Wellesley College ◊ CS251 Programming Languages ◊ Spring 2000

COURSE SYLLABUS
(Revised as of Februrary 27, 2000)

Notes:

- *This is a revised syllabus that includes extensive modifications to the syllabus handed out at the beginning of the term.*
- *This syllabus is tentative. It will be updated throughout the rest of the term to incorporate additional readings and indicate our actual progress.*
- *The readings listed with a lecture cover the material in that lecture. You are encouraged to do the reading **before** the associated lecture.*

Jan 27 (Thu) Lecture 1: Introduction
Topics: Programming language dimensions; programming paradigms; interpretation and compilation; Scheme examples.

Jan 28 (Fri)
Out: Problem Set 1 (Scheme) – due Friday, Feb 11.

Feb 1 (Tue) Lecture 2: Scheme I
Topics: Core constructs; function creation and invocation; substitution model; syntactic sugar.
Reading: SICP 1.1, 1.2.

Feb 3 (Thu) Lecture 3: Scheme II
Topics: Pairs and lists; list recursion; symbols and quotation.
Reading: SICP 2.1, 2.2—2.2.2, 2.3.

Feb 8 (Tue) Lecture 4: Higher-order Functions I
Topics: S-Expressions, functions as first-class citizens.
Reading: SICP 1.3.

Feb 10 (Thu) Lecture 5: Higher-order Functions II
Topics: Higher-order list manipulation (map, foldr)
Reading: SICP 2.2.3 – 2.2.4.

Feb 11 (Fri)
Due: Problem Set 1 (Scheme).
Out: Problem Set 2 (Higher-Order functions) – due Monday, Feb 28.

Feb 15 (Tue) Lecture 6: Higher-order Functions III
Topics: More higher-order list manipulation (forall, exists, foldl, filter, generate)

Feb 17 (Thu) Lecture 7: Higher-order Functions IV
Topics: Aggregate data paradigm (examples from APL, Unix, Scheme); functional data structures (environments), function composition.

Feb 22 (Tue) Lecture 8: A Simple Language
Topics: An integer expression language (INTEX); abstract and concrete syntax; programs that manipulate programs (size, substitution).

Feb 24 (Thu) Lecture 9: Interpretation

Topics: Substitution model interpreter for INTEX; environment model interpreter for INTEX; adding a naming construct to INTEX (to form BINDEX).

Reading: SICP 3.2.

Feb 28 (Mon)

Out: Problem Set 3 (Simple interpretation) – due Wednesday, March 8.

Due: Problem Set 2 (Higher-order functions).

Feb 29 (Tue) Lecture 10: Program Transformation

Topics: Binding multiple values; scope; program transformation: desugaring and optimization.

Mar 2 (Thu) Lecture 11: First-order Functional Language

Topics: First-order recursion equations; substitution model interpreter; environment model interpreter; block structure; let vs. letrec.

Mar 7 (Tue) Lecture 12: Higher-order Functional Language I

Topics: Closures; substitution model interpreter; environment model interpreter; lexical vs. dynamic scoping.

Reading: SICP 3.2, 4 – 4.2.2.

Mar 8 (Wed)

Out: Problem Set 4 (Interpretation of functional languages) -- due Friday, March 17.

Due: Problem Set 3 (Simple interpretation)

Mar 9 (Thu) Lecture 13: Higher-order Functional Language II

Topics: Parameter passing (call-by-name vs. call-by-value); lazy data; currying.

Reading: SICP 3.5, *MLWP* 5.12 – 5.20, Hughes's "Why Functional Programming Matters".

Mar 14 (Tue) Lecture 14: ML I

Topics: Typeful programming; primitive, function, and list types; parametric polymorphism; pattern matching.

Reading: MLWP Chapters 2, 3, 5.1-5.11.

Mar 16 (Thu) Lecture 15: ML II

Topics: Data types; more pattern matching; interpreters revisited.

Reading: MLWP Chapters 4, 9.

Mar 17 (Fri)

Out: Problem Set 5 (Typeful programming) -- due Friday, March 31.

Due: Problem Set 4 (Interpretation of functional languages)

Mar 18 (Sat) -- Mar 26 (Sun) *Spring Break*

Mar 28 (Tue) Lecture 16: Monomorphic Types I

Topics: Typing rules; type derivations; simple type checking.

Mar 30 (Thu) Lecture 17: Monomorphic Types II

Topics: Simple type inference.

Mar 31 (Fri)
Out: Problem Set 6 (Types) -- due Friday, April 14.
Due: Problem Set 5 (Typeful programming)

Apr 4 (Tue) Lecture 18: Polymorphic Types
Topics: Parametric polymorphism: typing rules, type checking, type inference.

Apr 6 (Thu) Lecture 19: Imperative Programming
Topics: Mutable data; mutable variables; memoization; imperative programming; benefits and drawbacks of state.
Reading: SICP 3.1— 3.3; *MLWP* Chapter 8

Apr 11 (Tue) Lecture 20: Continuations
Topics: Continuation passing style; continuation-passing interpreters; non-local exits.

Apr 13 (Thu) Lecture 21: Exception Handling
Topics: Raising and handling exceptions.

Apr 14 (Fri)
Out: Problem Set 7 (Imperative Programming) -- due Friday, April 28.
Due: Problem Set 6 (Types)

Apr 18 (Tue) Lecture 22: Logic Programming I
Topics: A query language
Reading: SICP 4.4 – 4.4.1

Apr 25 (Tue) Lecture 23: Logic Programming II
Topics: Implementing the query language
Reading: SICP 4.4.2 – 4.4.4

Apr 27 (Thu) Lecture 24: Object-Oriented Programming I
Topics: Objects as closures; message passing; inheritance.

April 28 (Fri)
Due: Problem Set 7 (Imperative Programming)
Out: Problem Set 8 (Logic/Object-Oriented Programming) – due Friday, May 5.

May 2 (Tue) Ruhlman Conference: *No Classes*

May 4 (Thu) Lecture 25: Object-Oriented Programming II
Topics: Benefits and drawbacks; message passing vs. generic functions; single vs. multiple inheritance.
Reading: SICP 2.4 – 2.5

May 5 (Fri, Tues Schedule) Lecture 26: Jeopardy!
Due: Problem Set 8 (Object-Oriented Programming)

There will be an open-book CS251 final examination during the normal final exam period.