CSCI 5432 - DESIGN AND ANALYSIS OF ALGORITHMS

Description:

The objective of this course is to cover a variety of concepts in Algorithm Design and Analysis. Topics include divide and conquer, the greedy method, backtracking, branch and bound, dynamic programming, NP-completeness, and graph algorithms.

Pre-requisites: a graduate or undergraduate level course in Algorithm Design plus knowledge of a high level programming language.

Audience:
This course is designed for students in the graduate program in computer science.

Instructor: Saïd Bettayeb, Ph.D
Professor, Computer Science and Computer Information Systems
Ph. 283-3857
Rm. Delta 166
Email: Bettayeb@uhcl.edu

Office Hours:  Office Hours:  Mon. 1:00-3:00 pm
                    Tues. 12 -1:00 pm
                    Wed. 7:00 - 8:00 pm
                    Thurs. by appointment.

Teaching Assistant: Ms. Ramya Gaddam.
                     Monday:  12.00PM - 4.00PM
                               5.00PM - 9.00PM
Tuesday: 10.00 AM - 1.00PM  
Thursday: 7.00PM - 10.00PM

e-mail: GaddamR6942@uhcl.edu

**Required Reading**

**Title:** Introduction to Algorithms  
**3rd Edition**

**Authors:** Cormen, Leiserson, Rivest and Stein

**Publisher:** McGraw Hill  
**ISBN:** 978-0-262-03384-8

**Recommended Reading**

**Title:** Computers and Intractability: A Guide to the Theory of NP Completeness  

**Authors:** Michael R. Gary and David S. Johnson

**Publisher:** W.H. Freeman and Company  
**ISBN:** 0-7167-104407

**Grading Policy:**

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<th>Component</th>
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<td>Midterm Exam</td>
<td>35%</td>
<td>October 17, 2011</td>
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<tr>
<td>Final Exam</td>
<td>45%</td>
<td>December 5, 2011</td>
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Late homework are accepted for the first two days after their due date with a 10% penalty per day or until the solution is handed out, whichever comes first.

No cell phone calls are permitted. Cell phones are to be turned off during class.

No make-up for missed quizzes under any circumstances.

**Specification of Course and Objectives**

**Statement of General Goals and Objectives:**

The student learns a variety of concepts in algorithm design and analysis. Topics include divide and conquer, the greedy method, backtracking, branch and bound, dynamic programming, graph algorithms, NP-completeness, approximation algorithms, and randomized algorithms. Focus on analysis techniques including amortized analysis.

Upon completion of this course, students will be able to:

- Understand the concepts of algorithm design
- Use rough and amortized analysis of algorithms
- Understand classic graph problems and algorithms such as spanning trees, shortest paths, topological sorts, maximum flow in networks
- Design solutions to moderately complex to complex problems using the techniques learnt.
- Understand basic issues in program complexity (i.e., P-class, NP-class, and NP-complete class problems). Learns when no algorithm is possible (undecidable problems)

**COURSE OUTLINE**

Weeks 1&2: August 22-Sept. 2, 2011:
   Analyzing and designing algorithms (Ch. 1-5)

Weeks 3&4: Sept 5-16, 2011:
   Dynamic Programming (Ch. 15)

Week 5: Sept. 21-23, 2011:
   The Greedy Method (Ch. 16)

Week 6: Sept. 26-Oct. 3, 2011:
   Amortized Analysis (Ch. 17)

Week 7: Oct. 3-10, 2011:
   Graph Algorithms (Ch.22-24)

Week 8: October 17, 2011
   Midterm Exam
Weeks 9, 10 & 11: Oct. 24- Nov. 7, 2010:
  Graph Algorithms (Cont) (Ch. 25, 26)

Weeks 12 & 13: Nov. 7 -21, 2011:
  Number Theoretic Algorithms and NP-completeness (Ch. 31, 34)

Week 13-14: Nov. 28, 2011
  Approximation algorithms: Traveling salesman and set covering. (Ch. 35)

Week 15: Dec. 5, 2011:
  Final Exam