

# King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

## MATH 302: Syllabus – Term 161

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<b>Course Code:</b>	MATH 302
<b>Title:</b>	Engineering Mathematics
<b>Textbook:</b>	<b>Advanced Engineering Mathematics</b> (Fifth Edition) by D.G. Zill and W.S. Wright, International Edition. <b>Elements of Electrodynamics</b> , 6 <sup>th</sup> edition, by M. N. O. Sadiku, Oxford University Press.
<b>Objectives:</b>	This course is designed to expose electrical and other engineering students to some basic ideas in vector calculus, linear algebra and complex numbers.
<b>Catalogue Description</b>	Vector spaces and subspaces. Linear independence, basis and dimension. Solution of linear equations. Orthogonality. Eigenvalues and eigenvectors. Vector calculus including vector fields, gradient, divergence, curl, line and surface integrals, Green's theorem, Gauss' and Stokes' theorems. Introduction to complex variables.

## Grading Policy

<b>Major Exam I:</b> 25% (100 points)	Material: 7.6-8.12 <b>October 26 &amp; Venue: TBA</b>
<b>Major Exam II:</b> 25% (100 points)	Material: 9.9, Ch 2, Ch 3, 4.7, 4.8 <b>December 7 &amp; Venue: TBA</b>
<b>Final Exam:</b> 35% (140 points)	Comprehensive. Time: TBA
<b>Class Work:</b> 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: Math 302 Engineering Mathematics

Upon completing this course student should be able to

1. Define a vector space, subspace, basis and dimension of a vector space and spanning set.
2. Solve systems of linear algebraic equations.
3. Compute eigenvalues, eigenvectors and inverse of a square matrix and rank of a matrix.
4. Construct an orthogonal matrix using eigenvectors of a symmetric matrix.
5. Evaluate simple line and surface integrals.

6. Apply the fundamental vector calculus integral theorems of Green, Stokes' and divergence to line and surface integrals.
7. Manipulate and calculate with complex numbers and complex functions including polynomials, roots and arguments, trigonometric, hyperbolic, exponential and logarithmic functions.
8. Identify analytic and harmonic functions.
9. Apply the Cauchy-Goursat theorem and Cauchy's integral formula to line integrals.
10. Calculate the Taylor and Laurent series of a function of a complex variable about a given point.
11. Compute residues and integrals using the Residue theorem.

TBA = To be announced.

Wk	Date	Sec.	Material	Homework
1	September 18 – 21	7.6	Vector Spaces ( <i>restricted to <math>\mathbb{R}^n</math> only</i> )	1, 2, 3, 22, 23,26
2	September 25 – 29	8.2 8.3	Systems of Linear Algebraic Equations Rank of a Matrix	1,6, 7, 10, 12 4, 8,9, 10, 14
3	October 2-6	8.6 8.8	Inverse of a Matrix ( <i>only using Theorem 8.6.4</i> ) The Eigenvalue Problem	1,2,19,25,28,30, 51,52 1,6, 8,16,20
4	October 9- 13	8.10 8.12	Orthogonal Matrices ( <i>excluding example 4</i> ) Diagonalization ( <i>excluding example 6</i> )	5,6,8,9,16, 18 1,2,4,12, 14, 26, 28
5	October 16-20	Ch 2	Cylindrical and spherical Coordinates	2.5, 2.7, 2.17, 2.18, 2.19, 2.20
6	October 23 – 27	Ch 3	Line, Surface and Volume Integrals Gradient	3.3, 3.4, 3.5, 3.8 3.10, 3.11
<b>Major 1: October 26</b>				
7	October 30 – November 3	Ch 3	Independence of Path Application: Electric Potential	2,4,6,12,15,22,25 Examples 4.11, 4.12(b)
8	November 6-10	Ch 3	Stokes's Theorem, Divergence Theorem The Laplacian	3.14, 3.22, 3.23, 3.26, 3.33 3.38, 3.39, 3.41
9	November 20 – 24	17.1 17.2	Complex Numbers Powers and Roots	2,4,6, 18, 30, 34,40 6,8,12,16,33,34

		17.3	Sets in the Complex Plane	4,5,8,23
10	November 27 – December 1	17.4	Functions of a Complex Variable	6,8,10,12,14,21,28,32
		17.5	Cauchy-Riemann Equations	1,2,4,5,6,8,22
		17.6	Exponential and Log. Functions	2,4,8,13, 28,32, 47
11	December 4 -8	17.7	Trigonometric and Hyperbolic Functions	6,8,10, 16
		18.1	Contour Integrals (excluding Theorem 18.1.3)	1,3,6,7,9
<b>Major 2: December 7</b>				
12	December 11 – 15	18.2	Cauchy-Goursat Theorem	2,4,5,8,12,15
		18.4	Cauchy's Integral Formulas	3,4,8, 10,14, 23
13	December 18 – 22	19.2	Taylor Series ( <i>Definition &amp; Examples</i> )	2,4,6,12
		19.3	Laurent Series ( <i>Definition &amp; Examples</i> )	2,6,10,21,25,26,27,28
		19.4	Zeros and Poles	2,4,6,8,10,14,16
14	December 25 – 29	19.5	Residues and Residue Theorem	1,2,8,10,22, 24
15	January 1 – 5	19.6	Evaluation of Real Integrals	14,11,12,32
16	January 8	Review/Catching up		

**Final Exam: TBA(Comprehensive)**