

# King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

## MATH 302: Syllabus – Term 202

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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 Electromagnetics</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.

### 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. Compute eigenvalues, eigenvectors and inverse of a square matrix and rank of a matrix.
3. Construct an orthogonal matrix using eigenvectors of a symmetric matrix.
4. Compute different types of integrals using Green's, Stokes' and Divergence theorems
5. Explain the geometry of the complex plane and state the main properties and examples of analytic functions.
6. Calculate the Taylor and Laurent series of a function of a complex variable about a given point.
7. Compute integrals by Cauchy-Goursat theorem, Cauchy's integral formula and Residue theorem.

### Weekly Distribution of the Material

Wk	Date	Sec.	Material	Homework
1	Jan. 17-21	7.6	Vector Spaces ( <i>restricted to <math>\mathbb{R}^n</math> only</i> )	1, 2, 3, 22, 23,26
2	Jan. 24-28	8.2	Systems of Linear Algebraic Equations	1,6, 7, 10, 12,
		8.3	Rank of a Matrix	4, 8,9, 10, 14
3	Jan 02-Feb 04	8.6	Inverse of a Matrix ( <i>only using Theorem 8.6.4</i> )	1,2,19,25,28,30, 51,52
		8.8	The Eigenvalue Problem	1,6, 8,16,20
4	Feb. 07-11	8.10	Orthogonal Matrices	5,6,8,9,16, 18

			(excluding example 4)	1,2,4,12, 14, 26, 28
		8.12	Diagonalization (excluding example 6)	
5	Feb. 14-18	Ch 2	Cylindrical and spherical Coordinates	2.5, 2.7, 2.17, 2.18, 2.19, 2.20
6	Feb. 21-25	Ch 3	Line, Surface and Volume Integrals Gradient	3.3, 3.4, 3.5, 3.8 3.10, 3.11
7	Feb 28-Mar. 04	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
8	Mar. 07-11	9.9 Ch	Independence of Path Calculation of Potential	2,4,5,9,13,19,25
		4.7, 4.8	Application: Electric Potential	Examples 4.11, 4.12(b)
9	Mar. 14-18	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	Mar. 21-25	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 1,2,4,5,6,8,22 2,4,8,13, 28,32, 47
11	Mar. 28- Apr. 01	17.7 18.1	Trigonometric and Hyperbolic Functions Contour Integrals (excluding Theorem 18.1.3)	6,8,10, 16 1,3,6,7,9
12	Apr. 04-08	18.2 18.4	Cauchy-Goursat Theorem Cauchy's Integral Formulas	2,4,5,8,12,15 3,4,8, 10,14,23
13	Apr. 11-15	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	Apr. 18-22	19.5	Residues and Residue Theorem	1,2,8,10,22, 24
15	Apr. 25-29	19.6	Evaluation of Real Integrals Review/Catch up	4,11,12,32

### Grading Policy:

**In-Person Midterm Exam:** 30% (90 points)    **Material, Location and Time:** TBA

**In-Person Final Exam:** 40% (120 points)    Comprehensive TBA

**Class Work:** 15% (45 points)    It is based on quizzes, class tests, or other class activities. The average  $x$  (out of 45) of the class work of each section should be in the interval  $[31.5, 33.75]$  ([70%, 75%] of the class work grade).

**Homework:** 15% (45 points)

**The total grade** is out of 300.

**Exam Questions:** The questions of the exams are based on the examples, homework problems, and exercises in the textbook.

**Misconduct in Exams:** Cheating or attempting to cheat will result in a grade of **F** in the course, along with reporting the incident to the higher university administration. Cheating in exams includes (but is not limited to) receiving help from anyone or any other outside source, disabling webcams, and unauthorized use of books, course notes, calculators, phones, or websites.

**Attendance:** Compulsory. KFUPM policy regarding attendance will be strictly enforced. A **DN** grade will be awarded to any student who accumulates 9 unexcused absences.

**TBA** = To be announced.