

Department of Mathematics, King Fahd University of Petroleum & Minerals
Syllabus of Math 333-Term 222
Dr. Izhar Ahmad (Office: B#5-327)

Course: MATH 333

Title: Methods of Applied Mathematics I

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 3D-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 given function.
4. Find Fourier series, Fourier cosine/sine series, Bessel and Legendre series of a given function.
5. Evaluate the eigenvalues and eigenfunctions for a given Sturm-Liouville boundary-value problem.
6. Solve boundary-value problems for wave, heat, and Laplace equations in various coordinate systems by variable separable method.
7. Use Laplace, inverse Laplace, Fourier, and inverse Fourier transforms to solve linear initial and boundary-value problems.

Weekly Distribution of the Material

Week	Date	Sec.	Topics	Suggested Important Problems
1	Jan. 15 – Jan. 19	9.1 9.5	Vector Functions Directional Derivative	9, 10, 13, 15, 18, 23, 31, 36, 40, 43 6, 10, 13, 18, 22, 25, 31, 32, 33, 35
2	Jan. 22 – Jan. 26	9.7 9.8	Curl and Divergence Line Integrals	2, 5, 10, 15, 19, 23, 27, 28 2, 5, 10, 11, 15, 19, 22, 29, 30, 34
3	Jan. 29 – Feb. 2	9.9 9.12	Independence of the Path Green's Theorem	5, 13, 18, 21, 23, 25 2, 4, 6, 10, 12, 23, 25
4	Feb. 5 – Feb. 9	9.13	Surface Integrals	2, 5, 6, 7, 10, 18, 22, 25, 30, 33
5	Feb. 12 – Feb. 16	9.14 9.16	Stokes' Theorem Divergence Theorem	1, 3, 5, 6, 8, 13, 15, 17 2, 4, 7, 9, 11, 12, 14
6	Feb. 19 – Feb. 21	4.1 4.2	Definition of the Laplace transform The Inverse Transform and Transforms of Derivatives	1, 5, 8, 14, 25, 30, 35, 37, 39 4,10, 16, 19, 22, 24, 33, 35, 39
Saudi Founding Day Feb. 22 – Feb. 23				
7	Feb. 26 – Mar. 2	4.3 4.4	Translation Theorems Additional Operational Properties	6, 14, 20, 24, 32, 48, 55, 63, 67, 70 1,7, 10, 14, 22, 25, 29, 33, 40, 46
8	Mar. 5 – Mar. 9	4.5 12.1	The Dirac Delta Function Orthogonal Functions	1, 5, 8, 11, 12 3, 5, 12, 13, 18

9	Mar. 12 – Mar. 16	12.2 12.3	Fourier Series Fourier Cosine and Sine Series	2, 6, 14, 17, 20 5, 8, 12, 16, 25, 28, 33, 35, 38
10	Mar. 19 – Mar. 23	12.5 12.6	Sturm-Liouville Theorem Bessel and Legendre Series	1, 2, 4, 6, 7, 8, 9 4, 6, 7, 8, 9, 10, 15, 17, 19, 20
11	Mar. 26 – Mar. 30	12.6 13.1	Bessel and Legendre Series (Continue) Separable Partial Differential Equations	2,4,6,8,15,20 2, 8, 12, 16, 23, 26, 28
12	Apr. 2 – Apr. 6	13.3 13.4	Heat Equation Wave Equation	2, 3, 6, 7 1, 2, 4, 5, 6, 9
13	Apr. 2 – Apr. 6	13.5 14.2	Laplace's Equation Problems in Cylindrical Coordinates	2, 4, 7, 10, 12, 16 1, 2, 3, 4, 9
	Apr. 16 – Apr. 27		Ramadhan break & Eid Al-Fitr holidays	
14	Apr. 30 – May 4	14.3 15.2	Problems in Spherical Coordinates Applications of the Laplace Transform	1, 3, 4, 5, 6 1, 2, 3, 4, 6, 10
15	May 7 – May 11	15.3 15.4	Fourier Integrals Fourier Transforms	1, 4, 8, 10, 12 1, 3, 4, 5, 6, 10, 12, 16
16	May 14 & May 15 May 16		Normal Wednesday & Normal Thursday Exam Preparation Break	

Assessment Policy:

Assessment	Percentage	Date	Material
Midterm 1	25% (100 points)	To be announced later	Chapter 9
Midterm 2	25% (100 points)	To be announced later	Chapter 4, 12
Final	35% (140 points)	To be announced later	Comprehensive
Classwork	10% (40 points)	Instructor choice	Will be announced in the class
Online Homework	5% (20 points)	Every week	

Classwork Interval: The classwork score should be in the interval [70%, 75%].

Letter Grades: The letter grades are based on curved grading (a grading curve), which will depend on the average of all students taking the course.

Entering Exam Hall: Student is not allowed to enter the exam hall without either KFUPM ID or Saudi ID or Iqama. Students must take the exam in the place assigned to them.

Mobile: Carrying mobile phones, smart watches or electronic devices to the exam halls is not allowed.

DN Grade: Students need to strictly adhere to the attendance policy of the university. A DN grade will be awarded to any student who accumulates more than 20% (9/45) unexcused absences or more than 33% (15/45) excused and unexcused absences of lectures and labs. DN-Grade will be assigned to the eligible students after their instructors have warned them twice through email.

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/she must bring an official excuse from Students Affairs. Otherwise, he/she will get zero in the missed exam.

Misconduct in Exams: The University takes any instances of academic misconduct very seriously. A student who cheats or attempts to cheat will be reported to the university administration for the appropriate course of action.