

King Fahd University of Petroleum & Minerals
Department of Mathematics
Math 333 Syllabus, Semester 241
Coordinator/Instructor: Rajai Alassar

Course Code and Name: Math333, Methods of Applied Mathematics I

Course Credit Hours: 3-0-3

Textbook: Advanced Engineering Mathematics by Zill and Wright (Fifth Edition)

Course Objectives: The objective of the course is to introduce students to calculus of vector functions, Laplace and Fourier transforms, Fourier series, and partial differential equations.

Catalog Description: Special functions. Bessel's functions and Legendre polynomials. Vector analysis including, vector fields, divergence, curl, line and surface integrals, Green's, Gauss' and Stokes' theorems. Sturm -Liouville theory. Laplace transforms. Fourier series and transforms. Introduction to partial differential equations and boundary value problems in rectangular, cylindrical and spherical coordinates.

Prerequisites: MATH 201, MATH 202 or MATH 208

Learning Outcomes: Upon completion of this course, students will be able to

1. calculate the line integral along plane or space curves and the surface integral over surfaces in 3-space.
2. compute different types of integrals using Green's, Stokes' and Divergence theorems
3. evaluate Laplace transform, inverse Laplace transform, and Fourier integral of a function.
4. find Fourier series, Fourier cosine/sine series, Bessel and Legendre series of a function.
5. evaluate eigenvalues and eigenfunctions for a Sturm-Liouville boundary-value problem.
6. solve boundary-value problems for wave, heat, and Laplace equations in various coordinate systems by variable separable methods.
7. use Laplace, inverse Laplace, Fourier, and inverse Fourier transforms to solve linear initial and boundary-value problems.

The Course Grading Policy:

	Date	Time	Place	Materials	Percentage
Exam I	October 6, 2024	TBA	TBA	Chapter 9	25%
Exam II	November 18, 2024	TBA	TBA	Chapter 4, 12	25%
Final Exam	Registrar	Registrar	Registrar	Comprehensive	35%
Quizzes	Class average within [70%-75%]				10%
Homework					5%

- Student is not allowed to enter the exam hall without either KFUPM ID or Saudi/Iqama ID.
- Students are not allowed to carry mobile phones and smart watches to the exam halls.

Exam Questions: The questions of the exams are based on examples, homework problems, and textbook exercises.

Misconduct in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of **F** in the course along with reporting the incident to the university higher administration. Cheating in exams includes (but is not limited to) receiving help from anyone or any other outside source, and unauthorized use of the book, course notes, calculators, phones, or websites.

Missing an Exam:

In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he must bring an official excuse from Students Affairs. Otherwise, he will get zero in the missed exam."

Attendance: Students are expected to attend all classes.

- If a student misses a class, he is responsible for any announcement made in class.
- Students need to strictly adhere to the attendance policy of the university.
- DN-Grade will be assigned to students who accumulate 20% unexcused absences from classes after being warned twice before.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin.

Week-Wise Break-Up of Teaching Material

W	Date	Sec.	Topics	Suggested Problems
1	Aug. 25-29	9.1 9.5	Vector Functions Directional Derivative	1,12,16,17,21,25,33, 41 2,7,9,14,17,21,23,32,29
2	Sept. 1-5	9.7 9.8	Curl and Divergence Line Integrals	2,6,10,14,17,22,27 2,6,8,11,16,19,24,28,33
3	Sept. 8 - 12	9.9 9.12	Independence of the Path Green's Theorem	1,10,15,18,21,23,26 2,4,6,9,18,23,25
4	Sept. 15-19	9.13	Surface Integrals	2,5,10,13,18,22,25,29,33
Sept. 22-23: National Day Holidays				
5	Sept. 24-26	9.14 9.16	Stokes' Theorem Divergence Theorem	1,3,6,8,13,17 2,4,7,11,14
6	Sept. 29- Oct. 3	4.1 4.2	Definition of the Laplace transform The Inverse Transform and Transform of Derivatives	1,5,14,26,30,37,43 2,10,19,22,24,32,35
7	Oct. 6-10	4.3 4.4	Translation Theorems Additional Operational Properties	2,8,13,20,24,31,37,48,55,63 1,10,16,22,27,31,38,46
8	Oct. 13-17	4.5 12.1	The Dirac Delta Function Orthogonal Functions	1,4,8,12 2,6,11,13
9	Oct. 20-24	12.2 12.3	Fourier Series Fourier Cosine and Sine Series	2,4,6,12 1,6,12,17,20
10	Oct. 27-31	12.5 12.6	Sturm-Liouville Theorem Bessel and Legendre Series	1,3,7,8,11,12
11	Nov. 3-7	12.6 13.1	Bessel and Legendre Series (continued) Separable Partial Differential Equations	2,4,6,8,15,16 2,8,12,16,22,26,27
Nov. 10-14: Midterm Break				
12	Nov. 17-21	13.3 13.4	Heat Equation Wave Equation	2,3,6, 7 1,2,4,5,6,9
13	Nov. 24 -28	13.5 14.2	Laplace's Equation Problems in Cylindrical Coordinates	2,4,7,10,14 2,4,9,12
14	Dec. 1-5	14.3 15.2	Problems in Spherical Coordinates Applications of the Laplace Transform	2,5,11,12 2,4, 10,14,18,24
15	Dec. 8-12	15.3 15.4	Fourier Integrals Fourier Transforms	1,4,10 1,6,10,12,16
16	Dec. 15-16		Review / Catching up	