

Faculty of Science

MATM45, Mathematics: Analytic Number Theory, 7.5 credits Matematik: Analytisk talteori, 7,5 högskolepoäng Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2020-06-02 to be valid from 2020-06-02, spring semester 2021.

General Information

Language of instruction: English

Main field of studies

Mathematics

Depth of study relative to the degree requirements A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The course aims to give an introduction to classical analytic number theory. The purpose is further to develop the students' ability to solve problems.

Knowledge and understanding

After completing the course the student should be able to:

- explain the concepts and methods within analytic number theory included in the course,
- identify the most important theorems in the course and explain the main features in their proofs.

Competence and skills

After completing the course the student should be able to:

- integrate knowledge from different parts of the course in connection with problem solving,
- identify problems that can be solved by methods that are part of the course and use an appropriate solution method,

- explain the solution to a mathematical problem within the framework of the course in speech and writing, logically coherent and with adequate terminology,
- plan and carry out assignments within a given time frame.

Judgement and approach

After completing the course the student should be able to:

• argue for the importance of analytic number theory within mathematics.

Course content

The course treats:

- Arithmetic functions
- Elementary analytic methods for investigating arithmetic functions, such as summation by parts and Dirichlet's hyperbola method
- Analytic theory of Dirichlet series, applications of Perron's formula
- Riemann zeta function, Prime number theorem
- Distribution of zeros of the Riemann zeta function, stronger quantitative versions of the prime number theorem, Riemann hypothesis
- Dirichlet characters, Pólya-Vinogradov inequality
- Dirichlet L-functions, Prime number theorem for arithmetic progressions

Course design

The teaching consists of lectures and seminars. Written hand-in assignments are given once per week.

Assessment

The examination consists of written assignments during the course, as well as an oral examination. The oral examination may only be taken by those students who pass the written assignment part.

Students who fail the regular examination are offered a re-examination shortly thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

For the assignments, only the grades Fail or Pass are given. The requirement for Pass is that the total number of points on all assignments is at least 50% of the maximal total number of points. To pass the course it is required to pass both the assignments and the oral examination. To obtain the grade Pass with distinction, it is required to

pass the assignments and obtain the grade Pass with distinction in the oral examination.

Entry requirements

For admission to the course, English 6/B is required as well as at least 90 credits in mathematics, including the courses MATM35 Number Theory, 7.5 credits, and MATM12 Analytic functions, 15 credits, or comparable knowledge.

The course MATB24 Linear analysis, 7.5 credits, is recommended but not compulsory.

Further information

The course may not be included in a degree together with MATM25 Specialised Course in Number Theory, 7.5 credits.

Applies from V21

2101 Assignments, 4,5 hp Grading scale: Fail, Pass
2102 Oral Examination, 3,0 hp Grading scale: Fail, Pass, Pass with distinction