TIM-8110, Programming Languages & Algorithms

(3 credits)

## Course Description:

New programming languages and algorithms are being proposed every day to try to solve problems faster, use less storage, and make programmers’ and researchers’ jobs easier. This course is an advanced study of the practical and theoretical principles behind the design, analysis, and implementation of algorithms and programming languages for research and professional practice.

## Number of Assignments: 8

## Course Learning Outcomes:

1. Evaluate computer algorithms for their efficacy in solving problems and improving on existing research.
2. Justify the design and implementation of computer algorithms and programming languages.
3. Evaluate new programming languages, mini languages, domain specific languages, and markup languages for their usefulness in research and professional practice.
4. Propose improvements to existing algorithms and programming languages.

## Course Concepts:

1. Programming language paradigms
2. Domain-specific languages
3. Algorithmic complexity
4. Algorithm categories and problems
5. Research in algorithms and programming languages

## Primary Resource/textbook:

None

## Course Outline

### Section 1: Programming Languages

#### Week 1

##### Assignment Title: Finish a Lexical Analyzer for a Simple Procedural Programming Language - Assignment Points: 10

#### Week 2

##### Assignment Title: Review Literature Related to Object Oriented and Functional Programming - Assignment Points: 10

#### Week 3

##### Assignment Title: Compare Domain Specific Languages - Assignment Points: 10

### Section 2: Algorithms

#### Week 4

##### Assignment Title: Critique Big-O and an Alternative to Big-O - Assignment Points: 10

#### Week 5

##### Assignment Title: Implement and Test Two Algorithms - Assignment Points: 10

#### Week 6

##### Assignment Title: Find a Problem Solvable with an Algorithm - Assignment Points: 10

### Section 3: Research and Application

#### Week 7

##### Assignment Title: Develop a Research Proposal – Assignment Points: 20

#### Week 8

##### Assignment Title: Reproduce a Published Experiment - Assignment Points: 20