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

COURSE				
Course title	**Integral Equations with Applications**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
AMAT 525	III	Elective course	7	3+2+0
Lecturer				
Course Goals	Integral equations are a useful tool for modelling various physical phenomena. The main goal of this module is to introduce students to methods for solving integral equations and the classic Fredholm theory.			
Learning Outcomes	After passing the module, the student is expected to master techniques for solving integral equations and methods of determining the existence of solutions to integral equations.			

COURSE CONTENT

- Introduction: Finite difference approximations; Fredholm alternative; Hadamard's inequality; Hilbert spaces;
- Basic theorems of existence: Fixed point theorems; Volterra's equations; Kernel with weak singularities; Degenerate nuclei; Volterra equations of the first type;
- Integral equations with L2 kernels: Compact operators; Autoadjoint compact operators; Applications to differential equations; Positive operators; Fredholm equations with autoadjoint compact operators; Fredholm alternative; Weight integral operators;
- Applications to partial differential equations: Linear functionals; Ordinary differential operators; Partial differential operators;
- Fourier transformation: Applications of Fourier transformation; Laplace transform; Application of Laplace transform; Hankel transformation; Mellin transformation; Projection method; Wiener-Hopf technique I; Wiener-Hopf technique II; Wiener-Hopf equations of the first type; Dual integral equations;
- Fredholm theory: Integer functions; Analytical structures; Positive kernels;
- Nonlinear equations: Schauder's fixed point theorem; Application;

LITERATURE

[1] Harry Hochstadt, Integral equations, 1983

[2] Masujima, M. Applied Mathematical Methods of Theoretical Physics - Integral Equations and Calculus of Variations. Weinheim, Germany: Wiley-VCH, 2005. ISBN: 3527405348.

STUDENT WORKLOAD (hours in a semester)

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

GRADING			REMARKS
Criterion	Maximum points	Minimum points	
Midterm exams	50	25	
Final exam	50	30	
T o t a l	100	55	