Aims

This course explores techniques and software tools that can be used in the production of high-quality, medium-size software systems.

By the end of the course, you should:

- understand the software development process and appreciate the use of specific technologies and strategies during different phases of software development
- be able to implement software systems via the Unix shell and Perl scripting languages
- be able to implement (components of) software systems in the C programming language
- be able to choose appropriate interfaces for users to interact with software systems and for software systems to interact with each other
- be able to experimentally analyse properties of existing programs, both in terms of correctness (by testing) and efficiency (by profiling)
- be able to improve the properties of existing programs, both in terms of correctness (by debugging) and performance (by tuning)
- be able to understand the configuration and installation of software systems under the Unix environment that use Make, CVS and Configure scripts

Assumed knowledge/prerequisites

COMP2041 this time will assume that you have a sound understanding of the C programming language, up to the level at which it is covered in COMP1021/COMP1721 or the postgraduate course COMP9021. It would also be useful if you had taken COMP2011 Data Organisation or COMP9024 Data Structures and Algorithms, simply to have more extensive programming experience. However, you should be able to cope as long as you have a *good* pass in at least one C-based course. You can do COMP2011 concurrently with COMP2041 if you wish. COMP2021 Digital Systems Structures is not specifically relevant for this course, but, once again, if you have already done it, the extra experience with programming will help you

Course Web Pages

http://www.cse.unsw.edu.au/~cs2041/

Staff

Staff Name	Role	Email	Extension
John Plaice	Lecturer-in-Charge		
Mike Bain	Lecturer (Weeks 2-5)		
Loc Huynh	Course Administrator	cs2041@cse.unsw.edu.au	55683

Please send your queries to the class account email cs2041@cse.unsw.edu.au
or use the on-line forum for general questions.

Syllabus

The following is a summary of the topics that will be covered in this course. For more information (e.g. level of detail for each topic) consult the course Web pages.

1. Qualities of software systems
   - Correctness, clarity, reliability, efficiency, portability, ...
2. Techniques for software construction
   - Analysis, design, coding, testing, debugging, tuning
   - Interface design, documentation, configuration
3. Tools for software construction
   - Programming languages (C)
   - Scripting languages (Perl, shell, CGI)
   - Filters (sed, grep, tr, sort, uniq, ...)
   - Analysis tools (debuggers, profilers)
   - Configuration tools (make, svn)

The focus for the practical work will be on Perl, shell scripting and tools, and C.

Lectures, Tutorials, and Labs

Each week there will be a one-hour lecture on Tuesday and a two-hour lecture on Thursday. Lectures will be used to present the theory and practice of the techniques and tools in this course. There will be extensive use of case studies and practical demonstrations during lectures. Lecture notes will be available on the course Web pages prior to each lecture (usually on the weekend before); you should print them out and bring them along to annotate during the class.

Lecture timetable:

Day	Time	Location
Tuesday	16:00-17:00	Central Lecture Block (CLB) 7
Thursday	15:00-17:00	Central Lecture Block (CLB) 7

Each week you will also be expected to attend a one-hour tutorial session to clarify ideas from lectures and work through exercises based on the lecture material. You will have registered in a tut/lab combination as part of your enrolment through myUNSW.

Following the tutorial class each week, there will be a two-hour lab class, during which you will work on a variety of small practical problems involving the tools introduced in lectures. Because this course is practical in nature, labs are a very important component, and they contribute to the overall mark. You should make every effort to attend the labs and complete the exercises diligently. In particular, **keep up-to-date** with the Lab work; if you fall behind it affects your ability to understand later material in the course.

COMP9041 students are recommended to attend tutorials and labs, but may opt to complete the work in their own time and not have it formally assessed. See Assessment notes.

Tutorials and labs start from week 3.

Assignments

In the assignments, you will work through the process of building and/or modifying software systems, using the tools and techniques described in lectures. The first assignment will involve Perl, while the second assignment will involve C programming.

Assignment	Description	Due
1	Perl programming	Week 7
2	C programming	Week 13

In keeping with requirements of the Academic Board, assignments for COMP9041 will be extended versions of the undergraduate equivalents.

Plagiarism

All work submitted for assessment must be your own work. Lab exercises and assignments must be completed *individually*. We regard copying of assignments or lab exercises, in whole or part, as a very serious offence. We use sophisticated plagiarism detection software to search for unreasonable similarities in submitted work.

- Submission of work derived from another person, without their consent, will result in automatic failure for the course with a mark of zero.
- Submission of work derived from another person with their knowledge, or jointly written with someone else, will result in zero marks for the submission.
- Allowing another student to copy from you will, at the very least, result in a reduction in the mark awarded for your own assignment or lab exercises. Do not provide your work to any other person, even people who are not UNSW students. You will be held responsible for the actions of anyone you provide your work to.
- Severe or second offences constitute academic misconduct, and will result in automatic failure, or exclusion from the University.

Prac Exam and Written Exam

There will be a three-hour practical exam, to be held in the CSE labs during the exam period . During this exam, you will be required to solve small programming problems, similar in nature to those completed in the lab classes. It is a hurdle requirement for this course that you perform satisfactorily on the prac exam. This is defined as solving a minimum number of the programming tasks (different for COMP2041 and COMP9041). You will be provided with on-line documentation, access to lecture notes, and a testing system in the exam to allow you to check your program's correctness.

There will also be a two-hour closed-book written exam for this course in the exam period. The written exam contributes

30% of the overall mark for the course.

Assessment

The following formula describes precisely how the mark will be computed and how the hurdle will be enforced.

Undergraduate students: COMP2041

```
labs   = mark for lab exercises  (out of 10)
ass    = mark for assignments    (out of 25)
prac   = mark for practical exam (out of 35)
exam   = mark for written exam   (out of 30) [scaled]

okExam = prac_tasks_solved >= 2 && written_exam >= 15/30

mark   = labs + ass + prac + exam
grade  = HD|DN|CR|PS   if mark >= 50 && okExam
       = PC*           if mark between 46 and 50  && okExam
       = UF            if mark >= 46 && !okExam
       = FL            otherwise
```

* whether or not a PC is awarded depends on your other results. PCs are ***not*** awarded to postgraduate students.

Postgraduate students: COMP9041

```
labs** = mark for lab exercises  (out of 10)
ass    = mark for assignments    (out of 25)
prac   = mark for practical exam (out of 35)
exam   = mark for written exam   (out of 30) [scaled]

okExam = prac_tasks_solved >= 3 && written_exam >= 15/30

mark   = labs + ass + prac + exam
grade  = HD|DN|CR|PS   if mark >= 50 && okExam
       = UF            if mark >= 50 && !okExam
       = FL            otherwise
```

** Labs are not compulsory for postgraduate students. Postgraduate students may elect (before week 3) an alternative distribution of

```
ass    = mark for assignments    (out of 30)
prac   = mark for practical exam (out of 40)
exam   = mark for written exam   (out of 30) [scaled]

mark   = ass + prac + exam
```

Note: PCs are ***not*** awarded to postgraduate students.

Both the Prac Exam and the Final Exam are hurdle requirements. If you fail to achieve a satisfactory standard in either of them, you will be given a grade of FL (if the overall mark is low), or UF (failure: unsatisfactory performance in a compulsory component).

The required standard in the Prac Exam is two tasks solved (three for COMP9041) of the 5 set. For the Final Exam, you must achieve a pass (15/30) on the scaled exam marks.

The lecturer may scale overall result, or individual components, up or down to reflect variations in assessment standards.

Reading Materials

The following book is the recommended text for this course:

- Kernighan & Pike, *The Practice of Programming*, Addison-Wesley.
  (Gives theory, philosophy and some tool details)

Other useful reference books include the following:

- Wall et al., *Programming Perl* (3rd ed), O'Reilly, 1996.
  (Invaluable Perl reference manual)
- McConnell, *Code Complete*, Microsoft Press, 1993.
  (Ok, ok, so it's Microsoft Press ... but it has many interesting case studies and good ideas)
- Peek, O'Reilly, Loukides, *Unix Power Tools*, O'Reilly, 1997.
  (Comprehensive guide to common Unix tools)
- Robbins, *Unix in a Nutshell: System Vr4 and Solaris 7*, O'Reilly, 1995.
  (Concise guide to Unix and its toolset)

- Loukides & Oram, *Programming with GNU Software*, O'Reilly, 1997.
  (Concise guide to the GNU toolset (gcc, gdb, make, gprof))
- Sebesta, *A Little Book on Perl*, Prentice Hall, 1999.
  (Neat little book on Perl, if you don't want a big heavy one)
- Christiansen et al., *Perl Cookbook*, O'Reilly, 1998.
  (Lots and lots and lots of interesting example Perl programs)
- Kernighan & Pike, *The Unix Programming Environment*, Prentice Hall, 1984.
  (Pre-cursor to the textbook, intro to Unix tools)

For pointers to other useful reading material, including documentation for all of the tools used in the practical work, see the course Web pages.