Level: bachelor

Course title: Number Theory (M4-31)

Status: elective

ECTS: 5

Requirements: none

Learning objectives

To introduce the basic concepts of number theory and to emphasise their importance within the system of mathematical disciplines.

Learning outcomes

Minimal

Understanding the basic principles of number theory and the ability to solve simpler arithmetical problems.

Desirable

The ability to creatively solve problems from elementary number theory and in-depth understanding of the underlying theory.

Syllabus

Theoretical instruction:

Introductory notions, Fermat's little theorem, Euler's theorem and Wilson's theorem. Multiplicative order, primitive roots. Quadratic residues. The law of quadratic reciprocity. Classical problems about primes. Diophantine equations. Pythagorean triples, the history of Fermat's last theorem. Pell's equation. Representations of numbers by sums of squares.

Extensions of the ring of integers: Gaussian integers, the ring $\mathbb{Z}[\sqrt{d}]$. Deep conjectures in number theory: the Riemann Hypothesis, Schinzel's Hypothesis H, the *abc*-conjecture. Overview of contemporary trends in number theory.

Practical instruction:

Basic properties of prime numbers and the divisibility relation. Applications of the Chinese remainder theorem. Applications of Fermat's little theorem, Euler's theorem and Wilson's theorem. Working with congruences of higher degree. Solving and applications of Pell's equation. Representations of numbers by sums of squares. Applications of extensions of the ring of integers. Conditional problem-solving under open assumptions.

Weekly teaching load				Other: 0
Lectures: 2	Exercises: 2	Other forms of teaching: 0	Student research: 0	