

**King Fahd University of Petroleum and Minerals**  
**College of Computing and Mathematics**  
**Department of Mathematics**  
**Math 513 Syllabus, Term 221**  
**Coordinator: Dr. Kareem Elgindy**  
**Office: 5-415 – Email: kareem.elgindy@kfupm.edu.sa**

**The Course Code and Name:** Math 513, Mathematical Methods for Engineers.

**The Course Credit Hours:** 3-0-3. (Two lecture sessions per week.)

**Instructor:** Dr. Kareem Elgindy.

**Lectures:**

- **Date and Time:** Sunday & Tuesday, 04:00-05:15 pm.
- **Location:** 59-1005.

**Office Hours:** Sunday & Tuesday, 11:50 am-12:45 pm & 02:10-03:45 pm.

**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 301 and MATH 513.)

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

1. Obtain Fourier series, Fourier-Bessel, and Fourier-Legendre expansions.
2. Classify linear partial differential equations.
3. Recognize regular, periodic, and singular Sturm-Liouville problems.
4. Obtain eigenvalues, eigenfunctions, and eigenfunctions expansions.
5. Solve the heat equation, the wave equation, and Laplace equation using eigenfunctions expansion, the Laplace transform, and Fourier transform.

**Textbook:** Dean G. Duffy. Advanced Engineering Mathematics With MATLAB, Fifth Edition. Chapman and Hall/CRC, 2021.

**Table 1: Tentative Classes Pacing Schedule**

Weeks	Dates	Chapter	Topic
1, 2	Aug. 28-Sep. 08	5	Fourier Series
3, 4	Sep. 11-22	6	The Fourier Transform
<b>National Day Holiday: Thursday, Sep. 22, 2022</b>			
5, 6	Sep. 25-Oct. 06	7	The Laplace Transform
<b>Midterm Exam: To Be Held During Oct. 02-06; Material: Chapters 5 &amp; 6</b>			
7, 8	Oct. 09-20	8	The Wave Equation
9, 10	Oct. 23-Nov. 03	9	The Heat Equation
11, 12	Nov. 06-17	10	Laplace's Equation
13	Nov. 20-24	11	The Sturm-Liouville Problem

<b>Midterm Break: Nov. 27-Dec. 01</b>			
14	Dec. 04-08	11	Continued
15	Dec. 11-15	12	Special Functions
<b>Final Exam: To Be Held During Dec. 21-Jan. 03; Material: Comprehensive</b>			

**Table 2: The Course Grading Policy**

<b>Classwork (written)</b>	20% (80 points)	<ul style="list-style-type: none"> <li>➤ The classwork consists of 2 homework assignments and 2 quizzes, each worth 20 points (5%).</li> <li>➤ The project consists of a report and a presentation, each worth 40 points (10%).</li> <li>➤ The exams questions are based on the examples, homework problems, and exercises of the Textbook.</li> </ul>
<b>Project (written)</b>	20% (80 points)	
<b>Midterm Exam (written)</b>	25% (100 points)	
<b>Final Exam (comprehensive written)</b>	35% (140 points)	
<b>Course Passing Grade</b>	A student must score at least 50% (200/400) to pass the course.	

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

**Midterm and Final Exams Formula Sheets:** Both exams will have a formula sheet when necessary that will aid students during the exams. Copies of the Formula Sheets will be available in the Blackboard for students to reference while studying. 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:**

- 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 make your programming assignment compile and run successfully on Windows platforms. Partial or no credit will be given for code that does not run or compile.

**Project Guidelines:**

- Late project report submission 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 two students.

**Cheating in Exams:** Cheating or any attempt of cheating by use of 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 miss 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 the Student Affairs no later than a week before the date of the Final Exam. In this case the student 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 the 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.
- 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 more than
  - 6 unexcused absences in classes.
  - 10 excused and unexcused absences in classes.
- A DN grade will be assigned to the eligible student after being warned twice by his/her instructor.

**Usage of Calculators:** Calculators are allowed in all exams.

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

**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, and my lecture slides 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.