Applied nonlinear analysis
Syllabus

Course Coordinator: Prof.dr. Vicentiu Radulescu
Code : MA 113
Cycle I : MASTER2
First year, Semester I, Cours 42 hours, Seminar 28 hours
Number of credits : 6
Domain : Matematics
Type : compulsory
Category : fundamental

Objectives: We develop some of the main techniques and principles in the modern nonlinear analysis, at the interplay with mathematical physics and numerical analysis. The course is conceived as a fundamental instrument and guide to do research in modern nonlinear analysis.
Necessary background: courses of partial differential equations and functional analysis
Evaluation form: Exam (E).

Conţents:
 A.Logistic equations
   Examples. The Keller-Osserman condition. Blow-up boundary solutions. Existence and uniqueness theorems for large solutions. The asymptotic behavior of the explosive solution. The Conjecture of H. Brezis.
B.Lane-Emden-Fowler singular type equations
   Elliptic equations with singular term. The Crandall-Rabinowitz-Tartar theorem. Case of convection terms. Similarities with the logistic equation.
C.Nonlinear eigenvalue problems for nonhomogeneous differential operators
   Elements of spectral theory for nonlinear operators. Orlicz-Sobolev spaces. Nonhomogeneous differential operators. Concentration of the spectrum. Open problems.

References :
H. Brezis, *Analiza functionala: teorie, metode si aplicatii*, Ed. Academiei, Bucuresti, 2002 (translation from French by V. Radulescu).
M. Ghergu, V. Radulescu, *Singular Elliptic Problems. Bifurcation and Asymptotic Analysis*, Oxford Univ. Press, 2008.
V. Radulescu, *Singular phenomena in nonlinear elliptic problems.* In Handbook of Differential Equations: Stationary PDEs, vol. 4 (M. Chipot, Ed.), North-Holland, Amsterdam, 2007, pp. 483-591.
V. Radulescu, *Qualitative Analysis of Nonlinear Elliptic Partial Differential Equations,* Contemporary Mathematics and Its Applications, Hindawi, 2008