

Advanced Programming

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Overview

- Background
 - What is Advanced Programming?
 - Differences to "old" Software Engineering
 - Who should be here?
- Syllabus
- Logistics
- Grading

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Background

- Experimental course – trial run for replacement for traditional CS 3156 (*Software Engineering*)
- Sequence:
 - Intro: modules, few dozen lines
 - DS: few hundred lines, stand-alone
 - AP: larger programs, different languages and styles
 - OS, networking, ISP, ...: specialized knowledge

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What is Advanced Programming?

- Become comfortable with multiple languages
- Multiple programming styles
- *Professional* programming:
 - program building
 - multi-person code development
 - systematic debugging
 - performance tuning
- Goal: robust, performing, industrial-strength code

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Differences to *Software Engineering*

- Less emphasis on software engineering principles
 - more on tools and techniques
 - some SE is best read, rather than lectured
 - hopefully, SE will make more sense afterwards...
- CS4156 will remain
- Group programming project?

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Who should be here?

- Know Java (and 313x), but no or little C/C++
- Likely doing systems or general track
- Want to do well in OS, DB, Networks, ...
- Interested in how real systems work
- Affinity for programming, not complexity theory

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Syllabus

- C programming language for Java programmers (2 weeks, 2 assignments)
 - summary of differences
 - pre-processor
 - strings
 - stdio
 - pointers and pointer arithmetic
 - malloc/free
 - unions
 - function pointers

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Syllabus

- Software development models, including open source
- Software development tools:
 - Unix
 - make
 - automake
 - autoconf -- cross-platform development
 - CVS
 - doc++ and other documentation tools [Oxygen](#)
 - gdb and DDD
 - purify, ElectricFence
 - truss

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Syllabus

- profiling: gprof
- Windows
 - Visual C
 - Code Warrior
- Program models: data driven, event driven, cgi, RPC, ...
- UML
- Data interchange
 - classical Unix style
 - serialization
 - XML

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Syllabus

- Scripting languages
 - sh
 - awk, sed
 - Tcl, expect
 - Perl
 - Python
- Standard Unix system call interface:
 - file access
 - time and date manipulation
 - system files
 - process management
 - signals
 - getopt
 - syslog

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Syllabus

- Internationalization
- secure programming
- design patterns
- web programming models (servlets, cgi, JavaScript, PHP, ...)
- web database interfaces (JDBC, MySQL, ...)
- Time permitting (these topics are also covered in CS 4118):
 - threads and concurrency
 - shared memory

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Logistics

- Web page:
<http://www.cs.columbia.edu/~hgs/teaching/ap/>
- Mailing list:
 - advanced-programming@cs.columbia.edu
 - Mailman (lists.cs.columbia.edu)
 - As-written or *digest* once a day
 - Web archive ~ newsgroup
- Office hours: Th, 5.30-7.30 pm, 815 CEPSP
- TA: Nikil Tiwari (nst8@columbia.edu)

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Books - required

- *Advanced Programming in the Unix Environment*, by W. Richard Stevens, Addison-Wesley. [ISBN 0201563177](#)
- *Code Complete : A Practical Handbook of Software Construction*, by Steve C McConnell, Microsoft Press. [ISBN 1556154844](#)

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Books - useful reading

- *Mythical Man Month*, by Frederick P. Brooks, Addison-Wesley. [ISBN 0201835959](#)
- *Building Secure Software*, by John Viega and Gary McGraw, Addison Wesley. [ISBN 020172152X](#)
- *Software Project Survival Guide*, by Steve C McConnell, Microsoft Press. [ISBN 0201563177](#)

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Grading

- Midterm 30%, final exam 40%, homework assignments 30%
- Group project(s) - NO

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Assignments

- Weekly programming assignments
- To be done individually.
- Conform to [coding style](#) guidelines.
- You **will lose points** if you don't follow the guidelines.

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Ombudsperson

- New course – new problems
- Designated, random individual
- Act as relay for "issues"
- Assumed to speak for (subsection of) class, not themselves
- Quicker than mid-term review

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