The University of Jordan
School of Engineering
Industrial Engineering Department
First semester 2024/2025

Course name:	Probabilistic Operations Research
Course code:	IE 0916555
Credits hours	3hr.
Contact hours& room\office hours:	12:30-13:30 Sunday, Tuesday, and Thursday. Office hours: 11:30 – 12:30 (in person) Sunday, Tuesday, and Thursday.
Course instructor's name, E-mail, and phone:	Prof. Dr. Mohammad D. AL-Tahat altahat@ju.edu.jo Phone: 22933
Course Coordinator:	
Textbook:	Hamdy A. Taha. Operations Research: An introduction. Prentice hall, 10thedition.
Other reference(s):	• Instructor's notes Paul A. Jenson and Jonathan F. Bard. Operations Research Models and Methods. John Wiley & Sons. ISBN 0-471- 38004-0.
Course Description:	This course introduces Probabilistic and stochastic models used to investigate the behavior of industrial systems; queuing theory, queuing models, queuing networks and its applications, discrete and continuous Markov processes, and related mathematical analysis.
Providing Department:	Industrial Engineering
Prerequisite Course:	0916357 + 0906356
Course type	Required (Mandatory)

Assessment Methods:	Method	Weight %	Date
	In-class activities and short exams	20	
	Mid Exam	30	
	Final Exam	50	

Course Learning Outcomes:	#	**After successful completion of this course, the student will be able to**	SO	
	CLO1	Gain essential knowledge and skills that will help in understanding queuing theory and related elements and terminology	**1**	
	CLO2	Master the mathematics of queuing models and analyze its performance.	**1**	
	CLO3	Learn the queuing networks and how to evaluate their performance.	**1**	
	CLO4	Practice the algebraic analysis of discrete-time Markov process	**1**	
	CLO5	Master the algebraic analysis of continuous-time Markov process	**1**	

	Week #	Topic
Brief list of topics	1	General Course Orientation
	1-10	- Queuing Theory: Why queues form, elements of queue, generalized queuing model. Specialized Poisson queues. - Mathematics of evaluating steady state measures of performance for single and multiple servers' models, and for limited and unlimited queuing models. - Applications - Queuing networks, modeling and analysis of queuing networks Real life applications of queuing networks.
	10-15	Markov Chains and Stochastic analysis - Definitions of stochastic process - Definition of Markov chains (CTMCs, and DTMCs) - State transition diagrams - Transition Matrix - Classifications of states - Modeling example (DTMC) - Modeling the Game of craps (DTMC) - Continuous-time Markov Chain - Modeling the ATM example (CTMC) - Absolute and n-step transition probabilities - Chapman-Kolomogorov mathematics, Steady state probabilities and First return time - First passage time - Analysis of absorbing states - Algebra of analyzing the Game of craps (DTMC) Model Algebra of analyzing the ATM model (CTMC) Model
	16	Assessments and evaluation
Important Notes:		a. Do not hesitate to ask questions b. You are required to bring a notebook and take notes in classes. c. Students are expected to attend every class session and they are responsible for all material, announcements, schedule changes, etc., discussed in class. d. Discuss the assignments among yourselves e. Don't Cheat; direct copying of others work will NOT be allowed or tolerated and will result in a reduction of grade. If you are found to be cheating in any way, on an exam or assignment, even signing the roll sheet for another student, you will be given an "F" for the course. There will be no exceptions. f. All cases of academic dishonesty will be handled in accordance with university policies and regulations. JU policy requires the faculty member to assign ZERO grade (F) if a student miss 15% of the classes that are not excused, and 20% of the classes that are excused g. Students are expected to be ready to take a quiz any time they have a class. There will be no make-up quizzes or homework. h. Any students with disabilities who need accommodations in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements for these accommodations.

	The B.Sc. in industrial Engineering program enables students to achieve, by the time of graduation the following program learning outcome (SOs)
1	*an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics*
2	*an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*
3	*an ability to communicate effectively with a range of audiences*
4	*an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts*
5	*an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives*
6	*an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions*
7	*an ability to acquire and apply new knowledge as needed, using appropriate learning strategies*