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	Aug 28-Sep 01	9.1	Vector Functions	9, 10, 13, 15, 18, 23, 31, 36, 40, 43
		9.5	Directional Derivative	6, 10, 13, 18, 22, 25, 31, 32, 33, 35
2	Sep 04-08	9.7	Curl and Divergence	2, 5, 10, 15, 19, 23, 27, 28
		9.8	Line Integrals	2, 5, 10, 11, 15, 19, 22, 29, 30, 34
3	Sep 11-15	9.9	Independence of the Path	5, 13, 18, 21, 23, 25
		9.12	Green's Theorem	2, 4, 6, 10, 12, 23, 25
4	Sep 18-21	9.13	Surface Integrals	2, 5, 6, 7, 10, 18, 22, 25, 30, 33
National Day Holiday Sep 22				
5	Sep 25-29	9.14	Stokes' Theorem	1, 3, 5, 6, 8, 13, 15, 17
		9.16	Divergence Theorem	2, 4, 7, 9, 11, 12, 14
6	Oct 02-06	4.1	Definition of the Laplace transform	1, 5, 8, 14, 25, 30, 35, 37, 39
		4.2	The Inverse Transform and Transforms of Derivatives	4,10, 16, 19, 22, 24, 33, 35, 39
7	Oct 09-13	4.3	Translation Theorems	6, 14, 20, 24, 32, 48, 55, 63, 67, 70
		4.4	Additional Operational Properties	1,7, 10, 14, 22, 25, 29, 33, 40, 46
8	Oct 16-20	4.5	The Dirac Delta Function	1, 5, 8, 11, 12

		12.1	Orthogonal Functions	3, 5, 12, 13, 18
9	Oct 23-27	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	Oct 30-Nov03	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	Nov 06-10	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	Nov 13-17	13.3 13.4	Heat Equation Wave Equation	2, 3, 6, 7 1, 2, 4, 5, 6, 9
13	Nov 20-24	13.5 14.2	Laplace's Equation Problems in Cylindrical Coordinates	2, 4, 7, 10, 12, 16 1, 2, 3, 4, 9
	Nov 27-Dec 01		**Midterm break**	
14	Dec 04-08	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	Dec 11-15	15.3 15.4	Fourier Integrals Fourier Transforms	1, 4, 8, 10, 12 1, 3, 4, 5, 6, 10, 12, 16
16	Dec 18		**Normal Thursday classes - Last Day of classes for the term**	

Assessment Policy:

Assessment	Percentage	Date	Material
Midterm 1	25% (100 points)	October 05, 2022	Chapter 9
Midterm 2	25% (100 points)	November 17, 2022	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.