

## CSE 402 Design and Implementation of Domain-Specific Languages

### Credits

4.0 (3 hrs lecture, 1 hr section)

### Lead Instructor

Ras Bodik

### Textbook

JavaScript, the good parts

JavaScript, the Definitive Guide

- JS is our implementation language

Mastering Regular Expressions

- more than you need to know about this topic

The Definitive ANTLR 4 Reference

- ANTLR is our parser

Programming in Lua

- how to implement objects; how to use coroutines

### Course Description

Design and implementation of domain-specific languages. Creation of new programming abstractions, formal and informal language specification techniques, implementation strategies to support language analysis and execution on traditional and non-traditional computing platforms. Selection and use of appropriate software tools and development environments to build novel DSLs.

### Prerequisites

CSE 332; CSE 351

### CE Major Status

Selected Elective

### Course Objectives

Programming languages bridge two levels of abstraction: (i) the world of the programmer who uses concepts of his domain, such as graphs or matrices, and (ii) the world of the computer, which prefers abstractions that can be efficiently executed, such as arrays, threads, and remote procedure calls.

This course will teach you how languages translate the programmer abstraction into the executable abstractions. We will talk about compilers, interpreters, parsers, and optimizations. The lectures will cover both general-purpose languages and the recent modern languages

designed for a specific domain task. The programming assignments will focus on the domain-specific languages.

### **ABET Outcomes**

- (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (H)
- (3) an ability to communicate effectively with a range of audiences
- (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (H)
- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (H)

### **Course Topics**

- Part I: Implementation Strategies / Regular Expressions
- Part II: Optimizations / Query Languages
- Part III: Parsing / Templating
- Part IV: Reactive Languages, Laziness / Working with Data
- Part V: Types and Objects, Garbage Collection, Staging