Program	Level	Second cycle
	Name of the program	Applied Mathematics, Pure Mathematics

COURSE

Course title	**Nonlinear Functional Analysis**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
PMAT 545	III	Elective course	7	3+2+0
Lecturer				
Course Goals	This course covers fundamental techniques in nonlinear functional analysis and selected applications. Topics include the contraction mapping principle, Frechet derivatives and higher derivatives of nonlinear functions between Banach spaces, the implicit function theorem, topological degree theory, and bifurcation theory, and applications to some optimization problems.			
Learning Outcomes	After completion of this course the student will be able to: - understand the concept of nonlinear functional analysis - understand contraction mapping principle - understanf Frechet derivative - understand implcit function theorem - understand the degree theory (basic) - understand the basic of bifurcation theory- - apply theory to some optimization problem.			

COURSE CONTENT

Introduction (fixed points and nonlinear equations). Brouwer degree. Differential calculus in Banach spaces. Bifurcation theory. Topological degree in Banach spaces..

LITERATURE

1.A. Ambrosetti and D. Arcoya, An introduction to nonlinear functional analysis and elliptic problems, Birkhäuser, 2011.
2. A. Ambrosetti and G. Prodi, A primer of nonlinear analysis, Cambridge University Press, 1993.
3. R.F. Brown, A topological introduction to nonlinear analysis, Birkhäuser, 1993.
4. M. Chipot, Elements of nonlinear analysis, Birkhäuser, 2000.
5. K. Deimling, Nonlinear functional analysis, Dover Publications, 2010.

STUDENT WORKLOAD (hours in a semester)

Lectures	45	Tutorial	30	Individual work	100	T o t a l	175

GRADING			**REMARKS**
Criterion	Maximum points	Minimum points	**Midterm exam**: only once in semester (end of November or first week of December). Students altogether write 120 minutes long test. This test is evaluated by max 50 points. The minimal score of the test is 25 points.
Midterm exams	50	25	
Homework assignment	-	-	
Project	-	-	
Laboratory assignments	-	-	**Final exam:** Students who do not reach the midterm exam minimal score must take the entire course in the final exam. In this case, the final exam is evaluated by max 100 points. The final exam's minimal score is 55 points. Students who reach the midterm exam minimal score take only the part of the final exam that is not covered by the midterm test. In this case, the final exam is evaluated by max 50 points. The minimal score is 30 points.
Final exam	50	30	
T o t a l	100	55	