King Fahd University of Petroleum and Minerals

Department of Mathematics & Statistics

Math 302 Syllabus, Term 193

Coordinator/Instructor: Dr. Bader Al Humaidi

The Course Code and Name: Math 302, Engineering Mathematics

The Course Credit Hours: 3-0-3

Textbook: Advanced Engineering Mathematics (Fifth Edition) by D.G. Zill and W.S. Wright, International Edition.

Elements of Electrodynamics, 6th edition, by M. N. O. Sadiku, Oxford University Press.

The Course Objective: This course is designed to expose electrical and other engineering students to some basic ideas in vector calculus, linear algebra and complex numbers.

The Course Content: 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.

The Course Prerequisite: Math 201.

The Course Learning Outcomes: 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 Grading Policy: 6 Weekly Tests **(240 points)** Classwork (**10 points**), Final Exam (**50 points**). Unless you are told otherwise, the material of each test will be the material covered in the week before according to the syllabus below. The final exam is comprehensive.

The Course Passing Grade: A student must score at least 50% (150/300) to pass the course.

Upgrade Policy: Upgrading is made automatically if a student is 1 or 2 points short of the next higher grade. If he is 3 points short, the final exam score alone, when scaled out of 300, must lie in the category of the next higher score for an upgrade to be applied. No other circumstances are subject to upgrading.

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

Misconduct in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud 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 the book, course notes, calculators, phones, or websites.

Missing an Exam: For the weekly tests, no make-up exam will be given under any circumstances. In case a student misses a test for a legitimate approved reason (such as medical emergencies), his score for that test will be determined based on his performance in the remaining tests. If a student misses the final exam for a legitimate approved reason, a make-up final exam will be given.

Attendance: Students are expected to attend all lecture classes.

- If a student misses a class, he is responsible for any announcement made in that class.
- A DN grade will be awarded to any student who accumulates
  - 6 unexcused absences in lecture classes.
  - 10 excused and unexcused absences in lecture classes.
- A student must response to his instructor during the class otherwise he will be considered absent.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin.

Week	Date	Sec	Material	Homework
1	May.30-June 4	7.6	The Vector Spaces $\mathbb{R}^n$ only	1, 3, 22, 23, 26
		8.2	System of Linear Algebraic Equations	1, 7, 12
		8.3	Rank of a Matrix	8, 9, 10, 14
		8.6	Inverse of a Matrix (Using only Theorem 8.6.4)	1, 2, 19, 30, 52
2	June 7-11	8.8	Eigenvalue Problem	1, 8, 16, 20
		8.10	Orthogonal Matrices (excluding example 4)	5, 8, 9, 16
		8.12	Diagonalization	2, 14, 28
3	June 14-18	Ch 2	Cartesian, Cylindrical and spherical Coordinates	2.5, 2.7, 2.17, 2.18, 2.19, 2.20
		Ch 3	Line, Surface and Volume Integrals	3.3, 3.4, 3.5, 3.8, 3.10, 3.11
4	June21- 25	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
		9.9	Independence of Path	2, 4, 6, 12, 15, 22, 25, 26
		Ch 4 (4.7)	Calculation of Potential Application: Electric Potential	Examples 4.11, 4.12(b)
5	June28-July 2	17.1	Complex Numbers	2, 4, 6, 18, 30, 34, 40
		17.2	Powers and Roots	6, 8, 12, 16, 33, 34
		17.3	Sets in complex planes	4, 5, 8, 23
		17.4	Functions of a Complex Variable	6, 8, 10, 12, 14, 21, 32
		17.5	Cauchy Riemann Equations	1, 2, 4, 5, 6, 8, 22
6	July 5-9	17.6	Exponential and Log. Function	2, 4, 8, 13, 28, 32, 47
		17.7	Trigonometric and Hyperbolic Functions	6, 8, 10, 16
		18.1	Contour Integrals	1, 3, 6, 7, 9
		18.2	Cauchy- Goursat Theorem	2, 4, 5, 8, 15
7	July 12-16	18.4	Cauchy Integral Formula	3, 4, 8, 10, 14
		19.2	Taylor Series	2, 4, 6, 12
		19.3	Laurent Series	2, 6, 21, 26, 28
		19.4	Zeros and Poles	2, 4, 6, 10, 16
		19.5	Residue Theorem	1, 2, 8, 10, 22
8	July 19	19.6	Evaluation of Real Integrals	4, 11, 12, 32