

Course Outline

COMP2411: Logic and Logic Programming

Aims

This subject aims to introduce a number of logical systems of importance in computer science. By the end of the subject, students should:

- be conversant with the syntax and semantics of propositional and predicate logic
- be familiar with a variety of applications of predicate logic in software verification, databases and knowledge-based systems
- be able to write specifications in predicate logic expressing state constraints
- understand the notion of formal proof, and be able to construct simple proofs in a natural deduction proof system for predicate logic
- be aware that there are inherent expressiveness and computational limitations to the applicability of logical systems, and be familiar with a number of restrictions under which the computational limitations can be overcome
- be able to write programs in a logic programming language,
- understand both the top-down and the bottom up operational semantics of logic programs
- be familiar with a logic for reasoning about sequential programs, and capable of constructing correctness proofs for simple programs

Pre-requisites

COMP1021 or COMP2811

Web Pages

Material related to this subject will be maintained at the following web page:
<http://www.cse.unsw.edu.au/~cs2441/>.

Staff

Lecturer in Charge: Ron van der Meyden; office: GAS (K17) 210; phone: 9385 4897; email: meyden@cse.unsw.edu.au
Tutors: to be advised — see the web page

Syllabus

The following is a summary of the topics that will be covered in this subject. A more detailed plan will be maintained on the subject web page.

- propositional logic
 - syntax and semantics
 - natural deduction proofs
 - decision procedures
 - Horn fragment
- predicate calculus
 - syntax and semantics
 - natural deduction proofs
 - undecidability and incompleteness
- Logic Programming
 - Horn fragment of predicate logic
 - unification and top-down operational semantics
 - use of a logic programming language
 - Datalog and bottom up operational semantics
- Reasoning about sequential programs

- partial correctness assertions
- computing weakest preconditions
- loop invariants
- reasoning about termination

Reading Material

The textbook for this subject is

- Logic in Computer Science, Modelling and Reasoning about Systems, M.R. Huth and M.D. Ryan, Cambridge University Press 2000.

This will be supplemented by lecture notes and additional readings. Pointers to further reading material will be provided on the web page.

Classes

Lecture timetable:

- Tuesday 2-3pm EEG24
- Thursday 12-2pm EEG24

Starting in Week 2, there will be a one hour tutorial each week of session. In most weeks, students should also expect to devote one hour to lab time. The tutorial may be held in the lab depending on the subject matter.

Assignments

Collaboration on assignments between *no more than two people* will be permitted on this subject. However, if you submit an assignment that is the work of two people, you must submit *one copy only* listing the names of both. The mark for the assignment will be evenly divided between the two. Thus, the maximum mark an individual can gain when submitting an assignment marked out of 10 under two names is 5.

Assignments submitted under one person's name *must be the work of one person*. Submitting multiple copies of collaborative work under different names, or submitting the work of another under your own name is plagiarism. The penalty for any instance of this will be zero marks for the whole subject.

Exams

There will be a midterm exam of 1.5 hours duration held in class 12-1:30pm on Thus April 20. A final exam of 3 hours duration will be held in the examination period at the end of session.

Assessment

The best way to learn the subject matter of this course is to solve a lot of problems. To encourage this, there will be regular small problem sets. In addition, the logic programming component of the subject will be assessed by a major programming assignment.

Regular written exercises	20
Midterm Exam	20
Programming assignment	20
Final Exam	40

In order to pass the subject, you must score better than 30/60 on the combined midterm and final exam marks.