

HARMONIC ANALYSIS ON SYMMETRIC SPACES, 7.5 CREDITS

CHALMERS/GU LP1/2017.

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1. INTRODUCTION

Harmonic analysis on semisimple Lie groups, and their associated symmetric spaces, is a beautiful and fundamental, albeit technical, part of modern mathematics, with deep connections to number theory, geometry, combinatorics and ergodic theory. The aim of this course is to survey some of the basic examples of this vast theory. Applications to number theory and geometry will be given at the end of the course.

2. REGISTRATION AND SCHEDULE

Registration by email to micbjo@chalmers.se.

The course will run during the first semester of 2017/18, meeting twice every week for 2 hours (45 + 45 min), and will be divided as follows:

Week 1 Locally compact groups, Haar measures.

Week 2 Harmonic analysis on locally compact ABELIAN groups (Pontryagin theory).

Week 3 Compact groups (Peter-Weyl theory) + Weyl's Character Formula for $U(n)$.

Week 4 $SL_2(\mathbb{C})$ - Weyl's unitary trick + Spherical functions.

Week 5 $SL_2(\mathbb{R})$ - Part I (Classification of irreducibles)

Week 6 $SL_2(\mathbb{R})$ - Part II (Spherical functions, Kunze-Stein phenomenon).

Week 7 $SL_n(\mathbb{R})/SO_n(\mathbb{R})$ - geometry of higher rank spaces.

Week 8 Applications.

3. PREREQUISITES

Basic functional analysis and group theory.

4. EXAMINATION

During the course, four home assignments (Weeks 1+2, 3+4, 5+6, 7+8) will be distributed, collected and graded. In order to pass the course, the students must also, in addition to passing

the home assignments, write a special report on some (individual) course topic. This report should be written in Latex.

5. COURSE MATERIAL

We will not follow any specific book. However, towards the end of the course, we will probably be inspired by the exposition in the book

Howe, Tan: *Non-Abelian Harmonic Analysis. Applications of $SL(2, \mathbb{R})$* .

Additional (free) material will be distributed during the course.

REFERENCES