

Course specification

(1206 Operations Research)

Faculty: HICIT

Programme(s) on which the course is given: Under graduate program in Computer Science

Major or minor element of programme: Compulsory

Department offering the programme: Department of Computer Science

Department offering the course: Department of Computer Science

Year / Class: 1st Year – 2nd semester

Date of specification approval: 22/2/2016

A- Basic Information

Title: Operation Research Code: 1206

Weekly Hours:

Lecture: 3

Exercise: 2

Practical: -

Total: 5

B- Professional Information

1- Course Objectives:

Upon successful completion of the course, students should be:

- have a working knowledge of the principle techniques and methods of operations research.
- understand how to formulate problems, construct and solve mathematical models, and apply the systems approach to problem solving.
- be able to apply the general concepts of optimization to solve these models.

2- Program ILOs Covered by Course

Program Intended Learning Outcomes

Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
a4, a21	b1, b2, b4, b7, b8, b13	c6, c16	d11

3 - Intended Learning Outcomes of course (ILOs)

a: Knowledge and Understanding

- a1. Understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- a2. Learn how to define and solve Linear Programming models by using various techniques.
- a3. Understand the Post Optimality analysis and Duality.
- a4. Learn how to build and solve the Transportation models.
- a5. Understand how to build and solve the Assignment models.
- a6. Learn how to build and solve the Network models using “CPM and PERT” techniques.

b: Intellectual skills

- b1. Develop analytical skills of problem formulation into appropriate decision models.
- b2. Design new simple model like: CPM, PERT to improve decision-making.
- b3. Develop critical thinking and objective analysis of decision problems.

c: Professional and practical skills

- c1. Acquire hands-on experience of computer packages dealing with quantitative techniques.
- c2. Implement practical cases.

d: General and transferable skills

- d1. work in a group in order to design and write programs to solve OR problems

4- Contents and Course Outline

Topic	Hours	Lec.	Exc /Lab
Chapter 2: Introduction to Linear Programming 2.1 Introduction. 2.2 Construction of the LP Model.	10	6	4
2.3 Graphical LP Solution. 2.3.1 Solution of a Maximization Model. 2.3.2 Solution of a Minimization Model. 2.3.3 Slack, Surplus, and Unrestricted Model. 2.4 Graphical Sensitivity Analysis. 2.4.1 Changes in the Objective Function Coefficient. 2.4.2 Unit Worth of a Resource. 2.5 Computer Solution of Linear Programming Problems. 2.6 Analysis of Selected Linear Programming Model.	15	9	6
3 The Simplex Method 3.1 Introduction. 3.2 Standard Linear Programming Form and Its Solutions. 3.2.1 Standard Linear Programming Form. 3.2.2 Determination of Basic Solutions. 3.2.3 Unrestricted Variables and Basic Solution. 3.3 The Simplex Algorithm. 3.4 Simplex Method Application. 3.5 Special Cases in Simplex Method Application. 3.5.1 Degeneracy. 3.5.2 Alternative Optima. 3.5.3 Unbounded Solution. 3.5.4 Infeasible Solution.	10 5	6 3	4 2
4 Duality. 4.1 Introduction.	5	3	2

4.2 Definition of the Dual Problem.			
4.3 Relationship between the Optimal Primal and Dual.			
5 Transportation Model.	10	6	4
5.1 Definition of the Transportation Model.			
5.3 The Transportation Algorithm.			
5.3.1 Determination of the Starting Solution.			
5.3.2 Iterative Computation of the Algorithm.			
5.4 The Assignment Model.			
6 Network Models	10	6	4
6.1 Scope of Network Application.			
6.2 Network Definitions.			
6.3 Minimal Spanning Tree Algorithm.			
6.4 Shortest Route Problem.			
6.5 Maximal Flow Model.			
6.7 CPM and PERT.			
6.7.1 Network Representation.			
6.7.2 Critical Path Computation.			
6.7.3 Construction of the Time Schedule.			

5- Teaching and learning methods

- 4.1 Lectures
- 4.2 Tutorial Exercises
- 4.3 Discussions.

6 -Student assessment methods

- 5.1 Midterm Exam: To assess the knowledge and understanding achieved by the student during the previous weeks.
- 5.2 Final Exam: To evaluate what the student gain at the end of the course, and to assess: the knowledge and understanding, general skills, and intellectual skills.
- 5.3 Course Work & Quizzes: To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills.

Assessment Schedule

Assessment	Week #
Mid Term Exam	8
Final Exam	16
Course Work & Quizzes	2-14

Assessment Weight

Assessment	Weight %
Mid Term Exam	10%
Final Exam	80%
Course Work & Quizzes	10%
Total	100

Course Work & Quizzes: (Short Exams, Assignments, Researches, Reports, Presentations, Class/Project discussion)

7 -List of references

7.1 Text Books : **Operations Research : An Introduction 8th Edition**

By **Hamdy A. Taha** University of Arkansas, Fayetteville

Prentice Hall 2008, Pearson Education International

Operations Research: An Introduction (10th Edition): Hamdy A. Taha

7.2 Internet Location : http://en.wikipedia.org/wiki/Operations_research

- Operational Research: The Science of Better: Promoting the knowledge and use of Operational Research in the UK
- International Federation of Operational Research Societies
- Operations Research Custom Search Engine
- Mathematics of Operations Research
- INFORMS OR/MS Resource Collection: a comprehensive set of OR links.
- Operations Research: The Science of Better: Initiative by INFORMS to promote OR.
- Operational Research: The Science of Better: Promoting the knowledge and use of Operational Research in the UK
- International Federation of Operational Research Societies
- INFORMS OR/MS Resource Collection: a comprehensive set of OR links.
- Operations Research: The Science of Better: Initiative by INFORMS to promote OR.

8- Required Facilities

- Modeling and simulation laboratories.
- Software programs specified in operations research.
- Data show and PC computer.

9 -Course Matrices

9-1 Course Contents/ILOs Matrix

Course Content/ILO Matrix

Course Contents	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1
1 Introduction to Linear Programming	√			√			√	√				
2 Graphical LP Solution	√		√	√		√	√				√	
3 The Simplex Method	√		√	√		√	√				√	
4 Duality		√	√		√	√		√	√	√	√	
5 Transportation Model.		√			√	√		√	√	√		
6 Network Models		√			√		√	√	√	√		

9-2 Learning Methods /ILOs Matrix

Learning Method /ILO Matrix

Learning Methods	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1
Lectures	√	√	√	√	√	√	√	√	√	√	√	
Tutorial Exercises							√	√	√	√	√	
Discussions.							√	√	√	√	√	√

9-3 Assessment Methods /ILOs Matrix

Assessment Methods /ILO Matrix

Assessment Methods	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1
Mid Term Exam	√	√	√	√	√	√	√	√	√	√	√	
Final Exam	√	√	√	√	√	√	√	√	√	√	√	
Course Work & Quizzes	√	√	√	√	√	√	√	√	√	√	√	√

Course Coordinator: Dr. Farouk Shaaban ()

Head of Department: Dr. Farouk Shabaan ()

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