Fall 2023
EE379K: Programming Paradigms

Instructor

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Teaching Assistant

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Website

We will use Canvas (`http://canvas.utexas.edu`) for the course website.

Catalog entry

Programming paradigms: software design for various programming languages and impact of various programming languages on software design.

Prerequisites

(Electrical Engineering 360C Algorithms) *AND* (422C Software Design & Implementation II *OR* 461L Software Engineering and Design Laboratory) with a grade of C- or higher in each.

Description and Topics

There are hundreds of programming languages out there and many of them bring (several) unique language features that (should) help developers to write correct software faster. This course will study several programming languages (including C, C++, Java, OCaml, ...) and some of the unique features that are introduced to increase developers' productivity. We will also explore how software engineering practices differ across languages and the set of design patterns for each language. Moreover, unique language features have impact on how developers organize, write, test, and analyze code; we will introduce and discuss several of these aspects.

Note that this is *not* a PL course, compilers course, or program analysis course. There are great course that cover these other topics: PL and compilers in the CS and program analysis (EE361G) and compilers in ECE. "Programming Paradigms" provides an engineering aspect of unique features and software engineering practices for various programming languages.

Calendar (tentative)

Week	Week of	Tuesday	Thursday
1	(2023-08-21)	[1] Introduction	[2] Compilers
2	(2023-08-28)	[3] Interpreters	[4] ANTLR
3	(2023-09-04)	[5] Declarative (SQL)	[6] Declarative (SQL)
4	(2023-09-11)	[7] Declarative (Cypher)	[8] Declarative (Cypher)
5	(2023-09-18)	[9] Scripting (bash)	[10] Scripting (bash)
6	(2023-09-25)	[11] OOP (Smalltalk)	[12] OOP (Smalltalk)
7	(2023-10-02)	[13] OOP (Smalltalk)	[14] Parallel (CSP)
8	(2023-10-09)	[15] Parallel (CSP)	[16] OOP (Go)
9	(2023-10-16)	[17] OOP (Go)	[18] Parallel (Linda)
10	(2023-10-23)	[19] Parallel (Linda)	[20] Functional (OCaml)
11	(2023-10-30)	[21] Functional (OCaml)	[22] Functional (OCaml)
12	(2023-11-06)	[23] Functional (OCaml)	[24] PL Semantics
13	(2023-11-13)	[25] PL Semantics	[26] PL Semantics
14	(2023-11-20)	Thanksgiving	Thanksgiving
15	(2023-11-27)	[27] Exam	[28] Overview

Figure 1: Calendar

Textbooks

The following text provide some basic material that would help students understand material presented in the class.

- *Compilers: Principles, Techniques, and Tools* by Alfred Aho, Jeffrey Ullman, Monica S. Lam, and Ravi Sethi. Pearson. ISBN: 0-201-10088-6.
- *Engineering a Compiler* by Keith D. Cooper and Linda Torczon. Morgan Kaufmann Publishers Inc. ISBN: 012088478X.
- *Effective Java* by Joshua Bloch. Addison-Wesley. ISBN: 0321356683.
- *C Programming - A Modern Approach (2nd Edition)*, by K.N. King, ISBN 0393969452.
- *The Go Programming Language*, by Alan Donovan, Brian Kernighan, ISBN 9780134190440.
- *Pharo by Example 9* `https://books.pharo.org/pharo-by-example9`

Course Grades

Course grades are based upon the total quantity of points earned during the semester. Points are available to be earned according to the following schedule:

Component	Date	Points
Assignment	date(s) will be announced on Canvas	20
Project	date(s) will be announced on Canvas	120
Exam	probably last lecture	30

At the end of the semester, the total number of points earned by each student will be converted into a letter grade. The precise conversion formula is subject to change if, based on the sole discretion of the professor, the awarding of points during the semester has been too low to be consistent with grades awarded to EE379k students in past semesters. In addition, some students may receive a grade higher than that prescribed by the formula if, in the professor's sole discretion, the student's actual performance in EE379k was considerably better than the performance implied by the scores. Such cases are extremely rare. In no case will a student be assigned a grade lower than that determined by the formula.

- 165 points or higher – grade of A
- 145 points or higher – grade of B
- 125 points or higher – grade of C
- 110 points or higher – grade of D
- Less than 110 points – grade of F

Examinations

Exam(s) will cover material from lecture and the assignments. If your work or a personal situation forces you to unexpectedly miss the exam, you should expect to get a zero. If you miss an exam because of illness, you are expected to provide a statement from a doctor stating that, in his/her opinion, it was impossible for you to attend because of illness. A slip showing you visited the UT Health Center or your personal doctor is not sufficient. Bring your student ID to the exam; it may be requested for proof of identity. Nobody can leave the exam room within 45 minutes from the start of the exam and 15 minutes prior to the end of the exam (to avoid disturbing those that are still working).

Programming Assignments

The assigned class work in this course will consist of one or several programming assignments. Programming is a discipline that you learn by doing, not by listening to a lecturer. Therefore, doing the programming assignments is crucial to performing well in this class. Each assignment will have a clearly stated due date and time. NO LATE ASSIGNMENTS WILL BE ACCEPTED. It is the students' responsibility to ensure that completed assignments are received by the TA through the proper submission procedure. If you complete an assignment but fail to submit it (or submit it incorrectly), you are likely to receive zero credit for that assignment.

Submitting Programming Assignments

Programming assignments will be submitted for grading using the Git version control system. Email submissions will not be accepted. You should open a GitHub account, and create a **private** repository that you will share with us. The repository has to start with **pp-** followed by your UT ID (lowercase only). For example, if your UT ID is "abc", then you create repository **pp-abc**. All the assignments should be done inside this repository unless stated otherwise. Please share your repository with *gliga* and HannanNaeem.

Final Examination

There will be no final exam (in the final exam period).

Grade Disputes and Corrections

If you discover an error in a grade assigned to you, you must submit your complaint, along with supporting evidence or arguments, to me (or to your TA or grader) within one week of the date that I (or your TA or grader) first attempted to return the exam or assignment results to you. For programming assignments, the dispute period starts with the posting of your score on the class Canvas page.

Complaints about grades received after the one-week deadline will be considered only if there are extraordinary circumstances for missing the deadline (e.g., student hospitalization). Exams submitted for re-grading will be completely re-graded.

Attendance

You choose if you want to attend the lectures or not. Whether you come to lectures or not, you are responsible for keeping up with what happens in lectures. If you miss a lecture, it is not reasonable for you to expect me to repeat the material that was covered in the lecture. This applies both to the content of the lecture as well as to announcements about course policies, events, deadlines, or whatever.

Use of Email

You cannot expect to get detailed answers to technical questions by email. Students are encouraged to discuss important matters with the teaching team during office hours.

Note

The plan (grading, topics, etc.) for this class is subject to change depending on the number of students in the class and prior knowledge that students have.

ECE Machines

You can use ECE machines (with Linux) for your development/testing/debugging. Details are available at: `https://wikis.utexas.edu/display/eceit/ECE+Linux+Application+Servers`. To create an account the students can visit `www.ece.utexas.edu/acme`.

Other Course Related Policies

Class Recordings

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

Sharing of Course Materials

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. This includes your own solutions to assignments. If you wish to share your project with, say, a recruiter, you may do so through a password-protected site. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

Distance Rule

If we end up with some in-person lectures this semester, maintain the distance of at least 6 feet from the instructor at any given time.

Academic Dishonesty (cheating)

The University and the Department are committed to preserving the reputation of your UT degree. Every piece of work that you turn in with your name on it must be yours and yours alone. No co-working is allowed on any test, project, or programming assignment. As an honest student, you are responsible for enforcing this policy in several ways:

1. You must not turn in work that is not yours. *Specifically, you are not allowed to copy someone else's program code.* This is plagiarism.

2. You must not enable someone else to turn in work that is not his or hers. Do not share your work with anyone else. Make sure that you adequately protect all your files. Even after you have finished a class, do not share your work or published answers with the students who come after you. They need to do their work on their own.

3. You must not allow someone to openly violate this policy because it diminishes your effort as well as that of your honest classmates. *Providing the questions or answers on an exam that you took earlier to another student who will take it later is cheating.*

Students who violate University rules on scholastic dishonesty in assignments or exams are subject to disciplinary penalties, including **negative (-50) points on an assignment or exam**, failure in the course, and/or dismissal from the University. Plagiarism detection software will be used on the programs submitted in this class. If cheating is discovered, a report will be made to the Dean of Students for all involved in the incident. Incidents of cheating become a permanent part of your academic record. The Dean of Students office may take assign additional penalties, up to and including dismissal from The University.

Learning Disabilities

If you have a learning disability that requires special attention, either during class or during an exam, please give me a letter from the Dean of Students describing what needs to be done. You should do this during the first week of classes. (The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 or the Cockrell School of Engineering, Director of Students with Disabilities at 471-4321.)

Religious Holy Days

A student who is absent from an examination or cannot meet an assignment deadline due to the observance of a religious holy day may take the examination on an alternate day, submit the assignment up to 24 hours late without penalty, or be excused from the examination or assignment, *ONLY* if proper notice of the planned absence has been given to the instructor at least fourteen days prior to the classes scheduled on dates the student will be absent. For religious holy days that fall within the first two weeks of the semester, notice should be given on the first day of the semester. The notice must be personally delivered to the instructor and signed and dated by the instructor, or sent by certified mail, return receipt requested. Email notification will be accepted if received, but a student submitting such notification must receive email confirmation from the instructor. A student who fails to complete missed work within the time allowed will be subject to the normal academic penalties.

Online Privacy

Web-based, password-protected class sites are associated with all academic courses taught at The University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging e-mail, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on restricting directory information see: `http://www.utexas.edu/student/registrar/catalogs/gi06-07/app/appc09.html`.

Classroom Evacuation for Students

All occupants of university buildings are required to evacuate a building when a fire alarm and/or an official announcement is made indicating a potentially dangerous situation within the building. Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building. If you require assistance in evacuation, inform your instructor in writing during the first week of class. For evacuation in your classroom or building:

1. Follow the instructions of faculty and teaching staff
2. Exit in an orderly fashion and assemble outside
3. Do not re-enter a building unless given instructions by emergency personnel