

Optional Course

Course title: Diophantine analysis – a problem course

Teaching staff: dr Poj Lertchoosakul

Forms of classes: Wykład (30 hours), Ćw. Audytoryjne (30 hours) - semestr letni

The realization of activities: lecture in the classroom, student's presentation

Language of instruction: English

Teaching methods: This is a problem course in Diophantine analysis. In each module of the course, some introductory lecture will be given; however, the students will be asked to actively participate by giving the presentation of the main content of each module. The students' presentation will be based on some questions and problems assigned by the lecturer.

Formal requirements: Calculus; Linear algebra

Prerequisites: Number theory; Abstract algebra

Aims of education: The aim of this course is to take the students as active participants to explore and develop the ideas of Diophantine analysis and to discover the fundamental results in Diophantine approximation and in Diophantine equations on their own.

Course contents:

1. Farey sequences
2. Dirichlet's theorem and Hurwitz's theorem on Diophantine approximation
3. Continued fractions
4. The law of best approximates
5. Markov's spectrum and numbers
6. Badly approximable numbers
7. Pell's equations
8. Liouville numbers
9. Roth's theorem
10. Pythagorean triples and Diophantine geometry
11. Elliptic curves
12. The geometry of numbers
13. Simultaneous Diophantine approximation
14. Minkowski's convex body theorem and the sum of some squares
15. Inhomogeneous Diophantine approximation

Bibliography of literature:

- E.B. Burger, "Exploring the Number Jungle: A Journey into Diophantine Analysis", Student Mathematical Library, 8, American Mathematical Society, Providence, RI, 2000
- J. Steuding, "Diophantine Analysis", Discrete Mathematics and Its Applications (Boca Raton), Chapman & Hall/CRC, Boca Raton, FL, 2005
- J.W.S. Cassels, "An Introduction to Diophantine Approximation", Cambridge Tracts in Mathematics and Mathematical Physics, No. 45, Cambridge University Press, New York, 1957
- T. Andreescu, D. Andrica and I. Cucurezeanu, "An Introduction to Diophantine Equations: A Problem-Based Approach", Birkhäuser Verlag, New York, 2010
- W.M. Schmidt, "Diophantine Approximations and Diophantine Equations", Lecture Notes in Mathematics, 1467, Springer-Verlag, Berlin, 1991