University of Macau

Undergraduate Mathematics Program

Coordinating Unit:	Department of Mathematics, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	MATB226	Year of Study:	2
Course Title:	Operational Research		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	MATB112 Linear Algebra or MATB220 Engineering Mathematics II		
Prerequisite Knowledge:	Nil		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture and one hour of tutorial per week.		
Laboratory/Software Usage:	Nil		
Course Description:	This course aims at providing students with knowledge on operational research. The topics include linear programming and simplex method. Revised simplex method. Duality of linear programming. Post-optimal analysis. Transportation and assignment problems. Game theory.		
Course Objectives:	1. Be able to solve linear programming problems by simplex methods and its variants. 2. Be able to use duality theory to find solutions to dual pairs. 3. be able to solve transportation problems and matrix game using related methods		
Learning Outcomes (LOs):	Upon completion of this course, students are expected to: 1. understand and be able to use simple method to solve linear programming problems. 2. understand and be able to use revised simplex method. 3. understand and be able to use duality to solve problems 4. understand and be able to use the transportation algorithm 5. understand and be able to solve matrix game		
Texts & References: *(* recommended textbook(s))*	1. * Operations Research: An introduction, 8th Ed., Taha, Pearson. 2. Introduction to Operations Research, 8th Ed., Hiller & Lieberman, McGraw-Hill.		
Student Assessment:	• Assignments: 15% • Midterm examination: 35% • Final examination: 50%		
Learning Outcome Assessment:	• Assignments, midterm and final examination		

Pedagogical Methods:	☑ Lecture	☐ Service learning
	☐ Guest speakers	☐ Internship
	☐ Case study	☐ Field study
	☐ Role playing	☐ Company visits
	☐ Student presentation	☐ e-learning
	☐ Project	☐ Independent study
	☐ Simulation game	☐ Others: _____
	☑ Exercises and problems	

Major Assessment Methods: For each Major Assessment Method below, please indicate the specific pedagogical methods involved (by putting a ✓ in the relevant box(es) on the right-hand side).	Case Study	Role Playing	Student Presentation	Individual project/paper	Group project/paper	Simulation Game	Exercises & problems	Service learning	Internship	Field Study	Company visits	Written examination	Oral examination	Others (please specify)
Class Participation/ Discussion (0%)														
Assignments (15%)							✓							
Quizzes (0%)														
Midterm Exam (35%)												✓		
Final Exam (50%)												✓		
Others *(please specify)*														
Course Web: (if any)														

Course Content: (topic outline)

Week no.	Topics	Assignment no.	LO no.
1	**Introduction: Linear Programming Problems** Linear programming model; graphical solutions for two dimensional problems	1	1
2	**Simplex Method** Basic concepts: optimal solution, basic feasible solution; simplex method for problems in feasible canonical form	1	1
3,4	**Artificial Variable Technique** Techniques for problems in more general forms, the M-method and the two-phase method, special cases in the simplex method: no feasible solution, unbounded optima, alternative optima, degeneracy	1,2	1
4, 5	**Advanced Linear Programming** Simplex method fundamentals, including some basic theory and relations between extreme points and basic solutions. Generalized simplex tableau in matrix form. Revised simplex method.	2,3	2
6, 7	**Duality of Linear Programming Problems** Definition of the dual problem, primal-dual relationships, dual simplex method	3	3
7,8	**Post-Optimal Analysis** Changes affecting feasibility, changes affecting optimality, parametric linear programming	3	2,3
9	**Revision and Midterm Examination** Revision and discussion on assignments		
10,11	**Transportation Problems** Transportation model and its variants, relation to duality and graph theory, methods for determining initial feasible solutions: North-West corner method, least cost method, etc. The transportation problem algorithm	4	4
12,13	**Matrix Game** Model for Matrix game, optimality in game theory, graphical method, relation to linear programming problems and duality, solving matrix games with simplex method	4	5
14	**Revision**		
TBA	**Final Examination**		

TBA: To be arranged by the Registry

Course Instructor(s):	Dr. SeakWeng Vong