Preliminary version of 18 January 2025

Course Information

General

This course counts for 3 credits.

Course objectives

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

1. Apply logical verification to establish correctness properties of computer programs.

Prerequisites

One of CS357, CS558, CS556, or equivalent experience, mainly programming in a functional language. (The textbook used in CS357, *Programming in Haskell, 2nd Edition*, by Graham Hutton, in full, is sufficient preparation for the course.)

Requirements

Laptop with VS Code installed.

UNM IT Academic Technologies offers a long-term (semester) laptop loaner program to students who do not have a laptop or whose laptop doesn't meet the computing needs of their program. This laptop loaner program is open to all UNM students on a first-come first-served basis. See `https://it.unm.edu/get-a-computer/computers.html`.

Lectures

Mondays and Wednesdays, 5:00–6:15, in Mech300.

Instructor

Darko Stefanovic, office FEC2020, phone 2776561, email `darko` — office hours Mondays, 4:00-5:00.

Teaching assistant

none

Grading

You are expected to attend class regularly, read the assigned reading before class, participate in class exercises and discussion, and periodically give oral presentations on readings and projects. Your grade will be determined as follows:

- Mid-term exam: 20%
- Final exam: 20%
- Programming assignments: 40%
- In-class exercises: 20%

Programming assignment hand-in policy

Programming assignments are to be submitted online. Detailed instructions will be provided with each assignment. Late programming assignment submissions will be penalized $2n^2$%, where n is the number of days late.

Textbooks

All course materials will be provided online, free of charge.

List of topics (tentative)

- Logic, proofs, natural deduction
- Types, terms, type checking, type inference
- Propositions, types, theorems, programs
- Proof assistants
- Tactics and backward proofs in Lean
- Forward proofs
- Functional programming with dependent types
- Formalizing operational semantics
- Formalizing Hoare logic – axiomatic semantics
- Formalizing denotational semantics
- Verification of programs and compilers

UNM statement of compliance with ADA

Every instructor should include an official statement in their course syllabus. The suggested syllabus statement should include the following text:

"In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as I am not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.
If you need an accommodation based on how course requirement[s] interact with the impact of a disability, you should contact me to arrange an appointment as soon as possible. At the appointment we can discuss the course format and requirements, anticipate the need for adjustments and explore potential accommodations. I rely on the Disability Services Office for assistance in developing strategies and verifying accommodation needs. If you have not previously contacted them I encourage you to do so."