

# MAT 800

TOPICS IN ANALYSIS Fall 2011

## *COURSE INFORMATION*

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**Office Hours:** Tuesday 11:30 am – 12:30 pm  
Thursday 11:30 am – 12:30 pm  
At other times by appointment

**Classes:** T Th 12:30 am – 1:50 pm Carnegie Building 208

**Text:** Notes will be provided during the course

**Prerequisites:** I will assume basic knowledge of measure theory, integration, analytic functions and some functional analysis.

**Course Description:** We will cover some of the following topics from complex analysis and the geometric theory of differential equations.

### **Conformal Geometry**

- conformal structures
- quasiconformal mappings

### **The Concept of Ellipticity**

- first order equations
- homotopy classification
- second order elliptic systems
- examples : the continuity equation and hodographic transformation

### **Elements of Sobolev Theory** (review)

- definitions of Sobolev spaces
- embedding theorems

### **Complex Potentials**

- the Cauchy transform
- the Beurling Ahlfors transform
- $L_p$  estimates

### **Analytical Foundations of Quasiconformal Mappings**

- integral formulas and estimates
- Liouville theorem
- the governing nonlinear systems

### **Solving the Beltrami Equations**

- existence
- uniqueness
- regularity: openness and discreteness
- Stoilow factorization

### **Riemann Mapping Theorem for Elliptic Systems**

- existence
- uniqueness
- applications

To make these lectures available to students whose mathematical knowledge may be limited, every effort will be made to reduce to a minimum the technical details and mathematical requirements. No prior exposure to these topics is assumed. You are invited to pursue the exercises given occasionally during the course.

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