| 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** | 06 |

| | | |
|---|---|---|
| **1.** | **Course Title** | Mathematical Physics-1 |
| **2.** | **Course Number** | 0322781 |
| **3.** | **Credit Hours (Theory, Practical)** | 3 theory |
| | **Contact Hours (Theory, Practical)** | 3 theory |
| **4.** | **Prerequisites/ Corequisites** | No prerequisites |
| **5.** | **Program Title** | M.Sc. in Physics |
| **6.** | **Program Code** | |
| **7.** | **School/ Center** | Faculty of Science |
| **8.** | **Department** | Department of Physics |
| **9.** | **Course Level** | 1st year |
| **10.** | **Year of Study and Semester (s)** | Fall semester 2023/2024 |
| **11.** | **Other Department(s) Involved in Teaching the Course** | |
| **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** | October 2024 |
| **16.** | **Revision Date** | December 2024 |

**17. Course Coordinator:**

Name: Dr. Noureddine Chair Contact hours: (01:00-2:15) Sunday, Tuesday, Thursday

Office number: 013 Phone number: 22023

Email: n.chair@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:**

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|---|
| As stated in the approved study plan. |
| As stated in the approved study plan. Tensor Analysis, Group Theory, Functions of a Complex Variable; Calculus of Residues, Differential Equations, Sturm -Liouville Theory. |

**20. Program Intended Learning Outcomes:** (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. To be able to 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.
2. To be able to formulate or design a scientific system, process, procedure or program to contribute achieving scientific desired needs.
3. To be able to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. To be able to communicate his/her scientific contributions effectively with a range of audiences.
5. To be able to recognize and demonstrate social, ethical and professional responsibilities and the impact of technical and/or scientific solutions in global economic, environmental, and societal contexts.

6. To be able to function effectively independently and on teams for establishing goals, plan tasks, meet deadlines, and analyze risk and uncertainty.v

**21. Course Intended Learning Outcomes:** (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

**1. Tensor Analysis:** Understand and apply scalar, vector, and second-rank tensors in mathematical and physical contexts.

**2. Group Theory:** Analyze symmetry and structure using the principles of group theory.

**3. Complex Variables:** Explore functions of a complex variable, including Cauchy-Riemann conditions, Laurent expansion, and mapping.

**4. Residue Calculus:** Solve problems using Cauchy's integral theorem, integral formula, and calculus of residues.

**5. Differential Equations:** Formulate and solve ordinary and partial differential equations in physical systems.

**6. Sturm-Liouville Theory:** Apply Sturm-Liouville theory to solve eigenvalue problems in mathematical physics.

| Course ILOs | The learning levels to be achieved | | | | | |
|---|---|---|---|---|---|---|
| | Remembering | Understanding | Applying | Analysing | evaluating | Creating |
| 1 | ✓ | ✓ | ✓ | ✓ | | |
| 2 | ✓ | ✓ | ✓ | ✓ | | |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 5 | ✓ | ✓ | ✓ | ✓ | | |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

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

| Program ILOs / Course ILOs | ILO (1) | ILO (2) | ILO (3) | ILO (4) | ILO (5) | ILO (6) |
|---|---|---|---|---|---|---|
| 1 | ✓ | ✓ | | ✓ | | |
| 2 | ✓ | ✓ | | ✓ | | |
| 3 | ✓ | ✓ | | ✓ | | |
| 4 | ✓ | ✓ | | ✓ | | |
| 5 | ✓ | ✓ | | ✓ | | |
| 6 | ✓ | ✓ | | ✓ | | |

**٢٣. Topic Outline and Schedule:**

| Week | Lecture | Topic | ILO/s Linked to the Topic | Learning Types (Face to Face/ Blended/ Fully Online) | Platform Used | Synchronous / Asynchronous Lecturing | Evaluation Methods | Learning Resources |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.1 | Vectors and tensors analysis | 1-8 | | Microsoft Teams | Synchronous **Lecturing** | | Mathematical methods for Physicists, Sixth edition, Arfken and Weber<br><br>Mathematical methods |
| | 1.2 | | | | | | | |
| | 1.3 | | | | | | | |
| 2 | 2.1 | | | | | | | |
| | 2.2 | | | | | | | |
| | 2.3 | | | | | | | |
| 3 | 3.1 | | | | | | | |
| | 3.2 | | | | | | | |
| | 3.3 | | | | | | | |
| | 4.1 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|
| 4 | 4.2 | | | Face to Face | | | Oral Quizzes Midterm Exam, Final Exam | in the physical sciences, third edition, Mary L. Boas, 2006 |
| | 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 | | | | | | | |
| | 8.2 | | | | | | | |
| | 8.3 | | | | | | | |
| 9 | 9.1 | Vector analysis in curved coordinates | 9-11 | | | | | |
| | 9.2 | | | | | | | |
| | 9.3 | | | | | | | |
| 10 | 10.1 | | | | | | | |
| | 10.2 | | | | | | | |
| | 10.3 | | | | | | | |
| 11 | 11.1 | Function of complex variable | 12-14 | | | | | |
| | 11.2 | | | | | | | |
| | 11.3 | | | | | | | |
| 12 | 12.1 | | | | | | | |
| | 12.2 | | | | | | | |
| | 12.3 | | | | | | | |
| 13 | 13.1 | | | | | | | |
| | 13.2 | | | | | | | |
| | 13.3 | | | | | | | |
| | 14.1 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|
| 14 | 14.2 | Functions of a complex variable calculus of residues | 15 | | | | | |
| | 14.3 | | | | | | | |
| 15 | 15.1 | | | | | | | |
| | 15.2 | | | | | | | |
| | 15.3 | | | | | | | |

**٢٤. Evaluation Methods:**

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

| Evaluation Activity | Mark | Topic(s) | ILO/s Linked to the Evaluation activity | Period (Week) | Platform |
|---|---|---|---|---|---|
| First Exam | 30% | | | 6 | On campus |
| Second Exam | 30% | | | 11 | On campus |
| Final Exam | 40% | | 1-6 | 15 | On campus |

**٢٥. Course Requirements:**

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| (e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):<br><br>N/A |

**٢٦. Course Policies:**

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| A- Attendance policies: According to JU by-laws.<br>B- Absences from exams and submitting assignments on time: According to JU by-laws.<br>C- Health and safety procedures: N/A<br>D- Honesty policy regarding cheating, plagiarism, misbehavior: According to JU by-laws.<br>E- Grading policy: According to JU by-laws.<br>F- Available university services that support achievement in the course: N/Av |

**2٧. References:**

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| A- Required book(s), assigned reading and audio-visuals:<br>Mathematical methods for Physicists, Sixth edition, Arfken and Weber<br>B- Recommended books, materials, and media:<br>Mathematical methods in the physical sciences, third edition, Mary L. Boas, 2006 |

**2٨. Additional information:**

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| N/A |

| | | |
|---|---|---|
| Name of the Instructor or the Course Coordinator:<br>…… Noureddien Chair …… | Signature:<br>N-Chair | Date:<br>10/2024 |
| Name of the Head of Quality Assurance Committee/ Department<br>…… | Signature:<br>……..…… | Date:<br>……..…… |
| Name of the Head of Department<br>…… | Signature:<br>……..…… | Date:<br>……..…… |
| Name of the Head of Quality Assurance Committee/ School or Center<br>…… | Signature:<br>……..…… | Date:<br>……..…… |
| Name of the Dean or the Director<br>…… | Signature:<br>……..…… | Date:<br>……..…… |