Zarqa University

Faculty of Engineering and Technology

Department: Energy Engineering
Course title: Operations Research

Prerequisite: 0902200
Instructor: Dr. Rana Haj Khalil
Lecture's time: 12:00-13:00 Sunday, Tuesday & Thursday
Semester: Second, 2016-2017
Office Hours: 9:00-12:00 Sunday, Tuesday & Thursday

Course description:

The course covers topics on linear programming, Graphical and Algebraic solutions, Simplex Method. Duality and Sensitivity analysis. Transportation and assignment problems. Network analysis. Queing analysis.

Aims of the course:

1. To familiarize students with the basic concepts, models and statements of the operations research theory.
2. To introduce the students how to use variables for formulating complex mathematical models in industrial/energy engineering science.
3. To provide the students with opportunity of using various software package for solving linear programming models.

Intended Learning Outcomes (ILOs):

Upon completion of the course the student should be able to use some scientific approaches to decision making that concern on how to conduct and coordinate the operations or activities within the organizational system.

OUTCOME 1: An ability to apply knowledge of mathematics, science and engineering to the analysis of industrial/energy engineering problems.
OUTCOME 3: An ability to identify, formulate and solve engineering problems.
OUTCOME 3: An ability to use the techniques, skills and modern engineering practice.

Course structures:

Week	C. Hrs	ILOs	Topics	Teaching Procedure	Assessment methods
1	3	OUTCOME 1	CHARTER One Introduction 1.1 The Origins of Operations Research 1.2 The Nature of Operations Research 1.3 The Rise of Analytics Together with Operations Research 1.4 The Impact of Operations Research	PowerPoint Slides	
2 &3	6	OUTCOME 1	CHARTER 2 Overview of the Operations Research Modeling Approach 2.1 Defining the Problem and Gathering Data 2.2 Formulating a Mathematical Model 2.3 Deriving Solutions from the Model 2.4 Testing the Model 2.5 Preparing to Apply the Model 2.6 Implementation	PowerPoint Slides	
4 &5	6	OUTCOME 2	CHARTER 3 Introduction to Linear Programming 3.1 Prototype Example 3.2 The Linear Programming Model 3.3 Assumptions of Linear Programming 3.4 Additional Examples 3.5 Formulating and Solving Linear Programming Models on a Spreadsheet	PowerPoint Slides	
6 &7	6	OUTCOME 2	CHARTER 4 Solving Linear Programming Problems: The Simplex Method	PowerPoint Slides	

			4.1 The Essence of the Simplex Method 4.2 Setting Up the Simplex Method 4.3 The Algebra of the Simplex Method 4.4 The Simplex Method in Tabular Form 4.5 Tie Breaking in the Simplex Method 4.6 Adapting to Other Model Forms 4.7 Postoptimality Analysis		
8 & 9	6	OUTCOME 2	CHAPTER 5 The Theory of the Simplex Method 5.1 Foundations of the Simplex Method 5.2 The Simplex Method in Matrix Form	PowerPoint Slides	
10 & 11	6	OUTCOME 3	CHAPTER 6 Duality Theory 6.1 The Essence of Duality Theory 6.2 Economic Interpretation of Duality 6.3 Primal-Dual Relationships 6.4 Adapting to Other Primal Forms 6.5 The Role of Duality Theory in Sensitivity Analysis	PowerPoint Slides	
12 & 13	6	OUTCOME 2	CHAPTER 7 Linear Programming under Uncertainty 7.1 The Essence of Sensitivity Analysis 7.2 Applying Sensitivity Analysis 7.3 Performing Sensitivity Analysis on a Spreadsheet	PowerPoint Slides	
13 & 14	6	OUTCOME 3	CHAPTER 9 The Transportation and Assignment Problems	PowerPoint Slides	

			9.1 The Transportation Problem 9.2 A Streamlined Simplex Method for the Transportation Problem 9.3 The Assignment Problem 9.4 A Special Algorithm for the Assignment Problem		
15	3	OUTCOME 3	CHAPTER 10 Network Optimization Models 10.1 Prototype Example 10.2 The Terminology of Networks 10.3 The Shortest-Path Problem 10.4 The Minimum Spanning Tree Problem 10.5 The Maximum Flow Problem 10.6 The Minimum Cost Flow Problem 10.7 The Network Simplex Method 10.8 A Network Model for Optimizing a Project's Time-Cost Trade-Off	PowerPoint Slides	

References:

1. "Introduction to Operations Research" by Frederick S.Hillier/Gerald J. Lieberman, Tenth edition, McGraw-Hill.
2. "Operations Research: An Introduction" by Hamdy A. Taha, Ninth Edition, Pearson.

Assessment Methods:

Methods	Grade	Date
Mid Term Exam	35%	27/5/2017
Two Quizes	10%	
Seminar	5%	22/5/2017
Final Exam	50%	