



**The Hashemite University**  
**Faculty of Science**  
**Department of Physics**

|                      |   |                             |   |
|----------------------|---|-----------------------------|---|
| <b>Course Title:</b> | Mathematical Physics (I)  | <b>Course Number:</b>       | 110102281   |
| <b>Semester:</b>     | Fall  | <b>Year:</b>                | 2023/2024   |
| <b>Designation:</b>  | Compulsory  | <b>Prerequisite(s):</b>     | 110102102   |
| <b>Instructor:</b>   | Dr. Gassem Alzoubi  | <b>Instructor's e-mail:</b> | <a href="mailto:gassem@hu.edu.jo">gassem@hu.edu.jo</a>                    |
|                      |   | <b>Webpage:</b>             | <a href="http://staff.hu.edu.jo/gassem">http://staff.hu.edu.jo/gassem</a> |
| <b>Office Hours:</b> | Sunday, Tuesday, and Thursday, 10:00 – 11:00 Am, Physics Building, Room # 107 |                             |   |

**Course Description (catalog):** Physics 281 is the first course in a two-semester sequence of mathematical physics courses for physics majors. It introduces students to a variety of basic mathematical tools that will be used in subsequent physics courses.

**. Textbook(s) and/or Other Supplementary Materials:**

**Textbook:** Mathematical Methods in the Physical Sciences, third edition by Mary L. Boas (Wiley, New York, 2006)

**References:**

- (1) Mathematical Methods for Physicists, 6th edition by George B. Arfken and Hans J. Weber (Academic Press, Elsevier, 2013)
- (2) Mathematical Methods for Physics and Engineering, third Edition by K. F. RILEY, M. P. HOBSON and S. J. BENICE (Cambridge University Press, 2006)

**Major Topics Covered:**

| Topics  | No. of Weeks | Contact hours* | Chapter in Text | Sections                       | Suggested Problems (from textbook 3d edition) |
|---|--------------|----------------|-----------------|--------------------------------|---|
| Complex Numbers   | 2            | 6              | 2               | 2.1-2.5,<br>2.8-2.16           |   |
| Linear Algebra  | 3            | 9              | 3               | 3.1-3.9,<br>3.11-3.12          |   |
| <b>Second Exam</b>  |              |                |                 |                                |   |
| Vector Analysis   | 3            | 9              | 6               | 6.1-6.11                       |   |
| Fourier Series and Transforms   | 2            | 6              | 7               | 7.1, 7.4-<br>7.5, 7.7-<br>7.11 |   |
| <b>Second Exam</b>  |              |                |                 |                                |   |
| Ordinary Differential Equations   | 3            | 9              | 8               | 8.1-8.7                        |   |
| Curvilinear coordinates and vector operations in orthogonal curvilinear coordinates | 2            | 6              | 10              | 10.8-18.9                      |   |
| <b>Final Exam</b>   |              |                |                 |                                |   |
| <b>Total</b>  | <b>15</b>    | <b>45</b>      |                 |                                |   |

\*Contact hours include lectures and exams

**Specific Outcomes of Instruction (Course Learning Outcomes):**

After completing the course, the student will be able to:

| Course Learning Outcomes (CLO) |   | (SO*)         |
|--------------------------------|---|---------------|
| <b>CLO1.</b>                   | Develop fundamental mathematical methods, techniques, and skills required for a physics major as an integral part of the student's overall education  | (a), (k), (i) |
| <b>CLO2.</b>                   | Use linear algebra, vector calculus, and matrices to solve problems in different physics applications   | (a), (k)      |
| <b>CLO3.</b>                   | Demonstrate the ability to solve first and second order linear differential equations in various fields of physics, such as mechanics and electricity | (a), (e) (k)  |

(SO\*) = Student Outcomes Addressed by the Course.

**Student Outcomes (SO) Addressed by the Course:**

| #                                    | Outcomes Description   | Contribution |
|--------------------------------------|--|--------------|
|                                      | Applied and Natural Sciences Student Outcomes  |              |
| (a)                                  | an ability to apply knowledge of mathematics, science, and applied sciences  | H            |
| (b)                                  | an ability to design and conduct experiments, as well as to analyze and interpret data                                   |              |
| (c)                                  | an ability to formulate or design a system, process or program to meet desired needs                                     |              |
| (d)                                  | an ability to function on multidisciplinary teams  |              |
| (e)                                  | an ability to identify and solve applied sciences problems   | L            |
| (f)                                  | an understanding of professional and ethical responsibility  |              |
| (g)                                  | an ability to communicate effectively  |              |
| (h)                                  | the broad education necessary to understand the impact of solutions in a global and societal context                     |              |
| (i)                                  | a recognition of the need for, and an ability to engage in life-long learning  |              |
| (j)                                  | a knowledge of contemporary issues   |              |
| (k)                                  | an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice. | M            |
| <b>H = High, M = Medium, L = Low</b> |  |              |

|                      |                      |           |            |
|----------------------|----------------------|-----------|------------|
| <b>Grading Plan:</b> | 1 <sup>st</sup> Exam | 30 Points | <b>TBA</b> |
|                      | 2nd Exam             | 30 Points | <b>TBA</b> |
|                      | Final exam           | 40 Points | <b>TBA</b> |

**General Notes:** **Attendance Policy:** students are expected to attend every class and arrive on time in compliance with HU regulations. In case you find yourself in a situation that prevents you from attending class or exam, you have to inform your instructor. If you miss more than 6 classes for the (Sunday, Tuesday, and Thursday model) or 4 classes for the (Monday and Wednesday Model), you cannot pass the course. Makeup excuses will be accepted only for very limited justified cases, such as illness and emergencies.

**Prepared by:** Dr. Gassem Alzoubi

**Date:** Oct, 8, 2023