**Professor:** Dr. James Arthur **Student:** Charles R. Lipford

**Independent Study Proposal**

The proposed Independent Study is to design and implement (at least partially) a programming language and interpreter by the end of the semester. The student has performed preliminary research and analyses of historical and modern languages. That focus has been on language syntax, semantics, trade-offs in flexibility and power, and unique features that the selected languages provide. He proposes to design and implement a new language that emphasizes concurrency, flexibility, readability, writeability, and modularity. To accomplish this, he will rely on similar concepts found in languages like Javascript, Ruby, Python, Elixir, Julia, and Go.

The student will be required to define a formal grammar along with a complete semantic description of all of the constructs it describes. The semantic description will consist of code snippets that are annotated with their meaning in the given context. After Dr. Arthur has reviewed the material and helped the student finalize the syntax and semantics, the next stage of the project is to implement a basic Scanner and Parser. The Scanner and Parser should be able to read an input file and determine whether or not it is a valid program in the newly defined language.

Once the student is able to systematically confirm a program’s validity, the next logical step is to execute, or at least simulate execution of that code. A design document detailing the different components of an interpreter for the language and how they work together will be required. This document shall explore the limitations of interpreters, in general, and how to minimize the negative impact of such limitations when constructing an interpreter for the newly defined language. Any design decisions included in the document shall be thoroughly explained. A desirable, but not required goal, is the development of a transpiler or simple interpreter that enables the actual execution of code reflecting defined language constructs.

Minimally, by the end of the semester the student shall have produced documents detailing a formal grammar, exhaustive semantics, an interpreter design, and sample programs that have been scanned, parsed, and validated.