

# King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

## **MATH 302: Syllabus** – Term 172

**Coordinator:** Dr. Ahmad Y. Al-Dweik

<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> , 3 <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: <b>7.6-8.12</b> <b>Time:</b> February 28, 8:30-10:30 pm & <b>Venue:</b> Building 57
<b>Major Exam II:</b> 25% (100 points)	Material: <b>Ch2, Ch3, 17.1-17.3</b> <b>Time:</b> April 4, 8:30-10:30 pm & <b>Venue:</b> Building 59
<b>Final Exam:</b> 35% (140 points)	Comprehensive. <b>Time:</b> May 6, 7:00-10:00 pm.
<b>Class Work:</b> 15% (60 points)	Quizzes + Homework

**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.

Wk	Date	Sec.	Material	Homework
1	January 21-25	7.6	Vector Spaces ( <i>restricted to <math>\mathbb{R}^n</math> only</i> )	1*, 2*, 3*, 22*, 23*, 26*
2	January 28- February 1	8.2 8.3	Systems of Linear Algebraic Equations Rank of a Matrix	1*, 6, 7*, 10*, 12* 4*, 8*, 9*, 10, 14*
3	February 04-08	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	February 11- 15	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	February 18-22	Ch 2	Cartesian, cylindrical, spherical coordinates and constant-coordinate surfaces	2.1, 2.2*, 2.4, 2.5*, 2.6, 2.7*, 2.12, 2.17*, 2.19, 2.20*, 2.21*
6	February 25- March 01	3.2 3.3	Differential length, Area and Volume Line, Surface and Volume Integrals	3.1*, 3.2*, 3.3* 3.4*, 3.5*, 3.7*, 3.8
<b>Major Exam I: Wednesday, February 28, 2018 at 8:30 PM, Loc.: Bld-57</b>				
7	March 04- 08	3.5 3.6	Gradient of a scalar Divergence of a vector and Divergence Theorem	3.12*, 3.13, 3.14*, 3.15* 3.32, 3.33*, 3.34, 3.35*, 3.36*, 3.38*
8	March 11-15	3.7 3.9	Curl of a vector and Stokes's Theorem Classification of vector fields	3.16, 3.31*, 3.37*, 3.40* 3.44*, 3.45*
9	March 18- 22	17.1 17.2 17.3	Complex Numbers Powers and Roots Sets in the Complex Plane	2*, 4*, 6, 18*, 30*, 34*, 40 6*, 8*, 12, 16, 33*, 34* 4*, 5*, 8*, 23
10	March 25-29	17.4 17.5 17.6	Functions of a Complex Variable Cauchy-Riemann Equations Exponential and Log. Functions	6*, 8*, 10*, 12*, 14, 21*, 28, 32* 1*, 2*, 4*, 5, 6*, 8, 22* 2*, 4, 8*, 13*, 28*, 32*, 47*
11	April 01-05	17.7 18.1	Trigonometric and Hyperbolic Functions Contour Integrals ( <i>excluding Theorem 18.1.3</i> )	6, 8*, 10*, 16* 1, 3, 6*, 7*, 9*
<b>Major Exam II: Wednesday, April 4, 2018 at 8:30 PM, Loc.: Bld-59</b>				
12	April 08- 12	18.2 18.4	Cauchy-Goursat Theorem Cauchy's Integral Formulas	2*, 4*, 5*, 8, 12, 15* 3, 4*, 8*, 10*, 14*, 23
13	April 15-19	19.2 19.3 19.4	Taylor Series ( <i>Definition &amp; Examples</i> ) Laurent Series ( <i>Definition &amp; Examples</i> ) Zeros and Poles	2*, 4*, 6*, 12 2*, 6*, 10*, 21*, 25*, 26, 27*, 28* 2*, 4*, 6*, 8*, 10*, 14*, 16*
14	April 22- 26	19.5	Residues and Residue Theorem	1*, 2*, 8*, 10*, 22*, 24
15	April 29- May 03	19.6	Evaluation of Real Integrals Review/Catching up	4*, 11*, 12*, 32*
<b>Final Exam: Sunday, May 6, 2018 at 07:00 PM</b>				

**Homework problems with \* should be submitted for grading.**