

# Math 7390, Section 1

## Harmonic Analysis II

**Textbook:** Lecture notes by R. Fabec and G. Ólafsson. Those notes are available at <https://www.math.lsu.edu/harmonic/>

**Time:** 10:40-11:30, Monday, Wednesday and Friday in Lockett 113)

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**web-page:** [www.math.lsu.edu/~olafsson](http://www.math.lsu.edu/~olafsson). This syllabus, list of problems, test dates, and solutions to tests, quizzes and other information will be available on this web-page.

### SYLLABUS

The four main topic in this class are:

- Basic Theory of topological groups;
- Group action on topological spaces and homogeneous spaces. Several examples will be discussed.
- Basic representation theory. Definition of unitary representations, direct sums and integrals. Examples, and some connections to wavelet theory and time frequency analysis.
- Representation theory of compact groups and the Plancherel theorem for compact homogeneous spaces and groups.
- If there is still time left, then we will also discuss Gelfand pairs.

Representations of topological groups are central in several branches of mathematics: In number theory and the study of automorphic functions and forms, in geometry as a tool to construct important vector bundles and differential operators, and in the study of Riemannian symmetric spaces. Finally, those are important tools in analysis, in particular analysis on some special homogeneous manifolds like the sphere, Grassmannians, the upper half plane and its generalizations. Representations even shows up in branches of applied mathematics as generalizations of the windowed Fourier transform and wavelets. Several examples of those applications in analysis and geometry will be discussed in the class.

You will be asked to turn in 4 sets of homework, and then there will be a take home test at the end of the semester.