Numerical Methods for Differential Equations

FMNN10, 8 credits, A (Second Cycle)

Valid for: 2019/20
Decided by: PLED F/Pi
Date of Decision: 2019-03-26

Aim

The aim of the course is to teach computational methods for solving both ordinary and partial differential equations. This includes the construction, application and analysis of basic computational algorithms for approximate solution on a computer of initial value, boundary value and eigenvalue problems for ordinary differential equations, and for partial differential equations in one space and one time dimension. Independent problem solving using computers is a central part of the course. Particular emphasis is placed on the students independently authoring project reports based on interpretation and evaluation of the numerical results obtained, with references and other documentation in support of the conclusions drawn.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to discretize ordinary and partial differential equations using finite difference and finite element methods, and to be able to independently implement and apply such algorithms
- be able to independently proceed from observation and interpretation of results to conclusion, and be able to present and account for his or her conclusions on a scientific
basis in free report format.

**Competences and skills**

For a passing grade the student must

- be able to independently, on a scientific basis, select suitable computational algorithms for given problems
- be able to apply such computational algorithms to problems from applications
- be able to independently evaluate the relevance and accuracy of computational results
- present solutions of problems and numerical results in written form.

**Judgement and approach**

For a passing grade the student must

- be able to write a logically well structured report in suitable terminology on the construction of basic numerical methods and algorithms
- be able to independently evaluate obtained numerical results in relation to the (unknown) solution of the differential equation studied
- be able to independently author project reports of scientific character, with references and other documentation of work carried out in support of his or her conclusions.

**Contents**


**Examination details**

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** The grade is based on homework assignments and a written exam.

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:** FMAB20 Linear Algebra, FMAB30 Calculus in Severable Variables, FMAN55 Applied Mathematics.

**The number of participants is limited to:** No

**The course overlaps following course/s:** FMN041, FMN050, FMN081, FMN130, FMNF01

**Reading list**


- It is enough to read one of the books. Edsberg’s book discusses modelling to a higher degree.

**Contact and other information**

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Course homepage: http://www.maths.lth.se/na/courses/FMNN10