هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Operations Research**
Course Code:	**473MATH-3**
Program:	**B. Sc. in Mathematics**
Department:	**Mathematics**
College:	**Science College**
Institution:	**Jazan University**
Version:	**2024**
Last Revision Date:	**9/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:	03

2. Course type

A.	University ☐	College ☐	Department ☒	Track☐	Others☐
B.	Required ☒		Elective☐		

3. Level/year at which this course is offered:	Level 11/Year 4

4. Course general 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.

5. Pre-requirements for this course (if any): Math 324

6. Co- requirements for this course (if any): None

7. Course Main Objective(s)

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.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100%
2.	E-learning		
3.	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4.	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	**42**
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	**3**
5.	Others (specify)	
	Total	**45**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	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.	K1	Lectures, Web based work, 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.	K2	Lectures, Web based work, 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.	K3	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	Skills			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
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	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), 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	S2	Lectures, Web based work, 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	S3	Lectures, Web based work, Classroom discussions	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
3.0	Values, autonomy, and responsibility			
3.1	Cultivate a mathematical attitude and nurture the interest.	V1	Group work, problem solving, web-based work	Assignments
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2	Group work, problem solving, web-based work	Assignments
3.3	Inculcating values and ethics in thought, expression and deed.	V3	Group work, problem solving, web-based work	Assignments

C. Course Content

No	List of Topics	Contact Hours
1.	Formulating LP problems - examples from different applications.	5
2.	Graphical method for solving LP problems.	4
3	Standard form of LP – conversion of LP to standard form- mathematical properties of LP problems - basic solutions.	4

4	Simplex method.	5
5	Special cases in applying the Simplex method – Big M-method – two-phase method.	5
6	Sensitivity analysis.	5
7	Duality of Linear programming problems.	4
8	Integer Programming problems.	4
9	Special LP application: transportation problems.	4
10	Non-linear programming problems.	5
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework and Quiz	3	5
2.	First exam	6	20
3.	Homework and Quiz	10	5
4	Second exam	12	20
5	Final exam	15	50

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Operations research: An introduction; Hamdy A. Taha, Eight edition, Pearson Education, Inc. (2007).
Supportive References	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 Applied Statistics available on the internet.
Other Learning Materials	Black board platform.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom, Computer Lab.
Technology equipment (Projector, smart board, software)	Data show; Smart Board; Statistics Software

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Instructor	Direct/Indirect
The extent to which CLOs have been achieved	Students, Faculty members	Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**Board Of Mathematics Department**
REFERENCE NO.	**2417**
DATE	**29/03/1446 A. H.; 2/10/2024 A. D.**