هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Operations Research**
Course Code:	**473 Math**
Program:	**B. Sc. in Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**

Table of Contents

A. Course Identification

1. Credit hours:	**03**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	Level 8/Year 4
4. Pre-requisites for this course (if any)**:**	Math 324
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**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	42
2	**Laboratory/Studio**	
3	**Tutorial**	3
4	**Others** (specify) Final Exams and Review	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description:

This course is designed to provide students with

- **Introduction to operation research.**
- **Methods of decision-making**: Circles theorem, Bert method and application.
- **Graph method** for solving linear programming problems and associated problems, graph method, associated problems or binary, Solve associated problems by graph method.
- **Solving linear programming simplex method**: Basics simplex method, Tabular simplex method, Analysis of post optimal solution, some of the problems of linear programming and methods to overcome them and solving associated problems.
- **Transport and assignment problems**: transport problem, allocation or selection problems.
- **Integer numerical programming**: Approximate method to solve integer programming problems, additional conditions to solve integer programming problem, integer programming models of integer method and Reduction branch.
- **Linear programming and statistics**: random programming, Use of linear programming in Statistics.
- **Non-linear programming**: Objective non-linear function that can be set convergent sequences, Karush–Kuhn–Tucker Conditions and Lagrange multiplications, quadratic programming, Reduce the time and means of production, estimate.

2. Course Main Objective:

After finishing the course, the student is expected to be familiar with the following:

- Graphical method to solve linear programming problem (LPP).
- Solve linear programming problem using Simplex method.
- Transportation problems.
- Integer programming.
- Non-linear programming problems.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Distinguish mathematical concepts relevant to Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, Big M-method, Two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems.	K1
1.2	Identify structures and features of Mathematics problems in Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems.	K2
1.3	Explain required notations and concepts in Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems.	K3
2	**Skills :**	
2.1	Apply aspects relevant to Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems	S1
2.2	Compute rates/quantities and Approximate Solutions Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems	S2
2.3	Apply mathematical problems using critical thinking and problem solving in Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems	S4
3	**Values:**	
3.1	Cultivate a mathematical attitude and nurture the interest.	V1
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2
3.3	Inculcating values and ethics in thought, expression and deed.	V3

C. Course Content

No	List of Topics	Contact Hours

1	Formulating LP problems - examples from different applications.	6
2	Graphical method for solving LP problems.	3
3	Standard form of LP – conversion of LP to standard form- mathematical properties of LP problems - basic solutions.	3
4	Simplex method.	6
5	Special cases in applying the Simplex method – Big M-method – two-phase method.	6
6	Sensitivity analysis.	6
7	Duality of Linear programming problems.	3
8	Integer Programming problems.	3
9	Special LP application: transportation problems.	3
10	Non-linear programming problems.	6
Total		45

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	Distinguish mathematical concepts relevant to Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems.	Lectures, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.2	Identify structures and features of Mathematics problems in Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems.	Lectures, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.3	Explain required notations and concepts in Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems.	Lectures, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	**Skills**		
2.1	Apply aspects relevant to Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods,	Lectures, problem solving, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer),

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems		Quizzes, Assignments
2.2	Compute rates/quantities and Approximate Solutions Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems	Lectures, problem solving, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.3	Apply mathematical problems using critical thinking and problem solving in Linear programming problem, methods used to solve this type of problems, Graphical methods, Simplex methods, M-method, two-phase method, dual problem, transportation problem, integer programming problem, nonlinear programming problems	Lectures, problem solving, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
3.0	**Values**		
3.1	Cultivate a mathematical attitude and nurture the interest.	Group and interactive discussion, Group work,	Assignments
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	Group and interactive discussion, Group work,	Assignments
3.3	Inculcating values and ethics in thought, expression and deed.	Group and interactive discussion, Group work,	Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework	3	5%
2	First exam.	6	20%
3	Second exam.	12	20%
4	Homework	14	5%
5	Final exam.	16	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 : Each group of students assigned to a member of staff who will be available for help and academic guidance office hours at specific hours on daily basis. At least be available 8 hours per week.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Operations research: An introduction; Hamdy A. Taha, Eight edition, Pearson Education, Inc. (2007).
Essential References Materials	1. Operations Research, P.K. Gupta & D.S. Hira. S. Chand. (2008). 2. Operations Research and Statistics, D. Ali Mahmoud Ajour, Dar Alfeqar Aljamaee, 2007. 3. Nonlinear Programming, 2nd Edition. Bartsekas, Dimitri. Belmont, Ma Athena Scientific Press. ISBN: 1886529000 (1999).
Electronic Materials	Web sites dedicated to Probability on the internet.
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom, Computer Lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show; Smart Board; Operations Research Software
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	Students, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect

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	**Board Of Mathematics Department**
Reference No.	**12th Meeting Of The Board Of Mathematics Department 1441-1442**
Date	**14/6/1442 A. H.; 27/1/2021 A. D.**