1	**Course title**	Probability and Queuing Theory
2	**Course number**	0907720
3	**Credit hours (theory, practical)**	3,0
	Contact hours (theory, practical)	3,0
4	**Prerequisites/corequisites**	None
5	**Program title**	Computer and Networks Engineering
6	**Program code**	0907
7	**Awarding institution**	The University of Jordan
8	**School**	Engineering
9	**Department**	Computer Engineering
10	**Level of course**	Semester 1 (First level)
11	**Year of study and semester (s)**	First Year, Second Semester
12	**Final Qualification**	Passing the exams and the research project
13	**Other department (s) involved in teaching the course**	None
14	**Language of Instruction**	English
15	**Teaching methodology**	☐Blended ☐Online ☒Physical
16	**Electronic platform(s)**	☐Moodle ☒Microsoft Teams ☐Skype ☐Zoom ☐Others……
17	**Date of production/revision**	October 2021

18. Course Coordinator:

Instructor: Prof. Khalid A. Darabkh
Office#: CPE 342,
Office hours: Daily 11:30 am -12:30 pm and 1:30 – 2:30 pm,
E-mail address: k.darabkeh@ju.edu.jo

19. Other instructors:

None

20. Course Description:

Axioms of probability, Conditional probability, Baye's Theorem-Random variable, Probability mass and density functions, Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions and their properties, Classification of stationary processes, Markov process, Markov chains,

Transition probabilities, Limiting distributions - Poisson process. Markovian models – birth and death queuing models, Single and multiple server queuing models, queues with finite waiting rooms, Little's Formula, M/G/1 queue- Pollaczek- Khintchine formula, Series queues, Open and closed networks.

21. Course aims and outcomes:

A- Aims:

- To understand and conduct computer systems modeling and performance analysis.
- To introduce the basic probability tools and concepts this is useful in modeling, such as Markov models and queuing theory.
- To provide necessary mathematical support and confidence to tackle real life problems.

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

I. Research current solutions for a problem in probability and queuing theory and report and present the results of this research. [4, 5, 8]

II. To acquire skills in handling situations involving more than one random variable and functions of random variables. [1]

III. To apply basic probability techniques and models to analyze the performance of computer systems, and, in particular, of networks and queues. [2]

IV. To have a well – founded knowledge of standard distributions which can describe real life phenomena. [3]

V. To understand and characterize phenomena which evolve with respect to time in a probabilistic manner. [7]

VI. To expose the basic characteristic features of a queuing system and acquire skills in analyzing queuing models. [1,7]

22. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Random Variables	1	Khalid A. Darabkh	II and III	Exams and Reports	[1]
Standard Distributions	4	Khalid A. Darabkh	IV	Exams and Reports	[2]
Markov Processes and Markov Chains	7	Khalid A. Darabkh	V	Exams and Reports	[3]

Queuing Theory	10	Khalid A. Darabkh	VI	Exams and Reports	[7]	
Non-Markovian Queues and Queue Networks	13	Khalid A. Darabkh	VI	Exams and Reports	[1, 7]	

23. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- The student attends the class presentations and participates in the discussions.
- The student studies online video recordings along with references and research papers.

24. Evaluation Methods and Course Requirements:

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

- Exams

25. Course Policies:

A. Attendance policies:

- Attendance is mandatory and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered cumulative.

B- Absences from exams and handing in assignments on time:

- A makeup exam can be arranged for students with acceptable absence causes.
- The project report must be handed in in time.

C- Health and safety procedures:

- All health and safety procedure of the university and school should be followed.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

- The research project and exams are expected to be individual work (have to be done by your own) and completed without any help of your classmates. Handing in work that was jointly prepared and/or copied will be considered plagiarism and will be handled according to the University regulations.

E- Grading policy:

- First Exam (30%)
- Second Exam (30%)
- Final Exam (40%)

F- Available university services that support achievement in the course:

- Course Website: http://eacademic.ju.edu.jo/k.darabkeh/Material

26. Required equipment: (Facilities, Tools, Labs, Training….)

None

27. References:

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

- O.C. IBE, "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007 (For chapters 1, 2 and 3).
- D. Gross and C.M. Harris, "Fundamentals of Queueing Theory", Wiley Student edition, 2004 (For units 4 and 5).

Recommended books, materials, and media:

- A.O. Allen, "Probability, Statistics and Queueing Theory with Computer Applications", Elsevier, 2nd edition, 2005.
- H.A. Taha, "Operations Research", Pearson Education, Asia, 8th edition, 2007.
- K.S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2nd edition, 2002

28. Additional information:

Students are assumed to have sufficient knowledge pertaining to Calculs 1 & 2.

Name of Course Coordinator: **Prof. Khalid A. Darabkh** Signature: ---------- Date: **Oct 12, 2021.**

Head of curriculum committee/Department: ---------- Signature: ----------

Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

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