CS 203 Computing and Algorithms III

COURSE SYLLABUS and CLASS POLICIES

PREREQUISITES: CS-211, Discrete Mathematics;

CS 102 Computing and Algorithms II

DESCRIPTION: An introduction to advanced data structures such as balanced binary trees, heaps; analysis of algorithms through sorting and searching; introduction to set and graph algorithms; an introduction to algorithm complexity relative to time and space issues. Students are required to write several program investigating algorithm complexity and implementation issues related to data structures.

INSTRUCTOR: Prof. Saroja Kanchi

BOOKS: "Introduction to Design and Analysis of Algorithms" by Levitin, Addison-Wesley, 2nd edition

EMAIL: <u>skanchi@kettering.edu</u> Please include the word CS203 in the subject line for early response. The email is the most preferred way of contacting me. The second best means is to stop at my office during office hours. Contacting by office phone or leaving a message there would be the last means of contacting me.

PHONE: 762-7987

OFFICE: AB 2-300P

OFFICE HOURS: M: 3:00pm-4:00pm

W: 3:00pm-5:00pm

Any other time, as long as I am in my office, you can call me and come in.

COURSE OBJECTIVES:

Each student who receives credit for CS-203 will have demonstrated the ability to do all of the following tasks:

- a) Perform an asymptotic timing analysis of an arbitrary program using appropriate notation.
- b) Construct advanced data structures (hash table, balanced search trees, *etc.*) correctly and analyze their behavior.
- c) Describe the philosophy guiding various design techniques (greedy, divide-and-conquer, dynamic programming, *etc.*)
- d) Choose (and defend) the appropriate algorithm design technique to apply to a given application problem.
- e) Apply properly the use of recursive backtracking and branch-and-bound algorithms to search problems.

TOPICS:

Asymptotic notation
Design and Analysis of Balanced Search Trees
Design and Analysis of Hash tables
Design and Analysis of Priority Queues

Design and Analysis of elementary graph data structures and algorithms

Greedy Algorithms design and analysis

Divide and Conquer Design and analysis

Dynamic Programming algorithms design and analysis

Recursive Backtracking

Branch and Bound Algorithms

SYLLABUS

- 1. Introduction to Complexity and Algorithms
- 2. Searching -Sequential Search
- 3. Searching-Binary Search
- 4. Searching 2-3 trees
- 5. Sorting -Smallest Based Sort
- 6. Sorting-Insertion sort
- 7. Sorting-Merge Sort
- 8. Sorting-Quick sort
- 9. Sorting-Heap Sort
- 10. Sorting-Bucket Sorting Algorithms
- 11. Sorting-Shell sort
- 12.Sorting- Radix Sort
- 13. Graphs-Introduction to graphs
- 14. Graphs-Minimum Spanning Tree Algorithms
- 15. Graphs-Depth First Search Tree and Breadth First Search Tree.
- 16. Graphs-Transitive Closure
- 17. Graphs -Warshall and Floyd's algorithms for All-pairs shortest path
- 18.NP-Completeness- Introduction to NP Completeness
- 19.NP-Completeness TSP
- 20.NP-Completeness- Knapsack

Note: The actual coverage may vary from the above syllabus, depending on students' performance, pace and other unforeseen circumstances. There is no guarantee that I will follow the above syllabus word-to-word and in that order. The above syllabus is only a guideline.

HOME PAGE: http://www.kettering.edu/~skanchi

DROP DATE: You may withdraw from the course with no grade assigned to the course up to Week 7, Friday

BLACKBOARD USAGE: We will be using blackboard for submitting assignments, posting assignments and lecture notes and for making announcements. If there is an important update, I will send out emails to you asking you to check the blackboard. However, there may be several announcements made in class, that may not appear on the blackboard. Checking blackboard is not a replacement for attending classes.

GRADING POLICIES

The grades for the course will be split among the following testing mechanisms.

Curve: Final course grades will initially be computed using the relative weights described above. Grades for the entire class will be adjusted upward if the course average is not at least 85. If the average is below 85, each grade will be added the same number of points to make the class average of 85. Note also that while computing the class average, grades below 45% are not included. Note that if the class size is small, then there may be additional restriction of a maximum of 15 point curve.

Please keep in mind that the individual assignments or tests are not curved. The class averages for individual assignments and tests will not be computed or provided. The curve will apply only to the final grade.

Programming Assignments You will have about 4-5 assignments in the term. They are tentatively expected to be due on the midnight of 3rd, 5th, 7th, 9th and 11th Wednesdays.

Your assignment will be based on the material taught in class and the tasks assigned in your labs. However, you WILL have to do a lot of experimentation and investigation into the book and Java related material to get your assignments done.

You are expected to start the assignments EARLY. Do not wait until the last day to start assignments. It is more likely that you will not be able to complete the assignment, if you start late.

You are expected to spend a LOT OF TIME outside the two hours of assigned lab time to complete the assignments. Some of the assignments are expected to be complicated and lengthy.

Assignment Write-Up

You will be asked to write up the report on the assignment some time (usually one week) before the deadline of the assignment. The write up should be in English (not java) and must include all the 6 steps described in the class for algorithm design. This must be turned in a the beginning of the class period it is due.

Biweekly Assignments A biweekly assignment consists of a homework and a quiz.

The list of homework problems is available in the class notes. You are expected to work on the homework problems on a daily basis. Your homework will be due on every other Monday starting Week 2. The homework to be turned in on a Monday will cover the problems that belong to sections covered up until previous Thursday . On Monday, you will turn in the homework at the beginning of the class. There will be 5 homework submissions in total corresponding to Weeks 2,4,6,8 and 10.

You can work with your friends on your homework but **you must write the solution on your own**. You must copy the question fully and then write the answer to the question. Each question must be answered on a separate page. You must write the answers legibly. You may download the homework problems and print them and then

use those pages to answer the questions. Please staple all the homework pages together before you turn it in.

There will be a quiz Thursday of even numbered weeks, on the homework you turned in. The quiz will consist of solving one or more of the homework problem that you turned in or a similar problem will be assigned.

The quiz will be graded for correctness, however, the homework will be graded for number of questions attempted and completeness of your solutions and often set of randomly selected questions will be graded for correctness. The quiz and the homework will each be counted as 50% of the biweekly assignment grade.

There will a time assigned at the end of every class and lab period where you can ask questions and work on homework problems.

Midterm and Final: Midterm will be in the fifth or sixth week and the final in the eleventh week. Final will include all the material taught from the beginning of the course. Use your homework as a study guide for preparing for midterm and final.

Grading: There will be a MINIMUM of one week between the time a material is submitted and the time the grades are returned back to you. Full credit will be given to correct solutions that meet all of the requirements. Partial solutions will receive partial credit. The amount of partial credit is up to the discretion of the grader. **You are required to keep the returned graded material in a safe place until the end of the term.**

I will keep the grades posted on blackboard so that you can check your performance in class at any time you wish. However, since the curve is applied only at the end of the course, what you see will be your raw grades. If you find a certain grade missing or incorrect, you must immediately bring it to my attention.

ABSENCES

You are required to attend all the classes so that you perform well in the course. If you miss a class it is your own responsibility to obtain lecture notes from your classmates. I will not go over the material on individual basis nor provide lecture notes.

If you cannot take the midterm or final for medical reasons please call me before hand, if possible. If you are unable to call before hand, you should talk to me about rescheduling the test as early as possible and test should be taken within one week of the missed test period. You may reschedule the midterm or final only with proper documents from a medical professional.

LATE POLICIES

All of the items including homeworks, quizzes, assignments etc are due on the day it is posted to be due. You are given two late coupons for the entire class. You may use each coupon to turn in one homework late by 24 hours, OR make-up one missed quiz, OR turn in one assignment late by 24 hours OR turn in one assignment write-up late by 24 hours. Note that if you do not use the coupon for the class, by the end of term, it cannot refunded for grade!

DISCIPLINARY AND ETHICAL POLICIES

To be fair, and to achieve high academic standards I require my students to adhere to the following rules. Failure to do so will result in heavy penalty.

- 1. Submission of work not entirely your own, will receive an automatic zero, with a warning, for the first offense. An automatic failing grade will be assigned for the course for any subsequent offense. This is applicable to all parties involved in the cooperative effort. Documentation related to cheating in assignments or tests will be forwarded to the Dean of Academic Affairs and will be added to the student's file.
- 2. You are expected to keep track of your grade at all times. If you see yourself failing, you should take necessary measures to improve your grade. Just before or just after the final exam I cannot entertain discussion of improvement in your grade. If you need to obtain a certain grade for whatever reason (for example being on probation) it is your responsibility to earn that grade.
- 3. You are expected to behave in a way that is responsible and fosters a learning environment for your classmates. This means that you will come to classroom and lab session on time, you will not distract the lectures by talking among yourselves and you will not be walking in and out of the class in the middle of the lectures. If any of these incidents occur, you will not be allowed to continue attending the classes.

Grading Of Programming Assignments

Assignments are due at midnight of the date it is due. The due date will be announced as soon as the assignment is made available. Assignments are graded during the following lab session after the due date.

To turn in the assignment, submit the source files (either zipped or separately) to the blackboard drop box by the deadline. If blackboard drop box does not work, you can send to me at skanchi@kettering.edu. This copy will be used as backup. However, you MUST have a clean copy of the program on the server (nova) by the deadline that compiles and runs. You must not modify this copy after the deadline. This copy will be used for grading.

An assignment program has to *compile* successfully so that it can receive credit above 30%. An assignment that does not compile will receive a maximum of 30 points depending on how much code is in. You are always better off coding a part of the functionality and testing what you have coded, and adding more code when the existing code works. Do not write thousands of lines of code to find out that the program does not even compile!

Assignments graded during the lab session after the due date of the assignment. You will need to provide print of the source files and the assignment grade sheet that is available on blackboard. You will be asked questions regarding your assignment, while I am grading it. You will demo your assignment the lab during the grading process.

Please see Grade Sheet for additional information on grading.

Cheating In Programming Assignments

It is expected that you write 100% of the program on your own. You must not get help from anyone outside the class, nor from any of your classmates. The only person you can get help from is me. During the grading, I will ask you questions about the code, and you must be able to answer them fully.

If two or more programs have essentially same code, (just changing variable names and method names will not make the code dissimilar) the parties involved will be considered to have cheated. I will not entertain discussion who cheated from whom. All parties involved will be equally guilty. Therefore make sure that you do not ge help from anyone and do not help anyone .
Submission of work not entirely your own, will receive an automatic zero, with a warning, for the first offense. An automatic failing grade will be assigned for the course for any subsequent offense. This is applicable to all parties involved in the cooperative effort. Documentation related to any incidence of cheating in assignments or tests will be forwarded to the Dean of Academic Affairs and will be added to the student's file.
Saroja Kanchi