

Department of Mathematics & Statistics, KFUPM
Math 433 Syllabus (Term 202)
Instructor: Khaled M. Furati

Course Title: Methods of Applied Mathematics II

Course Description: Introduction to linear spaces and Hilbert spaces. Strong and weak convergence. Orthogonal and orthonormal systems. Integral Equations: Fredholm and Volterra equations. Green's Function: Idea of distributions, properties of Green's function and construction. Any one of the following topics: Asymptotic Methods: Laplace method, Steepest descent method, Perturbation Theory: regular and singular perturbations, Integral Transforms: Fourier, Laplace, Mellin and Hankel transforms.

Prerequisite: Math 333

Textbook: Applied Mathematics by J. David Logan, 4th ed, 2013.

Learning Outcomes: Upon completion of this course, students should be able to

1. Define basic notion of Hilbert Space, convergence, and orthogonal systems
2. Solve Fredholm and Volterra integral equations
3. Use idea of distributions and Green's function
4. Apply methods of singular or regular perturbations to certain integral equations
5. Apply asymptotic approximation in simple cases or integral transforms (one of the two)
6. Solve some practical problems using Green's function, perturbation, or asymptotic methods (or integral transforms)

Assignment: Homework 30%, Midterm Exam 30%, and Final Exam 40%.

WK	Date	Sec	Topics	HW
1	Jan 17-21	1.1 & 1.2	Dimensional analysis and scaling	To be assigned
2	Jan 24-28	3.1	Regular perturbation	
3	Feb 01-04	3.2	Singular perturbation	
4	Feb 07-11			
5	Feb 14-18	3.3	Boundary layer analysis	
6	Feb 21-25	3.5	The WKB approximation	
7	Feb 28- Mar 4	3.6	Asymptotic expansion of integrals	
8	Mar 07-11	5.1	Boundary-Value problems	
9	Mar 14-18	5.2	Sturm-Liouville Problems	
10	Mar 21-25	5.3	Classical Fourier Series	
11	Mar 28-31	5.4	Integral equations	
12	Apr 04-08			
13	Apr 11-15	5.5	Green's function	
14	Apr 18-22			
15	Apr 25-29	5.6	Distributions	