

**SYLLABUS**  
 Semester II, 2005-2006 (052)  
 (Prof. A. Boucherif)

**Course #:** Math.637  
**Title:** Nonlinear Functional Analysis and Applications I  
**Textbook:** An Introduction to Nonlinear Analysis, M.Schechter  
 Cambridge University Press, UK, 2004  
**Reference** Nonlinear Functional Analysis, K.Deimling,  
 Springer-Verlag, Berlin, 1985  
**Course Description:** Fixed point methods. Nonexpansive mappings. Differential and integral calculus in Banach spaces. Implicit and inverse functions theorems. Potential operators and variational methods for linear and nonlinear operator equations. Extrema of functionals. Monotone operators and monotonicity methods for nonlinear operator equations. Applications to differential and integral equations.

<b>Wk #</b>	<b>Date</b>	<b>Sec.</b>	<b>Material</b>
1 – 3	Feb.12-14 Feb.19-21 Feb.26-28	Chapter 1	<b>Introduction</b> <b>Differential and Integral Calculus in Banach Spaces</b>
4 – 7	March 5-7 March 12-14 March 19-21 March 28-30	Section 4.8 Chapter 6	<b>Implicit and Inverse Functions Theorems</b> <b>Topological degree Theory</b> <b>Fixed Point Methods</b>
8 – 9	April 4 April 9-11 April 16-18	Chapter 2 Chapter 4 Chapter 5 Chapter 7	<b>Calculus of Variations-Extrema of Functionals</b>
10 – 12	April 23-25 April 30-May 2 May 7-9		<b>Monotone Operators and Monotonicity Methods</b>
13 – 15	May 14-16 May 21-23 May 28	Chapter 3 Chapter 10	<b>Applications to Nonlinear Problems</b>