Department of Mathematics & Statistics, KFUPM

Math 411 Syllabus (142)

Dr. K. M. Furati

Course Title: Advanced Calculu II

Textbook: Functions of Several Real Variables, M. Moskowitz and F. Paliogiannis, World Scientific, 2011.

Course Description: Theory of sequences and series of functions. Real functions of several real variables: limit, continuity, differentiability. Taylor's theorem. Maxima and minima, Lagrange multipliers rule. Elementary notion of integration on R^N. Change of variables in multiple integrals, Fubini's theorem. Implicit and inverse function theorems. Convergence and divergence of improper integrals- Differentiation under the integral sign.

Wk	Date	Sec.	Material	HW
1	Jan 25 - 29	1.1	The Euclidean space R^n	p. 23: 1, 4 p. 37: 14
		1.2	R^n as a vector space	
		1.3	R^n as an inner product space	
2	Feb 01 - 05	1.4	R^n as a metric space	1, 3, 7
		1.5	Convergence of sequences in R^n	p. 60: 1.8.14, 1.8.17
3	Feb 08 - 12	H	Series in R^n	Non
		1.6	Compactness (only defn and thm 1.6.5)	Non
4	Feb 15 - 19	2.1	Functions from R^n to R^m	2(c,e), 4, 7b
		2.2	Limits of functions	
		2.3	Continuous functions	3, 8, 9, 10, 11, 12
5	Feb 22 - 26	2.4	Linear transformations	Sec 2.7: 9, 10, 13, 15
		2.5	Continuous functions on compact sets	
6	Mar 01 - 05	3.1	Differentiable functions	6, 7, 10, 13, 20
7	Mar 08 - 12	3.2	Partial and Directional derivatives	
8	Mar 15 - 19	3.4	The mean value theorem	Non
		3.5	Higher Order derivatives	Non
Midterm Break				
9	Mar 29 - Apr 02	3.6	Taylor's theorem	1, 3b
		3.7	Maxima and minima in several variables	4, 20
10	Apr 05 - 09	3.8	The inverse and implicit function theorems	1, 2, 15
		3.9	Constrained extrema, Lagrange multipliers	2, 7
11	Apr 12 - 16	4.1	The integral in R^n	5, 6
12	Apr 19 - 23	4.2	Properties of multiple integrals	
		4.3	Fubini's theorem	2, 4
13	Apr 26 - 30	5.1	Change of variables	9, 11
14	May 03 - 07	5.2	Improper multiple integrals	
		5.3	Functions defined by integrals	
15	May 10 - 14	..	Review	

Course Objectives

This course is designed to provide a rigorous mathematical basis for the analysis of "Functions of several variables".

Learning Outcomes

- Gain familiarity with functions of several variables
- Be able to understand and write proofs of theorems
- Apply the results to solve exercises, mostly theoretical in nature
- Prepare the students for higher level analysis courses

Grading Policy

HW	20%
Exam I	25%
Exam II	25%
Final	30%