THE UNIVERSITY OF THE WEST INDIES, MONA

ECON 3037: Operations Research I

Semester I

Pre-requisites: Econ 2015 or MAT 1141

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COURSE DESCRIPTION:

This course will concentrate on linear programmimg. Linear programmimg is perhaps the most widely used optimization tool in the modern world. A linear programmimg problem is an optimization problem that seeks to maximize or minimize a linear function subject to a system of linear inequality and/or equality constraints. Applications of linear programmimg are diverse. These include transportation problems, corporate planning, inventory control, game theory, production scheduling, and many others. In this course you will learn how to model real world problems as linear programmimg, and solve them using a method called the simplex method. You will also study the theory behind the simplex method and learn how to carry out sensitivity analysis, that is, analyze how your optimal solution changes if certain parameters of your linear programmimg model are altered.

LEARNING OUTCOME:

Upon succesful completion of this course you should be able to

- model real world problems as linear programming (LP) problems,
- solve LP problems graphically,
- solve LP problems using the simplex method and the Big M method,
- use available software to solve LP problems,
- perform sensitivity analysis.

MODE OF DELIVERY

One two – hour online lecture and one online tutorial hour per week.

COURSE ASSESSMENT

Coursework – 50%

- Two assignments @ 15% each 30%
- One midsemester exam 20%

Final Exam – 50%

All assessment pieces will be written pieces and they will be submitted on OURVLE.

SYLLABUS

1. Modelling and the Graphical Method

1.1 Modelling real world problems
1.2 Graphical solution to two – variable LP problems
1.3 Types of solutions
1.4 Graphical interpretation of solutions

2. The Simplex Method

2.1 Converting an LP problem to standard form
2.2 The simplex algorithm
2.3 Identifying the different types of solutions
2.4 The Big M method
2.5 Unrestricted – in – sign variables

3. Sensitivity Analysis

3.1 Matrix algebraic representation of the LP problem
3.2 Derivation of some important formulas
3.3 Sensitivity analysis when one parameter is changed

4. The Dual Problem

4.1 Finding the dual of a LP problem
4.2 Economic interpretation of the dual problem
4.3 The Dual Theorem
4.4 Shadow prices
4.5 Complementary slackness
4.6 The dual simplex method

5. Goal Programmimg and Transportation Problems

5.1 Goal programmimg
5.2 Modelling transportation problems
5.3 The transportation simplex method
5.4 Sensitivity analysis for transportation problems
5.5 Assignment & Transshipment problems

Resources

Texts: 1. Wayne Winston, *Operations Research, 4th Edition*
2. Hamady Taha, *Operations Research, 10th Edition*