**OREGON INSTITUTE OF TECHNOLOGY**

**COMPUTER SYSTEMS ENGINEERING TECHNOLOGY DEPARTMENT**

**COURSE :** **Compiler Methods ( CST-320)**

4 Credit Hours (3 Class Hours, 3 Lab Hours)

Class meetings: MWF, 2-3, PV208

Professor: Philip Howard Ph.D.

Office Phone: x51604

Office Hours: M-W-F 1-2

Office: Room 165

Email: [phil.howard@oit.edu](mailto:sherry.yang@oit.edu)

**TEXTBOOK:**

Charles N. Fischer; Richard J. LeBlanc,; Ron K. Cytron, *Crafting a Compiler*, Addison-Wesley, 2010.

**SPECIFIC COURSE INFORMATION**:

**Catalog Description**

Basic concepts of compiler design and operation. Topics include lexical and syntactic analysis, parsing, translation, data flow analysis and code generation, and implementation of a small compiler.

**Prerequisite**

CST 229

**Required, Elective or Selective:**

Required

**Brief list of topics covered:**

1. Scanning techniques
2. Top-Down and Bottom-Up parsing techniques
3. Grammar attributes that facilitate Top-Down vs. Bottom-Up parsing
4. Intermediate Representations
5. Semantic Analysis of code
6. Memory layout
7. Code generation

**SPECIFIC GOALS OF THE COURSE:**

**Specific Outcomes of Instruction**

This course presents the computational methods used by compilers. This includes the mechanisms for processing the input, how to represent the input in a form that allows easier analysis by later stages of compilation, how to layout memory for variables declared in the source code, how to pass data to and get results from a function, and how to generate code from the Intermediate Representation.

Specifically, through this course you should:

1. Learn the fundamental principles involved in compiling a source language into executable code.
2. Learn to apply course material through the development of a working compiler.

**ABET Outcomes Addressed By Course**

A) An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

B) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.

D) An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

**COURSE OUTLINE:**

1. Scanning techniques
2. Top-Down parsing techniques
   1. Grammar requirements for top-down parsing
   2. Grammar transformation algorithms
3. Bottom-Up parsing techniques
   1. Grammar requirements for bottom-up parsing
   2. Grammar transformation algorithms
4. Compiler data structures
   1. Symbol Table
   2. Abstract Syntax Tree
5. Intermediate Representations
6. Type systems
7. Semantic Analysis
8. Structure of generated code
   1. Procedures and calling mechanisms
   2. Data layout: variables, structures, arrays
9. Code generation

**GRADING PROCEDURE**:

Labs 50%

Homework/Quizes 20%

Two Tests 15%

Final 15%

The lab grade will be composed of two components: Weekly labs and lab quizzes/tests. The lab quizzes/tests will attempt to measure how much you can do on your own vs. how much you can do while getting help. Your lab grade will be computed using one of two formulas:

lab\_score = x\*weekly\_labs + (1-x)\*(quizzes\_tests)

lab\_score = weekly\_labs \* (quizzes\_tests \* y)

where: x will be some value between 0.5 and 0.8

y will be some value between 1.0 and 1.2

The first formula is simply a weighted average. The second formula scales your weekly lab grade based on your quiz/test grade.

Whichever formula I choose, I will use the same formula and factor for all students.

Labs will be graded on two criteria: Correctness and Style. Correctness will count for at least 70% of each lab’s grade. Correctness will be determined based on an automated test suite. You will have access to a test suite while working on the lab, but I may use a different suite while evaluating your labs. You will be held responsible for all lab requirements whether or not the supplied test suite tests a particular requirement. The Style portion of the lab grade will be based on code quality: documentation, proper use of language features, elegance, readability, etc.

The labs for this course build on each other. In general, Labn is the starting point for Labn+1. If you are more than one week behind on your labs, you are probably hopelessly behind and should consider dropping the course. For this reason, late labs will be assessed a 50% penalty, and they will not be accepted at all after they are one week late.

Homework must be typed.

Most homework will be graded primarily on completeness. Quizzes (not the same as lab quizzes) will be used to evaluate correctness.

**GRADING SCALE**:

90%+ = A

80%+ = B

70%+ = C

60%+ = D

59%- = F

**CLASSROOM POLICIES**:

1. Every student is expected to attend class on TIME and is responsible for ALL work missed during any absences.
2. Plagiarism and other forms of cheating will not be tolerated. Please refer to OIT policy on Student Academic Integrity for more information: <http://www.oit.edu/libraries/student_handbook/student_academic_integrity_policy.pdf>. All academic dishonesty cases will be reported to the Vice President for Student Affairs as required by OIT policies.
3. There are no make-up exams or quizzes so please make arrangements with the instructor ahead of time if there is a schedule conflict.
4. Homework must be typed and turned in as a hard copy (unless otherwise specified). Homework is generally due at the beginning of the class after it was assigned. Homework can be turned in one class period late for a 50% penalty. Homework more than one class period late will not be accepted.
5. Short quizzes (<10 minutes) can be given at any time. When given, they will cover content from the previous couple of homework assignments and/or recent reading.
6. You are expected to check your OIT supplied email and the Blackboard area for this class regularly for course updates and announcements.
7. I am willing to make exceptions to my policies under extenuating circumstances. You have a better chance of being granted an exception if you contact me ahead of time instead of after the fact. Just because someone else was granted an exception does not mean you are automatically entitled to one.

**OTHER IMPORTANT INFORMATION**

You should be familiar with OIT policies as they relate to student conduct in an academic setting.

If you need a course adaptation or academic accommodation because of a disability, or if you need special arrangements in case the room or building must be evacuated, you need to contact Disability Services to determine what accommodations are available and appropriate. Please also see me as soon as possible so we can make arrangements to best accommodate your needs.

Some students may be granted permission to record this class. You are not allowed to record the class without permission, and if you are granted permission, the recordings are for your own personal use and may not be shared or distributed.