**COLLEGE OF ENGINEERING**

COMPUTER AND INFORMATION SYSTEMS ENGINEERING (CISE)

TENNESSEE STATE UNIVERSITY

**COURSE DESCRIPTION FOR CISE5010 (DATA STRUCTURES AND ALGORITHMS)**

**SEMESTER: FALL 2012 PROFESSOR: Dr. W. Chen**

**A. CATALOG COURSE DESCRIPTION**

This course presents the studies in selecting and designing data structures and algorithms for computer solutions to problems in various areas. Fundamentals of algorithm analysis are introduced and well known algorithm design techniques such as divide-and-conquer, dynamic programming, greedy technique are discussed. Data structures and algorithms for sorting, searching, pattern matching, networked computing and communication and some other mathematical problems, such as combinatorics are covered. **Prerequisite:** COMP 3200, Engr 2231 or equivalent.

1. **COURSE OBJECTIVES**
2. Ability of algorithmic problem solving
3. Skill of algorithm design, data structure selection, and algorithm analysis
4. Knowledge of limitations of computation power.

4. Skill of implementation of algorithms.

5. Ability to design efficient algorithms for solving problems in CISE and other areas.

**C. PREREQUISITE**

Students should have a grade of 'C' or better in COMP 3200, Engr 2231 or equivalent.

**D. COMPETENCIES**

1. A basic understanding of data structures and analysis of algorithms.

2. Ability to design efficient algorithms for information processing, networking, communication and other mathematical problems in combinatorics.

**E. PROJECTS**

|  |  |
| --- | --- |
| **Project #** | **Topic** |
| Project #1 | Implementing elementary data structures by using array and link list.  |
| Project #2 | Implementing dynamic dictionary by using advanced data structures  |
| Project #3 | Designing and implementing algorithms for selected application using divide-and-conquer.  |
| Project #4 | Designing and implementing algorithms for selected application using greedy technique, and/or dynamic programming  |

**F. GENERAL INFORMATION**

1. **Estimated ABET Category Content:**  NA

2. **Text Title and Author:**  Introduction to Algorithms by T.H.Cormen, C.E.Leiserson, R.L.Rivest.

 Published by MIT Press/McGraw-Hill

1. **List of References:**  Will be provided in class.

4. **Class Meeting:**  Will be decided

5. **Class Attendance:**  Class attendance is required.

6. **Instructor Information:**

 Telephone: 963- 5878

Email: wchen@tnstate.edu, URL: http://www.tnstate.edu/faculty/wchen

Office Location: MH Room 5N

 Office Hours: TR 11:10am – 12:40pm, 2:30pm – 3:00pm , MW 1:00pm – 3:00pm,

 F 9:40am – 11:40am(Aug 27 – Oct 14), 1:00pm – 3:00pm(Oct 15- Dec 7)

7. **Policy on Excessive Absence:**

The University’s Policy on Class Attendance and Excessive Absences will be followed. All students are encouraged to refresh themselves on this policy as listed in the latest TSU Graduate Catalog. Students are responsible for all material presented, and all assignments and announcements made during class.

1. **Evaluation of Student Work:** The final grade will be determined as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Grading:** |  |
| **Homework assignment**  | 20% | 90-100% | A |
| **Computer projects**  | 40% | 80-89% | B |
| **Mid term test**  | 15% | 70-79% | C |
| **Final test**  | 25% | 60-69% | D |
|  |  | Below 60% | F |

 **9.**  **Homework and Project Report:**

Problems will be assigned during the lecture and will be due at the next lecture. Late home work and/or assignment score will be reduced at a rate of ten percent (10%) per day from due date. All homework must display the following characteristics of professional-quality. Use only one side of Standard size (8 1/2" x 11") engineering paper with no ragged spiral-binder edges for homework assignments. If more than one page is required, all pages must be numbered and stapled together. All problem solutions should contain sufficient terse English to enable the reader to follow the reasoning process leading to the answer. Each problem should have a problem statement at the beginning. Name and homework problem number should be on the top right corner of the first sheet of each problem. Follow the Scientific Problem Solving, Computer Assignment Report and Design Assignment Report formats for all appropriate homework assignments. Problems will be assigned during lectures and will be due next lecture. No late homework will be accepted unless approved in advance.

 **10. Missed Exams or Quizzes:**

No test or quiz will be repeated for students who missed the test and quiz without the reason acceptable by

Students Affair Office. Extenuating circumstances should speak to the instructor as soon after the test as

possible (notification beforehand is necessary for exam absence which can be anticipated). Make-

up exams may not be given and no exam will be dropped.

**G. DETAILED COURSE OUTLINES**

Two Topics for Each Week

01 Distribute syllabus, introduce course

02 Notion of algorithm, fundamental of algorithmic problem solving

03 Data structures I: array, list, stack, queue

04 Data structures II: priority queue, binary search tree, graph

05 Implementation of elemental data structures: search in array, list and binary tree

06 Analysis framework, asymptotic

07 Analysis of no-recursive and recursive algorithms

08 Brute force algorithms: Selection sort and bubble sort, sequential search

09 Brute-force string matching, exhaustive search

10 Concept of Divide-and-Conquer

11 Quicksort

12 Mergesort

13 Strassen’s matrix multiplication

14 Implementation of the algorithms using Divide-and-Conquer

15 Concept of Dynamic Programming

16 Computing a binomial coefficient

17 Matrix-chain multiplication

18 Implementation of the algorithms using Dynamic Programming

19 Concept of Greedy Technique

20 Dijkstra’s algorithm

21 Huffman codes

22 Special topics I: Graph algorithms 1

23 Special topics I: Graph algorithms 2

24 Limitation of algorithm power, P, NP, and NP-complete problems

25 Special topics: parallel algorithms 1

26 Special topics: parallel algorithms 2

27 Special topics III: distributed algorithms 1

28 Special topics III: distributed algorithms 2

29 Fundamental techniques for analysis and design of distributed algorithms

30 Course review and wrap up