Zarqa University
Faculty of Science
Department of Physics
Course title: Mathematical Physics II
(0302301)

Instructor: Dr. Riad S. Masharfe
Lecture's time:8:00 - 09:00 (Su,Tu,Th)
Semester: First Semester
Office Hours:10:00-11:00 (Su,Tu,Th)

Course description:

This course covers the following topics: Fourier series, Calculus of Variations, Gamma, Beta, and Error Functions.

Learning Outcomes

After completing the course, the student should acquire basic knowledge of some topics in Mathematical Physics, such as the Fourier series applications, using the Euler equation and Lagrange's equations. The student should be able to solve problems by using Gamma, Beta, and Error functions and describe their significance in modern physics.

Aims of the course:

The aim of this course is to achieve an understanding and appreciation, in as integrated a form as possible, of some mathematical techniques which are widely used in theoretical physics.

Intended Learning Outcomes: (ILOs)

A. Knowledge and Understanding

A1. Concepts and Theories:

- ✓ Define and derive convergent and asymptotic series.
- ✓ Apply techniques of complex analysis, to the study of special functions of mathematical physics.
- ✓ Define Hamilton's principle.

A2. Contemporary Trends, Problems and Research:

- ✓ Be fluent in calculations of Fourier coefficients.
- ✓ Have confidence in solving mathematical problems arising in physics by a variety of mathematical techniques.

A3. Professional Responsibility:

- Solve integrals using Gamma and Beta functions.

B. Subject-specific skills

B1. Problem solving skills:

- Apply appropriate theories, principles and concepts relevant to the physics.

B2. Modeling and Design:

- Demonstrate a reasoned argument to the solution of familiar and unfamiliar problems relevant to mathematical equations in physics.

B3. Application of Methods and Tools:

- Integrate the concepts and principles of mathematical physics to solve physical problems.
- Integrate the concepts and principles of mathematical physics and its role in life sciences.
- Interpret any phenomena according to Mathematical physical laws.

Critical-Thinking Skills

C1. Analytic skills:

- Plan, design and execute practical activities using techniques and procedures appropriate to mathematic related to different aspects of physics.

C2. Strategic Thinking:

- Plan, design, record, execute and communicate a piece of independent research using mathematics media and techniques in physics.

C3. Creative thinking and innovation:

- Solve problems relevant to theoretical physics.

C. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Communication:

-Apply different physical principles in different disciplines of science and medicine.
- Enhance the observation of individual to the natural phenomena.
- Assist the student to participate in life science studies

D2. Teamwork and Leadership:

- Increase the cooperative behavior between the different research groups of different applications.
- To work in stressful environment and within constraints.
- To Communicate effectively.
- Use the efficient IT capabilities.
- Management the tasks efficiently.
- To Acquire entrepreneurial skills.
- Refer to relevant literature effectively.
- Searching for the information and going to self learning a new topic

Course structures:

Week	Credit Hours	ILOs	Topics	Teaching Procedure	Assessment methods
1,2,3,4, 5	3	A1,A3,D2,B3	**Fourier Series CH.7**	Lecture, Oral inquiry, Problem solving	Class participation problems (7.2(1-5), 7.3(1-4),7.4(3-6), 7.5(1-5), 7.7(1),7.8(1-5),7.9(1-3), 7.11(5-7)
6,7,8,9	3	A3,B3,C1,C2, B1	**Calculus of Variations CH.9**	Lecturing discussion, Problem solving	Homework: text problems(9.1(1-2), 9.2(3-6),9.3(1-4), 9.4(1-2), 9.5(1-4).
10,11, 12,13, 14	3	A3,C2,C3,B1	**Gamma, Beta, and Error Functions; Asymptotic series; Striling Formula; Eliptic Integrals and Functions CH.25**	Lecture, Class discussion	Oral, Homework: text problems(5, 19, 22, 37, 39, 50) Short-answer questions