King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

MATH 333: Syllabus – Term 183

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

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% (100 points)	Material: **9.1-9.16** **Time: TBA & Venue: TBA**
Major Exam II: 25% (100 points)	Material: **4.1-12.5** **Time: TBA & Venue: TBA**
Final Exam: 35% (140 points)	Comprehensive. **Time: TBA**
Class Work: 15% (60 points)	Quizzes + 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

Week	Date	Sec.	Topics	Suggested Homework Problems
1	June 09– 13	9.1 9.5 9.7 9.8	Vector Functions The Directional Derivative Curl and Divergence Line Integrals	1,12,16,17,21,26,33, 41 2,7,9,14,17,21,23,32,29 2,6,10,14,1722,27 2,6,8,11,16,19,24,28,33
2	June 16– 20	9.9 9.12 9.13 9.14	Independence of the Path Green's Theorem Surface Integrals Stokes' Theorem	1,10,15,18,21,26 2,4,6,9,18,23,25 2,5,10,13,18,22,25,33 1,3,6,8,13,17
Major Exam I: TBA Material 9.1 – 9.16,				
3	June 23 – 27	9.16 4.1 4.2 4.3	Divergence Theorem Definition of the Laplace transform Inverse Transform, Transforms of Derivatives Translation Theorems	2,4,7,11,14 1,5,14,26,30,37,43 2,10,19,22,24,32,35 2,8,13,20,24,31,37,48,55,63
4	June 30 – July 4	4.4 4.5 12.1 12.2	Additional Operational Properties The Dirac Delta Function Orthogonal Functions Fourier Series	1,10,16,22,27,31,38,46 1,4,8,12 2,6,11,13 2,4,6,12
5	July 7–11	12.3 12.5 12.6	Fourier Cosine and Sine Sturm-Liouville Theorem Bessel and Legendre Series	1,6,12,17,20 1,8,12,16,25,35,38 2,4,6,8,15,20
Major Exam II: TBA Material 4.1 -12.5				
6	July 14-18	13.1 13.3 13.4 13.5	Separable Partial Differential Equations Heat Equation Wave Equation Laplace's Equation	2,8,12,16,22,26,27 2,3,6 1,6,9,16,23 2,4,7,10,14
7	July 21-25	14.2 14.3 15.2 15.3	Problems in Cylindrical Coordinates Problems in Spherical Coordinates Applications of the Laplace Transform Fourier Transforms	2,4,9,12 2,5,11,12 2,4, 10,14,18,24 1,6,10,12,16
8	July 28-29		Review	
Final Exam : TBA				