Syllabus
for course at advanced level

Program Construction in C++ for Physicists	**7.5 Higher Education**
Programkonstruktion i C++ för fysiker	**Credits**
	7.5 ECTS credits

Course code:	DA8001
Valid from:	Autumn 2017
Date of approval:	2016-10-03
Department	Department of Mathematics (incl. Math. Statistics)
Subject	Informatics/Computer and Systems Sciences
Specialisation:	A1F - Second cycle, has second-cycle course/s as entry requirements

Decision
This syllabus has been approved by the Board of Science at Stockholm University, ...

Prerequisites and special admittance requirements
For course admission knowledge equivalent to Numerical Methods for Physicists II, 7.5 HECs (BE7001), and English B from Upper Secondary School level, is required.

Course structure

Examination code	Name	Higher Education Credits
THEO	Theory	4
PROJ	Project tasks	3.5

Course content
a. The course covers object-oriented programming, basic notions in, and syntax of, C++; objects, classes and their 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, and data structures for their implementation. Implementation of numerical methods for partial differential equations
and efficient implementation of numerical algorithms.

b. The course consists of the following items:
• Theory, 4 HECs
• Project tasks, 3.5 HECs

Learning outcomes
It is expected that the student after taking the course will be able to:
• 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.

Education

The education consists of lectures and exercises.
The education is conducted in English.

Forms of examination

a. Examination for the course is in the following manner: measurement of knowledge takes place through written examination. The examination is conducted in English.

b. Grading is carried out according to a 7-point scale related to learning objectives:
A = Excellent
B = Very Good
C = Good
D = Satisfactory
E = Sufficient
Fx = Fail
F = Fail

c. Grading criteria for the course will be distributed at the start of the course.

d. A minimum grade of E on all course parts is required to pass the course.

e. Students who fail to achieve a pass grade in an ordinary examination have the right to take further examinations, as long as the course is given. The number of examination occasions is not limited. The term "examination" here is used to denote also other compulsory elements of the course. Students who have achieved a pass grade on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have failed to reach a pass grade on two occasions have the right to request that a different examiner be appointed to set the grade of the course. A request for such appointment must be sent to the departmental board.

f. When the grade Fx is given, the student has the opportunity to complete up to grade E. The examiner decides which supplementary tasks to be performed and what criteria to apply in order to pass. The completion must take place before the next examination.

Interim

Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three occasions during a two-year-period after the end of giving the course. A request for such examination must be sent to the departmental board. This is also applicable if the syllabus is revised.

Limitations

The course may not be included in a degree together with the course Program System Construction using C++, 6 HECs, FL (DA3007).

Misc

The course is eligible within the Master's Programme in Computational Physics, and it can also be taken as an individual course.

Required reading

Course literature is decided by the departmental board and is published on the Dept. of Numerical Analysis and Computer Science's homepage at least 2 months prior to course start.