

CS 473 - Algorithms I

Semester: Summer 2011

Schedule: Monday, Tuesday, Thursday 13:40, 14:40

Classroom: EB 104

Instructor: Melih Onus

Office Hours: Monday, Tuesday, Thursday 15:40 - 17:30, EA 520

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Website: <http://www.cs.bilkent.edu.tr/~onus/ogr/yaz2011/cs473/index.html>

Description: Asymptotic notation. Divide and conquer approach. Solving recurrences: substitution method, master method. Bounding summations. Analysis of randomized quicksort. Medians and order statistics. Heaps: heapsort, priority queues. Sorting in linear time. Dynamic programming. Greedy algorithms. Amortized analysis: aggregate, accounting and potential methods, dynamic tables. Elementary graph algorithms: breadth-/depth-first search, topological sort, strongly connected components. Credit units: 3 ECTS Credit units: 6, Prerequisite: CS 202.

Text Book: T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein. *Introduction to Algorithms*, MIT Press and McGraw-Hill, 3. Edition, 2009.

References:

- Jon Kleinberg, Eva Tardos. *Algorithm Design*, Addison Wesley, Pearson Education, 2006.
- E. Horowitz and S. Sahni, *Fundamentals of Computer Algorithms*, Computer Science Press 1978.

Grading:

Midterm I (%25): June 17, 2011, 17:40 – 20:40 (Open book, closed notes), EB 101 – EB 102.

Midterm II (%25): July 1, 2011, 17:40 – 20:40 (Open book, closed notes), EB 101 – EB 102.

Midterm III (%25): July 15, 2011, 17:40 – 20:40 (Open book, closed notes), EB 101 – EB 102.

Final (%25): TBA (Open book, closed notes)

Attendance (%5)

Outline:

WEEK 1: Introduction: analysing algorithms, designing algorithms. Asymptotic notation. Solving Recurrences. (Chapters 1, 2, 3, 4)

WEEK 2: Divide and conquer: Strassen. Randomized quicksort: analysis. (Chapters 2, 4, 7)

WEEK 3: Medians and order statistics. Heaps: heapsort, priority queues. Sorting in linear time. (Chapter 9, 6, 8)

WEEK 4: Dynamic programming: matrix-chain multiplication, longest common subsequence, 0/1 Knapsack problem, resource allocation problem. (Chapter 15)

WEEK 5: Greedy algorithms: activity selection problem, Huffman codes, task scheduling problem. (Chapter 16)

WEEK 6: Amortized analysis: aggregate, accounting and potential methods, dynamic tables. (Chapter 17)

WEEK 7: Graphs. Breadth-First Search. Depth-First Search. Topological Sort. Strongly Connected Components (Chapter 22)

Attendance: You will fail the class if the attendance is below a certain percentage (%80 - %75).

Resources: MIT, Introduction to Algorithms, complete set of lecture notes and videos:

<http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-introduction-to-algorithms-sma-5503-fall-2005/>

Academic Integrity

Copying or communicating during an exam is considered cheating. Students caught cheating in an exam will be subject to disciplinary action, as explained in the "Student Disciplinary Rules and Regulation" (www.provost.bilkent.edu.tr/procedures/AcademicHonesty.htm).