COMP 1012 is intended as a first course in programming for students in engineering and science. The course is an introduction to programming. The instructor(s) will cover the essentials of a procedural programming language, equivalent to those covered in COMP 1010. At the same time, examples will focus on algorithms for numerical problems, drawn from engineering, physics, statistics and other areas. In addition to the main programming language, the instructor(s) will discuss other solution mechanisms, such as spreadsheets and/or symbolic processing, as appropriate. The course would be accepted as a prerequisite for COMP 2190 as an alternative to the existing prerequisite (COMP 1020).

COMP 1012 – Computer Programming for Scientists and Engineers

Calendar Description: An introduction to computer programming suitable for solving problems in science and engineering. Students will implement algorithms for numerical processing, statistical analysis and matrix operations. (Lab required)

Prerequisite: Mathematics 40S.

Corequisite: MATH 1500 or MATH 1510.

Cannot be held with: COMP 1010.

This course is a prerequisite for: COMP 1020, COMP 2190.

Outline

1. Numerical computation (3 weeks)
   - input and output
   - data types
   - evaluation of complex floating-point expressions
2. One-dimensional arrays and control structures (3 weeks)
   - computing basic statistics (mean, standard deviation, histograms)
   - random number generation and simulations
3. Procedural programming (2 weeks)
   - subprograms, parameters and return values
   - evaluation of sequences and series
   - convergence issues
4. Multi-dimensional arrays (3 weeks)
   - matrix manipulation and operations
   - large data sets
   - geometric interpretations
5. Topics (2 weeks)
   - simulation of dynamic systems
   - character-based data, pattern matching, and bioinformatics
   - symbolic computation

Textbook: *A Primer on Scientific Programming with Python, 2nd Edition*, by Hans Petter Langtangen, Springer, 2011.