FSF3565 Program Construction in C++ for Scientific Computing 7.5 credits

Programkonstruktion i C++ för tekniskt-vetenskapliga beräkningar

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSF3565 valid from Autumn 2016

Grading scale

Education cycle

Third cycle

Specific prerequisites

A Master degree including at least 45 university credits (hp) in in Mathematics (including differential equations and numerical analysis) and Computer Science (including programming). Moreover, English B or equivalent is required.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The aim of the course consists of providing knowledge how advanced numerical methods and complex algorithms in Scientific Computing can be implemented in C++.

After completion of the course the students can:

- Construct simple classes for often used mathematical objects;
- Create abstract classes and define simple template classes;
- Implement data structures for manipulating realistic geometry and complex grids for numerically solving partial differential equations;
- Optimize data structures and algorithms in C++ with respect to efficient computations for large-scale problems;
- Implement finite difference methods on structured grids.

Course contents

- Object-oriented programming, basic notions in, and syntax of, C++
- Objects, classes and its definition, constructors and destructors
- Operators, operator overloading, polymorphism
- Basics of abstract classes, inheritance, generic programming
- Selected components of the C++ standard library
- Structured and unstructured grids, data structures for their implementation
- Implementation of numerical methods for partial differential equations
- Efficient implementation of numerical algorithms
- Finite difference methods on structured grids.

Disposition

Computer lab work and project tasks.

Course literature

To be announced at least 4 weeks before the course starts.

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Projects reports

Written examination

Other requirements for final grade

Projects reports accepted.

Written examination passed.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.