CS 381 – Programming Language Fundamentals

Catalog 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.

Credits: 4

Prerequisites: CS 261, (MTH 231 or CS 225)

Courses that require this as a prerequisite: None

Structure: Three 50-minute lectures per week

Instructors: Martin Erwig

Course Content:
- Distinction between syntax and semantics
- Concrete vs. abstract syntax
- Approaches to defining semantics
- Language paradigms: functional programming, logic programming, object-oriented programming
- Run-time representation
- Parameter passing
- Typing

Learning Resources:
- Robert W. Sebesta, *Concepts of Programming Languages*, 8th Edition, Addison-Wesley, Reading, MA 2007 (required)
- John C. Mitchell, *Concepts in Programming Languages*, Cambridge University Press 2003 (optional)

Course Learning Outcomes: (* indicates quantitative outcome—see Criterion 4)
At the completion of the course, students will be able to…
1. **Define** abstract syntax for a language that is given in concrete syntax* (ABET Outcomes: A, C)
2. **Produce and explain** the output of a given program under static versus dynamic scoping mechanisms (ABET Outcomes: A, F, I)
3. **Produce and explain** the behavior of a given program under static versus dynamic typing mechanisms (ABET Outcomes: A, F, I)
4. **Produce and explain** the output of a given program under a selection of parameter passing mechanisms, such as by-value, by-reference, by-constant, by-result, by-value-result, and by-name (ABET Outcomes: A, F, I)
5. **Produce and explain** the contents of the run-time stack of a given program as it stands at any moment in program execution (ABET Outcomes: A, F, I)

6. **Produce** programs exhibiting the following kinds of polymorphism: parametric polymorphism, overloading, and subtype polymorphism, and explain their advantages and disadvantages. (ABET Outcomes: A, B, C, I, J, K)
7. **Explain** exception handling mechanisms and demonstrate the effects of exceptions on the runtime stack (ABET Outcomes: I, F)
8. **Explain** the differences between imperative, functional, object-oriented, and one other programming language paradigm, and why it is important to understand these programming language paradigms. (ABET Outcomes: B, C, I, K)
9. **Define** the semantics of simple languages or for individual language constructs using axiomatic, operational, or denotational semantics, and given such definitions, predict specific program values or relationships between values using the definitions (ABET Outcomes: A, B, C)

Students with Disabilities:
Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Link to Statement of Expectations for Student Conduct, i.e., cheating policies
http://oregonstate.edu/admin/stucon/achon.htm