King Fahd University of Petroleum and Minerals
Department of Mathematics
SYLLABUS
Semester II, Term (242)
(Dr. Shahzad Sarwar)

Course #:   **Math 513**
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.

Prerequisite: Graduate Standing. (Not open to Mathematics majors. Cannot be taken for credit with MATH 333.)

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

Assignments	20% (80 points)	• Homework Assignments.
Exam 1 **Date: February 13, 2025** **Time: TBA**	20% (80 points) **Material: Chapters 3 & 5**	• The project consists of a report and a presentation, each worth 20 points (5%).
Exam 2 **Date: April 10, 2025** **Time: TBA**	20 % (80 points) **Material: Chapters 6,7 & 8**	• The exam questions are based on examples, homework problems, and exercises from the textbook.
Project	10% (40 points)	
Final Date: TBA	30% (120 points)	
Course Passing Grade	A student must score at least 50% (200/400) to pass the course.	

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Section	Suggested Problems
3.2	2, 6, 8
3.3	3, 4
3.4	5, 6, 7
3.5	5, 6, 7, 8
3.6	7, 8, 9, 10
3.7	Example 3.7.1, 1, 3, 4, 9, 10, 11
5.1	4, 7, 8, 14
5.2	1, 2, 3
5.3	4, 5, 9
5.4	1, 2, 3, 4
5.5	2, 4
5.6	1, 5
6.1	1, 3, 7, 9
6.2	2, 3, 4
6.3	1, 2, 3
6.4	1, 3, 5
6.5	Example 6.5.3, 6.5.4, 6.5.5, 6.5.6,
7.3	Example 7.3.1, 7.3.2, 7.3.3, 7.3.4, Problem 9
8.3	Example 8.3.1, 8.3.2, 8.3.3, 8.3.4, 8.3.5(Eqn 8.3.78-8.3.81), 8.3.7, Problems 2, 5, 8, 9, 11, 13
9.3	Example 9.3.1, 9.3.3, 9.3.7, 9.3.10, Problems 3, 4, 5, 6, 7, 8, 16, 17, 18, 19, 20, 35, 36
11.1	2, 3, 4, 6, 7, 8
11.2	2, 3, 4
11.3	1, 2, 3, 4, 5, 6
11.4	4, 5, 8, 10
11.5	1, 2, 3, 4, 5, 6
11.6	1, 2, 3
12.1	2, 4, 6, 8, 10, 12, 14, 15, 16, 17
12.2	2, 3, 5, 8, 10
12.3	1, 3, 5, 7, 8, 9, 10, 12, 15, 16, 19, 21, 22, 23, 27, 31, 33, 35, 37, 39, 41,
12.4	1, 2, 3, 4
12.5	1, 3, 5, 7, 9
12.6	1, 3, 4, 5, 8, 10, 11, 12, 13, 15
12.7	
12.8	
12.10	

Letter Grades: The letter grades will follow a grading curve, which depends on the average of all students in the course.

Exams Formula Sheets: All the exams will have a formula sheet, when necessary, that will aid students during the exams. You should not print the Formula Sheet and bring the hard copy with you during the exam; instead, a hard copy of the Formula Sheet will be provided to you together with the exam copy on the exam day.

Homework Guidelines:
- The late homework assignment submission will not be accepted.
- Electronic submission of any homework assignment through email is not allowed.
- The homework includes exercises on the theoretical topics taught in classes in addition to MATLAB assignments.
- While I encourage discussions and work in groups, you must be the sole author of all work turned in, including computer programs.
- 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.
- You must use MATLAB software for the programming assignment with the code clearly commented. It is your responsibility to compile your programming assignment and run it successfully on Windows platforms. Partial or no credit will be given for code that does not run or compile.

Project Guidelines:
- Late project report submissions will not be accepted.
- Electronic submission of the project report through email is not allowed.
- You must use MATLAB software for the project assignment if programming is needed.
- Preparing the project report in groups is possible; in this case, the maximum number of students forming a group is 5 students.

Cheating in Exams: Cheating or any attempt to cheat by using illegal activities, techniques, and forms of fraud will result in a DN grade in the course along with reporting the incident to the 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.

Missing a Classwork Assignment, Project, or an Exam:

Classwork Assignments: No make-up assessment will be given under any circumstances. If a student misses any of the classwork assignments for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from the Student Affairs no later than a week before the date of the Final Exam. In this case the student grade for the classwork assignment will be the average of all other classwork assignments grades he/she received in the course during the term. Otherwise, he/she will receive a zero grade for the missed assignment.

Project: No make-up project will be given under any circumstances. All students should plan to complete and submit the project report as early as possible. If a student misses the project presentation for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Student Affairs no later than a week before the date of the Final Exam. In this case, the student's grade for the project presentation will be the average of the project report and the total quizzes grades he/she received. Otherwise, he/she will receive a zero grade for the missed project presentation.

Midterm and Final Exams: In case a student misses any of these exams for a legitimate reason, he/she must bring an official excuse from Student Affairs no later than a week after the date of the Exam to have a make-up exam. Otherwise, he/she will receive a zero grade for the missed exam.

Midterm 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.

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 starts; he/she is permitted to attend the remainder of the class session.
- A student who has a legitimate excuse for absence must present an official excuse from 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 more than 9 (20%) unexcused absences and 15 (33%) excused and unexcused absences.
- A DN grade will be assigned to the eligible student after being warned twice by his/her instructor.

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

Tips on How to Enhance Your Problem-Solving Skills:
- Make sure you understand the concepts and problem-solving techniques of each section.
- Take notes during classes and study your notes, textbook, and lecture slides before our next class.
- Do all the homework assignments on time.
- Always try 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 problem, 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.