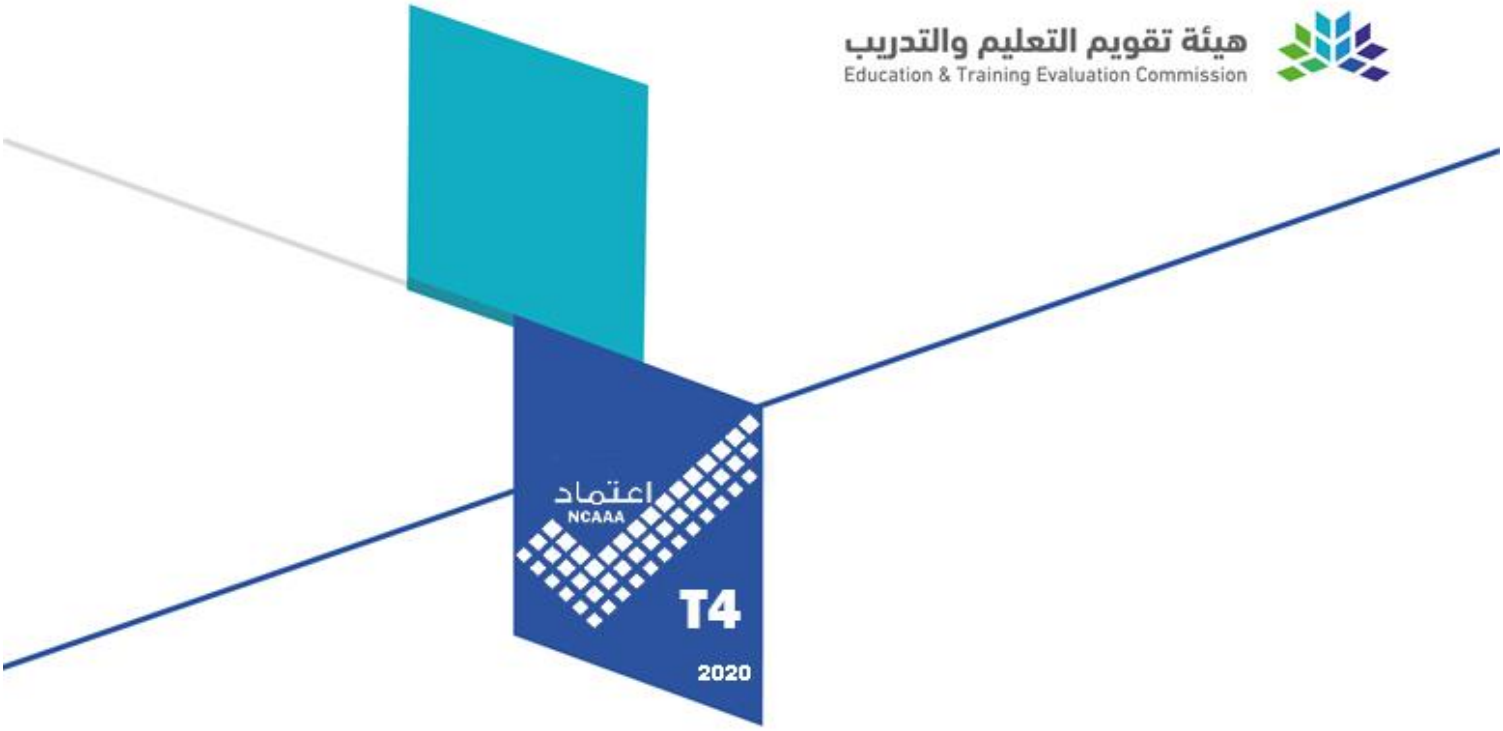
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Operational research
Course Code:	CSI 445
Program:	Computer Science &Information
Department:	Computer Science and Information
College:	College of Science at Az Zulfi
Institution:	Majmaah university

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☐ Elective ☑
3. Level/year at which this course is offered: **level 2**
4. Pre-requisites for this course (if any)**:** Computer Programming (CSI 131)
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	32	%80
2	**Blended**	2	%5
3	**E-learning**	2	%5
4	**Distance learning**	2	%5
5	**Other**	2	%5

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	20
2	**Laboratory/Studio**	
3	**Tutorial**	20
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Operations research (OR) seeks the determination of the best (optimum) course of action of a decision problem under the restriction of limited resources. The term operations research quite of-ten is associated almost exclusively with the use of mathematical techniques to model and analyze decision problems. Although mathematics and mathematical models represent a comer stone of OR, there is more to problem solving than the construction and solution of mathematical models. Specifically, decision problems usually include important intangible factors that cannot be translated directly in terms of the mathematical model. Foremost among these factors is the presence of the human element in almost every decision environment. Indeed, decision situations have been reported where the effect of human behavior has so influenced the decision problem that the solution obtained from the mathematical model is deemed impractical.

2. Course Main Objective

The purpose of this course is to enable the student to:

1.Understand and apply the paradigm What is, why we need, how to use tools of, and Where/When to apply: Optimization.
2.Recognize the concept of Absolute Extrema, and the concept of Lagrange Multiplier to determine the conditional Extrema.
3.Determine the type of solution (and find this solution if it exists) for a system of linear equations.
4.Establish linear programming as one of the Operations Research techniques used in planning for utilizing available resources with the best possible manner.
5.Be familiar with the mathematical properties of linear programming models, by graphical and algebraic concepts.
6.Explore practical applications that can be solved by linear programming and the ability to formulate linear programming problems.
7.Apply professionally the Simplex method to solving linear programming problems, then performing sensitivity analysis on optimal solution.
8.Interpret and apply the Duality process.
9.Construct and solve applications of the Transportation Model and its Variants.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Describe exactly and in a formal manner the type of a considered optimization problem.	K1
1.2	Recall and list different methods to attack a problem.	
1.3	Recognize the concepts and mathematical models of Linear programming.	
1.4	Match correctly the appropriate techniques of solutions with the concerned problems.	
2	**Skills :**	
2.1	Plan and explain how to solve an optimization problem.	S1
2.2	Reorganize the relationships between a linear programming problem and other objects.	
2.3	Differentiate and compare between the alternative solutions of a linear programming problem to justify the optimal one.	
2.4	Illustrate a plan to attack and solve a LP problem	
2.5	Use the available commercial software systems/packages in application to the suggested solution/plan.	
3	**Values:**	
3.1	Team working skills: cooperative working in groups inside the class, or/and efficient participation in take-home-assignments.	C6
3.2	Oral Skills: save the students' time and allow them to feel "involved" in the discussion, rather than simply being outside spectators.	
3.3	Communication skills : a video conference help the student to skip the fear-threshold of scientific interaction.	

C. Course Content

No	List of Topics	Contact Hours
1	1) Introduction and Basic Concepts of Optimization: Absolute Extrema, and Conditional Extrema. Solution of Systems of Linear of Equations.	8
2	2) What is Operational Research: Operational Research Models. Solving the OR Model. Art of Modeling. Solution of Systems of Linear Inequalities in Two Variables. Convexity.	6
3	3) Linear Programming (Graphical Solution): Two Variables LP Model. Applications: Manufacturing/Construction/Scheduling/Education with resource allocation, Nutrition, Psychology, Medicine, Agriculture, Transportation, Investment, Pollution Control, Capital Expansion, Sociology, Advertising, Opinion Survey, Purchasing.	10
4	4) Linear Programming (Analytical Solution): Computational Details of the Simplex Algorithm. Applications. Algebraic Sensitivity Analysis due to Changes in the Right-hand Side. Degeneracy Difficulties. Dual Simplex Algorithm	10
5	5) Transportation Model and its Variants: Definition of the model. Nontraditional Transportation Model. The Transportation Algorithm.	6
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Describe exactly and in a formal manner the type of a considered optimization problem.	Developing basic communicative ability through: - Lecturing, - Team work, - Oral Discussion, - Home Assignments.	- Quizzes, - Web search, -Graded home-work, -Class Participation, -Midterm and Final Exams,
1.2	Recall and list different methods to attack a problem.		
1.3	Recognize the concepts and mathematical models of Linear programming.		
1.4	Match correctly the appropriate techniques of solutions with the concerned problems.		
2.0	**Skills**		
2.1	Reconstruct, reorganize and analyze an optimization problem.	•Lectures •Exercises demonstrations •Case studies •Individual •Presentations •Brainstorming	□Class Participation □Essay Question □Presentation □Research
2.2	Plan and explain how to solve an optimization problem.		
2.3	Reorganize the relationships between a linear programming problem and other objects.		
2.4	Differentiate and compare between the alternative solutions of a linear programming problem to justify the optimal one.		
2.5	Illustrate a plan to attack and solve a LP problem		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.6	Use the available commercial software systems/packages in application to the suggested solution/plan.		
3.0	**Values**		
3.1	Team working skills: cooperative working in groups inside the class, or/and efficient participation in take-home-assignments.	•Small group discussion •Whole group discussion •Brainstorming •Presentation	•Written Exam •Web search and writing reports. •Lab assignments •Class Activities •Quizzes
3.2	Oral Skills: save the students' time and allow them to feel "involved" in the discussion, rather than simply being outside spectators.		
3.3	Communication skills : a video conference help the student to skip the fear-threshold of scientific interaction.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
	Class Activities:		
1	Homework assignments, Oral discussions	Weekly	30%
	Written summary reports through web search	3, 7, 9, 13	
	Class participation in solving problems	Weekly	
	Take-home-exams	5, 11	
	Project groups	5, 10	
	Quizzes	2, 4, 8, 14	
2	First Written Exam	6	15 %
3	Second Written Exam	12	15 %
4	Final Exam	16	40 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
Office hours - Office call – BLACK BOARD-Email - Mobile

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Hamdy A. Taha; Operations Research: An Introduction; 9th Edition, Printice Hall, 2010.

Essential References Materials	Ali Emrouznejad, William Ho; Applied Operational Research with SAS; Chapman and Hall/CRC, December 2011.
Electronic Materials	http://fisher.osu.edu/~croxton_4/tutorial/ http://people.hofstra.edu/Stefan_Waner/realworld/LPGrapher/lpg.html/ /http://people.hofstra.edu/Stefan_Waner/realworld/simplex.html
Other Learning Materials	Excel software. 2. TORA software. 3. STORM software. 4. Net search for highly well achieved systems: Educational, Transportation, Cultural, Social, Economic.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with required digital aids and to support traditional method of teaching using blackboard. • Classrooms with proper lighting and air conditioning system integrated with the sound System /audio system. • Classroom with smart board interface, display screen and a computer to aid the sessions
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board with supporting software / computers with updated versions of software as required to understand the subject concepts.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	A/N

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
course evaluation	Student-faculty management meeting	Questionnaires
Evaluation of Teaching	Program/Department Instructor	Discussion within the staff members teaching the course Departmental internal review of the course.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	

Date	