

M 514: Topics in Applied Math (“Analysis for Applied Mathematics”) Spring 2021

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This class

In this class, we'll learn some of the tools from mathematical analysis that underlie a few different aspects of applied math. We'll start by looking at perturbations of eigenvalues – that is, if you don't know 100% precisely what your matrix is, but you know it's close to some other matrix A , and you know the eigenvalues of A , what can you say about your matrix's eigenvalues?

This question gets more nuanced if we allow ourselves to work in infinite-dimensional vector spaces (Hilbert spaces), so after looking at the finite-dimensional matrix case, we'll move to the infinite-dimensional case. Once we're comfortable with Hilbert spaces, we'll also study some of the theory of compact operators on Hilbert spaces, in particular how that applies to the theory of inverse problems.

If there are other topics you'd like us to explore this semester, please let me know! I'm all ears.

Course structure

There will be weekly written homework assignments, to be done in pairs (pairings assigned randomly). Homework will be due on Fridays at 11:59 PM.

I will also ask everyone to give 2 presentations over the course of the semester, where you can explore a topic in more depth or connect the theory of this class to your own interests.

Grade breakdown

Homework: 80%

Presentations: 20%