to further support communication, by posting lecture notes, assignment instruction, timely announcements, and online submission of assignments.
ASSESSMENT:	**Summative**:

First Assessment: Written project (Individual; 2,300-2,700 words)	**60%**
Final Assessment: Written examination (Essay-type questions)	**40%**

	Formative:	
	In-class diagnostic examinations and problem-solving exercises	**0%**

The formative coursework aims to prepare students for the written project and the final examination.

The written project tests Learning Outcome 1
The final examination tests Learning Outcomes 2 and 3

Students are required to resit failed assessments in this module.

INDICATIVE READING:	

REQUIRED MATERIAL:
Render, B., Stair, Jr. R.M., Hanna, M.E. & Hale, T.S. *Quantitative Analysis for Management*. Pearson, latest edition

RECOMMENDED MATERIAL:

A. BOOKS
Anderson, D., Sweeney D. and Williams T., *An Introduction to Management Science: Quantitative Approaches to Decision Making,* Thomson Learning.

Levin, R.I., D.S. Rubin, J.P. Stinson and E.S. Gardner, Jr. *Quantitative Approaches to Management*. McGraw-Hill, latest edition, ISBN 0-07-909187-3

B. ARTICLES

Askin, R.G. & Hanumantha, G.J. (2018). "Queueing network models for analysis of nonstationary manufacturing systems", *International Journal of Production Research*, Vol. 56 No 1-2, pp. 22-42.

Brun, A. and Savino, M. (2018). "Assessing risk through composite FMEA with pairwise matrix and Markov chains", *International Journal of Quality & Reliability Management*, Vol. 35 No. 9, pp. 1709-1733.

Chiti, F., Fantacci, R. & Rizzo, A. (2018). "An integrated software platform for airport queues prediction with application to resources management". Journal of Air Transport Management, Vol. 67, pp. 11-18

Dhawalikar, M., Mariappan, V., Srividhya, P. and Kurtikar, V. (2018), "Multi-state failure phenomenon and analysis using semi-Markov model", *International Journal of Quality & Reliability Management*, Vol. 35 No. 9, pp. 2080-2091.

Djelassi, S., Diallo, M.F. & Zielke, S. (2018). "How self-service technology experience evaluation affects waiting time and customer satisfaction? A moderated mediation model". *Decision Support Systems*, Vol. 111, pp. 38-47

Giannikas V. and McFarlane, D. (2021), ""Examining the value of flexible logistics offerings", *European Journal of Operational Research*, Vol. 290 No 3. DOI: 10.1016/j.ejor.2020.08.056

Gupta, S. and Gupta, P. (2018), "Setting-up material handling network in manufacturing systems using graph theory", *Journal of Advances in Management Research*, Vol. 15 No. 1, pp. 58-67.

Jafari, H., Jonidi Jafari, A., Nekoei-Moghadam, M. and Goharinezhad, S. (2019), "The use of uncertain scenarios in disaster risk reduction: a systematic review", *Foresight*, Vol. 21 No. 3, pp. 409-418.

Kim, C., Yang, H. & Kim, S.W. (2018). "Optimal baggage sorting rule to reduce waiting time in baggage claim". *Service Business*, Vol. 12 No 2, pp. 435–451

Martinod, R., Bistorin, O., Castañeda, L. and Rezg, N. (2019), "Joint optimisation of operation and maintenance policies in an urban ropeway transport systems context", *International Journal of Quality & Reliability Management*, Vol. 36 No. 7, pp. 1106-1136.

Martins, H.S.R., Cruz, F.R.B., Duarte, A.R. & Oliveira, F.L.P. (2019). "Modeling and optimization of buffers and servers in finite queueing networks". *OPSEARCH*, Vol. 56 No 1, pp. 123-150

Meyerowitz, D., Lew, C. and Svensson, G. (2018), "Scenario-planning in strategic decision-making: requirements, benefits and inhibitors", *Foresight*, Vol. 20 No. 6, pp. 602-621.

Nikolopoulos, K., Puniab, S., Schäfers, A., Tsinopoulos, C. and Vasilakis, C. (2021), ""Forecasting and planning during a pandemic: COVID-19 growth rates, supply chain disruptions, and governmental decisions", *European Journal of Operational Research*, Vol. 290 No 1, pp.99-115

Romero-Silva, R., Marsillac, E. & Shaaban, S. (2019). "Reducing the variability of inter-departure times of a single-server queueing system–The effects of skewness". *Computers & Industrial Engineering*, Vol. 135, pp. 500-517

Sabet, E., Yazdani, B., Kian, R. and Galanakis, K. (2020). "A strategic and global manufacturing capacity management optimisation model: A Scenario-based multi-stage stochastic programming approach". *Omega*, Vol. 93, DOI: 10.1016/j.omega.2019.01.004

Singhal, K., Singhal, J. & Kumar, S. (2019). "The Value of the Customer's Waiting Time for General Queues". *Decision Sciences*, Vol. 50, pp. 567-581.

Taylor, M., Kwasnica, V., Reilly, D. and Ravindran, S. (2019), "Game theory modelling of retail marketing discount strategies", *Marketing Intelligence & Planning*, Vol. 37 No. 5, pp. 555-566.

Temur, G. and Bolat, B. (2018), "A robust MCDM approach for ERP system selection under uncertain environment based on worst case scenario", *Journal of Enterprise Information Management*, Vol. 31 No. 3, pp. 405-425.

Van Brummelen, S.P.J., de Kort, W.L. & van Dijk, N.M. (2018), "Queue length computation of time-dependent queueing networks and its application to blood collection". *Operations Research for Health Care*, Vol. 17, pp. 4-15

	Wang, Y., Dai, L., Zhang, X. and Wang, X. (2019), "The shortest-path spanning tree of assembly dimension and its application", *Assembly Automation*, Vol. 39 No. 2, pp. 254-261. Weiss, E.N. & Tucker, C. (2018). "Queue management: Elimination, expectation, and enhancement". *Business Horizons*, Vol. 61 No 5, pp. 671-678.
INDICATIVE MATERIAL: *(e.g. audiovisual, digital material, etc.)*	**REQUIRED MATERIAL:** N/A **RECOMMENDED MATERIAL:** N/A
COMMUNICATION REQUIREMENTS:	Use of appropriate academic conventions as applicable in oral and written communications.
SOFTWARE REQUIREMENTS:	MS Office
WWW RESOURCES:	www.maths.mu.oz.au www.lumina.com www.mcs.anl.gov www.managementscience.org

INDICATIVE CONTENT:	1. MS/OR and Information Systems
	2. Decision Theory and Decision Trees
	3. Linear Programming
	   3.1. Graphical Methods
	   3.2 Simplex Method: Maximization and Minimization
	4. Building LP Models and Interpreting Solutions
	   4.1. Problem Formulation
	   4.2. Duality
	   4.3. Sensitivity Analysis
	   4.4 LP Applications
	5. Specially Structured Linear Programs
	   5.1. Transportation Problems
	   5.2. Assignment Problems
	6. Networks
	   6.1. Scheduling with Resource Limitations
	   6.2. Maximal Flow Problems
	   6.3. Minimal-Spanning-Tree Problems
	   6.4. Shortest Route Problems
	7. Waiting Lines
	8. Inventory Models
	9. Simulation
	10. Markov Analysis
	11. Recent Approaches to MS/OR
	   10.1 Predictive Models in Business Intelligence
	   10.2 Risk Analysis