Introduction to Algorithms & Programming
(COMS1018)

February, 2015

http://www.cs.wits.ac.za/~celik/COMS1018

Teaching Staff:
• Lecturer: Prof. Turgay Çelik, email: Turgay.Celik@wits.ac.za, office: UG22
• Lab Assistant(s): To be announced (TBA)

Course Description: This course provides an introduction to problem solving through algorithmic thinking using the basic building blocks sequence, selection, repetition and abstraction. Translation of algorithms into working C++ programs and advanced C++ programming features including parameter passing mechanisms, static and dynamic array allocation, file input/output, and pointer arithmetic fall into the main scope of the course.

Course Objectives: At the completion of this course, students will be able to:
• apply fundamental building blocks of algorithms (sequence, selection, repetition, abstraction) for developing solutions;
• recall some fundamental algorithms and transfer algorithmic methods and skills to new problems;
• analyze simple problems, construct algorithms for their solution;
• translate simple algorithms into working C++ programs, make efficient use of an integrated development environment and work efficiently in small teams.

Prerequisite(s):
• None

Textbook:
• Bjarne Stroustrup, “Programming: Principles and Practice Using C++ (2nd Edition),” Addison-Wesley, 2014. (Recommended textbook, however, you don’t have to buy the book.)

References:
• http://www.cplusplus.com/doc/tutorial/
• http://www.python.org/

Syllabus:
• Introduction to the course:
  – What the course is really about
  – Computer programming
  – First program in C++
  – Compiling, linking, loading and running
• Algorithms and pseudocodes:
  – What is an algorithm?
  – Flowchart and pseudocode representation
  – Decisions, conditionals, branch instructions
  – Looping (jump instructions)
  – Sequencing, branching and looping
• Getting started in C++:
  – Variable declaration and initialization
  – Integer math
  – Floating point math
  – The if/else construct
  – Logical expressions

This course outline is subject to change. Changes, if any, will be announced in class. Students will be held responsible for all changes.
Loops:
- The for loop
- The while loop
- The do/while loop

Functions:
- Motivation for using functions
- User-defined functions
- Call by value, call by reference, reference parameters
- Scope rules

More variable types, data abstraction:
- The float variable
- The character variable
- The array class
- The vector class

More data abstraction, arrays, structures, classes:
- Arrays
- Character arrays
- Structures
- Classes

Miscellaneous topics:
- Random number generation
- Simple sorting
- Recursion
- Input/output from/to files
- Command line arguments

Introduction to programming in Python:

Meeting Times and Venues:

<table>
<thead>
<tr>
<th>Event</th>
<th>Day</th>
<th>Times</th>
<th>Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Tuesday</td>
<td>10:15–12:00</td>
<td>CB142</td>
</tr>
<tr>
<td>Lecture</td>
<td>Thursday</td>
<td>14:15–15:00</td>
<td>FNB33</td>
</tr>
<tr>
<td>Lab</td>
<td>Thursday</td>
<td>15:15-17:00</td>
<td>MSL</td>
</tr>
<tr>
<td>Office Hours</td>
<td>Wednesday</td>
<td>12:00–14:00</td>
<td>UG22</td>
</tr>
</tbody>
</table>

Grading Policy: At the end of COMS1018 a final examination paper will be written. It will count for 60% of the final mark. The remaining 40% will be allocated to class tests, laboratory test and assignments as follows:

- Class Tests (2) 20%
- Laboratory Test (1) 10%
- Assignments (5) 10%

The following table shows the dates, weights and times associated with these assessment activities:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Weight</th>
<th>Time</th>
<th>Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Test 1</td>
<td>26/03/2015</td>
<td>10%</td>
<td>14:00–15:00</td>
<td>RW4/5</td>
</tr>
<tr>
<td>Class Test 2</td>
<td>21/05/2015</td>
<td>10%</td>
<td>14:15–15:00</td>
<td>TBA</td>
</tr>
<tr>
<td>Lab Test</td>
<td>14/05/2015</td>
<td>10%</td>
<td>15:15–17:00</td>
<td>MSL</td>
</tr>
<tr>
<td>Final Exam</td>
<td>TBA</td>
<td>60%</td>
<td>TBA</td>
<td>TBA</td>
</tr>
</tbody>
</table>

The final examination consists of one, one and a half hour paper, whose scope and content comprises of all the material covered during the course, such as lectures, tutorials, practicals, assignments and so on. The ratio of the course work mark to the examination mark is 40% to 60%. To pass the course, you need to obtain at least 50% as your final examination mark. Just like the class tests you will be writing during the course, the final examination is also a closed book examination. Your notes and other items of information

This course outline is subject to change. Changes, if any, will be announced in class. Students will be held responsible for all changes.
are not permitted, either in your person or anywhere near where you will be sitting for your examination. Whatever material you may need for the examination will be clearly specified on your examination paper.