Programming (1100-2009)

60 hours (30 lecture hours, 30 lab classes hours), summer semester

Prerequisite courses:

- Computing Workshop (1100-1006) or Advanced Computing Workshop (1100-11F22)

Recommended preceding courses:

- Computing Workshop (1100-1006)
- Advanced Computing Workshop (1100-11F22)
- Introduction to Programming (1100-2010)

Students who complete the course will know how to:

- find algorithms for solving computational problems of medium complexity level, including typical numerical problems
- write programs in the C++ language working in accordance with such algorithms, including the use of appropriate data structures and presentation of results in graphical form

Main topics:

1. The C++ language
    a) Syntax, simple data types, operators and expressions
    b) Functions
    c) Structures, unions and classes, inheritance
    d) Overloading operators
    e) Handling errors using exceptions
    f) Standard library
2. Standard Template Library (STL)
    a) string class and text processing
    b) Stacks, queues, vectors and their applications
    c) Templates and iterators
3. Graphics – the Qt library
    a) Introduction – event driven programs, components of a GUI
    b) The hierarchy of Qt classes, signals and slots
    c) Creating a simple GUI with the help of Qt
    d) The qwt library and drawing function graphs
4. Introduction to numerical programming
    a) Numerical integration
    b) Solving nonlinear equations using the Newton algorithm
    c) Using the Runge-Kutta method for solving ordinary differential equations

d) Solving systems of linear equations using Gauss and Gauss-Jordan elimination

5. Advanced data structures and their applications
   a) Hash tables
   b) Trees and graphs