King Fahd University of Petroleum and Minerals

Department of Mathematics and Statistics
MATH 513 Syllabus, Term 252
Instructor: Dr. Adel Al-Mahdi (almahdi@kfupm.edu.sa)

Course #: **Math 513 (3-0-3)**
Title: Mathematical Methods for Engineers
Textbook: Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 4th 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: Graduate Standing. (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

The Course Grading Policy

Classwork (quizzes, assignments, attendance, class activities, class participations, etc.)	15% (60 points)
Project	10 % (40 points)
Exam I (written) **Date: TBA**	20% (80 points)
Exam II (written) **Date: TBA**	20% (80 points)
Final Exam (comprehensive & written) **Date of Final Exam: TBA**	35% (140 points)

The exams questions: are based on the examples, homework problems, and exercises of the Textbook.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Graduate Bulletin on the Registrar Webpage.

Excuse: In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get a score of zero in the missed exam

Homework Guidelines:

- Late homework assignment submission will not be accepted.
- Electronic submission of any homework assignment through email is not allowed.
- You should properly cite any outside sources you used.
- You are expected to express your answers clearly with solid justifications. Stating the final answer to a question without any justifications shall attract a zero mark.
- Box your final answer(s) and important intermediate results.

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will be reported to the department chairman and higher university administration. Cheating in exams includes, but not limited to:

- Looking at the papers of other students.
- Talking with other students.
- Using mobiles or any other electronic devices including smart watches.

Mobiles: The use of mobiles is strictly banned during class. Students are required to keep their phones off/silent and placed inside their pockets during the class timings.

Project: Project Guidelines will be uploaded to Blackboard, and guidelines for the report will also be posted there. The instructor will form project groups.

Major and Final Exams Admission Requirements:

- All students must bring and show their identity cards (KFUPM/National/Iqama) before entering the exam hall.
- Students are not allowed to carry mobile phones, smart watches, or electronic devices to the exam halls.
- Students must take the exam in the places assigned to them.

Attendance: Students must adhere to the attendance policy of KFUPM.

- If a student misses a class, he/she is responsible for any announcement made in that class.
- A student is considered absent if not attending the class 10 minutes after the class start time; he/she is permitted to attend the remainder of the class session.
- A student, who has a legitimate excuse for an absence, must present an official excuse from the Student Affairs no later than a week before the date of the Final Exam; no excuses shall be accepted after that date.
- A DN grade will be awarded to any student who accumulates 9 unexcused absences in classes or 20 excused and unexcused absences.
- A DN grade will be assigned to the eligible student after being warned twice by his/her instructor.

Tips on How to Enhance Your Problem-Solving Skills:

- Make sure you understand the concepts and techniques of each section.
- Take notes during classes and study your notes, textbook before our next class.
- Do all the homework assignments on time.
- Try always to solve the problems on your own first before reading the solution or asking for help.
- Practice more problems than those given in the homework assignments.
- If you find it difficult to solve a certain type of problems, you should try more problems of that type.
- Try to make good use of my office hours.
- Solve old exams as part of your preparation for the Midterm and Final Exams.
- Last, but not least, consult me whenever you feel you need help understanding a concept or solving a problem.

Use of AI Tools: Students are encouraged to use AI responsibly as a learning aid for understanding lecture content, practicing statistical concepts, and preparing for exams. However, the use of AI during quizzes and exams is strictly prohibited and will be reported and treated as an academic integrity violation.