ICS0017 Fundamentals of C/C++ Programming

Overview

The primary goals of this course are:
1. Give some complementary knowledge about C.
2. Introduce the paradigms and methods of software object oriented design and implementation.
3. Teach programming in C++ programming language.
4. Train the students to give them some practical experience in programming.

Number of ECTS credits awarded for this course is 6.0.

Presumptions

This course is not for those who have no any experience in C. Generally, it is supposed that the students have passed examination in ICS0004 "Fundamentals of Programming". If you have not, read the syllabus and judge yourself are you prepared to participate.

Time and place

The course is offered in the autumn term. The lessons (once per week, 4 * 45 minutes) include lectures as well as exercises and practical work.

The lessons are held in classroom ICT-401 on each Tuesday from 13:45 until 17:00.

Language

The courseware and the lectures are in English.

Software support

In our computer class we use Windows 10 / 11 and Microsoft Visual Studio 2022. The students are advised to download and install into their own laptop computers Visual Studio Community Edition https://visualstudio.microsoft.com/downloads/ (freeware).

Course themes

1. C: some advanced features:
   a. Bitwise operations and their usage.
   b. Bit fields.
   c. Functions with variable number of arguments.
   d. Linked lists and operations with them.
   e. Other linear data structures.
   f. Unions.
   g. Serialization.
   h. Long jump.

2. Introduction to C++:
   a. Memory allocation operators.
   b. Unicode and type *wchar_t*. Operations with Unicode strings. Windows *TCHAR* macro.
   c. Scope resolution operator.
   d. Default values for function arguments.
   e. Overloading.

    f. Inline functions.
    g. References. *lvalue* and *rvalue*.
    h. Exceptions.

3. C++ basic features:
    a. Objects and classes.
    b. Declaration of classes and definition of member functions.
    c. Creating of objects and working with them.
    d. Access modifiers and accessor functions.
    e. Constructors.
    f. Destructors.
    g. Inline member functions.
    h. Aggregation
    i. Inheritance
    j. Protected members and deriving modes.
    k. Polymorphism, virtual functions and late binding.

4. Deeper into C++:
    a. Structs in C++.
    b. Copy constructor.
    c. Pointer *this*.
    d. Friends.
    e. Operator overloading.
    f. Assignment overloading.
    g. Static members.
    h. Constant members.
    i. Constant objects.
    j. Casting.
    k. New keywords: *bool* and *nullptr*.
    l. Enumerations

5. Some C++ standard classes:
    a. Namespaces and the *using* directive.
    b. C++ standard library.
    c. Input / output streams. Global objects *cin* and *cout*.
    d. File streams. Operations with text files and binary files.
    e. Standard exceptions.
    f. Strings and operations with them.
    g. String streams.

Courseware

The range of books on programming in C++ is wide and it is impossible to say which of them are the best to acquire the material of the current course. The instructor's advise is to turn attention to books written by Ivor Horton, Herbert Schildt and Marc Gregoire. Books printed before 2011 may be somewhat out of date.

The full reference of C++ is on http://www.cplusplus.com/reference/. The instructor considers that https://www.geeksforgeeks.org/c-plus-plus/ is the best on-line source for learning.

The participants will be supplied with course material including copies of [PowerPoint slides](#) and example code snippets. The complete printed notes, however, are not provided and the students are expected to participate the classwork.

Consultations

In case of problems write viktor.leppikson@liewenthal.ee

Assessment

To pass the course, the students has just to present the both [courseworks](#) (i.e. two perfectly running applications) and demonstrate their work. The students may be asked to explain their code or even right on the spot write a small modification.