Version of 24 January 2018

Course Information

Lectures

Tuesdays and Thursdays, 11:00-12:15, Dane Smith Hall 123.

Labs

Tuesdays, 5:00-6:00, Centennial Engineering Center B146.

Instructor

Darko Stefanovic. Office hours Mondays 11:00-12:00, Tuesdays 10:00-10:50, and Thursdays 10:00-10:50 in Farris Engineering Center 2020.

Teaching assistant

Joseph Haugh. Office hours Wednesdays 2:00-3:30 and Fridays 11:00-12:30 in Farris Engineering Center 2000.

Course description

From the UNM Catalog:

CS 357 Declarative Programming 3 credits

Course focuses on one of the declarative programming paradigms: functional, logic, or constraint programming. Specialized techniques are introduced with a view towards general principles. Selected advanced topics in programming language design and implementation are covered.

Prerequisite: CS 251L.

Specific outcomes of instruction:
At the completion of this course students will be able to:

- Understand the differences between functional and imperative programming languages.
- Understand recursion on the domains of integers, lists and trees.
- Understand how higher-order functions can be used for procedural abstraction.

- Understand the difference between strong- and weakly-typed programming languages, and between type declaration and type inference.
- Understand how polymorphic functions can be implemented using type classes and how polymorphism facilitates reuse of components.
- Understand how the combination of first-class functions and lazy evaluation contributes to software modularity.
- Understand how referential transparency permits code transformations useful for optimization and parallelization.

Topics and format

In Spring 2018, the course will be an informal introduction to functional programming techniques, using the language Haskell. The textbook is *Programming in Haskell, 2nd Edition*, by Graham Hutton. The course will consist of lectures, extensive programming assignments, three midterm exams, and a final exam.

Textbook

Graham Hutton, *Programming in Haskell*, 2nd Ed., Cambridge University Press, 2016, ISBN-13: 978-1316626221.

Grading

You are expected to attend class regularly, *read the assigned reading before class*, and participate in class discussion. The grade will be determined as follows:

Homeworks 50%

Exams 50% (10% each midterm exam, 20% final exam)

Grading option change requests will not be considered after the last class period.

Homework and programming assignment hand-in policy

This course covers a lot of material. Being late with assignments will hamper your ability to learn the next section of the course. Therefore, late assignments will be penalized $2n^2\%$, where n is the number of days late.

Topics

1. Week 1: introduction to functional programming and Haskell: prelude types and classes (textbook chapters 1–3)

2. Week 2: functions and list comprehensions; polymorphism (chapters 4–5)
3. Week 3: recursive and higher-order functions (chapters 6–7)
4. mid-term exam 1
5. Week 4: declaring types and classes (chapter 8)
6. Week 5: lists in depth: map, filter, foldr, and their algebraic laws
7. Week 6: trees with folds, binary heap trees, rose trees
8. mid-term exam 2
9. Week 7: interactive programming (chapter 10)
10. Week 8: algebraically structured programing: functors, applicatives, and monads (chapter 12)
11. Week 9: monadic parsing (chapter 13)
12. mid-term exam 3
13. Week 10: foldables (chapter 14)
14. Week 11: lazy evaluation and infinite data structures (chapter 15)
15. Week 12: reasoning about programs in Haskell (chapter 16)
16. Week 13: survey of other functional programming languages
17. final exam (cumulative)

Electronic device policy

Laptops, tablets, and phones must be turned off during lectures. (You do not need to take detailed lecture notes; lecture notes will be posted after each class.)

Laptops (or other devices with Haskell installed) are encouraged during labs.

UNM statement of compliance with ADA

Qualified students with disabilities needing appropriate academic adjustments should contact the instructor as soon as possible to ensure their needs are met in a timely manner. Handouts are available in alternative accessible formats upon request. Contact Accessibility Resource Center (Mesa Vista Hall 2021, 277-3506) for additional information.