

King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

MATH 301: Syllabus – Term 172

Coordinator: Dr. Ali N. Duman, aliduman@kfupm.edu.sa

Course Code:	MATH 301
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% (100 points)	Material: 9.1-9.16 February 28, 8:30-10:30pm & Venue: Building 57
Major Exam II: 25% (100 points)	Material: 4.1-12.6 April 4, 8:30-10:30pm & Venue: Building 59
Final Exam: 35% (140 points)	Comprehensive. May 6, 7-10pm
Class Work: 15% (60 points)	Quizzes +HW+ Attendance

Attendance: compulsory. KFUPM policy regarding attendance will be strictly enforced. A 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

Wk	Date	Sec.	Material	Suggested Homework Questions
1	January 21 – 25	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	January 28 – February 01	9.7 9.8	Curl and Divergence Line Integral	2,4,6,9,18,23,25 2,5,10,13,18,22,25,33
3	February 4-8	9.9 9.12	Independence of the Path Green's Theorem	1,3,6,8,13,17 2,4,7,11,14
4	February 11- 15	9.13 9.14	Surface Integrals Stokes' Theorem	2,6,10,14,17,22,27 2,6,8,11,16,19,24,28,33
5	February 18-22	9.16 4.1	Divergence Theorem Definition of the Laplace transform	1,10,15,18,21,26 1,5,14,26,30,37,43
6	February 25 – March 01	4.2 4.3	Inverse Transform, Transforms of Derivatives Translation Theorems Major 1: February 28	2,10,19,22,24,32,35 2,8,13,20,24,31,37,48,55, 63
7	March 04 –08	4.4 4.5	Additional Operational Properties The Dirac Delta Function	1,10,16,22,27,31,38,46 1,4,8,12
8	March 11-15	12.1 12.2	Orthogonal Functions Fourier Series	2,6,11,13 1,6,12,17,20
9	March 18 – 22	12.3 12.5	Fourier Cosine and Sine Series Sturm-Liouville Theorem	1,8,12,16,25,35,38 2,4,6,12
10	March 25 –29	12.6 13.1	Bessel and Legendre Series Separable Partial Differential Equations	2,4,6,8,15,20 2,8,12,16,22,26,27
11	April 1 -5	13.3 13.4	Heat Equation Wave Equation Major 2: April 4	2,3,6 1,6,9,16,23
12	April 8-12	13.5 14.2	Laplace's Equation Problems in Cylindrical Coordinates	2,4,7,10,14 2,4,9,12
13	April 15 – 19	14.3 15.2	Problems in Spherical Coordinates Applications of the Laplace Transform	2,5,11,12 2,4, 10,14,18,24
14	April 22 – 26	15.4	Fourier Transforms	1,6,10,12,16
15	April 29 – May 3		Review Final: May6, 7-10pm	

