Mathematics 664
Nonlinear Functional Analysis and Applcations

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Title: Nonlinear Functional Analysis and Applications.

Course description: In these self contained lectures I will introduce and develop some of the basic analytical tools in nonlinear functional analysis. The main focus will be on the implementation of these methods in investigating and solving certain nonlinear problems, with emphasize on nonlinear partial differential equations. The course will be useful to all students with interest in nonlinear analysis, differential geometry and applied and computational mathematics.

Background: Students are expected to know Real Analysis.

Proposed topics to be covered:

1. Review of Basic Function Spaces.

2. Some Fixed Point Theorems.

3. Monotone Iterations.

4. Calculus in Banach Spaces.

5. Brouwer Degree.

6. Leray-Schauder Degree and Applications.

7. Variational Method: Palais-Smale Condition and Moutain Pass Lemma (if time allows).

8. Bifurcation Theory (depends on students interest and if time allows).

References:

Various sources from the mathematical literature.