Programming Language Paradigms

CS-231 **Spring 2019**

Course Information

Catalog Course Description: This course examines imperative and functional programming paradigms. Imperative paradigm topics include: data representation, dynamic structures, parameter passing, memory management, and I/O. Functional paradigm topics include: lists, first class and higher order functions, lazy evaluations, and infinite data structures.

Prerequisites: CS-102, Computing and Algorithms II

Course Topics:

- Imperative programming paradigm in C:
  - Problem solving, program design, implementation, and testing.
  - Basic expression and statements: comments, constants, literals, variables and assignments.
  - Control flow: conditional statements and iteration statements.
  - Pointers and memory management.
  - Structures and abstract data types.
  - Pipes and I/O redirection.
- Functional programming paradigm in Haskell:
  - Problem solving, program design, implementation, and testing.
  - Basic types and definitions: booleans, integers, characters.
  - Complex data types: tuples and lists.
  - Functions over lists.
  - Generalization: polymorphism and pattern of computation.
  - Higher-order functions: functions as arguments, function compositions, expressions for functions.
  - Algebraic and abstract data types, e.g. linked list.
  - Lazy evaluation.

Course Objectives: By the end of this course, you should be able to demonstrate the ability to do all of the tasks listed below:

- Imperative programming paradigm in C:
  - Properly design, implement, compile, and test an imperative program.
  - Implement a simple Linux command, e.g. ls.
  - Create, terminate, and execute processes via calls to system routines.

- Functional programming paradigm in Haskell:
  - Properly design and implement a functional program.
  - Use lists together with higher-order functions to solve common programming problems.
  - Create and use polymorphic data structures and functions.
  - Use infinite data structures in programs.

Administrative Information

Textbook: *HASKELL the craft of functional programming, Ed. 3*; Simon Thompson; Addison Wesley copyright 2011

Optional Textbook: *Understanding Unix/Linux Programming,* Molay; Prentice Hall copyright 2003

Optional Textbook: *C: A Reference Manual,* Harbison & Steele Jr.; Prentice Hall copyright 2002

Optional Textbook: *Advanced Programming in the Unix Environment, Ed. 2* ;Stevens & Raga; Addison Wesley copyright 2008

Instructor: Dr. Vineyard

Email: `dvineyar@kettering.edu`

Office: AB 2-300J

Office Hours: 9:00 a.m. to 10:00 a.m. Tuesdays and Fridays, and by appointment

Office Phone: 762-9500, x5768

Course Overview

You will learn how to write code in C and in Haskell, the example languages of imperative and functional paradigms. There will be discussion about different paradigms. There will also be discussions on the types of software developed using languages of these paradigms.

Course Requirements and Grading

Exams, and Assignments

There will be a number of coding assignments in both C and Haskell. Each assignment will have a point value. The assignments in C will be worth 30% of your grade. The

assignments in Haskell will also be worth 30% of your grade. There will also be 2 exams, Thursday of week 5, May 2, is the date for the exam over the C language. The last exam will be given during the final exam period and will test your knowlege of the Haskell language. Each of these exams will be worth 20% of your grade.

You are expected to do your own work. Do not work with other students in the class on material you are to turn in. You will be clearly told of any exceptions to this policy.

Attendance

You are expected to attend each class and lab section, and to be on time. It is your responsibility to know all material which is covered, and all announcements particularly about assignments, due dates, quizes, and tests.

Course Grades and Policies

A percentage will be calculated for each student using the weights described above. Your final grade will be determined from your percentage. Any percentage in the 90s will be worth at least an A-. Any percentage in the 80s will be worth at least a B-. Similarly a 70 is worth at least a C- and a 60 is worth at least a D. I reserve the right to give a higher grade based on perceived difficulty of assignments and overall class performance.

All suspected cases of academic dishonesty will be handled in *strict* accordance with Kettering University policy. Any questions regarding appropriate behavior should be cleared with the instructor in advance.

Common Statement on Students with Documented Disabilities

The University will make reasonable accommodations for persons with documented disabilities. Students need to register with the Wellness Center every term they are enrolled in classes. To be assured of having services when they are needed, students should contact the Wellness Center during the first week of each term. Note that it is the student's responsibility to arrange accommodations with each professor. For more information on "Disability Services," refer to the Student Life section of Undergraduate Catalog or the Student Life webpage. This information is also noted in the Student Handbook.

Common Statement on Ethics in the University and Academic Integrity

Kettering University values academic honesty and integrity. Cheating, collusion, misconduct, fabrication, and plagiarism are serious offenses. Each student has a responsibility to understand, accept, and comply with the University's standards of academic conduct as set forth in our statement, "Ethics in the University," and "Academic Integrity" as well as policies established by individual professors. For more information, refer to the Undergraduate Catalog or the Student Life webpage. This information is also noted in the Student Handbook.

Common Statement on Medical Excuse Policy

Only professors may excuse absences of any type. The Kettering University Wellness Center does not "excuse" absences except under certain specific circumstances, i.e., if an illness or injury that, after examination by a licensed health care practitioner [either at the Wellness Center or elsewhere], is determined to be either so severe or contagious that it possesses a threat to the patient or to the university community. Except in these circumstances, the Wellness Center does not produce written medical excuses.

Changes to Syllabus

This syllabus provides a general plan for the course; deviations may be necessary.