COURSE SYLLABUS

Numerical Analysis, 7.5 credits

Numerisk analys, 7,5 högskolepoäng

Course Code:	TNAR22	**Education Cycle:**	Second-cycle level
Confirmed by:	Dean Mar 1, 2021	**Disciplinary domain:**	Technology
Revised by:	Director of Education Oct 25, 2023	**Subject group:**	MA1
Valid From:	Aug 1, 2024	**Specialised in:**	A1N
Version:	2		

Intended Learning Outcomes (ILO)

After a successful course, the student shall:

Knowledge and understanding
- show familiarity with the basic methods for numerically solving problems in mechanical engineering
- display knowledge of methods for solving nonlinear problems by hand and by computer
- demonstrate comprehension of the use of numerical tools required to solve real life problems in mechanical engineering

Skills and abilities
- demonstrate skills of computer programming of finite volume and finite element methods
- demonstrate the ability to approximate any given continuous problem in solid or fluid mechanics by a system of equations

Judgement and approach
- demonstrate the ability to choose discretization method for a given mechanical problem
- demonstrate an understanding of stability and accuracy in numerical schemes

Contents

The course is intended to give the student basic knowledge in numerical approximation. This concerns the approximation of functions, of solutions to ordinary and partial differential equations arising in fluid and solid mechanics, and of integrals in several dimensions. It also concerns the computer implementation of approximation schemes.

The course includes the following elements;
• Interpolation and least squares approximation in several dimensions.
• Numerical integration in several dimensions.
• Explicit and implicit finite difference time stepping methods for ordinary differential equations.
• Finite volume and finite element methods for partial differential equations.

Type of instruction

Teaching consists of lectures mixed with computational exercises. Laboratory work with the programming of 2D program codes to solve problems from solid and fluid mechanics.

The teaching is conducted in English.

Prerequisites

The applicant must hold the minimum of a bachelor's degree (i.e the equivalent of 180 ECTS credits at an accredited university) with at least 90 credits in Materials and Manufacturing, Mechanical Engineering, Chemical Engineering, Product Development or Engineering Physics or equivalent. The bachelor's degree should comprise a minimum of 15 credits in mathematics. Proof of English proficiency is required.

Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

Name of the Test	Value	Grading
Examination[I]	5 credits	5/4/3/U
Assignments	2.5 credits	U/G

[I] Determines the final grade of the course, which is issued only when all course units have been passed.

Course literature

The literature list for the course will be provided 8 weeks before the course starts.

Lecture notes by P. Hansbo