هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Linear Programming
Course Code:	MTH 352
Program:	BS-Mathematics
Department:	Mathematics
College:	College of Sciences, AlZulfi
Institution:	Majmaah University, Saudi Arabia

Table of Contents

A. Course Identification

1. Credit hours: 4(3+1)								
2. Course type								
a.	University	☐	College	☐	Department	√	Others	☐
b.	Required	√	Elective	☐				
3. Level/year at which this course is offered: 1st Semester /3st year								
4. Pre-requisites for this course (if any)**:** Linear Algebra 1 (MATH241)								
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**	56	90%
2	**Blended**	0	0%
3	**E-learning**	4	10%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	0
3	**Tutorial**	15
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description :

This course will cover:
Introduction to operations research-Mathematical model for some real problems- Mathematical formulation of linear programming problem- Graphical method for solving linear programming problems- Convex sets-Polygons- Extreme point- Optimality theorem- Analytical method (Simplex method) – Big-M method – Two-phase method- Formulation mistakes- Duality problem- Sensitivity analysis- Application to transportation and network problem.

2. Course Main Objective

- - Knowing how to make the mathematical model of some actual problems (the mathematical formulation of the linear programming problem.
- - Recognizing the optimality theory and the different methods for solving the linear programming problem.
- - Knowing the problem, the solution of the duality problem and sensitivity analysis for each problem.
  - Knowing how to apply the linear programming in solving some of the actual problem (transportation and networks problems).

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the Operations Research and the mathematical models of the real problem.	K4
1.2	Outline of the mathematical formulation of a linear programming problem.	K4
1.3	State optimization theory and recall a different ways to solve a problem of linear programming.	K4
1...		
2	**Skills :**	
2.1	Knows how to work the mathematical formulation of some actual problems (mathematical formulation of the linear programming problems). - Recognize the optimization theory and different ways to solve a linear programming problem.	S2, S4
2.2	Knows the duality problem and how to solve it, and sensitivity analysis for each problem. - Applied a linear programming in solving some actual problem (and transportation problems and networks).	S4
2.3		
2...		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours

1	Introduction of operations research, Formulate of linear programming problems, Modeling of live problem.	12
2	Convex sets, Convex function and concave functions. the polygon, vertex point, and optimization theory	4
3	Graphical Method ,Analytical Methods (Simplex method, M-technique)	16
4	Revised Simplex methods, Two-phases Methods	8
5	Duality Problem, sensitivity analysis	12
6	applications of the linear programming problem (Transportation problems, Game Theory, Network)	8
Total		60

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	- Define the Operations Research and the mathematical models of the real problem - Outline of the mathematical formulation of a linear programming problem. - State optimization theory -Recall a different ways to solve a problem of linear programming.	**Direct teaching**: lectures and discussions **Aimed teaching**: Discovery and oral questions	• Homework • Quiz • Midterms • Final Exams • E-exam • Presentation
1.2	- Define the duality problem of the primary problem and how to solve them - Recognize a sensitivity analysis for each problem. -Apply a linear programming on some problems (transportation problems and network)	**Direct teaching**: lectures and discussions **Aimed teaching**: Discovery and oral questions •	• Midterms • Final Exams • E-exam • Presentation
1.3			
2.0	**Skills**		
2.1	-Knows how to work the mathematical formulation of some actual problems (mathematical formulation of the linear programming problems). - Recognize the optimization theory and different ways to solve a linear programming problem.	**Direct teaching**: lectures and discussions **Aimed teaching**: -Raise the spirit of dialogue and discussion among students. - Ask indirect questions interesting and varied and give incentive to those who based solution.	• Midterms • Final Exams • E-exam • Presentation

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		Indirect teaching: Peer Learning •	
2.2	- Knows the duality problem and how to solve it, and sensitivity analysis for each problem. - Applied a linear programming in solving some actual problem (and transportation problems and networks).	**Direct teaching**: lectures and discussions **Indirect teaching**: Peer Learning • - Assigning students solve the exercises in each chapters	• Midterms • Final Exams • Presentation
2.3			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam 1	7th	20 %
2	Midterm Exam 2	12th	20 %
3	Electronic Exam	13th	5 %
4	Homework	During semester	5 %
5	Presentation	During semester	5 %
6	Quizzes	During semester	5 %
7	Final Examination	14th	40 %
8	Total		100 %

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

E. Student Academic Counseling and Support

Department of mathematics has "**Student Academic Advisory Committee**". This committee is responsible for students counseling and advising works in synchronization and collaboration with the Deanship of Admissions and Registration and Student Affairs. Department of mathematics Alzulfi has a continuous and standardized procedure that be associated with the student's progress until completion of degree and includes psychological, social and behavioral guidance. This advisory committee also maintain the student's files. The students with GPA below than 50 % in Mid 1 and Mid 2 are stayed under serious observation and continuous consultations with respective course instructor about their performing. The course teacher will commit to a minimum scheduled time for student consultation equivalent to 4 HOURS PER WEEK.
The contact with students by e-mail and website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	(1) Quantitative analysis for management -Barry Render - 9 edition – Prentice Hall -2006 (2) H.A.Taha, Introduction Operations Research 6th edition, London, Macmilla Publishing Company, Inc.
	(3) V. Chvatal: Linear Programming, San Francisco: McGill University, W.H. Freeman and Company, 1)
Essential References Materials	1-M.Bazara and Shetly: Linear programming, Theory and Algorithm, New York, John Wiley,1993. 2- B. Gottfried and J. Weisman:Introduction to Optimization Theory, Prentic-Hell,Inc.,Englewood Cliffs,New Jersey. 3-O.L. Mangasarian: Nonlinear programming, McGraw-Hill,York,1969. 4-Donald M.Simmons: Nonlinear Programming for Operations Research **1)**
Electronic Materials	http://people.brunel.ac.uk/~mastjjb/jeb/or/morelp.html
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- The size of the room should be proportional to the number of students - Provide enough seats for students. - The number of students do not exceed on 30 in the classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	- Mathematics Lab is equipped with a computer. - Provide overhead projectors and related items i.e smart Board, Wi-Fi, AV. - Updated Math Software i. e Mathematica, Matlab, Maple. etc
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students/ internal committee	Direct (Students evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Extent of achievement of course learning outcomes	Staff members (Peer Reviewer)	Indirect (Frequent meetings consultation among the teaching staffs)
Quality of learning resources.	Staff members (course coordinators)	Direct (Meeting between course coordinators and the tutors)

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	