COMSW 1003-1

Introduction to Computer Programming in C

Lecture 1

Spring 2011

Instructor: Michele Merler

http://www1.cs.columbia.edu/~mmerler/comsw1003-1.html
Course Information - Goals

“A general introduction to computer science concepts, algorithmic problem-solving capabilities, and programming skills in C”

- Learn how to program, in C
- Understand basic Computer Science problems
- Learn about basic data structures
- Start to think as a computer scientist
- Use all of the above to solve real world problems

University bulletin
Course Information - Instructor

• Michele Merler
  – Email: mmerler@cs.columbia.edu or mm3233@columbia.edu
  – Office: 624 CEPSR
  – Office Hours: Friday 12pm-2pm

• 4th year PhD Student in CS Department

• Research Interests:
  – Image & Video Processing
  – Multimedia
  – Computer Vision
Course Information- TA

- TDB
  - Email: TDB@columbia.edu
  - Office: TA room
  - Office Hours: TDB
Course Information- Courseworks

We will be using Courseworks (https://courseworks.columbia.edu/) for:

• Message board for discussions
• Submit Homeworks
• Grades

Check out the board before you send an email to the instructor or the TA, the answer you are looking for could already be there!
Course Information
Requirements and Books

Requirements
• Basic computer skills
• CUNIX account

Textbooks
• The C Programming Language (2nd Edition)
  by Brian Kernighan and Dennis Ritchie
  http://www1.cs.columbia.edu/~mmerler/coms1003-1/C Programming Language.rar

• Practical C Programming (3rd Edition) by Steve Oualline
Course Information - Grading

- 5 Homeworks (10%, 10%, 10%, 10%, 10%)
- Midterm Exam (20%)
- Final Exam (30%)
Course Information

Academic Honesty

It’s quite simple:
• Do not copy from others
• Do not let others copy from you

Do your homework **individually**

Please read through the department’s policies on academic honesty
Course Information - Syllabus

Go to class webpage

http://www1.cs.columbia.edu/~mmerler/coms1003-1_files/Syllabus.html
What is Computer Science?

**Computer science** (sometimes abbreviated **CS**) is the study of the theoretical foundations of **information** and **computation**, and of practical techniques for their implementation and application in computer systems

"Computer science and engineering is the systematic study of algorithmic processes—their theory, analysis, design, efficiency, implementation, and application—that describe and transform information"

"Computer science is the study of information structures"

"Computer Science is the study of all aspects of computer systems, from the theoretical foundations to the very practical aspects of managing large software projects."
Massey University

Wikipedia
What is Computer Science?

Computer Science is the discipline that studies how to make computers perform tasks that are too complex or boring for humans.
Why programming?

- We need a way to tell computers what to do.
- It would be nice to communicate with computers in English, but...
  - English can be ambiguous!
  - Computers only understand binary!
- Solution: programming languages
What is a Program?

• A **Program** is a sequence of instructions and computations

• We’ll be designing programs in this course.

• These programs will be based on **algorithms**

• An **Algorithm** is a step-by-step problem-solving procedure
Example

• Add 3 large numbers
  ▪ 453 + 782 + 17,892

• Hard to do all at once
  ▪ Solution: “divide and impera”!
  ▪ (453 + 782) + 17,892 =
  ▪ 1,235 + 17,892 = 19,127

• Algorithms help us divide and organize complex problems into sub-problems which are easier to solve (bottom-up approach)
Programming

• Back in the day, programmers wrote in **Assembly**, a language where each word stands for a single instruction

  ```
  add     eax, edx
  shl     eax, 2
  add     eax, edx
  shr     eax, 8
  sub     cl, al
  ```

• But then they had to **hand translate** each instruction into binary!!!

• Solution: the **assembler**, a computer program to do the translation

• From then, programmers could worry only about writing assembly code

• Then they started to devise higher level languages (FORTRAN, COBOL, PASCAL, C, C++, JAVA, Perl, Python, etc.), which get translated into Assembly by **compilers** (we will use **GCC**, a C compiler for Unix)
What is C?

• Programming language developed by Dennis Ritchie in 1972 at AT&T Bell labs

• Why is it named “C”?
  Well... the B programming language already existed!

• C is still the most used programming language for Operating Systems

• Popular because:
  • Flexible
  • C compiler was widely available

• Basis for other popular programming languages: C++, C#
What is C?

• Among the “high level” programming languages, C is one with the lowest level of abstraction

• Close to English, but more precise!

• Easy to compile into Assembly => Fast

• Rich set of standard function = we don’t have to implement everything from scratch!
Why C? Interesting Facts ...


slide credit: Priyank Singh
Why C? Interesting Facts ...

Why C? Interesting Facts ...


Slide credit: Priyank Singh
Example of C program

Hello world!
Announcements

• Homework 0 is out! Due at the beginning of next class

• Bring your laptop to class