

## ADVANCED CALCULUS II – MATH 441 – TERM 212

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Also by **appointment** through SLACK



### Textbook:

Moskowitz, M. & Paliogiannis, F. **Functions of Several Real Variables**. World Scientific, Singapore, 2011

### References:

R1) Laczko, M. & Sós, V. **Real Analysis: Series, Functions of Several Variables, and Applications**. Springer, 2017

### 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  $\mathbb{R}^n$
- 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.

### Student Learning Outcomes:

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

- Recall basic geometry and topology of Euclidean space.
- Discuss notion of limit of a function of several variables to state directional, partial and Fréchet derivatives.
- Discuss Inverse and Implicit function theorems.
- Determine nature of critical points using Hessian matrix.
- Apply method of Lagrange multipliers to extremum problems with constraints.
- Use Fubini's theorem to compute multiple integrals.
- Discuss convergence of improper integrals.

### Grading Policy:

- 15%: Homework
- 50%: Two Major Exams: first 25%, second 25%
- 35%: Final comprehensive exam

### Evaluation:

Final grade is according to the scale

GRADE	RANGE
A+	[90%, 100%]
A	[80%, 90%]
B+	[75%, 80%]
B	[70%, 75%]
C+	[65%, 70%]
C	[55%, 65%]
D+	[50%, 55%]
D	[45%, 50%]
F	[0%, 45%]

**Course Schedule:**

Week	Topic	Section	HW
1	Sequences and Series of Functions	7.1 & 7.2 (from Reference R1)	
2	Basic Features of Euclidean Space, $R^n$	1.1, 1.2, & 1.3	Page 23: 1, 4 & Page 37: 14
3 & 4		1.4, 1.5 & 1.6	Page 42: 1,3,7 & Page 60: 1.8.24, 1.8.17
5	Functions on Euclidean Spaces	2.1, 2.2 & 2.3	2(c, e), 4, 7b 3,8,9, 10, 11, 12
6		2.4 & 2.5	Sec 2.7: 9, 10, 13, 15  <b>EXAM I – Week 5 or 6</b>
7	Differential Calculus in Several Variables	3.1	6, 7, 10, 13, 20
8		3.4	1, 3b
9		3.6 & 3.7	4, 20
10		3.8	1, 2, 15
11		3.9	2, 7  <b>EXAM I – Week 10 or 11</b>
12	Integral Calculus in Several Variables	4.1	5, 6
13		4.2 & 4.3	2, 4
14	Change of Variables Formula, Improper Multiple Integrals	5.1	9, 11
15		5.2 & 5.3	

**FINAL EXAM – See Registrar website**