

CS 152: Programming Language Paradigms

GREEN SHEET

Spring Semester 2014

Department of Computer Science
San Jose State University
Instructor: Ron Mak

Section 5: MW 3:00 – 4:15 PM, Duncan Hall, room 318

Office hours: MW 7:15 - 8:30 PM

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Course catalog description

"Programming language syntax and semantics. Data types and type checking. Scope, bindings, and environments. Functional and logic programming paradigms, and comparison to other paradigms. Extensive coverage of a functional language." 3 units

Course goal

To study programming language design, with an emphasis on the functional paradigm.

Course objectives

- To ensure that students gain an understanding of programming language design and language translation.
- To achieve competence in a functional programming language.

Student learning outcomes

Upon successful completion of this course, students should be able to:

- Have a basic knowledge of the history of programming languages.
- Have a basic knowledge of the procedural, object-oriented, functional, and logic programming paradigms.
- Understand the roles of interpreters, compilers, and virtual machines.
- Critique the design of a programming language.
- Read and produce context-free grammars.
- Write recursive-descent parsers for simple languages, by hand or with a parser generator.
- Understand variable scoping and lifetimes.
- Write interpreters for simple languages that involve arithmetic expressions,

- bindings of values to names, and function calls.
- Understand type systems.
- Understand the implementation of procedure calls and stack frames.
- Produce programs in a functional programming language in excess of 200 LOC.

BS in Computer Science program outcomes supported

- An ability to apply knowledge of computing and mathematics to solve problems.
- An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- An ability to use current techniques, skills, and tools necessary for computing practice.
- An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- An ability to apply design and development principles in the construction of software systems of varying complexity.

Prerequisites

CS 151 or Object-Oriented Design
CMPE 135

A grade C- or better in each, or instructor's consent. **The Department of Computer Science strictly enforces prerequisites.** A student not meeting any prerequisites must fill out an Add Form at the beginning of the semester to explain his or her justifications to take the course, and it will be the instructor's and the department's decision whether or not to allow the student to enroll.

Any student who does not show up during the first two class meetings may be dropped by the instructor.

Material assumed from prerequisite courses

Students are expected to have these skills:

- Basic Java programming skills (indirectly from CS 46A)
- Lists, stacks, trees, hash tables (from CS 46B)
- Classes, inheritance, polymorphism, reflection (from CS 151)

Required texts

Title: Programming Languages: Principles and Practice, 3rd edition
Author: Kenneth Loudon and Kenneth Lambert
Publisher: Cengage Learning, 2012
ISBN-13: 978-1-111-52941-3

There may be additional reading assignments and use of tools from the Internet. I will provide URLs.

Schedule

This schedule is subject to change with fair notice.

Week	Dates	Topics and activities	Readings
1	Jan 27, 29	Introduction and history Language abstractions Computational paradigms <i>Form project teams</i>	1
2	Feb 3, 5	Syntax and semantics Language design Introduction to language translation	1 2
3	Feb 10, 12	Functional programming with Scheme	3
4	Feb 17, 19	Functional programming with Scheme	3
5	Feb 24, 26	Functional programming with Scheme Logic programming with Prolog	3 4
6	Mar 3, 5	Logic programming with Prolog	4
7	Mar 10, 12	Object-oriented programming SmallTalk OOP design and implementation <i>Midcourse review</i>	5
8	Mar 17, 19	Midterm exam Monday, March 17 Language syntax Context-free grammars and BNF Syntax diagrams	6
	Mar 24-28	Spring recess	
9	Apr 2	Scanning Recursive-descent parsing Parser generators	6
10	Apr 7, 9	Language semantics Declarations and scope	7
11	Apr 14, 16	Name resolution and overloading Primitive and reference types Type conversion and checking Polymorphism	7 8
12	Apr 21, 22	Program execution Expressions Conditional expressions and guards	9

		Looping constructs Exception handling	
13	Apr 28, 30	Procedures and functions Parameter passing Runtime stack Dynamic memory management Garbage collection	10
14	May 5, 7	Abstract data types Parallel programming	11 12
15	May 12	Parallel programming <i>Course review</i>	13
	May 20	<i>Final exam: Tuesday, May 20</i> 12:15 – 2:30 PM, Duncan Hall 318	

Laptops and lab time

Bring your laptops to class — we'll try to set aside some "lab" time for all the students to get together and share tips and accomplishments. This class will move rapidly and cover lot of material. Class attendance and participation are very important.

Project teams

You will form project teams of 2 to 3 students each. The teams will last throughout the semester. Once the teams are formed, you will not be allowed to move from one team to another, so form your teams wisely! Each student must be on a team.

Course requirements and assignments

Assignments will be team-based. For each assignment, each project team will turn in one set of work, and all members of each team will receive the same score for the assignment. Each team is responsible for choosing a team lead and dividing up the work among the team members. You are personally responsible for participating and contributing to your team's work, and for understanding each part of the work for every assignment whether or not you worked on that part.

Each assignment is worth a maximum of 100 points. Late assignments will lose 20 points and an additional 20 points for each 24 hours after the due date.

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

University policy F69-24: "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

Assessments

At the end of the semester, each of you will turn in an assessment of your own performance on your team, and an assessment of each of the other members of your team.

Exams

The midterm and final examinations will be open book, notes, and laptops. Instant messaging, e-mails, texting, tweeting, or other communication with anyone else during the exams will be strictly forbidden. You will get an individual score for each quiz and exam.

Class grade

Your individual class grade will be weighted as follows:

60%	Assignments*
15%	Midterm exam**
25%	Final exam**

* *project team scores*

** *individual scores*

Each assignment and exam will be scored (given points) but not assigned a letter grade. The mean score and standard deviation will be announced after each assignment and exam.

Final individual class letter grades will be assigned based on the class curve. Your final class grade can be adjusted up or down depending on your level and quality of participation on your project team as determined by the project tracking tools and your team members' assessments of your performance.

Classroom protocol

It is important for each student to attend classes and to participate. Cell phones in silent mode, please.

Dropping and adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's Catalog Policies section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic_calendars/. The Late Drop Policy is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at <http://www.sjsu.edu/advising/>.

Recording lectures and public sharing of instructor material

Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.

Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.

Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at <http://www.sjsu.edu/studentconduct/>.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Integrity Policy S07-2 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

In 2013, the Disability Resource Center changed its name to be known as the Accessible Education Center, to incorporate a philosophy of accessible education for students with disabilities. The new name change reflects the broad scope of attention and support to SJSU students with disabilities and the University's continued advocacy and commitment to increasing accessibility and inclusivity on campus.