MATH-464

TNT: Automorphic forms and L-functions

Michel Philippe

Cursus	Sem.	Type
Ing.-math	MA1, MA3	Opt.
Mathematics for teaching	MA1, MA3	Opt.
Mathématicien	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Oral
Workload	150h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Modular forms have a central place in number theory and occur also in many other branches of mathematics. Starting from the theta series associated to quadratic forms we will introduce the basic concepts associated to modular or automorphic forms and provide some applications of the theory.

Content

1-Spherical harmonics, quadratic forms and theta functions
2- The space of lattices, SL_2, the Poincaré upper-half plane and its arithmetic quotients
3-The space of holomorphic modular forms. Fourier expansion, Petersson inner product and the Petersson formula.
4-Hecke theory and L-functions
6-Applications: integral points on spheres, design of golden quantum gates, construction of Ramanujan graphs (Pizer and Lubotsky-Phillips-Sarnak)

Keywords

lattices, modular forms, L-functions, quadratic forms.

Learning Prerequisites

Required courses

Introduction to analytic number theory,
Algebraic number thery,
Analysis III,
Analysis IV

Learning Outcomes

By the end of the course, the student must be able to:

- Synthesize the theory of modular forms and their applications
- Solve basic problems involving modular forms

Teaching methods

course ex-cathedra
exercises

Expected student activities

proactive attitude during the courses and the exercises sessions (possibly with individual presentation of the solution of various problems).

Assessment methods

oral presentation

Supervision

Office hours	No
Assistants	Yes
Forum	No
Others	moodle page