

King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

MATH 333

Syllabus – Term 192

Coordinator: Dr. Mohammad Kafini,

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Course Code:	MATH 333
Title:	Methods of Applied Mathematics
Textbook:	Advanced Engineering Mathematics (Fifth Edition) by D.G. Zill and W.S. Wright, International Edition.
Catalogue 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.

Grading Policy:

Major Exam I: 25% (75 points)	Material: 9.1-9.16 Feb. 26, 2020 (08.30-10.00 PM) & Venue: TBA
Major Exam II: 25% (75 points)	Material: 4.1-12.5 April 01, 2020 (08.30-10.00 PM) & Venue: TBA
Final Exam: 35% (105 points)	Comprehensive. Wednesday, May 06, 2020, 01:00 PM
Class Work: 15% (45 points)	Quizzes +HW+ Attendance

The Course Passing Grade: A student must score at least 50% to pass the course.

Attendance: Compulsory. KFUPM policy regarding attendance is strictly enforced.

DN: DN grade will be awarded to any student who accumulates 9 unexcused absences.

Learning Outcomes

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

1. Recognize the vector fields, find their curl and divergence, and test whether they are conservative.
2. Evaluate the line integral along plane or space curves and the surface integral over surfaces in 3-space.
3. Use Green's, Stokes' and Divergence theorems to relate and evaluate different types of integral.
4. Evaluate the Laplace transform and inverse Laplace transform of a given function.
5. Apply the Laplace transform, inverse Laplace transform, and their operational properties to solve linear initial-value and boundary-value problems.
6. Find the Fourier series, the Fourier cosine and sine series, and the Bessel and Legendre series of a given function.
7. Find the eigenvalues and eigenfunctions for a given Sturm-Liouville boundary-value problem and state their orthogonality relation.
8. Solve separable partial differential equations.
9. Solve boundary-value problems involving the wave, heat and Laplace equations in various coordinate systems.
10. Evaluate the Fourier integral and the Fourier cosine and sine integrals of a given function.
11. Use the Fourier transform, inverse Fourier transform, and their operational properties to solve linear boundary value problems

Pacing Schedule

Week	Date	Sec.	Topics	Suggested & Homework Problems
1	Jan 19- 23	9.1 9.5	Vector Functions The Directional Derivative	1,12,16,17,21,26,33, 41 2,7,9,14,17,21,23,32,29
2	Jan 26- 30	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	Feb 02- 06	9.9 9.12	Independence of the Path Green's Theorem	1,10,15,18,21,26 2,4,6,9,18,23,25
4	Feb 09- 13	9.13 9.14	Surface Integrals Stokes' Theorem	2,5,10,13,18,22,25,33 1,3,6,8,13,17
5	Feb 16- 20	9.16 4.1	Divergence Theorem Definition of the Laplace transform	2,4,7,11,14 1,5,14,26,30,37,43
6	Feb 23- 27	4.2 4.3	Inverse Transform, Transforms of Derivatives Translation Theorems	2,10,19,22,24,32,35 2,8,13,20,24,31,37,48,55,63
Major Exam I: Feb. 26, 2020 (08.30-10.00 PM). Material 9.1 – 9.16				
7	Mar 01- 05	4.4 4.5	Additional Operational Properties The Dirac Delta Function	1,10,16,22,27,31,38,46 1,4,8,12
8	Mar 08- 12	12.1 12.2	Orthogonal Functions Fourier Series	2,6,11,13 1,6,12,17,20
9	Mar 15- 19	12.3 12.5	Fourier Cosine and Sine Series Sturm-Liouville Theorem	1,8,12,16,25,35,38 2,4,6,12
10	Mar 22- 26	12.6	Bessel and Legendre Series	2,4,6,8,15,20
11	Mar 29- April 02	13.1 13.3	Separable Partial Differential Equations Heat Equation	2,8,12,16,22,26,27 2,3,6
Major Exam II: April 01, 2020 (08.30-10.00 PM). Material 4.1 – 12.5				
12	April 05- 09	13.4 13.5	Wave Equation Laplace's Equation	1,6,9,16,23 2,4,7,10,14
13	April 12- 16	14.2 14.3	Problems in Cylindrical Coordinates Problems in Spherical Coordinates	2,4,7,10,14 2,5,11,12
14	April 19- 23	15.2 15.3	Applications of the Laplace Transform Fourier Integrals	2,4, 10,14,18,24 1,4,10
15	April 26- 30	15.4	Fourier Transforms	1,6,10 , 12, 16
Final Exam : Wednesday, May 06, 2020, 01:00 PM				