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|---|---|---|
| **Form: Course Syllabus** | **Form Number** | EXC-01-02-02A |
| | **Issue Number and Date** | 2/3/24/2022/2963 05/12/2022 |
| | **Number and Date of Revision or Modification** | |
| | **Deans Council Approval Decision Number** | 2/3/24/2023 |
| | **The Date of the Deans Council Approval Decision** | 23/01/2023 |
| | **Number of Pages** | 08 |

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|---|---|---|
| **1.** | **Course Title** | **Applied Probability** |
| **2.** | **Course Number** | 0301338 |
| **3.** | **Credit Hours (Theory, Practical)** | 3 |
| | **Contact Hours (Theory, Practical)** | 3 |
| **4.** | **Prerequisites/ Corequisites** | 0301333 |
| **5.** | **Program Title** | B.Sc. |
| **6.** | **Program Code** | |
| **7.** | **School/ Center** | Science |
| **8.** | **Department** | Mathematics |
| **9.** | **Course Level** | College requirement |
| **10.** | **Year of Study and Semester (s)** | 3rd year, all Semesters |
| **11.** | **Other Department(s) Involved in Teaching the Course** | None |
| **12.** | **Main Learning Language** | English |
| **13.** | **Learning Types** | ■Face to face learning ☐Blended ☐Fully online |
| **14.** | **Online Platforms(s)** | ■Moodle ■Microsoft Teams |
| **15.** | **Issuing Date** | November,9,2017 |
| **16.** | **Revision Date** | 28/11/2024 |

**17. Course Coordinator:**


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|---|---|
| Name: Ahmad Zghoul | Contact hours: 11:30-12:30 Su, Tue |
| Office number: | Phone number: |
| Email: a.zghoul@ju.edu.jo | |

**18. Other Instructors:**

| |
|---|
| Name: |
| Office number: |
| Phone number: |
| Email: |
| Contact hours: |
| Name: |
| Office number: |
| Phone number: |
| Email: |
| Contact hours: |

**19. Course Description:**

| |
|---|
| - Revision of some probability distributions |
| - Queuing Theory (Description of queuing models, the Poisson process, Birth-Death processes, single Server queue and some modifications) |
| - Reliability Theory (Failure laws and failure rate, reliability of series and parallel systems) |
| - Quality control (control charts, acceptance sampling, single sampling plan, other sampling plans) |
| - Information theory and coding (Uncertainty, information measures and entropies, the first coding theorem discrete channels and the second coding theorem) |

**20. Program Student Outcomes (SO's):**

(To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

**SO1.** Identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of Mathematics and Science and/or technical topics to areas relevant to the discipline.

**SO2.** Formulate or design a system, process, procedure or program to meet desired needs.

**SO3.** Develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.

**SO5.** Reflect the impact of technical and/or scientific solutions in economic, environmental, and societal contexts.

**SO8.** Utilize techniques, skills, and modern scientific tools such as mathematical packages, statistical software, graphing calculators, and online resources necessary for professional practice.

**21. Course Intended Learning Outcomes (CLO's):**

(Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. **Understand and Utilize random variables, distributions, and Stochastic Processes**: Students will review basic distribution theory, then develop the ability to analyze and work with key stochastic processes, such as the Poisson process and Birth-Death processes, to model and predict probabilistic behavior in various applied contexts.
2. **Model and Solve Queuing Systems**: Students will gain the ability to describe, model, and solve problems involving queuing systems using concepts such as the Poisson process, Birth-Death processes, and single-server queues.
3. **Assess System Reliability**: Students will learn to evaluate the reliability of systems, including calculating failure rates and determining the reliability of series and parallel configurations using appropriate probabilistic methods.
4. **Implement Quality Control Techniques**: Students will acquire the skills to design and interpret control charts, implement various acceptance sampling plans (including single and other sampling strategies), and assess the quality of manufacturing or service processes using probabilistic methods.
5. **Apply Information Theory to Communication**: Students will understand and apply fundamental concepts of information theory, such as entropy and uncertainty, to evaluate communication systems, and learn to use coding theorems to optimize discrete channels.

| Course CLOs | The learning levels to be achieved | | | | | |
|---|---|---|---|---|---|---|
| | Remembering | Understanding | Applying | Analysing | evaluating | Creating |
| Understand and Utilize Stochastic Processes | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Model and Solve Queuing Systems | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Assess System Reliability | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Implement Quality Control Techniques | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Apply Information Theory to Communication | ✓ | ✓ | ✓ | ✓ | ✓ | |

**22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:**

| Program SO's / Course CLO's | SO (1) | SO (2) | SO (3) | SO (4) | SO (5) | SO (6) | SO (7) | SO (8) |
|---|---|---|---|---|---|---|---|---|
| CLO (1) | ✓ | ✓ | ✓ | | ✓ | | | ✓ |
| CLO (2) | ✓ | ✓ | ✓ | | ✓ | | | ✓ |
| CLO (3) | ✓ | ✓ | ✓ | | ✓ | | | ✓ |
| CLO (4) | ✓ | ✓ | ✓ | | ✓ | | | ✓ |
| CLO (5) | ✓ | ✓ | ✓ | | ✓ | | | ✓ |

**23. Topic Outline and Schedule:**

| Week | Lecture | Topic | CLO/s Linked to the Topic | Learning Types Face to Face (FF) Blended (BL) Fully Online (FO) | Platform Used | Synchronous (S) Asynchronous (A) | Evaluation Methods | Learning Resources |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.1 | Random Variables and Distributions | 1 | | EL & Teams | | Tests | Text book |
| | 1.2 | Discrete Random Variables | 1 | | EL & Teams | | Tests | Text book |
| | 1.3 | Continuous Random Variables | 1 | | EL & Teams | | Tests | Text book |
| 2 | 2.1 | Moments and generating functions | 1 | | EL & Teams | | Tests | Text book |
| | 2.2 | Joint distributions | 1 | | EL & Teams | | Tests | Text book |
| | 2.3 | Conditional distributions | 1 | | EL & Teams | | Tests | Text book |
| 3 | 3.1 | Stochastic Processes | 1 | | EL & Teams | | Tests | Text book |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3.2 | Description of queuing models | 2 | | EL & Teams | | Tests | Text book |
| | 3.3 | The Poisson Process | 2 | | EL & Teams | | Tests | Text book |
| **4** | 4.1 | The Poisson Process | 2 | | EL & Teams | | Tests | Text book |
| | 4.2 | The Poisson Process | 2 | | EL & Teams | | Tests | Text book |
| | 4.3 | Birth & death process | 2 | | EL & Teams | | Tests | Text book |
| **5** | 5.1 | Birth & death process | 2 | | EL & Teams | | Tests | Text book |
| | 5.2 | Birth & death process | 2 | | EL & Teams | | Tests | Text book |
| | 5.3 | The single server queue | 2 | | EL & Teams | | Tests | Text book |
| **6** | 6.1 | The single server queue | 2 | | EL & Teams | | Tests | Text book |
| | 6.2 | Modification of the single server queue | 2 | | EL & Teams | | Tests | Text book |
| | 6.3 | Modification of the single server queue | 2 | | EL & Teams | | Tests | Text book |
| **7** | 7.1 | **Reliability Theory** Failure laws and reliability | 3 | | EL & Teams | | Tests | Text book |
| | 7.2 | Failure laws and reliability | 3 | | EL & Teams | | Tests | Text book |
| | 7.3 | Failure laws and reliability | 3 | | EL & Teams | | Tests | Text book |
| **8** | 8.1 | First Exam | | | | | | |
| | 8.2 | Series Connection | 3 | | EL & Teams | | Tests | Text book |
| | 8.3 | Series Connection | 3 | | EL & Teams | | Tests | Text book |
| **9** | 9.1 | Parallel Connection | 3 | | EL & Teams | | Tests | Text book |
| | 9.2 | Parallel Connection | 3 | | EL & Teams | | Tests | Text book |
| | 9.3 | Life testing and Estimation | 3 | | EL & Teams | | Tests | Text book |
| **10** | 10.1 | Life testing and Estimation | 3 | | EL & Teams | | Tests | Text book |
| | 10.2 | Life testing and Estimation | 3 | | EL & Teams | | Tests | Text book |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10.3 | Life testing and Estimation | 3 | | EL & Teams | | Tests | Text book |
| **11** | 11.1 | **Quality Control and Acceptance Sampling** Control Charts | 4 | | EL & Teams | | Tests | Text book |
| | 11.2 | Control Charts | 4 | | EL & Teams | | Tests | Text book |
| | 11.3 | Acceptance sampling plans by attributes-Single sampling plans | 4 | | EL & Teams | | Tests | Text book |
| **12** | 12.1 | Second Exam | | | | | | |
| | 12.2 | Acceptance sampling plans by attributes-Single sampling plans | 4 | | EL & Teams | | Tests | Text book |
| | 12.3 | Acceptance sampling plans by attributes-Single sampling plans | 4 | | EL & Teams | | Tests | Text book |
| **13** | 13.1 | Other acceptance sampling plans | 4 | | EL & Teams | | Tests | Text book |
| | 13.2 | Other acceptance sampling plans | 4 | | EL & Teams | | Tests | Text book |
| | 13.3 | Other acceptance sampling plans | 4 | | EL & Teams | | Tests | Text book |
| **14** | 14.1 | **Information Theory and Coding** Uncertainty, Information and Theory | 5 | | EL & Teams | | Tests | Text book |
| | 14.2 | Discrete sources and the first coding theorem | 5 | | EL & Teams | | Tests | Text book |
| | 14.3 | Discrete sources and the first coding theorem | 5 | | EL & Teams | | Tests | Text book |
| **15** | 15.1 | Discrete channels and the second coding theorem | 5 | | EL & Teams | | Tests | Text book |
| | 15.2 | Discrete channels and the second coding theorem | 5 | | EL & Teams | | Tests | Text book |
| | 15.3 | Discrete channels and the second coding theorem | 5 | | EL & Teams | | Tests | Text book |
| **16** | | | | | | | Final Exam | |

**24. Evaluation Methods:**

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

| Evaluation Activity | Mark | Topic(s) | CLO/s Linked to the Evaluation activity | Period (Week) | Platform |
|---|---|---|---|---|---|
| **First Midterm Exam** | 30% | Review Chapters (1-7), ch11 | CLO 1, CLO 2 | Week 8 | Classroom Exam |
| **Second Midterm Exam** | 30% | Chapter 12, ch13 | CLO 3, CLO 4 | Week 12 | Classroom Exam |
| **Final Exam** | 50% | Comprehensive Coverage of All Chapters | All CLOs | Last Week of Semester | Classroom Exam |

**25. Course Requirements:**

Students should have a computer, internet connection, webcam, and account on teams.

**26. Course Policies:**

Attendance is essential to succeeding in this course. You are expected to attend every class; please notify your instructor if you know you will be absent. All exams must be taken at the scheduled times. Exceptions will be made only in extreme circumstances by prior arrangement with the instructor.
If a student is absent for more than 15% of the lectures without a valid excuse (such as sickness or other unavoidable circumstances), they will not be allowed to take the final examination and will receive a failing grade in the course.
Students who need to be excused from exams due to medical reasons should provide a medical certificate to the University Physician for approval. The approved certificates should then be submitted to the Dean of the Faculty within two weeks of the student no longer attending classes.
After grading, test papers will be returned to the students. One week after the papers are returned, the student's mark will be considered final.
Cheating is strictly prohibited in this course. Any student found cheating in exams or homework will be subject to the University's cheating regulations, which will be enforced without exception.

**27. References:**

**A-** Required book:

Ian F. Blake, An Introduction to Applied Probability, John Wiley and Sons.

**B-** Recommended books, materials, and media:

**(1)** Lecture Notes
**(2)** Bain and Engelhardt, Introduction To Probability And Mathematical Statistics, Second Edition.

**28. Additional information:**

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|---|---|---|
| Name of the Instructor or the Course Coordinator:<br>**Prof. Ahmad Zghoul** | Signature:<br>…… | Date:<br>28/11/2024 |
| Name of the Head of Quality Assurance Committee/ Department:<br>**Prof. Manal Ghanem** | Signature:<br>…… | Date:<br>…… |
| Name of the Head of Department:<br>**Prof. Baha Alzalg**. | Signature:<br>…… | Date:<br>…… |
| Name of the Head of Quality Assurance Committee/ School of Science:<br>**Prof. Emad A. Abuosba** | Signature:<br>…… | Date:<br>…… |
| Name of the Dean or the Director:<br>**Prof. Mahmoud I. Jaghoub** | Signature:<br>…… | Date:<br>…… |