	MAT 544 Analysis **Fall 2001**

This is a first course in real analysis. The objective is to establish the ground work upon which great part of modern mathematics is based. The main topics to be covered are: 1) the basics of the real number system and metric spaces; 2) ordinary differential equantions; 3) calculus on several dimensions and inverse and implicit function theorems and 4) measure theory. A detailed syllabus can be seen following the link below.

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Office hours: Wed 3:30-4:30pm, Thu 11am-12pm or by appointment.

Course Syllabus

Homework: Homework will be assigned approximately weekly and collected one week after having been assigned. Click here for the assignement. Doing the homework is *fundamental* part of the course work. In particular, it will count for 30% of the overall course grade.

Midterm Exam: Friday, October 12th, in class, including all the material we manage to cover until then.

Final Exam: The final exam is Friday, Dec. 14th, 12am - 3pm in P-131.

Final Grade: 30% MT + 30% HW + 40% Final

Analysis MAT 544

Fall Semester

1. Advanced Calculus and Ordinary Differential Equations (ODE)
   - Review of the real number system
   - Metric spaces, continuity, uniform convergence
   - Contraction mapping principle
   - Existence and uniqueness theorems for ODE
   - Global existence theorem for linear ODE
   - Linear transformations, orthogonal projections and matrix exponential
   - Linear systems of ODE with constant coefficients
   - Derivatives in R^n and in Banach spaces
   - Newton's method and the inverse function theorem
   - The implicit function theorem
2. Measure Theory
   - Riemann integral in R^n
   - Cantor-type sets, dyadic decompositions in R^n
   - Measures arising from volume functions on open sets
   - Basic properties of the Lebesgue measure
   - Measurable and integrable functions
   - Convergence theorems for Lebesgue integrals: monotone and dominated convergence theorems and Fatou's lemma
   - Criterion for Riemann integrability
3. Additional Topics
   - Iterated integrals; Tonelli's and Fubini's Theorems
   - Riesz Representation Theorem
   - Radon-Nikodym Theorem

The main reference is Geller's book. A rough timetable of the pace to cover the book is:

Ch. 1	2½ weeks
Ch. 2	2 weeks
Ch. 3	3½ weeks
Ch. 4	2½ weeks
Ch. 5	2½ weeks
Ch. 6	Homework
Ch. 7 & 8	2½ weeks

References:

- Daryl Geller, *A first graduate course in real analysis. Part I,*

Solutions Custom Publishing (to be distributed in class)

- Walter Rudin, *Principles of mathematical analysis*,
  3rd ed., McGraw-Hill, New York 1976
- Walter Rudin, *Real and complex analysis*,
  3rd ed., McGraw-Hill, New York 1987

	MAT 544 **Analysis I** **Fall 2001**

Homework Sets:

1) Chapter 1 - Due Friday, Sept. 7th.

Section 1) 3, 7, 9, 10, 11

Section 2) 1, 5, 6, 7

2) Chapter 1 - Due Friday, Sept. 14th.

Section 3) 1, 3, 7, 8

Section 4) 2, 4

Section 5) 3, 4, 7

3) Chapter 2 - Due Friday, Sept. 28th.

Section 1) 3, 5, 6

Section 2) 2, 4, 7, 10

Section 3) 1, 3

4) Chapter 2 - Due Friday, Oct. 5th.

Section 3) 4, 6, 7, 9

5) Chapter 3 - Due Friday, Oct. 12th.

Section 1) 2, 6

Section 2) 1, 3

Section 3) 4, 5, 6, 7

6) Chapter 3 - Due Friday, Oct. 26th.

Section 5) 2

Section 6) 3, 7, 9

Section 8) 2, 8

7) Chapter 4 - Due Monday, Nov. 12th.

Section 1) 1, 3

Section 2) 1, 2,

Section 3) 2, 3, 4, 5

Section 4) 2

Section 5) 3, 4, 5

Section 6) 1, 3, 5

Section 7) 1, 2, 3

8) Chapter 5 - Due Monday, Nov. 26th.

Section 2) 1, 2, 3, 4, 7, 8

Section 3) 3, 4, 5

Section 5) 2, 3, 4

9) Review Problems - Due Wednesday, Dec. 12th. to Yasuhiro Tanaka.