Course Specifications

Course Title:	**Linear Programming**
Course Code:	**30114201-3**
Program:	**BSc. Mathematics 301100**
Department:	**Mathematics**
College:	**Al Leith University College**
Institution:	**Umm Al Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Seventh Level / Fourth Year
4. Pre-requisites for this course (if any)**:** Linear Algebra (1) 30112402-4
5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	(3 hours) x (15 weeks)	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Correspondence**	0	0%
5	**Other**	0	0%

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45 hours
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (Exams & Quizzes)	8 hours
	Total	53 hours
Other Learning Hours*		
1	**Study**	45 hours
2	**Assignments**	15 hours
3	**Library**	0
4	**Projects/Research Essays/Theses**	0
5	**Others** (workgroup)	15 hours
	Total	75 hours

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Linear Programming is perhaps the most recognized and widely used optimization tool in the world today. It has its origins in planning and operations models from World War II through the seminal work of George Dantzig and his development of the simplex method. Alternatives to the simplex method termed interior point methods have gained popularity in the last twenty years. In this course, you will learn how to model real world problems as linear programs, you will learn how to solve them with state-of-the-art solvers, and we will study the theory behind linear programming solvers. Topics we cover include the simplex method, linear programming duality, sensitivity analysis, network-type problems, interior point methods and (if time permits) an introduction to discrete optimization and integer programming.

2. Course Main Objective

Gain experience in modeling, solving and analyzing problems using linear programming.
Recognize different methods for solving linear programming problems (LPP).
Reveal the fundamental concepts and theories related to linear programming problems.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Recognize how to modeling the real problem in the form of linear programming problems.	K4
1.2	Describe the problem graphically.	K3
1.3	Identify different terminology, concepts and theories of linear programming problems.	K1
1.4	State different methods and their related definition and theories for solving linear programming problems.	K4
2	**Skills :**	
2.1	Classify real situations in the form of linear programming problems	S7
2.2	Examine real problems graphically.	S6
2.3	Use appropriate method to solve a given linear programming problems.	S5
2.4	Solve problems using a range of formats and approaches in basic science	S9
3	**Competence:**	
3.1	Generalize scientific models and tools effectively.	C2
3.2	Use the internet to write reports about basic linear programming principles.	C4
3.3	Apply knowledge gained during the course using computer applications	C4
3.4	Invent a personal view in the context of an understanding of solving problems knowledge	C5
3.5	Develop connections within branches of Operation research and between linear programming and other disciplines	C1

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to operations research and linear programming problem (LPP)	3
2	Convex sets, Convex function, vertex points, and optimization theory	3
3	Graphical method for solving LPP	3

4	Simplex methods,	6
5	Special cases of simplex method Duality Problem, sensitivity analysis	9
6	Special cases of simplex method Two Phase Method	6
7	applications of the linear programming problem (Transportation problems, Game Theory, Network)	6
8	Use software application to solve LPP	6
9	Revision	3
Total		45

D. Teaching and Assessment

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

CLOs		Teaching Strategies	Assessment Methods
1	**Knowledge:**		
1.1	Recognize how to modeling the real problem in the form of linear programming problems.	Lectures Discussion Problem Solving	Exams Assignments Quizzes
1.2	Describe the problem graphically.		
1.3	Identify different terminology, concepts and theories of linear programming problems.		
1.4	State different methods and their related definition and theories for solving linear programming problems.		
2	**Skills :**		
2.1	Classify real situations in the form of linear programming problems	Lectures Discussion Problem Solving Brain Storming	Assignments. Reports. Quizzes. Discussion
2.2	Examine real problems graphically.		
2.3	Use appropriate method to solve a given linear programming problems.		
2.4	Solve problems using a range of formats and approaches in basic science		
3	**Competence:**		
3.1	Generalize scientific models and tools effectively.	Lectures Brain storming Tasks to measure students' Personal skills.	Assignments. Reports. Discussion
3.2	Use the internet to write reports about basic linear programming principles.		
3.3	Apply knowledge gained during the course using computer applications		
3.4	Invent a personal view in the context of an understanding of solving problems knowledge		
3.5	Develop connections within branches of Operation research and between linear programming and other disciplines		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm 1	6th week	20 %
2	Midterm 2	12th week	20%
3	Homework + reports + Quizzes	During the semester	10%
4	Final exam	End of semester	50 %

***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 :

1- There are student advisor committee for the students,

2- The office hours for the teaching staff is depicted on their office.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	H.A.Taha, Introduction Operations Research 6th edition, London, Macmilla Publishing Company, Inc. V. Chvatal: Linear Programming, San Francisco: McGill University , W.H. Freeman and Company,
Essential References Materials	G. Hodley, linear programming, Addision-weley, 1969 P.K.Gupta and D.S.Hira, Problems in Operations research, Ram Nagar, 1998. Michel Sakarovitch, Linear Programming, Springer-Verlag, 1983 Gerald Brickman, Mathematical Introduction to Linear Programming, Springer Verlag, New York, 1989.
Electronic Materials	http://www.freetechbooks.com http://tutorial.math.lamar.edu/sitemap.aspx
Other Learning Materials	http://www.freetechbooks.com http://tutorial.math.lamar.edu/sitemap.aspx http://mathforum.org/advanced/numerical.htm/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	-Classroom with capacity of 30-students. - Library
Technology Resources (AV, data show, Smart Board, software, etc.)	all classrooms are equipped by data show
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	deanship of registration and acceptance	Student feedback through electronic survey
Quality of learning resources	Program Leaders	Student feedback through electronic survey
Evaluation of the teachers by internal & external faculty members	Program Leaders	Course Reports, evaluation of random grading report
Program Quality	Peer Reviewer	Peer evaluation and feedback

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

H. Specification Approval Data

Council / Committee	Council of the Mathematics Department	The mathematical sciences (college of applied sciences) and the mathematics (Al-Leith University College) department's first meeting of the coordinative committee
Reference No.	4101050782	First meeting
Date	Sunday, 17 November 2019	Thursday, 17 October 2019

Department Head

Dr. Ali Hassani