هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Discrete Simulation**
Course Code:	**MAT 1465**
Program:	**Bachelor of Science in Applied Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**08/10/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 1Lab, 1 Tutorial)					
2. Course type					
A.	☐University	☐ College	☒ Department	☐Track	☐Others
B.	☒ Required		☒ Elective		
3. Level/year at which this course is offered:					
Level 6 / Year 3 or Level 7 / Year 4					
4. Course general Description:					
This elective course makes students familiar with the most important elements of the Monte Carlo method applied to the statistical and Queuing models of discrete event in order to simulate and visualize the solutions. The course puts the theoretical basis of the random number's generators and its application in discrete simulation.					
5. Pre-requirements for this course (if any):					
STA 1206					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
This course provides an introduction to system modeling using both computer simulation and mathematical techniques. Emphasis will be on discrete-event simulation model development methodologies and implementation techniques.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	15

3.	**Field**	0
4.	**Tutorial**	15
5.	**Others (specify)**	0
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	**To outline the basic Discrete Event Simulation Concept and language.**	**K1, K2**	**●3 lecture hours\week**	**●Regular Exams**
1.2	**To memorize the Monte Carlo method and its importance in finance as well as other areas.**	**K1, K2**	**●2 tutorial hours\week ●Self-study**	**●Assignments ●Short Quizzes**
2.0	**Skills**			
2.1	**To develop basic techniques of discrete simulation.**	**S1, S2**	**Real-life problems**	**Short Quizzes**
2.2	**To present Monte Carlo method clearly and precisely both orally and in writing.**	**S4**	**Self-study**	**Participations**
2.3	**To use Internet in searching for Markov chains**	**S5**	**Real-life problems**	**Short Quizzes**
2.4	**To demonstrate the efficiency of Queuing models.**	**S3**	**Self-study**	**Participations**
3.0	**Values, autonomy, and responsibility**			
3.1	**To listen to the teacher's explanation of Mathematics**	**V1, V3**	**Personal questions**	**Participation**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	reasoning and illustration.			
3.2	**To show attitude of support the use of computers in learning/teaching mathematics.**	**V1, V2**	**Team work**	**Homework and Mini-projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Review of some probability and Statistics concepts:** Random variables, probability distribution, Estimation examples.	**6**
2.	**Introduction to Simulation:** Random numbers, sequences of connected events, etc.	**9**
3.	**Discrete Event Simulation Concept.**	**6**
4.	**Monte Carlo simulation.**	**9**
5.	**Statistical Models in Simulation**	**9**
6.	**Analysis of Queuing Models.**	**6**
7.	**Analysis of Simulation Data.**	**9**
8.	**Markov chains Monte Carlo method.**	**6**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15-16	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	*Simulation Modeling and Analysis with Expert fit Software*, **Averill Law, Averill M. Law & Associates, McGraw-Hill Science, 2007. (Main Reference).**
Supportive References	1. *Discrete-Event Simulation: A First Course, Lawrence M. Leemis, Stephen K. Park0, Prentice Hall, 2005.* 2. *Simulation Model Design and Execution: Building Digital Worlds, Paul A. Fishwick, Prentice Hall, 1995.* 3. *Monte Carlo Methods, J.M. Hammersley and D.C. Handscomb, Publisher: Chapman and Hall, 1983.*
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Classrooms:** Equipped with whiteboards, projectors, and Smart Boards for interactive lessons and group discussions. • **Laboratories:** Feature computers with internet access, enabling hands-on activities and exploration of algebraic and trigonometric concepts. • **Exhibition Rooms:** Spaces for showcasing projects and presentations to encourage collaborative learning.
Technology equipment (projector, smart board, software)	• **Data Show Projectors:** For clear presentations in classrooms and labs. • **Smart Boards:** To enhance interactivity during lessons. • **Mathematical Software:** Essential for graphing and analysis.
Other equipment (depending on the nature of the specialty)	• **Computers:** For mini-project and homework and practical applications in laboratories. • **Advanced Calculators:** For computations and problem-solving and supporting the study of limits, continuity, and differentiation. • **Whiteboards and Markers:** To facilitate brainstorming and collaboration.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty, Program Manager, Students, Course Coordinator	- **Student Course Evaluation**: Student feedback surveys to assess teaching quality (clarity, engagement, delivery). - **Instructor Course Report**: Instructor reflection on their teaching effectiveness and challenges. - **Classroom Observations**: Conducted by the program manager or course coordinator to directly observe teaching methods. - **Benchmarking Between Male and Female Sections**:

Assessment Areas/Issues	Assessor	Assessment Methods
		Compare student evaluations and performance across gender-based sections to identify any disparities in teaching effectiveness. - **Advisory Board Feedback**: Gathering insights on teaching methods from external academic or industry professionals.
Effectiveness of Students assessment	Faculty, External Reviewers, Program Manager, Course Coordinator	- **Alignment of Assessments with CLOs**: Ensuring exams, assignments, and projects measure the intended CLOs. - **Benchmarking Between Semesters**: Comparing assessment effectiveness across different semesters to maintain consistency and improvement. - **CLOs Assessment Excel Sheet**: Tracking student performance in relation to CLOs to evaluate the strength of assessments. - **Instructor Course Report**: Faculty analysis of assessment outcomes and potential adjustments. - **External Audit/Reviewers**: External examiners review assessments for rigor and fairness.
Quality of learning resources	Program Manager, Librarians, Faculty, Course Coordinator	- **Student Course Evaluation**: Students provide feedback on the usefulness and availability of learning resources (textbooks, software, etc.). - **Instructor Course Report**: Faculty report on the adequacy and relevance of learning materials. - **Resource Usage Statistics**: Data on the usage of learning resources (digital/physical) such as library access, software downloads. - **Benchmarking Between Sections/Semesters**: Compare resource satisfaction across male/female sections and over semesters. - **Advisory Board Input**: External experts suggest updated or alternative resources to align with industry or academic developments.
The extent to which CLOs have been achieved	Faculty, Program Manager, External Reviewers, Course Coordinator	- **CLOs Assessment Excel Sheet**: Regular tracking of student performance for each CLO based on exams, projects, and assignments. - **Instructor Course Report**: Faculty reflection on CLO achievement and any gaps identified. - **Student Course Evaluation**: Students assess whether they feel they've met the course learning outcomes. - **Benchmarking Between Semesters**: Analyze CLO achievement across different semesters to ensure continuous improvement. - **Advisory Board Feedback**: Assess whether CLOs are

Assessment Areas/Issues	Assessor	Assessment Methods
		aligned with industry or academic standards and if students are adequately prepared.
Other	None	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	8/1446
DATE	05/04/1446 (08/10/2024)