جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

# Course Syllabus

***According to JORDAN National Qualification Framework (JNQF)***

# Course Name: Probability Theory

# Course Number: 0101341

## General Course Information:

| | |
|---|---|
| Course Title | **Probability Theory** |
| Course Number | **0101341** |
| Credit Hours | 3 credit hours |
| Education Type | Traditional learning |
| Prerequisites/Co-requisites | 0101201 |
| Academic Program | BS.c |
| Program Code | 0101 |
| Faculty | Faculty of Information Technology |
| Department | Mathematics |
| Level of Course | 3 |
| Academic Year /Semester | 2023/2024 1st Semester |
| Awarded Qualification | BS'c |
| Other Department(s) Involved in Teaching the Course | - |
| Language of Instruction | English |
| Date of Production | 2021-2022 |
| Date of Revision | October 2023 |

## Course Coordinator:

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|---|---|
| Coordinator's Name | Dr. Ma'mon Abu Hammad |
| Office No. | 9319 |
| Office Phone Extension Number | |
| Office Hours | 11-12:30 Sunday- Tuesday.<br>9:30-11 Monday- Wednesday. |
| E-mail | m.abuhammad@zuj.edu.jo |

## Other Instructors:

| | |
|---|---|
| Instructor Name | NA |
| Office No. | |
| Office Phone Extension Number | |
| Office Hours | |
| Email | |

## Course Description *(English/Arabic)*:

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|---|---|
| **English** | *This course discusses the basic axioms of the probability and probability rules, random variables and probability distributions, multi-variate density and multivariate distributions and functions of random variables.* |
| **Arabic** | *يهتم هذا المساق بالبديهيات الأساسية لقواعد الاحتمال والاحتمال، والمتغيرات العشوائية والتوزيعات الاحتمالية، والكثافة متعددة المتغيرات والتوزيعات متعددة المتغيرات ووظائف المتغيرات العشوائية.* |

## Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Devore, Jay,L. and Berk, Kenneth,N., Modern Mathematical Statistics with Applications. Publisher Thomson Brooks/Cole 2007.

## References: *Author(s), Title, Publisher, Edition, Year, Book website.*


1. Bain,Lee, J. and Engelhardt, Introduction to Probability and Mathematical Statistics, Max. Publisher Duxbury Press, 2nd edition, 1987.
2. Miller & Miller, Mathematical Statistics with applications, Pearson Prentice Hall, seventh edition, (2004).2


## Course Educational Objectives (CEOs):

| | |
|---|---|
| **CEO1** | **Develop a solid understanding of fundamental probability concepts, including events, sample spaces, and the rules of probability.** |
| **CEO2** | **Understand the concept of random variables and their probability mass functions or probability density functions.** |
| **CEO3** | **Understand the concepts of expectation (mean) and variance for discrete random variables and their applications.** |

## Intended Learning Outcomes (ILO's):

| Intended learning outcomes (ILOs) | | Relationship to CEOs | Contribution to PLOs | Bloom Taxonomy Levels* | JNQF Descriptors** |
|---|---|---|---|---|---|
| **K** | Knowledge and Understanding | | | | |
| **ILO1-k** | Identify the probability concept. | CEO1 | PLO1-k | Remembering | k |
| **ILO2-k** | Understand the expectation function and properties. | CEO1 | PLO1-k | Understanding | K |
| **S** | Intellectual skills | | | | |
| **ILO3-s** | Analyze the probability properties. | CEO1, CEO2 | PLO6-s | Analysing | S |
| **ILO4-s** | understand the meaning of the random variable and distinguish discrete and continuous R.V. | CEO1, CEO2 | PLO6-s | Understanding | S |
| **ILO5-s** | Apply theorems to solve problems. | CEO3 | PLO6-s | Applying | S |
| **C** | Subject specific skills | | | | |
| **ILO6-c** | Obtain the probability distribution of a function of random variables. | CEO2, CEO3 | PLO12-c | Applying | C |
| **ILO7-c** | Develop the individual's ability to communicate and interact with other mathematical courses | CEO3 | PLO12-c | Creating | C |

*Bloom Taxonomy Levels:

| Level # | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Level Name | Remembering | Understanding | Applying | Analyzing | Evaluating | Creating |

** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.

## Program Learning Outcome (PLOs):

| | (PLOs) | JNQF Descriptors** | | |
|---|---|---|---|---|
| | | K | S | C |
| 1. | Knowledge of the main concepts in pure mathematics. | √ | | |
| 2. | Knowledge of the main concepts in applied mathematics. | √ | | |
| 3. | Explain concepts, principles and theories in the fields of probability and statistics. | √ | | |
| 4. | Possession of technological culture related to the fields of mathematics and its applications. | √ | | |
| 5. | Making use of mathematical logic in practical life. | | √ | |
| 6. | Engaging scientific methodology as a way of thinking and as a tool in facing problems. | | √ | |
| 7. | Applying mathematical software packages in problem solving. | | √ | |
| 8. | Being capable of data analysis. | | √ | |
| 9. | Capability of teaching according to modern educational techniques. | | √ | |
| 10. | Develop creative and innovative methods of teaching mathematics. | | √ | |
| 11. | Showing the ability to work under ethical and professional standards within teams. | | | √ |
| 12. | Gaining critical thinking and scientific research skills. | | | √ |

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

**Weekly Schedule** *(please choose the type of teaching)*

- ☒ **Face to Face (F2F)**
- ☐ **Hybrid** *(One – To - One)*
- ☐ **Online**

## Schedule of Simultaneous and their Topics:

| Week | First Lecture (F2F) | Second Lecture (F2F) | ILOs | PLOs | JNQF Descriptors* |
|---|---|---|---|---|---|
| 1 | Sample Space. | Set operations with events Probability of events, Addition Rule. | ILO1-**k** | PLO1-k | k |
| 2 | Conditional probability Multiplication Rule. | Independent events, Law of Total Probability and Bayes Rule. | ILO1-k | PLO1-k | k |
| 3 | Concept of a random variable. | Probability distribution. | ILO1-k | PLO1-k | K |
| 4 | Expectations and Variance.. | Moments and moment generating | ILO1-k ILO2-k | PLO1-k | k |

| | | | | | |
|---|---|---|---|---|---|
| | | function. | | | |
| **5** | Distribution functions (Uniform, Binomial). | Distribution functions Poisson, Hypergeometric. | ILO1-k<br>ILO2-k | PLO1-k | K |
| **6** | Specific Continuous parametric distributions-Univariate Uniform. | Exponential, Normal Joint distributions. | ILO1-k | PLO1-k | k |
| **7** | Joint distribution function | Joint moment. | ILO2-k | PLO1-k | k |
| **Midterm Exam (30%)** | | | | | |
| **9** | Conditional distributions | Independence of random variables. | ILO3-s | PLO6-s | S |
| **10** | Product moments. | conditional expectation. | ILO3-s | PLO6-s | S |
| **11** | Functions of random variables. | Transformation technique one variable. | ILO3-s | PLO6-s | S |
| **12** | Transformatio n technique several variable. | Moment-Generating function technique. | ILO5-s | PLO6-s | S |
| **13** | Special probability densities. | Order statistics. | ILO2-k | PLO1-k | K |
| **14** | Order statistics. | Sampling distribution. | ILO6-c<br>ILO7-c | PLO12-c | C |
| **15** | Distributions of Sample mean. | Distribution of sample variance. | ILO4-**s** | PLO6-s | S |
| **16** | **Final Exam (40%)** | | | | |

* **K: Knowledge, S: Skills, C: Competency**

## Teaching Methods and Assignments:

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

- Lecture.

## Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) 3**0%**
- Midterm **30 %**
- Final Exam **4** 0**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

## Required Equipment:

- Classroom
- E-learning plan

## Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework

## Responsible Persons and their Signatures:

| | | | |
|---|---|---|---|
| **Course Coordinator** | Mamon Abu Hammad | **Completed Date** | **October 2023** |
| | | **Signature** | |

| | | | |
|---|---|---|---|
| **Received by (Department Head)** | | **Received Date** | / / |
| | | **Signature** | |