King Fahd University of Petroleum and Minerals

Department of Mathematics

MATH333 Syllabus, Term 242 (Spring 2025)

Instructor: Dr. Waled Al-Khulaifi (waled.alkhulaifi@kfupm.edu.sa)

Office Hours: Sunday, Tuesday, Thursday 02:10 PM – 03:10 PM **Office Location:** 5-411

Course Code and Title: MATH333, Methods of Applied Mathematics I

Course Credit Hours: 3-0-3

Textbook: Advanced Engineering Mathematics by Zill and Wright (Sixth Edition), 2018.

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

Course 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.

Prerequisite: MATH 201 and (MATH 202 or MATH 208)

Course Learning Outcomes: Upon successful completion of the course, a student should 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.

Grading Policy:

	Date	**Time**	**Place**	**Material**	**Percentage**
Exam I	Saturday, 1st March	9:30-11:30 PM	TBA	Chapter 9	25% (100)
Exam II	Sunday, 13th April	6:30-8:30 PM	TBA	Chapter 4 and 12	25 % (100)
Final Exam	Determined by the Registrar Office			Comprehensive	35% (140)
Online Homework	Through Blackboard				5% (20)
Class Work	Based on quizzes and your absence record				10% (40)
				Total	100% (400)

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

Attendance: Students are expected to attend all lecture classes.

- If a student misses a class, he/she is responsible for any announcement made in that class.
- After warned **twice** by the instructor, a DN grade will be awarded to any student who accumulates:
  - 09 unexcused absences in lectures. (20%)
  - 15 excused and unexcused absences in lectures. (≈33%)

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

Graduate Attributes: Check this link https://math.kfupm.edu.sa/bsinmathematics/graduate-attributes .

Coverage Plan

Week	Date (2024)	Section
1	Jan. 12-16	9.1 Vector Functions
		9.5 Directional Derivative
2	Jan. 19-23	9.7 Curl and Divergence
		9.8 Line Integrals
3	Jan. 26-30	9.9 Independence of the Path
		9.12 Green's Theorem
4	Feb. 02-06	9.13 Surface Integrals
5	Feb. 09-13	9.14 Stokes' Theorem
		9.16 Divergence Theorem
6	Feb. 16-20	4.1 Definition of the Laplace Transform
		4.2 The Inverse Transform and Transform of Derivatives
Saudi Foundation Day Holiday: Sunday 23rd February		
7	Feb. 24-27	4.3 Translation Theorems
		4.4 Additional Operational Properties
Major Exam 1. Material: Chapter 9. Date: Saturday, 1st March. Time: 9:30-11:30 PM.		
8	Mar. 02-06	4.5 The Dirac Delta Function
		12.1 Orthogonal Functions
9	Mar. 09-13	12.2 Fourier Series
		12.3 Fourier Cosine and Sine Series
10	Mar. 16-20	12.5 Sturm-Liouville Problem
		12.6 Bessel and Legendre Series
Eid Al-Fitr Holidays: Mar. 23 – April 03		
11	April 06-10	12.6 Bessel and Legendre Series (continued)
		13.1 Separable Partial Differential Equations
12	April 13-17	13.3 Heat Equation
		13.4 Wave Equation
Major Exam 1. Material: Chapter 4 and 12. Date: Sunday 13th April. Time: 6:30-8:30 PM.		
13	April 20-24	13.5 Laplace's Equation
		14.2 Problems in Cylindrical Coordinates
14	April 27 – May 1	14.3 Problems in Spherical Coordinates
		15.2 Applications of the Laplace Transform
15	May 04-08	15.3 Fourier Integrals
		15.4 Fourier Transforms
16	May 11	Review and Catching Up
Final Exam: Comprehensive. Date: Check the Registrar Website		