King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 333 Syllabus, Term 231
Coordinator/Instructor: Ashfaque Bokhari

The Course Code and Name: Math333, Methods of Applied Mathematics I

The Course Credit Hours: 3-0-3

Textbook: Advanced Engineering Mathematics by Zill and Wright (Fifth Edition)

Course Objectives: The objective of the course is to introduce students to calculus of vector functions, Laplace and Fourier transforms, Fourier series and partial differential equations.

Catalog Description: Special functions. Bessel's functions and Legendre polynomials. Vector analysis including, vector fields, divergence, curl, line and surface integrals, Green's, Gauss' and Stokes' theorems. Sturm -Liouville theory. Laplace transforms. Fourier series and transforms. Introduction to partial differential equations and boundary value problems in rectangular, cylindrical and spherical coordinates.
Prerequisites: MATH 201, MATH 202, or MATH 208

Learning Outcomes: Upon completion of this course, students will be able to:

1. Calculate the line integral along plane or space curves and the surface integral over surfaces in 3-space.
2. Compute different types of integrals using Green's, Stokes' and Divergence theorems
3. Evaluate Laplace transform, inverse Laplace transform, and Fourier integral of a function.
4. Find Fourier series, Fourier cosine/sine series, Bessel and Legendre series of a function.
5. Evaluate eigenvalues and eigenfunctions for a Sturm-Liouville boundary-value problem.
6. Solve boundary-value problems for wave, heat, and Laplace equations in various coordinate systems by variable separable method.
7. Use Laplace, inverse Laplace, Fourier, and inverse Fourier transforms to solve linear initial and boundary-value problems.

The Course Grading Policy:

	Date	**Time**	**Place**	**Materials**	**Percentage**
Exam I	TBA	TBA	TBA	Chapter 9	25%
Exam II	TBA	TBA	TBA	Chapter 4, 12	25%
Final Exam	By Registrar	By Registrar	By Registrar	Comprehensive	35%
Quizzes					10%
Homework					5%

Quizzes are subjective to bound $[70\%, 75\%]$.

Notes on the exam:

• Student is not allowed to enter the exam hall without either KFUPM ID or Saudi/Iqama ID.

• Students are not allowed to carry mobile phones and smart watches to the exam halls.

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 university higher administration. Cheating in exams includes (but is not limited to) receiving help from anyone or any other outside source, and unauthorized use of the book, course notes, calculators, phones, or websites.

Missing an Exam:

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

Attendance: Students are expected to attend all lecture and lab classes.

- If a student misses a class, he is responsible for any announcement made in that class.
- Students need to strictly adhere to the attendance policy of the university.
- DN-Grade will be assigned to the eligible students who accumulates 20% unexcused absences in Lecture + Lab classes after their instructors have warned them twice.

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

Week-Wise Break-Up of Teaching Material

Week	Date	Sec.	Topics	**Suggested Problems**
1	Aug 27 - 31	**9.1** **9.5**	Vector Functions Directional Derivative	1,12,16,17,21,25,33, 41 2,7,9,14,17,21,23,32,29
2	Sept 3 - 7	**9.7** **9.8**	Curl and Divergence Line Integrals	2,6,10,14,17,22,27 2,6,8,11,16,19,24,28,33
3	Sept 10 - 14	**9.9** **9.12**	Independence of the Path Green's Theorem	1,10,15,18,21,23,26 2,4,6,9,18,23,25
4	Sept 17 - 21	**9.13**	Surface Integrals	2,5,10,13,18,22,25,29,33
			Sept 24: National Holiday	
5	Sept 25-28	**9.14** **9.16**	Stokes' Theorem Divergence Theorem	1,3,6,8,13,17 2,4,7,11,14
6	Oct 1-5	**4.1** **4.2**	Definition of the Laplace transform The Inverse Transform and Transform of Derivatives	1,5,14,26,30,37,43 2,10,19,22,24,32,35
7	Oct 8 – 12	**4.3** **4.4**	Translation Theorems Additional Operational Properties	2,8,13,20,24,31,37,48,55,63 1,10,16,22,27,31,38,46
8	Oct 15-19	**4.5** **12.1**	The Dirac Delta Function Orthogonal Functions	1,4,8,12 2,6,11,13
9	Oct 22 – 26	**12.2** **12.3**	Fourier Series Fourier Cosine and Sine Series	2,4,6,12 1,6,12,17,20
10	Oct 29-Nov 2	**12.5** **12.6**	Sturm-Liouville Theorem Bessel and Legendre Series	1,3,7,8,11,12
11	Nov 5 - 9	**12.6** **13.1**	Bessel and Legendre Series (continued) Separable Partial Differential Equations	2,4,6,8,15,16 2,8,12,16,22,26,27
12	Nov 12 – 16	**13.3** **13.4**	Heat Equation Wave Equation	2,3,6, 7 1,2,4,5,6,9
	Nov 19 - 23		Mid Term Break	
13	Nov 26 - 30	**13.5** **14.2**	Laplace's Equation Problems in Cylindrical Coordinates	2,4,7,10,14 2,4,9,12
14	Dec 3-7	**14.3** **15.2**	Problems in Spherical Coordinates Applications of the Laplace Transform	2,5,11,12 2,4, 10,14,18,24
15	Dec 10 - 14	**15.3** **15.4**	Fourier Integrals Fourier Transforms	1,4,10 1,6,10,12,16
16	Dec 17		Normal Sunday Class – Review and Catch up	

Final Exam (Comprehensive): Follow the registrar webpage for final exam schedule.

Please let me know if there are any mistakes or errors in the syllabus.