Course syllabus

Partiella differentialekvationer med distributionsteori
Partial Differential Equations with Distribution Theory

FMAN75, 7.5 credits, A (Second Cycle)

Valid for: 2017/18
Decided by: PLED F/Pi
Date of Decision: 2017-04-06

General Information

Language of instruction: The course will be given in English on demand

Aim

• The probably largest class of mathematical models among technical systems is based on partial differential equations (PDE). An indispensable tool in the modern theory for these equations is distribution theory.
• The aim of the course is on the one hand to give a more stable theoretical foundation for concepts and methods for PDEs that have been introduced in earlier courses, and a greater ability to independently use these, and on the other hand to develop the theory further. Moreover, the course aims to give the analytical background to some frequently used numerical solution methods.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

• be able to explain the foundations of the theory at an oral examination.
• be able to explain the concept of a weak solution to a PDE, and its connection to distribution theory.

Competences and skills
For a passing grade the student must

• with access to literature independently be able to integrate methods and views from
different parts of the course in order to solve problems and answer questions within the
framework of the course.
• in writing and orally, with proper terminology and clear logic be able to explain the
solution to a mathematical problem within the course.

Contents

Distribution theory: derivatives, convergence, fundamental solutions, Green’s functions,
the Fourier transform, the Laplace and the wave operators.

Partial differential equations: spectral methods, eigenfunction expansions, weak solutions.
Approximation methods. Integral equations, finite element methods. Geometrical
methods. Characteristics. The study of some model equations.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written and/or oral test, to be decided by the examiner. Written
assignments.

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.

Admission

Required prior knowledge: FMAN55 Applied Mathematics, first part of FMAN80
Functional Analysis and Harmonic Analysis.
The number of participants is limited to: No
The course overlaps following course/s: FMA250

Reading list

• Renardy & Rogers: An Introduction to Partial Differential Equations. Springer, 2004,
• Material distributed by the department.

Contact and other information

Course coordinator: Studierektor Anders Holst, Studierektor@math.lth.se
Course homepage: http://www.ctr.maths.lu.se/course/partdiff/