CS 381

Programming Language Fundamentals

Syntax, Semantics & Paradigms

CS 381 Programming Language Fundamentals
Section 400   4 credits

Instructor: Eric Ianni   iannie@oregonstate.edu
Teaching assistant: TBD

Course Description
An introduction to the concepts found in a variety of programming languages. Programming languages as tools for problem solving. A brief introduction to languages from a number of different paradigms (catalog).

Prerequisites or Corequisites
CS 261 with C or better and (CS 225 [C] or MTH 231 [C])

Rationale
This course is an examination of the constructs of programming languages, the four major programming paradigms, and several programming languages, including their application and underlying execution models. The paradigms examined in this course include imperative, object-oriented, functional, and logical. Students will gain exposure to and experience in a variety of languages, including Raku, Ruby, Racket, and Prolog. Other languages will be discussed in context in the explorations.

Learning Outcomes
At the completion of this course, students will be able to:
1. Produce an abstract syntax for a language given its concrete syntax.
2. Create functional programs using algebraic data types and recursive functions.
3. Produce and explain the type and result of an expression in the context of functional programming.
4. Create a denotational semantics for a language given its abstract syntax and an informal specification of its behavior.
5. Produce and explain the behavior of a program under static vs. dynamic typing, and discuss the benefits and drawbacks of each approach.
6. Produce and explain a program's output under different parameter passing schemes, such as call-by-value vs. call-by-name vs. call-by-need.
7. Produce and explain a program's output under static vs. dynamic scoping of names.
8. Create logic programs and express queries using predicates.

Communication
- Always use your OSU email to contact us. The Canvas mailbox doesn't work very well.
- When you send usan email, you must include the tag "[CS 381]" in your email subject.

Please use the email addresses above to contact the instructor and TAs. You should expect a response to emails within 48 hours. Emails sent over the weekend sometimes take longer to respond to.

Post allcourse-relatedquestions on the Edboardso the whole class may benefit from our conversation. Please sign up yourself on Ed. You can use the course Teamschannel to ask questions as well.

For grading questions and regrading requests, please contact the TA who graded your assignment by posting privately on Ed (private posts are viewable by the entire instructional team)and try tagging the TA in the post using the @ in the body of your question. Don't post re-grading request on Teams. You should expect your grade to be posted one week after the due date. If you submit the assignment late, it may take longer for your grade to be released.

The instructional team will be using the class mailing listextensively to communicate with you. We will also frequently post information on Ed. It is your responsibility to keep up-to-date with these communiques and they are considered part of the required learning material.

Course Schedule

MODULE	TOPIC	CHAPTER	LAB	HOMEWORK	QUIZ
1	Language	1, 2		Hw1	Q1
2	History	2	Lab 1	Hw2	Q2
3	Grammar	3		Hw3	Q3
4	Syntax & Semantics	3, 5	Lab 2	Hw4	Q4
5	Types & OOP	6,11,12		Hw5	Q5
6	Expressions & Statements	7, 8	Lab 3	Hw6	Q6
7	Functions	9, 10		Hw7	Q7
8	Functional Programming	15	Lab 4	Hw8	Q8
9	Logic Programming	16		Hw9	Q9
10	Special Topics	13, 14	Lab 5	Hw10	Q10

Grading Criteria

ACTIVITY	QUANTITY	WEIGHT
Programming	5	40%
Homeworks	10	30%
Quizzes	10	30%
Exams	0	0%

Textbook

The primary learning content of this course is provided as explorations within Canvas. We also require the following supplemental textbook for students to explore topics in more depth and to practice with more examples. This textbook is useful for homeworks and quizzes.

Concepts of Programming Languages by Robert W Sebesta, 12th ed. (2019)

The most recent 12th edition is only available from the publisher as an electronic text. Because of the high cost, it is recommended that students instead buy an older, used edition.

Any of the following versions will suffice.
- Concepts of Programming Languages, Global ed (2016) (amazon)
- Concepts of Programming Languages, 11th ed (2015)   (amazon)
- Concepts of Programming Languages, 10th ed (2012)   (amazon)

Course Structure

This section describes the structure of the course and an overview of the graded components.

93-100	A	73-76	C
90-92	A-	70-72	C-
87-89	B+	67-69	D+
83-86	B	63-66	D
80-82	B-	60-62	D-
77-79	C+	0-59	F

Homeworks

Homeworks are practice problems worth 30% of the total grade. There is a homework assignment associated with each module. These ten homeworks are given as Canvas quizzes. The homeworks serve as drills, intended to review and solidify the course content while preparing students for the end of module quiz. Each homework contains 10 questions. The types of questions include true/false, multiple choice, multiple answer, numeric answer, ordering, and matching.

You are permitted three attempts on each homework assignment. Your highest score achieved will be retained. The questions change between attempts. Students are encouraged to use all three attempts to practice with the course topics. Students may use all course resources while completing the homework. There is no time limit on homeworks.

Programming Labs

There are five programming assignments, worth 40% of the total grade. For each programming assignment you are given a series of tests. Assessment of your programming assignment is based on your intelligent code formatting, informative code comments, and the number of tests you pass. Rubrics for the programming labs will be provided by the instructor.

You are expected to use the Internet to seek out tutorials, documentation, and examples in order to learn these languages. There will be a lab exploring regular expressions (Raku) as well as a lab for each programming paradigm: imperative (Raku), object-oriented (Ruby), functional (Racket), and logical (Prolog).

Failure to submit two or more labs may result in an automatic failure of the course.

Module Quizzes

The module quizzes are assessments worth 30% of the total grade. There is a quiz at the conclusion of each module. These ten quizzes are given as Canvas quizzes. Each quiz contains 10 questions. The types of questions include true/false, multiple choice, multiple answer, numeric answer, ordering, and matching.

You are permitted two attempts on each module quiz. You may repeat each quiz up to two times. Your highest score achieved will be retained. The questions change between attempts. Students are encouraged to use both attempts. Students may use the textbook and Canvas explorations while completing the quiz. Students may not use other Internet resources. Quizzes are not proctored. There is a 20 minute time limit on module quizzes.

Exams

There are no exams in this course.

Course Policies

Deadlines

All assignments are due at 11:59pm Pacific Time. Be aware of what time zone Canvas is using to display deadlines. If it's not your local time zone, you can set it to be.The Canvas phone app always displays times for the time zone the phone is in. This is important to keep in mind if you will be traveling.

Late Work Policy

Requests for extensions are considered on a case-by-case basis. Non-emergency requests must be submitted **via email at least 72 hours before the due time**. (Not having enough time to get the assignment done does not, by itself, constitute an emergency, sorry!). **If you don't know if you will need an extension but might, you should ask for one.**

Time elapsed past the due date	Penalty Applied(if no extension is granted)
T < 24 hours	-10%
T < 48 hours	-20%
T < 72 hours	-30%
T >= 72 hours	-100%

Proctoring

This course does not require any proctoring. Students are bound to Oregon State University's high standards of academic integrity, as discussed below.

Incompletes

Incomplete (I) grades will be granted only in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the last programming assignment). If you are having any difficulty that might prevent you completing the coursework, do not wait until the end of the term and notify the instructor right away.

Statement Regarding Religious Accommodation

Oregon State University is required to provide reasonable accommodations for employee and student sincerely held religious beliefs. It is incumbent on the student making the request to make the faculty member aware of the request as soon as possible prior to the need for the accommodation. See the Religious Accommodation Process for Students.

Academic Calendar

All students are subject to the registration and refund deadlines as stated in the Academic Calendar: https://registrar.oregonstate.edu/osu-academic-calendar.

Student Bill of Rights

OSU has twelve established student rights. They include due process in all university disciplinary processes, an equal opportunity to learn, and grading in accordance with the course syllabus: https://asosu.oregonstate.edu/advocacy/rights

Technical Assistance

If you experience any errors or problems while in your online course, contact 24-7 Canvas Support through the Help link within Canvas. If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the IS Service Desk online.

Academic Integrity

Integrity is a character-driven commitment to honesty, doing what is right, and guiding others to do what is right. Oregon State University Ecampus students and faculty have a responsibility to act with integrity in all of our educational work, and that integrity enables this community of learners to interact in the spirit of trust, honesty, and fairness across the globe.

Expectations for Student Conduct

Student conduct is governed by the university's policies, as explained in the Student Conduct Code (https://beav.es/codeofconduct). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

In particular, you will not misrepresent the work of others as your own, nor will you give or receive unauthorized assistance in the performance of academic coursework. You should understand that your instructor would report any infraction of academic integrity to the Office of the Dean and that any such matter would be investigated and prosecuted fully. Typically, the penalty is a grade of F in the course.

Fostering Healthy Online Dialogue

The internet is a wonderful tool and has provided immeasurable value to humanity. That said, there are parts of online existence that have made aspects of life harder. One of those is in how we communicate with one another in a purely written form. We sometimes forget how much communication is accomplished via non-verbal cues: tone, body language, and facial expressions. Without these non-verbal cues many of us will find ourselves misunderstanding others and being misunderstood ourselves. It is important that we afford others the benefit

of the doubt when it comes to possible misunderstandings. Therefore, if we find ourselves becoming upset by something someone says online, we need to take a step back and try to find a non-offensive way to read the same statements. Even if the person meant to be upsetting, why give them that power over us? In short: be kind to others and assume kindness from others.

Establishing a Positive Community
It is important you feel safe and welcome in this course. If somebody is making discriminatory comments against you, sexually harassing you, or excluding you in other ways, contact the instructor, your academic advisor, and/or report what happened at https://studentlife.oregonstate.edu/studentconduct/reporting so we can connect you with resources

Definition of Academic Misconduct
Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a tutorial on academic misconduct, and you can also refer to the OSU Student Code of Conduct and the Office of Student Conduct and Community Standard's website for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

Examples of Academic Misconduct
Please note the following examples of what is considered inappropriate.

- Viewing another student's quiz, test, paper, or code while working on your own.
- Directly providing another student a copy, electronic or otherwise, of your work.
- Accepting a copy, electronic or otherwise, of another student's work.
- Copying and pasting *any* component of another student's work into your own.
- **Copying solutions found online or otherwise**, pasting it into your own work.

Code Reviews
The instructor retains the right to request a meeting with students to discuss their programming assignment submission. In this meeting the student will be expected to explain the code they submitted. If the student is unable to sufficiently explain their own code, they may review a zero on the assignment.

Gradescope
Your instructor requires you submit your assignments to Gradescope, which utilizes a code plagiarism prevention service. Your assignment content will be checked for potential plagiarism against Internet sources, academic sources, and the submissions of other OSU students, for common or borrowed content. Gradescope Code Similarity generates a report that highlights any potentially unoriginal code in your programming assignments. The report

will be submitted directly to your instructor. Any code you submit through Gradescope for this or any class will be added to the OSU Gradescope database and may be checked against other OSU paper submissions. You retain all rights to your work.

Related: For further information, visit Academic Integrity for Students: Turnitin – What is it?

Cheating Websites

The use of websites such as Chegg, Course Hero, Slader or any similar site is strictly forbidden. Posting course materials to these sites constitutes a violation of academic integrity and will results in an F in the course. Such violations may be processed after the completion of the course and could result in a retroactive change of your course grade. The questions you receive throughout the course are unique to you and this signature can be traced back to you. Do not submit course materials online.

Public Repositories (Github)

Students may not share their programming assignments in a public Github repository or elsewhere publically on the Internet. If another student later submits an assignment that you made pubically available, you will be held responsible for a violation of academic integrity. Such violations may be processed after the completion of the course and could result in a retroactive change of your course grade. Do not share your programming assignments publically. Private Github repositories are allowed and encouraged.

Statement Regarding Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Accessibility of Course Materials

All materials used in this course are accessible. If you require accommodations please contact Disability Access Services (DAS). Additionally, Canvas, the learning management system through which this course is offered, provides a vendor statement certifying how the platform is accessible to students with disabilities.

Tutoring Assistance

TutorMe is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Access TutorMe from within your Canvas course menu.

Ecampus Reach Out for Success

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success.

Ecampus students are always encouraged to discuss issues that impact your academic success with the Ecampus Success Team. Email ecampus.success@oregonstate.edu to identify strategies and resources that can support you in your educational goals.

- **For mental health:**
  Learn about counseling and psychological resources for Ecampus students. If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

- **For financial hardship:**
  Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (541-737-8748).

Student Evaluation of Courses

During Fall, Winter, and Spring term, the online Student Evaluation of Teaching system opens to students the Wednesday of week 8 and closes the Sunday before Finals Week. Students will receive notification, instructions and the link through their ONID email. They may also log into the system via Online Services. Course evaluation results are extremely important and used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to "sign" their comments, agreeing to relinquish anonymity) and unavailable to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.