MTH 630 Functional Analysis II – Spring 2013

Instructor: Orlando Merino, Lippitt 101c, 874-4442, merino@math.uri.edu

Meets: TuTh 9:30 am to 10:45 am

Location: Lippitt Hall, room 201

Prerequisites   MTH513

Text: Optimization by Vector Space Methods, by D. Luenberger, Wiley 1997.

MTH630 Functional Analysis II is designed for students in mathematics, natural sciences, computer science, engineering, and other fields. It is a good course for graduate students of engineering and basic sciences who would like to strengthen mathematical skills and knowledge.

The main topic of MTH629 is normed vector spaces, linear and nonlinear operators, and applications to mathematical optimization. List of topics:

> Normed vector spaces. Duality. Linear Functionals. Hahn-Banach Theorems, extension and geometric forms. Linear Operators Optimization of Functionals. Gateaux and Frechet derivatives. Convexity.Primal and dual optimization problems. Positive cones and (partially) ordered vector spaces. Karush-Kuhn-Tucker Theorem. Newton's method and other methods for solving equations. Nonlinear equations.   Fixed point theory. Convex optimization. Semidefinite programming and linear matrix inequalities, Sums of squares and application to Lyapunov functions.

There is some flexibility in the choice of topics, and I plan to include certain topics depending on interest of the registered students.

The requirements of the course are graduate level linear algebra and familiarity with proofs. Evaluation is based on homework, and a project which is to be presented at the end of the semester.

Here are some useful references:
Nonlinear Functional Analysis and its Applications III, by E. Zeidler
Applied Nonlinear Analysis, by J.P. Aubin and I. Ekeland, Wiley 1984

MTH630 is a second course in Functional Analysis; however, a student may take it without taking previously MTH629 Functional Analysis I.

Please send me a note (merino@math.uri.edu) if you are interested in knowing more about MTH630.