San José State University
College of Science/Department of Computer Science
CS152, Programming Paradigms, Fall 2015

Course and Contact Information

Instructor:	Jon Pearce
Office Location:	416 MacQuarrie Hall
Telephone:	(408) 924-5065
Email:	jon.pearce@sjsu.edu
Office Hours:	TR 13:30 – 15:00, W 15:00 – 16:30

Class Days/Time:	section 1: TR 10:30 – 11:45 section 2: TR 12:00 – 13:15
Classroom:	233 MacQuarrie Hall
Prerequisites:	C- or better in CS 46B and CS 151

Course 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.

Course Learning Outcomes (CLO)

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

1. Have a basic knowledge of the history of programming languages
2. Have a basic knowledge of the procedural, object-oriented, functional, and logic programming paradigms
3. Understand the roles of interpreters, compilers, and virtual machines
4. Critique the design of a programming language
5. Read and produce context-free grammars
6. Write recursive-descent parsers for simple languages, by hand or with a parser generator
7. Understand variable scoping and lifetimes
8. Write interpreters for simple languages that involve arithmetic expressions, bindings of values to names, and function calls
9. Understand type systems
10. Understand the implementation of procedure calls and stack frames
11. Produce programs in a functional programming language in excess of 200 LOC

Required Texts/Readings

Textbook

Lecture note and other materials will be posted at CS152 Course Website
at http://www.cs.sjsu.edu/faculty/pearce/modules/courses/F15/cs152/index.htm

Other Readings [Optional]

David Watt, Programming Language Concepts and Paradigms, Prentice Hall, 1990

Friedman, Wand and Haynes, *Essentials of Programming Languages*, 2nd ed., MIT Press 2001

Lohr, *Go To: The Story of the Math Majors, Bridge Players, Engineers, Chess Wizards, Maverick Scientists and Iconoclasts--The Programmers Who Created the Software Revolution*.

Other equipment / material requirements (include if applicable)

Students should bring laptops to class. The following software should be installed:

Scala Eclipse
SWI Prolog
Star UML 2

Course Requirements and Assignments

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.

Many of the assignments require students to implement parsers and reference interpreters in Java or Scala for various made-up languages. No prior knowledge of Scala will be assumed. Several weeks will be spent introducing students to Scala, a language which supports multiple paradigms. Thus, students will gain experience with different programming paradigms while learning programming language concepts through the reference interpreters they will write. These assignments enable the following CLOs: 2, 3, 5, 6, 7, 8, 9, 10, and 11. The actual assignments and their due dates are posted below. Assignment weights are proportional to the maximum number of possible points assigned to each assignment. These points can be found on Canvas.

NOTE that University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that "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."

Grading Policy

Grades will be determined by programming assignments and in-class labs (50%), one midterm (20%), and a final exam (30%).

Note that "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

Classroom Protocol

Students should bring laptops to class and be prepared to work together on in-class labs.

University Policies

General Expectations, Rights and Responsibilities of the Student

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. See University Policy S90–5 at http://www.sjsu.edu/senate/docs/S90-5.pdf. More detailed information on a variety of related topics is available in the SJSU catalog, at http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

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/.

Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- "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."
    - It is suggested that the greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.
    - In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.
- "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/.

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.

CS 152 / Programming Paradigms, Fall 2015, Course Schedule

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1		History and Concepts
2		Concepts
3		Prolog and Logic Programming
4	9/10	From Prolog Overview at http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/languages2/pro following labs: Evaluating Expressions PropLog Turn them in on Canvas by 9/10.
5	9/18	Implement the following in Java: CalcuTron: http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/languages2/concepts/l Labs 1 – 3 of Cranberry : http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/languages2/concepts/l Turn them in on Canvas by 9/18.
6	9/25	Complete the Scala Sequence Control Lab problems 1 – 6. http://www.cs.sjsu.edu/faculty/pearce/modules/labs/scala/Lab1.htm Submit signed reports on Canvas by 9/25.
7	10/8	Complete Math Lab, problems 1 – 8 (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/math.htm) String Lab, problems 1 – 7 & 10 (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/strings.h Recursion Lab, problems 5, 7, 9, and 10 (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/Recursion Submit worksheets on Canvas by 10/8.
8	10/17	Complete Functional Programming, problems 1 – 3, 5 – 10 (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/Functiona

Week	Date	Topics, Readings, Assignments, Deadlines
		List Processing I, problems 1 – 8 (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/lists.htm List Processing II, problems 1, 3, 4 (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/ListProce Due 10/17 at 11:59 PM
9	10/20	Midterm
10		Guest lectures: Professors Horstmann & Austin
11	11/10	Complete the following labs from OOP Labs: (http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/oop/index.htm) Dungeons & Dragons Generics Indus Acorn FunCall Jawa Adapter Pattern Due 11/10 at 11:59 PM
12	11/19	Complete problem 1 (Lex) and problem 4 (Writing regular expressions) on: http://www.cs.sjsu.edu/faculty/pearce/modules/lectures/scala/labs/patterns/index.htm You can turn in problem 4 as a worksheet and problem1 as a single .scala file Due 11/19 at 11:59 PM
13		Complete the reference interpreter for Ewok (http://www.cs.sjsu.edu/faculty/pearce/modules/projects
14		Complete the reference interpreter for Wookie http://www.cs.sjsu.edu/faculty/pearce/modules/projec
15		C omplete the reference interpreter for Sith http://www.cs.sjsu.edu/faculty/pearce/modules/projects/Jedi/Sith.htm
16		Final Review
Final Exam		Dec 14: CS152 sec 4 final exam, 945 - 12:00 Dec 16: CS152 sec 2 final exam, 945 - 12:00