COURSE SYLLABUS

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YEAR COURSE OFFERED:  2020

SEMESTER COURSE OFFERED:  Spring

DEPARTMENT:  Computer Science

COURSE NUMBER:  COSC4315

NAME OF COURSE:  Programming Languages and Paradigms

NAME OF INSTRUCTOR:  Carlos Ordonez

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The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.

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Learning Objectives

Students will gain a good understanding on the theory, principles and computer systems aspects to design and implement programming languages. This course will cover basic compiler and interpreter system issues. Students will learn why it is necessary to develop specialized programming languages and why one language cannot be a universal solution. The course will explain imperative, procedural, modular, functional and object-oriented approaches and how they can interoperate. The course will make emphasis on which design and theory principles are essential and which practical features have made some languages more successful than others. Students will learn concepts in mainstream programming languages like C++ and Python.

Major Assignments/Exams

This is a course that gives more weight to programming homeworks. Grading is as follows:

- 80%: 4 programming assignments (2 on recursion, functional programming and data types, 2 on parsing/evaluation)
- 20%: midterm exam (around 10th week)
- COVID-19 update: Starting March/23/2020 all lectures will be online Tu Th 10-11:30am (official class time), via Webex (connect info by email). 2 programming assignments have already been graded as of Mar/20. The 2 remaining programming assignments will be submitted and graded in the same manner as the first two homeworks. The midterm exam will be online during official class time. The course will follow the official UH calendar/ Specifically, the last lecture will be Thu Apr/25 and final grades will be ready by Monday May/11/2020
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Required Reading

There is no single textbook since the subject is very broad, but the following textbooks are used in the course:


B. Stroustrup, The C++ Language, 4th edition, Addison-Wesley, 2018

Daniel P. Friedman, Essentials of Programming Languages, MIT Press, 3rd edition

John C. Mitchell, Concepts in Programming Languages, 2002

List of lecture topics

1. Taxonomy of languages
2. Data types (simple, data structures, inference, dynamic vs static, ADT, pattern matching)
3. Programming: OO vs functional decomposition
4. Recursion (types, functions, tail, fixed points, stack manipulation)
5. Evaluation (translation, macros, lazy, memoization, exceptions, garbage collection)
6. Functional aspects (lambda calc, closures, higher order functions, currying, no mutation)
7. Object-oriented aspects (classes, polymorphism, containers, multiple inheritance, subtyping, extensibility)
8. (optional, depending on progress) Concurrent vs parallel programming (shared memory, distributed memory)