Towson University: Department of Computer and Information Sciences

# COSC 483: The Design and Analysis of Algorithms, Fall 2006

http://triton.towson.edu/~hhochhei/classes/fall06/483

**Instructor:** Dr. Harry Hochheiser, E-mail: hhochheiser@towson.edu
**Office:** YR 425, Phone: 410 704 3090, Office Hours: Monday 1:45PM-2:45PM, Wed: 11AM -12PM, Thur: 4-5PM, or by appointment.

**Class Time:** Tues., Thurs., 5:30-6:45, **Room:** YR 201

**Textbook:** T. Cormen, C. Leiserson, R. Rivest, and C. Stein , Introduction to Algorithms , McGraw Hill/MIT Press . (I can suggest supplemental texts upon request.)

**Introduction** This course has two goals: 1) To provide a background in techniques for analyzing the correctness and computational cost of algorithms and 2) To discuss specific algorithms from a variety of fields in Computer Science. Mathematical foundations will be reviewed, including asymptotic notation, summation techniques, and recurrences.. Several algorithm design techniques, including greedy algorithms and dynamic programming will be discussed. Specific examples from graph theory, computational geometry, string matching, and NP-completeness theory will also be covered as time allows.

**Organization** Coursework will consist of 6-7 homework assignments, and 2 exams - a final and a midterm. Although the homework may count for a relatively small portion of the final grade, it still must be taken seriously: you may face difficulty on the eams if you have not done the homework.

**Policies**

- All homework will be handed in on the due date. Late assignments will be penalized 15% for each day of delay. Assignments will not be accepted after solutions have been discussed in class or posted on the web site.
- Your work should be easy to read: there are many papers to be graded and we do not have the time to decipher cryptic handwriting. If possible, type your work. Otherwise, please write neatly and clearly. In any case, please explain your answers clearly and succinctly. No credit will be given for answers that we cannot understand.
- The work you turn in must be your own. You can feel free to discuss assignment questions with others, but tyou must not take any written notes out of these discussion. Cheating in any form - including copying someone else's work or letting your work be copied - is unacceptable at Towson University. Do not turn in work that has been copied from somebody else, do not let your work be copied. Anyone found cheating (on either side, copying or being copied) will receive an F for the course and a letter to the dean will be sent. Any incidents of cheating will be handled through appropriate administrative channels.
- Attendance will be taken at each class session. If you miss a class, it is your responsibility to make up the material, to get information about assignments, and to complete those assignments. Requests for permission to make up exams must be supported by written verification of the reason for the absence.
- Towson University does not post grades. The department office will not inform you about your grade after a course is completed since you can check your grades online.
- University policy states that students may not repeat a course more than once without prior permission of the Academic Standards Committee.
- No food or drink is allowed in the labs; no food is allowed in the classrooms.
- Please don't use cell phones, pagers, laptops, etc. in class.

**Grading**

- Homework: 25%.
- Midterm: 35%. Tentatively scheduled for October 10
- Final Exam (Tuesday, December 12): 40%.

*Grading Policy*

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|---|---|---|---|---|
| *A*: 93-100 | *A*-: 90-92.9 | *B*+: 87-89.9 | *B*: 83-86.9 | *B*-: 80-82.9 |
| *C*+: 75-79.9 | *C*: 70-74.9 | *D*+: 65-69.9 | *D*: 60-64.9 | *F*:$<$ 60 |

Although class participation is not listed explicitly, you will need to attend class in order to do well in this course..

**Syllabus**

- Foundations: algorithms and efficiency, asymptotic notation, average and worst-case analysis, mathematical tools, recurrences.
- Sorting and Selection: merge sort, quick sort, selection.
- Algorithm Design Techniques: Greedy algorithms, divide and conquer, dynamic programming, amortized analysis.
- Data Structures: binary heaps, binomial heaps, binary search trees, balanced trees, disjoint sets.
- Graph algorithms: basic traverals, minimum spanning trees, shortest paths, network flow algorithms
- Computational Geometry: convex hulls, closest points, range searching
- Computational Complexity: P and NP, NP-Complete problems, Heuristic approaches for NP-complete problems, Approximation algorithms.
- Others: pattern matching and others as time allows.

**Schedule** Approximate - dates and topics subject to change.

| Week | Date | Topic | Reading |
|---|---|---|---|
| 1 | Aug. 29 | Fundamentals,Background | Chaps. 1-3, Apps. A |
| 2 | Sep 5 | Recurrences, sorting. Homework 1, Due Sep. 14 | Chaps. 4, 6-7 |
| 3 | Sep 12 | Selection, | Chaps. 9 |
| 4 | Sep 19 | Greedy Algorithms, Homework 2, Due Sep. 28 | Chap. 16 |
| 5 | Sep 26 | Divide and Conquer, Dynamic Programming | Chap. 15 |
| 6 | Oct. 3 | Amortized Analysis, Binary Heaps Homework 3, Due Oct. 17 | Chaps. 17,6 |
| 7 | Oct. 10 | Binomial Heaps *Midterm: Oct. 10* | Chap. 19 |
| 8 | Oct. 17 | Binary Search Trees, Balanced Trees, Disjoint Sets. Homework 4, Due Oct. 26 | Chaps. 12-13,21 |
| 9 | Oct. 24 | Graphs: Basics, Minimum Spanning Trees | Chaps. 22-23 |
| 10 | Oct. 31 | Shortest Paths, Network Flow.Homework 5, Due Nov. 9 | Chaps. 25-26 |
| 11 | Nov. 7 | Shortest Paths, Network Flow | Chaps. 25-26 |
| 12 | Nov. 14 | Computational Geometry. Homework 6, Due Nov. 27 | Chap. 33 |
| 13 | Nov. 21 | NP-Completeness | Chap. 34 |
| 14 | Nov. 27 | More NP-Completeness Approximation Algorithms. Homework 7, Due Dec. 4 | Chap. 35 |
| 15 | Dec. 4 | String matching and review | Chap. 32 |

*Final Exam:* Tuesday, December 12

This schedule is approximate and subject to change.