Course Specification
(Bachelor)

Course Title:	Simulation Analysis & Design
Course Code:	4371-INE-3
Program:	Bachelor of Industrial Engineering
Department:	Industrial Engineering
College:	*Engineering*
Institution:	King Khalid University.
Version:	*1*
Last Revision Date:	18/11/2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (....)					
2. Course type					
A.	☐ University	☐ College	☐ Department	☐ Track	☐ Others
B.	■ Required		☐ Elective		
3. Level/year at which this course is offered: (7th level/4th Year.)					
4. Course General Description:					

This course introduces to basic theory of industrial simulation. Building simulation models. Organization of simulation studies. Simulation modeling and application to medium and large-scale production and service system problems. Output analysis. Variance, reduction, and optimization. Use of software such as ARENA for discrete and continuous system simulation. Often, computer experiments are used to study simulation models. Simulation is also used with scientific modeling of natural systems or human systems to gain insight into their functioning. Simulation is also used when the real system cannot be engaged, because it may not be accessible, or it may be dangerous or unacceptable to engage, or it is being designed but not yet built, or it may simply not exist.

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

Applied Statistics in Industrial Engineering 2331-INE-3

6. Co-requisites for this course (if any)**:**

Nil

7. Course Main Objective(s):

The course aims to introduce the students to the fundamentals of simulation systems and determine important areas within industrial simulation of logistics and transportation. Identifying the target area is the design of an industrial simulation of industrial systems.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
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**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60Define simulation, model

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Define simulation, model**	**K1**	**Lectures and tutorials**	**Assignments Midterm Exam Final Exam**
1.2				

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
...				
2.0	**Skills**			
2.1	**Solve the inventory problem of maintaining the required amount of spare parts for repair**	**S2**	**Lectures and tutorials**	**Assignments Midterm Exam Final Exam**
2.2	**Evaluate the waiting time, simulation parameters for a queuing system problem**	**S2**	**Lectures and tutorials**	**Assignments Midterm Exam Final Exam**
2.3...	**Evaluate the generating methods of random numbers**	**S4**		
2.4	**Utilize a Monte Carlo simulation to simulate the real-world example**	**S6**		
2.5	**Demonstrate using the Arena solution to solve problems in theoretical class**	**S4**	**lab**	**Lab exam and activity**
3.0				
3.1	Effectively plan and achieve professional development, evaluate own learning and performance, and autonomously make decisions related to self-development.	**V2**	**lab**	**Lab exam and activity**
3.2	Communicate effectively on engineering activities	V4	**lab**	**Lab exam and activity**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	with a range of audiences.			

C. Course Content

No	List of Topics	Contact Hours
1.	General principles and simulation languages	4
2.	Statistical models in simulation	8
3	Queueing models Random number generation	8
4	Random variate generation: Input modeling	8
5	Verification and validation: Output analysis for a single model	7
6	Comparison and evaluation of alternative	6
7	System Designs: Introduction to Simio	9
8	Serial Manufacturing Systems Animation in Simio	5
9	Entity Routing Advanced Modeling Techniques: Simio Processes	5
Total		60

D. Students' Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	assignment	6	15
2.	Quiz1	7	
3.	Quiz2	12	
4	Lab exam	14	15
5	Mid term	5,10	30
6	Final exam	16	40
	Total		100

*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	**Banks, J., Carson, J. S., Nelson, B. L., & Nicol, D. M *Discrete-event system simulation* (4th ed.). Prentice Hall.(2020)** **2. Pegden, C. D., & Sturrock, D. T. *Rapid modeling solutions: Introduction to simulation and Simio* (Simio LLC, included with software)(2020).** **GREASLEY, Andrew. *Simulation modelling: concepts, tools and practical business applications*. Routledge, 2022.**
Supportive References	**Joines, J. A. and S. D. Roberts, Simulation Modeling with SIMIO: A Workbook. Available online atwww.simio.com/academics/workbook/index.html (optional).**
Electronic Materials	**Simio/ARENA Software**
Other Learning Materials	**Lecture handouts**

2. Required Facilities and Equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with 50 seats and a projector facility Laboratory- 25 desktop computers with Simio/ARENA software
Technology equipment (projector, smart board, software)	projector
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Questionnaire)
Effectiveness of Students assessment	Faculty	Direct
Quality of learning resources	Program Leaders	Direct
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, 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**