Math 556 – Metric Spaces

Course Description from Bulletin: Point-set theory, compactness, completeness, connectedness, total boundedness, density, category, uniform continuity and convergence, Stone-Weierstrass theorem, fixed-point theorems. (3-0-3)

Enrollment: Elective for AM and other majors.

Textbook(s): *Metric Spaces*, course notes authored by P. C. Deliyannis, and additional handouts

Other required material:

Prerequisites:

Objectives:

1. Students will master basic metric concepts, including convergence, completeness, compactness, separability, and category.
2. Students will apply these concepts to key classes of spaces, including R^n, l_p and L_p.
3. Students will learn to analyze mappings between spaces.
4. Students will study the proofs of important theorems – including the Stone-Weierstrass, Peano, and Banach fixed-point theorems – and will learn to apply these results.
5. Students will learn to use metric space methods to solve problems in science and engineering.
6. Students will attain background for advanced courses in real analysis, functional analysis, and topology.

Lecture schedule: 3 50-minute (or 2 75-minute) lectures per week

Course Outline:	Hours
1. Metrics: basics, comparisons, classes of examples	6
2. Convergence, closure, completeness; Stone-Weierstrass theorem	8
3. Compactness, separability, boundedness; Peano's theorem	8
4. Open coverings, category	5
5. Completions; L_p spaces	4
6. Mappings: continuity, uniform continuity, equicontinuity	6
7. Product spaces	2
8. Fixed-point theorems and applications	6

Assessment:		
	Problem sets	40-80%
	Projects and presentations	20-40%
	Exams	0-50%

Syllabus prepared by: Jerry Frank
Date: July, 2006