Lahore University of Management Sciences

PHY 223 / MATH 241 Mathematical Methods in Physics and Engineering- I
Spring 2024

Instructor	Tajdar Mufti
Room No.	9-117A
Office Hours	TBA
Email	tajdar.mufti@lums.edu.pk
Telephone	0423 560 8395, 0340-2130662 (only in case of emergency)
Secretary/TA	
TA Office Hours	
Course URL (if any)	
Support Services	LUMS offers a range of academic and other services to support students. These are mentioned below, and you are encouraged to use these in addition to in-class assistance from course staff. For a complete list of campus support services available for you click here (https://advising.lums.edu.pk/#supportservices)

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 min
Recitation (per week)	Nbr of Rec (s) Per Week		Duration	
Lab (if any) per week	Nbr of Session(s) Per Week		Duration	
Tutorial (per week)	Nbr of Tut(s) Per Week		Duration	

Course Distribution	
Core	Yes
Elective	
Open for Student Category	
Closed for Student Category	

COURSE DESCRIPTION
Mathematical methods I presents mathematical methods and concepts which are widely used in science and engineering. In this course we'll discuss vector calculus, complex variables, integral transforms, special functions and partial differential equations. Where possible, we will attempt to link the mathematical tools that we will discuss with physical problems to provide context and help develop understanding.

COURSE OBJECTIVES
The main objective of the course is to provide students mathematical techniques which are essential to the solutions of advanced courses as well as some of the problems encountered in Physics and engineering. The course is intended to be thorough in covering topics. The students are to be encouraged to utilize tools for numerical computations and plotting of the results.

COURSE PREREQUISITE(S)

Lahore University of Management Sciences

• • •	**MATH 102 Calculus-II** and (**MATH 120 Linear Algebra with Differential Equations** or **MATH 220 Linear Algebra I**)

Grading Breakup and Policy
Home Work: 10% (5-6 Homework Assignments) Ungraded
Assignments are due before 5 pm on the due date. There will be a 20 % penalty subsequently for each late day.
Quiz(s): 20% (4-6 quizzes)
Midterm Examination: 30%
Final Examination: 40%
NOTE: The grading distribution may change up to 5% during the semester. Slight changes in the number of assignments and quizzes is possible.

Examination Detail	
Midterm Exam	Yes/No: YES, 1 midterm exam for each individual. Combine Separate: Separate Duration: (up to) 3 hours Exam Specifications: Close book/notes
Final Exam	Yes/No: YES Combine Separate: Separate Duration: 3 hours Exam Specifications: Close book/notes

Week	Topics
• 1-2	**Complex Analysis - 1** Review of basics (complex planes, complex algebra and phasors) Euler's Formula Exponential and Trigonometric functions Hyperbolic functions Logarithms Complex Infinite series
• 3-4	**Complex Analysis - 2** Analytic functions Complex series (Laurent Series and Taylor series) Calculus of residues Evaluations of integrals
• 5-6	**Vector Analysis** Fields, Vectors (and scalars) and Tensors Directional derivatives and gradient Divergence theorem Stoke's theorem
• 7-8	**Fourier Series** **Convolution**
• 9-10	**Fourier transforms**
• 11	**Laplace transforms and integral transforms**

	12	**Review of Ordinary differential equations**
•	12-13	**Partial Differential Equations**
•	14	**Series solutions of differential equations** (Bessel, Legendre, Laguerre, Hermite

Textbook(s)/Supplementary Readings

Primary textbook:

Mathematical Methods for Physicists: Tai L. Chow

Mathematical Methods for in Physical Sciences, by Mary L. Boas.

Mathematical Methods for Physicists, George B. Arfken and Hans J. Weber

Advanced Engineering Mathematics, by Erwin Kreyszig

Mathematical Methods for Physics and Engineering by Riley, Hobson and Bence.

Campus supports & Key university policies

Campus Supports

Students are strongly encouraged to meet course instructors and TA's during office hours for assistance in course-content, understand the course's expectations from enrolled students, etc. Beyond the course, students are also encouraged to use a variety of other resources. (Instructors are also encouraged to refer students to these resources when needed.) These resources include Counseling and Psychological Services/CAPS (for mental health), LUMS Medical Center/LMC (for physical health), Office of Accessibility & Inclusion/ OAI (for long-term disabilities), advising staff dedicated to supporting and guiding students in each school, online resources (https://advising.lums.edu.pk/advising-resources), etc. To view all support services, their specific role as well as contact information click here (https://advising.lums.edu.pk/#supportservices).

Academic Honesty/Plagiarism

LUMS has zero tolerance for academic dishonesty. Students are responsible for upholding academic integrity. If unsure, refer to the student handbook and consult with instructors/teaching assistants. To check for plagiarism before essay submission, use similarity@lums.edu.pk. Consult the following resources: 1) Academic and Intellectual Integrity (http://surl.li/gpvwb), and 2) Understanding and Avoiding Plagiarism (http://surl.li/gpvwo).

LUMS Academic Accommodations/ Petitions policy
Long-term medical conditions are accommodated through the Office of Accessibility & Inclusion (OAI). Short-term emergencies that impact studies are either handled by the course instructor or Student Support Services (SSS). For more information, please see Missed Instrument or 'Petition' FAQs for students and faculty (https://rb.gy/8sj1h)

LUMS Sexual Harassment Policy
LUMS and this class are a harassment-free zone. No behavior that makes someone uncomfortable or negatively impacts the class or individual's potential will be tolerated.

To report sexual harassment experienced or observed in class, please contact me. For further support or to file a complaint, contact OAI at oai@lums.edu.pk or harassment@lums.edu.pk. You may choose to file an informal or formal complaint to put an end to the offending behavior. You can also call their Anti-Harassment helpline at 042-35608877 for advice or concerns. *For more information: Harassment, Bullying & Other Interpersonal Misconduct: Presentation (http://surl.li/gpvwt)*