Aims

This course aims to explore 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

Pre-requisites

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. It would also be useful if you had passed COMP2011 Data Organisation before attempting this course, simply to have a greater level of programming experience. However, you should be able to cope ok as long as you have a *good* pass in COMP1021 Computing 1B or COMP1721 Higher Computing 1B. 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

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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 (awk, sed, grep, tr, ...)
   - Analysis tools (debuggers, profilers)
   - Configuration tools (make, rcs, cvs)

The focus for the practical work will be on C and Perl. However, you would be well advised to acquaint yourselves with the facilities provided by the Unix shell.

Reading Materials

The following book is the recommended text for this course:

- Kernighan & Pike, *The Practice of Programming*, Addison-Wesley, 1998.
  (Gives theory, philosophy and some tool details)

Another useful and interesting book that you might consider buying:

- McConnell, *Code Complete*, Microsoft Press, 1993.
  (Ok, ok, so it's Microsoft Press ... but it has many interesting case studies and good ideas)

Other useful reference books include the following:

- 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))
- Wall et al., *Programming Perl* (2nd ed), O'Reilly, 1996.
  (Invaluable Perl reference manual)
- 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.

Classes

Each week there will be a one-hour lecture on Wednesday 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 before each lecture; you should print them out and bring them along to annotate during the class.

Lecture timetable:

Day	**Time**	**Location**
Wednesday	12pm-1pm	Biomed C
Thursday	10am-12pm	Biomed D

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. Tutorial registration will occur via Sirius in week 2.

Following the tute 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, lab class are a very important component, and 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.

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. The assignments together contribute 20% of the overall mark for the course.

Ass	**Description**	**Due**	**Marks**
1	Perl	Week 8	10%
2	C programming	Week 13	10%

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 plagiarism detection software to search for multiply-submitted work.

- Submission of work derived from another person, or jointly written with someone else will, at the very least, result in automatic failure for COMP2041 with a mark of zero.
- Allowing another student to copy from you will, at the very least, result in a mark of zero for your own assignment or lab exercises. Do not provide your work to any other person, even people who not UNSW students. You will be held responsible for the actions of anyone you provide your work to.
- Severe or second offences will result in automatic failure, exclusion from the university, and possibly other academic discipline.

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 at least two of the programming problems. You will be provided with a testing system in the exam to allow you to check whether your program is correct or not. The prac exam contributes 40% of the overall mark for the course.

There will also be a two-hour closed-book written exam for this course in the June/July exam period. The exam will consist of a mixture of multiple-choice, descriptive questions, quantitative analysis, and small programing exercises, and will include material related to the assignment work. You will not be expected to remember the details of programming languages used in the course; reference information will be provided along with the exam paper, giveing a summary of any language that we expect you to use. Written exam programming questions will be marked leniently with respect to to precise syntax. The written exam contributes 30% of the overall mark for the course.

Assessment

The course assessment includes components from lab work, project work, a prac exam and a final written exam, in the following proportions:

Component	Ident	Value		Component	Ident	Value
Lab Work	`lab`	10%		Assignments	`ass`	20%
Prac Exam	`prac`	40%		Final Exam	`exam`	30%

Your **final mark** in this course will be the sum of the above components. Your **final grade** will be determined by your performance on the individual components. Note: 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 UF (which is a fail in this course). The required standard in the Prac Exam is two questions solved. For the Final Exam, you must achieve a pass (15/30) on the scaled exam marks.

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

```
labs   = mark for lab exercises  (out of 10)
ass    = mark for assignments    (out of 20)
prac   = mark for practical exam (out of 40)
exam   = mark for written exam   (out of 30) [scaled]

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

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