

Faculty of Health, Science and Technology Mathematics

Syllabus

Course Approval

The syllabus was approved by the Faculty Board of Health, Science and Technology on 23 October 2013, and is valid from the Spring semester of 2014 at Karlstad University. It replaces the former syllabus MAGC01 from 2008-05-12.

Course Code: MAGC01 Fourier Analysis, 7.5 ECTS Credits (Fourieranalys, 7.5 Swedish credit points) Degree Level: Bachelor Progressive Specialisation: G2F (First cycle, has at least 60 credits in first-cycle course/s as entry requirements)

Language of Instruction

Swedish or English

Prerequisites

Mathematics, 60 ECTS cr., including Linear Algebra, 7.5 ECTS cr., Analysis B1, 7.5 ECTS cr., Analysis B2, 7.5 ECTS cr., Introduction to Analysis, 7.5 ECTS cr., or equivalent.

Major Field of Study

MAA (Mathematics)

Learning Outcomes

Upon completion of the course the student should be able to:

- apply the Abel transform and properties of the Dirichlet kernel to determine pointwise or uniform convergence of trigonometric series;

- apply the convergence theorems to determine pointwise or uniform convergence of the Fourier series for a given piecewise smooth function;

- apply Parseval s equality to evaluate the sums of series;
- perform summation of Fourier series using Fejér and other summation kernels;
- find expansions of elementary functions in series of Legendre and Chebyshev polynomials;
- evaluate Fourier transforms using elementary methods of integration and the table of standard transforms;
- apply the Fourier convolution theorem to evaluate convolutions and solve integral equations;

- solve Dirichlet boundary value problem for the Laplace equation in a rectangle and in a circle using the Fourier method;

- solve initial and boundary value problems for two- and three-dimensional wave and heat partial differential equations using Fourier series and Fourier transform;

- prove a given selection of theorems treated in the course.

Content and Form of Instruction

- Fourier coefficients and Fourier series of a periodic function.
- Convergence of Fourier series for piecewise smooth functions.
- Abel transform.
- Dirichlet kernel. Summation kernels.
- General Fourier series (introduction to L2-theory).
- Bessel s inequality and Parseval s equality.
- Convolutions.
- Fourier transform.
- Plancherel Theorem.
- Orthogonal polynomials; Legendre and Chebyshev polynomials.

- Solution to some initial and boundary value problems for partial differential equations using Fourier series and Fourier transform.

Each student is required to carry out a minor project.

Reading List

See separate document.

Examination

Examination is in the form of a written exam and by a written and oral presentation of the project. The number of examination opportunities for passing the course is limited to three per academic year.

Grades

One of the grades U (Fail), G (Pass), or VG (Distinction).

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course assessment is based on student views and experiences as reported in written course evaluations and/or group discussions. Students will be informed of the result of the evaluation and of the measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional Information

Students who enrolled before 1 July 2007 will complete their studies in accordance with the requirements of the earlier admission. Upon completion students may request degree and course certificates to be issued under the current ordinance if they meet its requirements.

The local regulations for studies at the Bachelor's and Master's levels at Karlstad University stipulate the obligations and rights of students and staff.

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