

King Fahd University of Petroleum and Minerals

Department of Mathematics and Statistics

**SYLLABUS**

Semester II, 2021-2022 (212)

(Dr. Muhammad Yousuf)

**Course #:** Math 513  
**Title:** Mathematical Methods for Engineers  
**Textbook:** Advanced Engineering Mathematics with MatLab, Dean G. Duffy, 4<sup>th</sup> Edition  
**References** Advanced Engineering Mathematics by Zill and Wright.

**The Course Description:** Laplace transforms including the convolution theorem. Error and gamma functions. The method of Frobenius for series solutions to differential equations. Fourier series and Fourier-Bessel series. Boundary value problems. Sturm-Liouville theory. Partial differential equations: Separation of variables, Laplace transforms, and Fourier integrals methods. The heat equation, Laplace equation, and wave equation. Eigenvalue problems for matrices. Diagonalization.

**The Course Prerequisite:** Math 202. (Not open to mathematics majors. Students cannot receive credit for both MATH 333 and MATH 513.)

**Learning Outcomes:** After completion of the course, the student should be able to:

1. Understand and apply basic linear algebra.
2. Obtain Fourier series representations of commonly used functions.
3. Solve Sturm Liouville Problems.
4. Solve Wave, Heat, and Laplace equations using separation of variables method.
5. Solve these PDEs using Fourier Series, Laplace Transform, and Fourier Transforms

Week	Chapters	Material
1-2	3	Linear Algebra
3-4	5	Fourier Series
5-6	6	The Sturm-Liouville Problems
7-8	7	The Wave Equation
9-10	8	The Heat Equation
11-12	9	The Laplace Equation
13	11	The Fourier Transform
14-15	12	The Laplace Transform

**Grading Policy:** Homework and Quizzes 15%, Two Midterms 25% each, Final 35%

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