Course Specification
(Bachelor)

Course Title: Advanced Operations Research
Course Code: INE 4321
Program: Bachelor of industrial engineering
Department: Industrial Engineering
College: College of Engineering
Institution: King Khalid University, Abha, Saudi Arabia
Version: 3
Last Revision Date: 17-12-2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (7/4)					
4. Course general Description:					
This course will cover important topics in linear algebra, review in networks and project management, goal programming, theory of games, stochastic models, Markovian decision process, computer applications using TORA, LINGO, LINDO. **This course deals with the application of advanced analytical methods to help make better decisions. This course is used to analyze complex real-life problems typically with the goal of improving or optimizing performance. The conventional method of classroom interaction using multimedia teaching aids and animations/videos will be used for lecture sessions. The communication between the instructor and the students will be regularly maintained using blackboard interface**					
5. Pre-requirements for this course (if any):					
INE 3321					
6. Co-requisites for this course (if any):					
NIL					
7. Course Main Objective(s):					
To enable students to Introduce to basic of mathematics for formulation, step-by-step procedure to solve and decision making for better performance, Integer programming-using Gomory cutting plane method, branch & bound method. Game Theory, Markov decision making, dynamic programming to solve cargo loading problems, and the shortest distance problems.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100

No	Mode of Instruction	Contact Hours	Percentage
2	E-learning		
3	Hybrid ● Traditional classroom ● E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	15
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		60

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	Understand the broad in-depth knowledge to solve concept of engineering problems using the principles of engineering sciences, mathematics and natural sciences, and validate the solution obtained in the field	K1		Assignments Midterm Exam Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	of Industrial Engineering.			
1.2	Define the wide range of specialist knowledge in industrial system management, process optimization, sustainability, economics, environment, policy, health and safety, to be understood drawing on current developments in industrial engineering.	K3		Assignments Midterm Exam Final Exam
2.0	**Skills**			
2.1	Use critical thinking and improve creative solutions to existing problems, in numerous complex settings, in the fields of industrial engineering.	S3		Assignments Midterm Exam Final Exam
2.2	Use and familiarize progressive procedures, methods, tools, mechanisms in dealing with several complex practical accomplishments in industrial engineering.	S4		Assignments Midterm Exam Final Exam
3.0	**Values, autonomy, and responsibility**			
3.1	Effectively plan and achieve professional	V2		Project

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	development, evaluate own learning and performance, and autonomously make decisions related to self-development.			

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Operation research and basic mathematics	4
2.	Revision of Linear programming method	6
3.	Integer programming using Gomory cutting plane method	10
4.	Integer programming using Branch & Bound method.	6
5.	Markovian decision making.	9
6.	Theory of games by dominance, graphical & linear programming method	12
7.	Dynamic programming for cargo loading problem.	6
8.	Shortest distance problem	6
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	6, 9,14	15%
2.	Quizzes	7, 14	10%
3.	Midterm 1	7	15%
4.	Case study	15	5%
5.	Final practical exam	14	15%
6.	Final exam	15	40%

*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	Introduction To Operations Research: 2024 Release Ise 12Th Ed Frederick S. Hillier

	ISBN 10: 1266933220 / ISBN 13: 9781266933226 Published by McGraw-Hill Education, 2024
Supportive References	Linear Algebra and its Applications, David c. Lay; Steven R. Lay; Judi J. McDonald, 5th Edition, Pearson, 2015, ISBN-13: 9780321982384, ISBN-10: 032198238x
Electronic Materials	TORA Software, Animation Videos
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom with 50 seats • Laboratory with 25 seats
Technology equipment (projector, smart board, software)	• Computer system • Projector
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student and faculty	Indirect through surveys
Effectiveness of Students' assessment	Quality Committee	Direct through Rubrics
Quality of learning resources	Student and faculty	Indirect through surveys (Student, faculty)
The extent to which CLOs have been achieved		
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**REVIEWED BY CURRICULUM COMMITTEE** **APPROVED BY QUALITY COMMITTEE**
REFERENCE NO.	**9-6-47**
DATE	**25/06/1447**