King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences

MATH 411(061)

Course Syllabus

Course Instructor: Dr. Mohamed A. El-Gebeily

Recommended Text: "A First Course in Real Analysis" by Protter & Morrey, 2nd Ed, Springer (1991)

Main Topics to be Covered: Sequences and Series of functions, Continuity and differentiability of functions of several variables, Partial derivatives, the chain rule, Taylor's Theorem, Maxima and Minima, Integration of functions of several variables, Convergence and divergence of improper integrals, Derivative of functions defined by improper integrals.

Course Objectives: This course is designed to provide a rigorous mathematical basis for the analysis of "Functions of several variables" and improper integrals. The student may have seen some of the above topics during his sophomore calculus course. However, most of this material as well as the level of rigor are all new to the student.

Students Learning Outcome: After completion of the course, the students should be able to

- Gain familiarity with functions of several variables
- Be able to understand and write proofs of theorems
- Be able to manipulate improper integrals
- Apply the results to solve exercises, mostly theoretical in nature

Computer Usage: Computer software is not required in this course, however, the student is encouraged to use packages such as Maple, Mathematica, … etc.

Course Evaluation Policy:
Exam I 25% Exam II 25% Final Exam 35% Homework 15%
Policy about Unexcused Absences: KFUPM policy on unexcused absences will be followed.

Late Comers: A student coming late in the class will be awarded ½ absence.

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Office Hours: SMW: 10:00-11:20 or by appointment

Weekly Coverage of Course Material

Week	Date	Section	Topic	Suggeted Homework
1	Sep 9-14*	6.1 6.2	The Schwartz and Triangle Inequalities; Metric Spaces Elements of Point Set Topology	1,2,4,5,9 1,2,11,12,15
2	Sep 16-20	6.3 6.4	Countable and Uncountable Sets Compact Sets and the Heine-Borel Theorem	1,5,9 2,9,13
3	Sep 24-27	6.5 6.6	Functions on Compact Sets Connected Sets	1,2,12,14 1,2,3,7
4	Sep 30- Oct 4	6.7	Mappings from One Metric Space to Another	1,5,9,10,16
5	Oct 7-11	7.1 7.2	Partial Derivatives and the Chain Rule Taylor's Theorem; Maxima and Minima	1,2,4,5,6,8 1,2,3,7,8,11
6	Oct 28-Nov 1	7.2	Taylor's Theorem; Maxima and Minima (continued) **1st Major**	
7	Nov 4-8	7.3 8.1	The Derivative in $\boldsymbol{R}^N$ Volume in $\boldsymbol{R}^N$	2,4,7,8 1,4
8	Nov 11-15	8.2	The Darboux integral in $\boldsymbol{R}^N$	1,4,6,8,14
9	Nov 18-22	8.3	The Reimann Integral in $\boldsymbol{R}^N$	2,3,5,6,7
10	Nov 25-29	9.1 9.2	Tests for Convergence and Divergence Series of Positive and Negative Terms; Power Series	13,16,17,18 3,8,12,16,24,26
11	Dec 2-6	9.3 9.4	Uniform Convergence of Sequences Uniform Convergence of Seires; Power Series	1,7,12,17,18 1,10,11,28,37
12	Dec 9-13	9.4	Uniform Convergence of Seires; Power Series (continued) **2nd Major**	
13	Dec 16-20	11.1 11.2	The Derivative of a function Defined by an Integral; the Leibniz Rule Convergence and Divergence of Improper Integrals	1,3,10,14,18 3,7,1213,14
14	Jan 6-10	11.3	The Derivative of Functions Defined by Improper Integrals; the Gamma Function	3,7,9,10,14,22
15	Jan 13-17		Catch up	

- Thursday, October 12 to Friday, October 27, 2006: Id Al-Fitr Vacation
- Thursday, December 21 to Friday, January 5, 2006: Id Al-Adha Vacation

* Thursday, September 14 is a normal Saturday