Knight Foundation School of Computing and Information Sciences

Course Title: Competitive Programming and Problem Solving

Date: 04/06/2011

Course Number: COP 4516

Number of Credits: 3

Subject Area: Algorithms, programming	**Subject Area Coordinator:** Tim Downey **email:** downeyt@cis.fiu.edu
Catalog Description: Problem solving for programming competitions. Algorithms, analysis, programming, debugging, group collaboration. Participation in team practices and rigorous individual preparation.	
Textbook: *Competitive Programming*, by Steven Halim and Felix Halim, Lulu.com, 2010	
References: *Programming Challenges*, by Steven S. Skiena and Miguel A. Revilla. *Data Structures and Algorithm Analysis in Java 2nd ed*, by Weiss	
Prerequisite Courses: COP 3530	
Corequisite Courses:	

Type: General free elective

Prerequisite Topics:

P1. Be familiar with basic techniques of algorithm analysis
P2. Be familiar with writing recursive methods
P3. Master the implementation of linked data structures such as linked lists and binary trees
P4. Be familiar with advanced data structures such as maps, sets, and priority queues.
P5. Be familiar with some graph algorithms such as shortest path and minimum spanning tree
P6. Master the standard data structure library of a major programming language

Course Outcomes:

O1. Be familiar with standard competitive programming strategies and effective team collaboration techniques

O2. Be able to implement efficient solutions to programming problems while working under time pressure
O3. Be able to recognize the appropriateness and application of standard algorithmic strategies to new and challenging problems.

Relationship between Course Outcomes and Program Outcomes

BS in CS: Program Outcomes	**Course Outcomes**
a) Demonstrate proficiency in the foundation areas of Computer Science including mathematics, discrete structures, logic and the theory of algorithms	**O1, O2, O3**
b) Demonstrate proficiency in various areas of Computer Science including data structures and algorithms, concepts of programming languages and computer systems.	**O1, O2, O3**
c) Demonstrate proficiency in problem solving and application of software engineering techniques	**O1, O2, O3**
d) Demonstrate mastery of at least one modern programming language and proficiency in at least one other.	**O1, O2, O3**

Outline

Topic	**Number of Lecture Hours**	**Outcome**
• Language API Review o intrinsic data types o string manipulation o sets, maps, lists, arrays o comparators o pattern matching o file and stream I/O o debugging tools	4	O2
• Competitive Programming Strategies o evaluating difficulties of problems o making optimal use of time o effective teamwork principles o balancing time/productivity constraints o dynamics of group interaction o simulated competitions	10	O1, O2

• Applying Standard Algorithms to Problem Solutions o radix sort o permutations and combinations o backtracking o graph searching o optimization o grids o computational geometry	21	O3

Course Outcomes Emphasized in Laboratory Projects / Assignments

Outcome	Number of Weeks
O1	24 lab projects and assignments, 2 per week
O2	
O3	

Oral and Written Communication:

None

Social and Ethical Implications of Computing Topics:

None

Approximate number of credit hours devoted to fundamental CS topics

Topic	Core Hours	Advanced Hours
Algorithms:	1.5	0.0
Software Design:	0	0.0
Computer Organization and Architecture:	0	0.0
Data Structures:	1.5	0.0
Concepts of Programming Languages:	0	0.0

Theoretical Contents:

None

Problem Analysis Experiences:

12 assignments

Solution Design Experiences:

12 assignments

Assessment Plan for the Course & how Data in the Course are used to assess Program Outcomes

Student and Instructor Course Outcome Surveys are administered at the conclusion of each offering, and are evaluated as described in the School's Assessment Plan: https://abet.cs.fiu.edu/csassessment/