DEPARTMENT OF MATHEMATICAL SCIENCES

MMG801   Partial Differential Equations, 7.5 credits

Partiella differentialekvationer, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2022-10-04 to be valid from 2023-01-16, spring semester of 2023.

Field of education: Science 100%
Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programme: 1) Bachelor's Programme in Mathematics (N1MAT)

Main field of studies	*Specialization*
Mathematics	G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Entry requirements

General entry requirements and the equivalent of 60 credits in mathematics and the course MMG300 Multivariable Analysis.

Learning outcomes

On successful completion of the course the student will be able to:

- analyze existence, uniqueness, and stability of problems with initial or boundary conditions,
- construct and analyze finite element solutions with respect to stability and convergence,
- use polynomial interpolation and quadrature rules,
- use methods of variation (choice of analytic/approximate function spaces and bases),

- determine stiffness, mass, and convection matrices for FEM approximations in polygonal domains,
- make computer implementations of solution algorithms,
- compare analytical, approximate, and implemented solutions.

Course content

Classification of basic differential equations in technology and physics. Variational methods. Existence and regularity of solutions of linear partial differential equations of elliptic, parabolic, and hyperbolic type by using the Riesz representation theorem and Lax-Milgram theory. Studies of dynamical systems. Introdution to interpolation, quadrature rules, and the finite element method. Convergence analysis: a priori and a posteriori error estimates and adaptive error control. Stability estimates. Application to problems in strength of materials, heat conduction, fluid mechanics, electromagnetism, acoustics, quantum mechanics, etc.

Form of teaching

The course will be taught in English unless everyone involved speaks Swedish.

Assessment

The examination consists of two obligatory assignments and a written examination.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

The course is evaluated with an anonymous questionnaire and/or a discussion with the student representatives. The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

Additional information

For a list of course literature, see:
https://www.chalmers.se/sv/institutioner/math/utbildning/grundutbildning-goteborgs-universitet/kurslitteratur/Sidor/Kurslitteratur-i-matematik.aspx

The course MMG801 Partial Differential Equations has the same content as the course MMG800 Partial Differential Equations. It is not possible to be registered and/or examined on more than one of these courses.