**COEN 4870 - Evolutionary Computation**

**Class Schedule:** 3 Credit course, meeting the equivalent of 3-50 minute lectures periods per week.

**Course Coordinator**: Dr. Richard J. Povinelli

**Course Materials:**

**Required:** Introduction to Evolutionary Computation, 2nd edition by A. E. Eiben and J. E. Smith, Springer, 2015.

**Course Description:**

Covers a set of search methods based on the Darwinian principle of survival of the fittest. The methods include genetic algorithms, evolutionary strategies and evolutionary and genetic programming, which have been successfully applied to many different problem domains including optimization, learning, control, and scheduling. Provides students with the background and knowledge to implement various evolutionary computation algorithms, discusses trade-offs between different evolutionary algorithms and other search methods, and discusses issues related to the application and performance evaluation of evolutionary algorithms.

**Prerequisites**: COSC 2010, MATH 1450, and MATH 2105

**Selected Elective** in ELEN Computer Hardware & Software area, COEN Intelligent Systems area (breadth and depth)

**Contribution to Professional Component**: Engineering Science 30 %

Engineering Design 70 %

**Course Goals:**

To discuss and evaluate the field of evolutionary computation, including theory and application.

**Course Objectives:**

*By the end of this course, you should...*

1. Be able to explain and apply a simple genetic algorithm (sGA).
2. Be able to explain and apply evolutionary strategies.
3. Be able to explain and apply evolutionary and genetic programming.
4. Be able to explain the theoretical foundations for genetic algorithms.
5. Be able to compare and contrast different evolutionary algorithms.

**Contribution to Program Objectives**: partial fulfillment of Criterion 3 objectives A, C, D, E, F, G, I, K

**Course Topics: Tentative Dates**

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| Problems to Be Solved | wk 1 |
| Evolutionary Computing: The Origins | wk 1-2 |
| What is an Evolutionary Algorithm? | wk 2-3 |
| Representation, Mutation, and Recombination | wk 3-4 |
| Fitness, Selection, and Population Management | wk 5 |
| Popular Evolutionary Algorithm Variants | wk 6 |
| Parameters and Parameter Tuning | wk 7 |
| Parameter Control | wk 9 |
| Working with Evolutionary Algorithms | wk 10 |
| Memetic Algorithms | wk 11 |
| Nonstationary and Noisy Function Optimization | wk 12 |
| Coevolutionary Systems | wk 13 |
| Theory | wk 14 |

Last Updated: 3 November 2017