The University of Georgia

Department of Computer Science

Course Information Sheet

CSCI 4560

Evolutionary Computation and Its Applications

Brief Course Description
(50-words or less)

An in-depth introduction to evolutionary computation methods and an exploration of research problems in evolutionary computation and its applications which may lead to work on a project or a dissertation.

Extended Course Description / Comments

The course is appropriate both for students preparing for research in evolutionary computation, as well as science and engineering students who want to apply evolutionary computation techniques to solve problems in their fields of study.

Pre-Requisites and/or Co-Requisites

CSCI 1302
Software Development

Approved Textbooks
(If more than one, course text used during a semester is at the discretion of the instructor)

Author(s): A.E. Eiben and J.E. Smith
Title: Introduction to Evolutionary Computing
Edition: Corrected second printing 2007
ISBN-13: 978-3-540-40184-1

Specific Learning Outcomes (Performance Indicators)

This course presents a survey of topics in evolutionary computation. At the end of the semester, all students will be able to do the following:

1. Formulate a problem as an evolutionary computation search/optimization by specifying representations, selection and variation operators.
2. Write a program or use a package to implement an evolutionary algorithm.
3. Conduct evolutionary optimization experiments and properly report and discuss the results.
4. Effectively present an evolutionary computation article to an audience.
5. Review and critique evolutionary computation articles.
6. Reason about the schema theorem and the theory of evolutionary computation.

Relationship Between Student Outcomes and Learning Outcomes

		Student Outcomes										
		A	b	c	d	e	f	g	h	i	j	k
Learning Outcomes	1	•	•							•		
	2	•		•						•		
	3	•		•						•		
	4	•					•					
	5	•								•		
	6	•								•		

Student Outcomes

a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
c. An ability to design, implement, and evaluate a computer-based

system, process, component, or program to meet desired needs.

d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security and social issues and responsibilities.
f. An ability to communicate effectively with a range of audiences.
g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
h. Recognition of the need for and an ability to engage in continuing professional development.
i. An ability to use current techniques, skills, and tools necessary for computing practice.
j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
k. An ability to apply design and development principles in the construction of software systems of varying complexity.

Major Topics Covered
(Approximate Course Hours)

3 credit hours = 37.5 contact hours
4 credit hours = 50 contact hours

Note: Exams count as a major topic covered

Introduction (5-hours)
Components of an Evolutionary Algorithm (2.5-hours)
Genetic Algorithms (4.5-hours)
Evolution Strategies (2.5-hours)
Evolutionary Programming (2.5-hours)
Genetic Programming (2.5-hours)
Learning Classifier systems (3.5-hours)
Parameter Control (2.5-hours)
Multi-modal Problems(2.5-hours)
Multi-objective Evolutionary Optimization (2.5-hours)
Hybridization and Memetic Algorithms (2.5-hours)
Working With Evolutionary Algorithms (3.5-hours)
Theory (3.5-hours)
Paper Presentations (10-hours)

Assessment Plan for this Course

Each time this course is offered, the class is initially informed of the Course Outcomes listed in this document, and they are included in the syllabus. At the end of the semester, an anonymous survey is administered to the class where each student is asked to rate how well the outcome was achieved. The choices provided use a 5-point Likert scale containing the following options: Strongly agree, Agree, Neither agree or disagree, disagree, and strongly disagree. The results of the anonymous survey are tabulated and results returned to the instructor of the course.

The course instructor takes the results of the survey, combined with sample student responses to homework and final exam questions corresponding to course outcomes, and reports these results to the ABET committee. If necessary, the instructor also writes a recommendation to the ABET committee for better achieving the course outcomes the next time the course is offered.

How Data is Used to Assess Program Outcomes	Each course Learning Outcome, listed above, directly supports one or more of the Student Outcomes, as is listed in "Relationships between Learning Outcomes and Student Outcomes". For CSCI 4560, Student Outcomes (a), (b), (c), (f) and (i) are supported.
Course Master	Dr. Khaled Rasheed
Course History	