

# King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

## MATH 302: Syllabus – Term 201

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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>Online Assessment 1:</b> 15% (45 points)	Material: 7.6- 8.12	Date: <b>Oct. 07 (8:00 - 10:00 PM)</b>
<b>Midterm</b> : 15% (45 points)	Material: 7.6- Ch. 3	Date: <b>Oct. 21 (8:00 - 10:00 PM)</b>
<b>Online Assessment 2:</b> 15% (45 points)	Material: 9.9- 17.6	Date: <b>Nov. 11 (8:00 - 10:00 PM)</b>
<b>Final Exam</b> : 25% (75 points)	Comprehensive	Date: <b>TBA</b>
<b>Quizzes (1-5)</b> : 25% (75 points)		
<b>Class Work</b> : 05% (15 points)	HW, Attendance,	

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

**The Passing Grade** is 150 out 300 that is 50%.

**Interval for Quizzes** should be in  $[52.5, 56.25]$  which is  $[70\%, 75\%]$  of 75 points.

**Upgrade policy:** The upgrade policy is applied when 3 points are needed to get the next higher grade. For instance, the passing grade D starts at 150/300. If a student gets 149/300 or 148/300, then his grade will automatically upgrade to D. However, if a student gets 147/300, his grade will upgrade to D only if his final exam score is greater than or equal to 50% of the Final Exam grade, i.e., 60/120.

**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.

### The Pacing Schedule

WK#	Date	SEC	Material	HW
1	Aug 30-Sep 03	7.6	Vector Spaces ( <i>restricted to <math>\mathbb{R}^n</math> only</i> )	1, 2, 3, 22, 23,26
2	Sep 06-10	8.2	Systems of Linear Algebraic Equations	1,6, 7, 10, 12
		8.3	Rank of a Matrix	4, 8,9, 10, 14
3	Sep 13-17	8.6	Inverse of a Matrix ( <i>only using Theorem 8.6.4</i> )	1,2,19,25,28,30, 51,52 1,6, 8,16,20
		8.8	The Eigenvalue Problem	
4	Sep 20-22	8.10	Orthogonal Matrices ( <i>excluding example 4</i> )	5,6,8,9,16, 18
		8.12	Diagonalization ( <i>excluding example 6</i> )	1,2,4,12, 14, 26, 28
<b>Wednesday-Thursday, Sep. 23-24, 2020: The National Day Holiday</b>				
5	Sep 27-Oct 01	Ch 2	Cylindrical and spherical Coordinates	2.5, 2.7, 2.17, 2.18, 2.19, 2.20
6	Oct 04-08	Ch 3	Line, Surface and Volume Integrals Gradient	3.3, 3.4, 3.5, 3.8 3.10, 3.11

7	Oct 11-15	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	Oct 18-22	9.9 Ch 4	Independence of Path 4.7 Calculation of Potential Application: Electric Potential	2,4,6,12,15,22,25  Examples 4.11, 4.12(b)
9	Oct 25-29	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	Nov 01-05	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	Nov 08-12	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
12	Nov 15-19	18.2 18.4	Cauchy-Goursat Theorem Cauchy's Integral Formulas	2,4,5,8,12,15 3,4,8, 10,14, 23
13	Nov 22-26	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	Nov 29-Dec 03	19.5	Residues and Residue Theorem	1,2,8,10,22, 24
15	Dec 06-10	19.6	Evaluation of Real Integrals	14,11,12,32
16	Dec 13-14	Rev.	Dec 13: Normal Wednesday Classes Dec 14: Normal Thursday Classes	

**Final Exam (Comprehensive):** Follow the registrar final schedule on his webpage.