Coordinator: Dr. Izhar Ahmad (drizhar@kfupm.edu.sa)

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 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 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	Homework Problems
1	Jun. 05-09	9.1	Vector Functions	1,12,16,17,21,26,33, 41
		9.5	Directional Derivative	2,7,9,14,17,21,23,32,29
		9.7	Curl and Divergence	2,6,10,14,17,22,27
		9.8	Line Integrals	2,6,8,11,16,19,24,28,33
2	Jun. 12-16	9.9	Independence of the Path	1,10,15,18,21,26
		9.12	Green's Theorem	2,4,6,9,18,23,25
		9.13	Surface Integrals	2,5,10,13,18,22,25,33
		9.14	Stokes' Theorem	1,3,6,8,13,17
3	Jun. 19-23	9.16	Divergence Theorem	2,4,7,11,14
		4.1	Definition of the Laplace transform	1,5,14,26,30,37,43
		4.2	The Inverse Transf. and Transf. of Derivatives	2,10,19,22,24,32,35

		4.3	Translation Theorems	2,8,13,20,24,31,37,48,55,63
4	Jun. 26-30	**4.4**	Additional Operational Properties	1,10,16,22,27,31,38,46
		4.5	The Dirac Delta Function	1,4,8,12
		12.1	Orthogonal Functions	2,6,11,13
		12.2	Fourier Series	2,4,6,12
			Hajj Holidays July 03-14	
5	Jul. 17-21	**12.3**	Fourier Cosine and Sine Series	1,6,12,17,20
		12.5	Sturm-Liouville Theorem	1,3,7,8,11,12
		12.6	Bessel and Legendre Series	2,4,6,8,15,16
6	Jul. 24-28	**13.1**	Separable Partial Differential Equations	2,8,12,16,22,26,27
		13.3	Heat Equation	2,3,6
		13.4	Wave Equation	1,6,9,16,23
		13.5	Laplace's Equation	2,4,7,10,14
7	July 31-Aug.04	**14.2**	Problems in Cylindrical Coordinates	2,4,9,12
		14.3	Problems in Spherical Coordinates	2,5,11,12
		15.2	Applications of the Laplace Transform	2,4, 10,14,18,24
		15.3	Fourier Integrals	1,4,10
8	Aug. 07-08	**15.4**	Fourier Transforms	1,6,10,12,16

Grading Policy:

Type of Assessment	Percentage	Date and Time	Time/Place	Material
Major Exam 1	25% (100pts)	**Thursday, June 23, 2022**	TBA/TBA	Chapter 9
Major Exam 2	25% (100pts)	**Sunday, July 24, 2022**	TBA/TBA	Chapters 4 and 12
Final	35% (140pts)	Check Registrar's Website		Comprehensive
Classwork	15% (60pts)	Depends on your instructor		
Total	100% (400pts)			

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

Letter Grades: The letter grades will follow a grading curve, which depends on the average of all students in the course.

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.

DO NOT BRING YOUR MOBILE, SMART WATCH OR ANY ELECTRONIC DEVICE IN THE EXAM HALL.

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 lecture classes.

• If a student misses a class, he is responsible for any announcement made in that class.

• A DN grade will be awarded to any student who accumulates more than 20% unexcused absences or 33% excused and unexcused absences.

Note: The student will be warned **twice** by his instructor before he is assigned a DN grade.