Course E-Syllabus

1	**Course title**	Probabilistic Operations Research (OR2 0916555)
2	**Course number**	IE 0916555
3	**Credit hours**	3hr.
	Contact hours (theory, practical)	3hr. per week
4	**Prerequisites/corequisites**	(0906357 + 0906356)
5	**Program title**	B.Sc. Industrial Engineering
6	**Program code**	
7	**Awarding institution**	Engineering
8	**School**	Engineering
9	**Department**	Industrial Engineering
10	**Level of course**	5th year
11	**Year of study and semester (s)**	Fall (1st semester) 2020/2021
12	**Final Qualification**	
13	**Other department (s) involved in teaching the course**	-
14	**Language of Instruction**	English
15	**Teaching methodology**	☐Blended ☒Online
16	**Electronic platform(s)**	☒Moodle ☐Microsoft Teams ☐Skype ☒Zoom ☐Others……
17	**Date of production/revision**	

18 Course Coordinator:

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19 Other instructors:

Name:
Office number:
Phone number:
Email:

Name:
Office number:
Phone number:
Email:

20 Course Description:

As stated in the approved study plan.

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. (As per 2019/2020 plan description).

21 Course aims and outcomes:

A- Aims:
Introduce the Probabilistic and stochastic models used to investigate the behavior of industrial and services systems, queuing theory, queuing models, queuing networks and its applications, discrete and continuous Markov processes, and related mathematical analysis

B- Intended Learning Outcomes (ILOs):
Upon successful completion of this course, students will be able to:

ILO #	After successful completion of this course, the student will be able to	Mapping with The ABET SOs
ILO1	Gain essential knowledge and skills that help in understanding queuing theory and related elements and terminology	**1**
ILO2	Master the mathematics of queuing models and analyze its performance.	**1**
ILO3	Learn the queuing networks and how to evaluate their performance.	**1**
ILO4	Practice the algebraic analysis of discrete-time Markov process	**1**
ILO5	Master the algebraic analysis of continuous-time Markov process	**1**

22. Topic Outline and Schedule:

Week	Lecture	Topic	Teaching Methods*/platform	Evaluation Methods**	References
1	1.1	General Course Orientation	Microsoft Teams		Lecture Video
	1.2				
	1.3	- 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.	Microsoft Teams	General activities, exercises, project, short exams, and assignments	Chapter 18 Hamdy A. Taha. Operations Research: An introduction. Prentice hall, 10th edition. Lectures' Videos
2	2.1				
	2.2				
	2.3				
3	3.1				
	3.2				
	3.3				
4	4.1				
	4.2				
	4.3				
5	5.1				
	5.2				
	5.3				
6	6.1				
	6.2				
	6.3				
7	7.1				
	7.2				
	7.3				
8	8.1	Markov Chains and Stochastic analysis			
	8.2				
	8.3				
9	9.1				
	9.2				
	9.3				

10	10.1 10.2 10.3	- 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	Microsoft Teams	General activities, exercises, project, short exams, and assignments	**Students' notes** **Video lectures** **Chapters 11, 12, 13, 14, &15** •Paul A. Jenson and Jonathan F. Bard. Operations Research Models and Methods. John Wiley & Sons. ISBN 0-471-38004-0.
11	11.1 11.2 11.3				
12	12.1 12.2 12.3				
13	13.1 13.2 13.3				

		ATM model (CTMC) Model			
14	14.1	Assessments and evaluation			
	14.2				
	14.3				
15	15.1				
	15.2				
	15.3				

- Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
- Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz…etc

23 Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
General activities, exercises, project, short exams, and assignments	20	Variant	variant	Teams Moodle Others
Mid Exam	30	Queuing Theory	8	On Campus
Final Exam	50	All Topics	16	On Campus

24 Course Requirements (e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

University E-mail account
Internet connection
Computers/ Lab top/ or any other suitable device
Webcam

25 Course Policies:

A- Attendance policies:
According to JU- Rules, students are expected to attend every class session and they are responsible for all material, announcements, schedule changes, etc., discussed in class.

B- Absences from exams and submitting assignments on time:
There will be no make-up quizzes Exams or HomeWorks.

Make-up of final exam is subjected to the Dean permission and his approval

C- Health and safety procedures:
Students are obliged to stick with JU rules and COVID protocol

D- Honesty policy regarding cheating, plagiarism, misbehavior:
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.

E- Grading policy:

On campus: 20% general exercises, project, and short exams, 30% mid. 50% final exam
Online : 50% general exercises, project, short exams, and others. 50% final exam

F- Available university services that support achievement in the course:
University internet and electronic systems

26 References:

A- Required book(s), assigned reading and audio-visuals:

Hamdy A. Taha. Operations Research: An introduction. Prentice hall, 10th edition.

Video lectures

B- Recommended books, materials, and media:

Paul A. Jenson and Jonathan F. Bard. Operations Research Models and Methods. John Wiley & Sons. ISBN 0-471- 38004-0.

27 Additional information:

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*	*6*	*an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions*
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*	*7*	*an ability to acquire and apply new knowledge as needed, using appropriate learning strategies*

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*			

Name of Course Coordinator: **Mohammad D. AL-Tahat** -Signature: ---------- Date: **9 Oct. 2020**

Head of Curriculum Committee/Department: ---------- Signature: ----------

Head of Department: **Mohammad D. AL-Tahat** Signature: ----------

Head of Curriculum Committee/Faculty: ---------- Signature: ----------

Dean: ---------- Signature: ----------