

## Math 6212 Real Analysis II

SP 2019

**Instructor:** Ovidiu Costin

**email:** costin.9@osu.edu

### Syllabus

## 1 Topics covered

### 1.1 Elements of functional analysis

Hilbert spaces. Linear operators and adjoints. The Baire Category Theorem and applications: the uniform boundedness principle, the open mapping theorem, the closed graph theorem.

### 1.2 $L^p$ spaces

Basic theory of  $L^p$  spaces, the Hölder and Minkowski inequalities, the dual of  $L^p$ , Chebyshev's inequality, Minkowski's inequality for integrals. Interpolation of  $L^p$  spaces.

### 1.3 Radon Measures

Radon measures, Baire  $\sigma$ -algebras, dual of  $C_0$ .

### 1.4 Fourier series, Fourier transform

More about Fourier series. Applications to PDEs and the isoperimetric inequality; the Poisson kernel, the Schwarz space. The Fourier transform; the Fourier inversion theorem. The Gibbs phenomenon. Convolutions, the Poisson summation formula. Applications to PDEs. The Laplace transform.

### 1.5 Distribution theory

The space  $\mathcal{D}$ ; important examples of distributions. Support; convolutions; the structure theorem; smoothing. The Fourier transform; Sobolev spaces.

### 1.6 The Haar measure, an introduction

Topological groups. Left and right Haar measures.

There will be two midterms and a final exam. Homework will be handed out each Monday and you will have one week to turn the solutions in. The distribution of points, out of 500, will be:

HW : 100; Midterm 1 : 100; Midterm 2 : 100; Final Exam : 200

### **Academic Misconduct Statement:**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7). For additional information, see the Code of Student Conduct at <http://studentlife.osu.edu/csc/>.

### **Disability Services Statement:**

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.