CS 330 — Discrete Structures Syllabus

Final except for correcting typos or unforeseeable circumstance

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1 Course Summary

Welcome to CS 330 Discrete Structures. This class has two major thrusts which complement each other nicely: increasing the mathematical sophistication (proofs and logic) and introducing the mathematical foundation of computer science. The emphasis is on understanding the material rather than simply accumulating information.

The class consists of two weekly (standard) lectures and one recitation session (officially called “lab”, Fridays 11:25-12:15, normally administered by the TA) in which students solve problems related to the lectures. Meeting time and locations:

| Class 11:25 am - 12:40 pm MW Life Sciences 240 Aug 20, 2012 - Dec 01, 2012 Lecture |
| Class 11:25 am - 12:15 pm F Life Sciences 240 Aug 20, 2012 - Dec 01, 2012 Lab |

The instructor is going to some conferences during the semester. Thus there will be some lectures with recitations only, while sometimes normal classes will be held instead of recitations. The exact dates for conference travels will be announced at least a week in advance.

2 Textbook

The required textbooks is

Discrete Mathematics and Its Applications by Kenneth H. Rosen,

The sixth edition would be O.K. for learning, but may not be for assigned homework.

Recommended are


These books should be available at the bookstore and on the web. Our library has the textbook on reserve.

3 Current Catalog Descriptions
Introduction to the use of formal mathematical structures to represent problems and computational processes. Topics covered include Boolean algebra, first-order logic, recursive structures, graphs, and abstract language models. Co-requisite: CS 116 or CS 201. (3-0-3)

4 Course Goals

Students should be able to:

1. Illustrate by examples the basic terminology of functions, relations, and sets and demonstrate knowledge of their associated operations.
2. Demonstrate in practical applications the use of basic counting principles of permutations, combinations, inclusion/exclusion principle and the pigeonhole methodology.
3. Calculate probabilities of events and expectations of random variables for problems arising from games of chance.
4. Establish and solve recurrence relations that arise in counting problems including the problem of determining the time complexity of recursively defined algorithms.
5. Model logic statements arising in algorithm correctness and real-life situations and manipulate them using the formal methods of propositional and predicate logic.
6. Outline basic proofs for theorems using the techniques of - direct proofs, proof by counterexample, proof by contraposition, proof by contradiction, mathematical induction.
7. Relate the ideas of mathematical induction to recursion and recursively defined structures.
8. Illustrate by example basic terminology of graph theory and model problems in computer science using graphs and trees.
9. Deduce properties that establish particular graphs as Trees, Planar, Eulerian, and Hamiltonian.
10. Illustrate the application of trees and graphs to data structures.
11. Explain the basic concepts modeling computation including formal machines, languages, finite automata, Turing machines

5 Getting Help

Reasonable accommodations will be made for students with documented disabilities. In order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources and make an appointment to speak with me as soon as possible. The Center for Disability Resources is located in the Life Sciences Building, room 218, 312-567-5744 or disabilities@iit.edu.

Office hours are Monday and Wednesday 1-2, in room SB 229C, or by appointment. For an appointment send e-mail to xli@cs.iit.edu or call 312-567-5207. Please spend a little time trying to understand a homework problem before asking for help.
Some handouts (including this syllabus, homeworks, and some solutions) will be available at http://www.cs.iit.edu/~cs330.

The TA for the class will be Taeho Jung (email: tjung@hawk.iit.edu, office phone number: 312 567 5869) and has office hours Tuesday 1-2 PM and Friday, from the end of the class until 2PM, in room SB 019.

Students are expected to check email every week day of the semester. Clarifications on assignments or other important announcements might be sent by email - and will also be posted on the class web page and/or blackboard.

6 Grading

The grading allocation is given below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homeworks</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm 1</td>
<td>15%</td>
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<tr>
<td>Midterm 2</td>
<td>15%</td>
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<tr>
<td>Final exam</td>
<td>25%</td>
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<tr>
<td>Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Class Participation</td>
<td>5%</td>
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</tbody>
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The first midterm will be on Oct. 5, instead of recitation. The second midterm will also be instead of recitation, on November 9th. The final exam will be held as scheduled by the University (see university schedule for the exact date and time).

**Eleven** homeworks will be assigned (typically assigned on Wednesday, and due by midnight of the Wednesday one week or two weeks later, other than exam weeks). You can discuss the problems from homework assignments with other students in the class, but must write the solutions individually. Seek help from me if you are having difficulties with the homework. Except for extraordinary circumstances, homework solutions will be accepted at latest one week late. The penalty for late submission is **5%**, **for two days late, 10% for five days late, and 20% for one week late**.

You have to upload the electronic version of your homework solution to blackboard. We only accept PDF files for grading. Name your solution file by **FirstName-LastName-HWXX-CS330.pdf**. Here **XX** is the number for the homework and FirstName and LastName are your first name and last name respectively. You also HAVE to include your name and homework number in the cover page of your submission.

The submission time of your homework will purely be based on the time when you successfully uploaded your solution to the blackboard.

We also need EACH student to submit the hardcopy of your homework solution to TA before the deadline.

Among the eleven homework assignments, only the highest **ten** scores will be used to compute your final grade.

The **first midterm** will be **open-books and closed notes**. Precisely, each student can bring either the sixth or seventh edition of the textbook, printed version only, with no handwritten
notes on the book. Electronic versions will not be allowed; however a printout from the textbook (only) of maximum 50 double-sided pages may be used provided it is given to the instructor the lecture before the exam.

The second midterm and the final will be closed-books and closed notes, except for some possible notes distributed by me (photocopied key terms and results). The exams will be strictly individual, and may contain (slightly modified) homework problems. Standard departmental policy regarding academic (dis)honesty applies.

There will be no make-up exams, other than the final exam. Exams missed for valid reasons will be replaced by a higher weight of the final.

There will be 12 quizzes (15 minutes each), each Friday (or Monday) other than weeks with exams. Discussion with any students during the quizzes is not allowed. The lowest two quiz scores will be dropped when computing the composite score.

Attendance (including the recitation) is mandatory and will be reflected in the “class participation” score (valid excuses are required after the third missed class/recitation). Also, disturbing the class will decrease this score. Moreover, students will be assigned reading from the textbook to competently discuss in class. Exceptions from the attendance: students whose score reflect an A may go to recitations only (no score is not A).
Every electronic device (anything with an on/off button) should be off during the class (exception: disability-helping devices).

Each score will be scaled by the average of the highest FIVE scores in the class. Then a composite score will be computed, and grades assigned almost based on the ranges:

A=90-100,  B=80-89,  C=70-79,  D=60-69,  E=0-59.

There is no prescribed curve and you are not competing with each other.

7 Topics to be covered

- Sets, Functions and relations - sets, set operations, functions, summations, growth of functions, equivalence relations, countable and uncountable sets, examples of algorithm analysis
- Counting Methods permutations, combinations, discrete probability, pigeonhole principle
- Advanced counting inclusion-exclusion, recurrence relations, methods of solving recurrences, examples from computer sciences
- Introductory Logic propositional logic, predicate logic, proof methodologies, examples of algorithm correctness
- Introduction to Graphs - trees, connectivity, Eulerian traversals, minimum spanning tree, planarity, Euler formula, matchings.
- Languages