The University of Memphis
Department of Mathematical Sciences

MATH 7311-8311 **Nonlinear Analysis – Topics in Analysis Spring 2016**

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Text:
Primary (required):
Nonlinear Functional Analysis by K. Deimling, Dover 2010, ISBN: 978-0486474410
Secondary (recommended):
Methods of Nonlinear Analysis by P. Drábek and J. Milota, Birkhäuser 2007, ISBN: 978-3764381462
The second text is freely available online via SpringerLink (at the UofM)

Course description: This course provides an introduction to nonlinear functional analysis. It will expose participants to central analytical and topological techniques required in the study of nonlinear operators and nonlinear equations. Topics covered will be taken from:

1. Topological degree in finite and infinite dimensions
2. Borsuk's theorem
3. Brouwer's fixed-point theorem
4. Banach fixed-point theorem
5. Inverse/implicit function theorem
6. Newton's method and variants
7. Schauder's fixed-point theorem, Leray-Schauder degree
8. Monotone and accretive operators
9. Local/global bifurcation
10. Applications to differential equations and other areas of interest

Prerequisites: **Real Variables I&II** (MATH 7350/7351) or equivalent; mathematical maturity, advanced skills in analysis.
Knowledge of linear functional analysis (other than the material presented in Real Variables) is not necessary.

Grades: The grade range is from A to F. The plus-minus system will not be used. Grades will be based on presentations by students and/or homework solutions. Students enrolled at the 8000 level will have to demonstrate their proficiency in both categories.