

UNIT GUIDE

COMP474 Advanced Topics in Programming Languages

First Half 2010

Teaching Staff

Convenor and Lecturer

Tony Sloane, Anthony.Sloane@mq.edu.au, E6A315, 98509582

Lecturer

Dom Verity, domv@ics.mq.edu.au, E6A325, 98509522

Co-badging

This unit is only available as COMP474.

Unit description

This unit is concerned with the principles of functional programming languages. We will first study lambda calculus which provides a framework for understanding all programming languages. This topic will be followed by study of a Scheme-like higher-level functional programming language. In each case, students will write programs in the language and learn how to implement it.

Practical work in this unit will use the Kiama language processing library under development at Macquarie. Kiama provides a suite of useful language processing paradigms embedded as libraries within the high-level Scala programming language. Topics in Kiama and Scala will be covered as needed.

Expected Learning Outcomes and Graduate Capabilities

- *An understanding of the theoretical foundations of functional programming.*
- *Practical experience in writing functional programs.*
- *Experience in implementing functional languages.*

- *Discipline Specific Knowledge and Skills*
- *Critical, Analytical and Integrative Thinking*
- *Problem Solving and Research Capability*
- *Creativity and Innovation*
- *Effective Communication*

Classes

COMP474 has a single two hour class per week that will be a mixture of lecture, demonstration and tutorial. Classes will held in Weeks 1-6 of the semester. During the remaining weeks students will work on their projects and consult with the lecturers as

needed. A session will be organised near the end of the semester for students to present their projects to the class.

Online Resources

COMP474 resources, assignment submission etc will be performed using the Department of Computing Moodle site (<https://moodle.comp.mq.edu.au/>). Students should check the Moodle site regularly for unit updates.

Technology Used and Required

COMP474 will be taught using the Scala programming language (<http://www.scala-lang.org/>) so an implementation of Scala is needed. The easiest option for most people is to use the Scala plugin for the Eclipse IDE which runs on Windows, Mac OS X and Linux, but there are other options, including command-line usage. For the available options and instructions for installation, see the Scala site, particularly under Software | Download Scala | IDE support.

Unit Materials

Recommended Text

M. Odersky, L. Spoon and B. Venners. *Programming in Scala*. artima press, 2008.

Copies of this book will be made available to students for use as a Scala reference during the semester. Some topics that are particularly unusual in Scala will be covered in class, but students will be responsible for applying their existing programming knowledge to Scala. The books must be returned after the semester. Notes will be made available as readings for the topics that are not covered by the textbook.

Topics

<i>Week</i>	<i>Topic</i>
1	Lambda calculus basics, parsing combinators in Scala
2	Semantic checking for lambda calculus, attribute grammars in Kiama
3	Evaluation of lambda calculus, term rewriting in Kiama
4	Practical Functional Programming and ISWIM
5	Continuations and Control Flow in Functional Programming
6	Compiling Functional Languages and the SECD Machine

Summary of Assessment Tasks

Assessment in COMP474 consists of two assignments and a project which will involve using and implementing functional programming languages using Scala and the Kiama library. The assignments are designed to provide practice with basic skills. The project provides an opportunity for students to apply those skills to a more involved task.

<i>Task</i>	<i>Topic</i>	<i>%</i>	<i>When Due</i>
Lambda calculus assignment	Weeks 1-3	15	Week 5
ISWIM Assignment	Weeks 4-6	15	Week 8
Project Code	All topics	30	June 18
Project Report	Project	20	June 18
Project Presentation	Project	20	Week of June 18

Examination Conditions

There is no examination.

Extension Requests

Requests for a deadline extension for an assessment task will not be granted other than in exceptional circumstances involving serious and unavoidable disruption.

In the event of serious and unavoidable disruption, special consideration may be granted for any assessment task in accordance with the Macquarie University policy on Special Consideration (see Useful Resources below). It is Department of Computing policy that a student who is granted special consideration for the final examination will be asked to sit a supplementary examination.

Useful Resources

All students should familiarize themselves with the policies that govern learning and teaching at Macquarie University, in particular:

- Macquarie University Academic Honesty Policy
<http://www.student.mq.edu.au/plagiarism/>
- Macquarie University Assessment Policy and Code of Practice
<http://www.mq.edu.au/policy/docs/assessment/policy.html>
http://www.mq.edu.au/policy/docs/assessment/policy_code_of_practice.html
- Macquarie University Special Consideration Policy
http://www.mq.edu.au/policy/docs/special_consideration/policy.html

Macquarie University also provides a range of Academic Student Support Services. Details of these services can be accessed at <http://www.student.mq.edu.au>.

If all other avenues have been exhausted, serious issues relating to study in the Department of Computing in general or in this unit in particular should be raised with the Department's Director of Teaching (Dr. Christophe Doche) or the Head of Department (Prof. Bernard Mans).

Changes to the Unit Since the Last Offering

The main change to COMP474 since the last offering is to use the Scala language instead of the Haskell language. The general aim of the unit to teach functional programming language implementation concepts and techniques is the same.