The University of Jordan

Accreditation & Quality Assurance Center

Course Syllabus

Course Name:
Probability Theory

1	**Course title**	Probability Theory
2	**Course number**	0301932
3	**Credit hours (theory, practical)**	3
	Contact hours (theory, practical)	3
4	**Prerequisites/requisites**	None
5	**Program title**	Ph.D.
6	**Program code**	
7	**Awarding institution**	The University of Jordan
8	**Faculty**	Science
9	**Department**	Mathematics
10	**Level of course**	Obligatory
11	**Year of study and semester (s)**	Third year
12	**Final Qualification**	Ph.D. degree
13	**Other department (s) involved in teaching the course**	None
14	**Language of Instruction**	English
15	**Date of production/revision**	

16. Course Coordinator:

Dr. Mohammad Z. Al-Raqab
Department of Mathematics
Email: mraqab@ju.edu.jo

17. Other instructors:

Dr. Ahmad Al-Zghoul Department of
Mathematics Email:
a.zghoul@ju.edu.jo

18. Course Description:

This course introduces rigorous theory of probability
various concepts in probability theory, including conditioning properties, conditional probability measures, interchangeable random variables, independence, central limit theorem, martingales and related inequalities, infinite divisible laws, Markov chains, birth and death processes, renewal theorem, Brownian motion.

19. Course aims and outcomes:

A- Aims:
The main aim of this course is to expose students to a variety of probability theorems and rules that can be used to deal with some stochastic processes problems.

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

1. Give a count of the foundations of probability theory from a measure-theoretic perspective;
2. Describe theory for conditional probability and expectation from a measure-theoretic perspective;
3. Enable to characterize probability distributions using the characteristic functions;
4. Define and relate different types of central limit theorems in obtaining the asymptotic normal distribution for large sample size under different conditions;
5. Appreciate the use of high level procedures in stochastic processes in the fields of engineering, biology and medical studies.

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Conditioning Arguments Conditional properties, conditional expectations, conditional independence, conditional probability measures, interchangeable random variables	1-3		1+2		
Martingales Basic properties of martingale, inequalities, applications, convex functions of inequalities for martingales, stochastic inequalities.	4-5		1+2		
Distribution and characteristic functions Uniqueness and inversion, convergence theorems, representation theorems	6-7		3		
Central Limit Theorem Independence components, miscellaneous central limit theorems, Liapounov and Lindeberg-Feller theorems.	8-9		3+4		
Infinitely Divisible Laws Infinitely divisible characterizing function, infinitely divisible laws, stable laws.	10-11		3+5		

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Stochastic Processes Renewal theorem, applications of the renewal theorem, Brownian motion, Brownian paths.	12-15		1+2+5		

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following <u>teaching and learning methods</u>:
In order to succeed in this course, each student each student need to be an active participant in learning-both in class and out of class.
- Class time will be spent on lecture as well as discussion of homework problems and some groupwork
- To actively participate in class, you need to prepare by reading the textbook and doing all assigned homework before class.
- You should be prepared to discuss your homework.
- You are encouraged to work together with other students and to ask questions and seek help from the professor, both in and out of class

22. Evaluation Methods and Course Requirements:

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

ILO/s	Learning Methods	Evolution Methods	Related ILO/s to the program
	Lectures	Exam	
	Published Papers	Presentation	
		Home work	

23. Course Policies:

1. Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.
2. If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.
3. Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.
4. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
5. Solutions for the exams questions and marks will be announced to the students.
6. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on home-works

24. Required equipment:

25. References:

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

   1. *Kai Diethelm*, The Analysis of Fractional Differential Equations, Springer, 2010.

B- Recommended books, materials, and media:

   2. K.S. Miller & B.Ross. ,An Introduction to the Fractional Calculus and Fractional Differential Equations Hardcover , Wiley-Blackwell, 1993.

   3. I. Podlubny, Fractional Differential Equations, Academic Press, San Diego 1999.

   4. Selected Papers.

26. Additional information:

1- Probability Theory: Independence, Interchangeability, Martingales, 1988, by Y. S. Chow & H. Teicher, Springer-Verlag.
2- A course in Probability Theory, by K.L. Chung, 2000, 3rd ed. or later edition, Academic Press Inc.

Name of Course Coordinator : Prof. M. Al-Raqab   Signature : ---------------------- Date : ------------------------

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

Head of Department : Prof. M. Al-Raqab   Signature : ------------------------

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

Dean : Prof. Fuad Kittaneh   Signature : --------------------------

Copy to:
 Head of Department
 Assistant Dean for Quality Assurance
 Course File