COSC5334, Design and Analysis of Algorithms

Course Catalogue Description:
An advanced course that concentrates on the design and analysis of algorithms used to solve a variety of problems. The methods of design covered include such topics as: divide-and-conquer, the greedy method, dynamic programming, search and traversal techniques, and backtracking.

Course Learning Objectives:
The student will have been provided with:
1. A framework for the general discussion of algorithmic complexity. These notions will be independent of implementation specifics.

2. An opportunity for detailed analyses of some fundamental algorithms.

3. An appreciation of some "real-life" implications of the asymptotic complexity measures.

Textbook: Introduction to Algorithms, 3rd edition
T. H. Cormen, C. E. Leiserson, R. L. Rivest, and Clifford Stein
Published by: MIT Press or McGraw-Hill

Student Performance Evaluations:
Course grades will be determined by three examinations concerning text material, lectures, etc. Each of these parts will contribute equally towards the final grade. To be more specific, the course examination average will be used to determine course marks using the "traditional" 90, 80, 70, 60 percent minima for “A”, “B”, “C” and “D”, respectively.
Tentative Course Schedule:
We will proceed *guided* by the outline that follows. The numbers indicate the appropriate text portions, while an item followed by "(?)" may be omitted or greatly abbreviated. The first two examinations will occur, approximately, during the 6-th, and 11-th week. The third examination will occur during the University-mandated final examination period.

I. Foundations (weeks 1-5)
   1. Introduction: The Role of Algorithms in Computing
   2. Getting Started-Mathematical Foundations
      2.1 Insertion Sort
      2.2 Analyzing Algorithms
      2.3 Designing Algorithms
   3. Growth of Functions
      3.1 Asymptotic Notation
      3.2 Standard Notations and Standard Functions
   4. Divide and Conquer-Recurrence Relations
      (4.1 The Maximum Sub-array Problem- Not Covered)
      4.2 Strassen’s Method- overview only
      4.3 The Substitution Method for Solving Recurrences- overview only
      4.4 The Recursion tree method for solving Recurrences
      4.5 The master method for solving Recurrences
      (4.6 Proof of the master method- Not Covered)

EXAMINATION #1

II. Sorting and Order Statistics (weeks 5-10)
   6. Heapsort
      6.1 Heaps
      6.2 Heap property
      6.3 Building a Heap
      6.4 Heapsort
      6.5 Priority Queues
   7. Quicksort
      7.1 Description
      7.2 Performance
      7.3 Randomized Quicksort
      7.4 Analysis
8. Sorting in Linear Time
  8.1 Optimal sorting methods
  8.2 Counting Sort (Brief overview only)
  (8.3 Radix Sort Not Covered)
  (8.4 Bucket Sort-Not Covered)

III. Selected Topics (weeks 10 - 15)
  9. P and NP (Chapter 34
     34.1 Polynomial Time
     34.2 Polynomial-time Verification

EXAMINATION #2

  34.3 NP-completeness and reducibility
  34.4 NP-completeness proofs (overview only)
  34.5 NP-complete problems

IV. Possible Extra Topics (if time allows)
  15. Dynamic programming (Overview only)
  16. Greedy Algorithms
     16.1 An Activity-selection Problem
     16.2 Elements of the Greedy Strategy
     16.3 Huffman Codes
  22. Elementary Graphical Algorithms
  23. Minimal Spanning Trees

EXAMINATION #3
Some University-mandated Notes:

Course Withdrawal:
I hope that you never find it necessary to withdraw from (or, informally drop) this or any other course. However, events can sometimes occur that make course withdrawal a necessary, or even a wise, decision. Please consult with me before you decide to withdraw from this course to discuss possible alternatives.

Should you determine that dropping the course is your preferred course of action, then you must initiate the process by going to the Student Services Center and filling out a course drop form. Merely stopping your attendance and participation will not automatically result in your being withdrawn from the class.

Please be certain that you properly submit this paperwork. Should my signature be required you may obtain it either at a class meeting, during my regularly scheduled office hours, or by appointment. Failure to properly complete the course withdrawal procedure will result in your receiving a course grade based on the work you have actually completed.

Academic Integrity/Plagiarism
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct will not be tolerated.

Classroom/professional behavior
Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

Disabilities Accommodations
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Corpus Christi Hall 116.
If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

**Grade Appeals (College of Science and Engineering Version)**

As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage (http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

**Statement of Academic Continuity**

In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.