California State University, Northridge

MATH 680A: Applied Functional Analysis, Fall 2009

Class Number: 17833 Schedule: MW 5:30pm – 6:45pm in CR5123
Instructor: Dr. Vladislav Panferov, office SN 129, phone (818)677-2326
Email `vladislav.panferov@csun.edu`
Office hours: Monday 12-1pm, Wednesday 12-2pm, or by appointment (email)
Course website: `www.csun.edu/~panferov/math680a/`

Course description: This course gives an introduction to basic principles of functional analysis, emphasizing applications to differential equations and mathematical physics.

References: E. Kreyszig, Introductory Functional Analysis with Applications, Wiley 1989; E. Zeidler, Applied Functional Analysis: Applications to Mathematical Physics, Springer 1999, J. Dieudonne, Foundations of Modern Analysis, Academic Press, 1969.

Prerequisites: General topology, MATH 501, Real Analysis MATH 552.

A tentative course outline (to be revised in the future)

1. Metric spaces. Completeness. Compactness. Applications to differential equations.
2. Linear spaces. Linear operators and functionals. The Hahn-Banach theorem. Applications.
3. Normed spaces. Bounded operators and functionals. Dual spaces.
4. Hilbert spaces. Orthogonality, orthogonal projection. Riesz representation theorem. Applications to boundary-value problems. Lax-Milgram lemma.
5. Fundamental theorems for normed spaces. Baire's category thorem. Open mapping theorem. Clased graph theorem. Strong and weak convergence.
6. Adjoint and self-adjoint operators. Spectral theory of operators on Hilbert spaces.

Grading: 55% homework assignments, 15% midterm (date TBA), 30% final exam.

The percentages are generally translated into letter grades using the following scale: 90-100% A; 80-89% B, 70-79% C, 60-69% D, 0-59% F. This scale may be modified at the instructor discretion, but only to increase everybody's grades.

Final Exam: Dec 16, 2009, 5:15pm - 7:15pm, in CR5123.