# CSE 260: Discrete Structures in Computer Science
# Fall 09
# (DRAFT 6, 17 Nov: section numbers added for weeks 11, 12)

## Course Description:

Propositional and first order logic. Equivalence, inference and method of proof. Mathematical induction, diagonalization principle. Basic counting, discrete probability. Set operations, relations, functions. Grammars and finite state automata. Applications to computer science and engineering.

## Course Objective:

The role of discrete mathematics in computer science is analogous to the role of calculus in physics and in engineering: it provides the mechanisms that allow computer scientists to define and reason about complex systems. Complex systems of interest include software, algorithms, data structures, and hardware. The objectives of this course are to introduce the mathematical concepts that provide the basis for much of computer science and to develop the ability to describe and analyze problems in a logical and systematic fashion. This course focuses primarily on:

- Logic and mathematical reasoning
- Set theory and functions
- Induction and recursion
- Mathematical relations
- Grammars, finite state machines and Turing Machines

To achieve these objectives, we study broad, general concepts in these areas. Applications in computer science and in computer engineering are discussed to illustrate concepts. (Current ABET/CAC accreditation requirements (http://www.abet.org/) for CS programs specify a half year of mathematics courses, including Discrete Structures; thus this is the only math course currently named as a CS program requirement.)

## Textbook:

***Discrete Mathematics and its Applications***, sixth edition (Kenneth H. Rosen; 2006) A copy of the text and similar texts are on reserve in the Eng. Library.

## Instructors:

**Section 1**: Dr Laura Dillon www.cse.msu.edu/~ldillon
Office Hours: 3132 EB Monday noon – 1:30 p.m. Thursday 3-4:20 p.m.
**Section 2:** Dr George Stockman www.cse.msu.edu/~stockman
Office Hours: 2128 EB Monday 1:30 – 2:30 p.m. Thursday 10-11:30 p.m.

## Teaching Assistant:

Paul Cornwell
Office Hours: EB 3345 Tue 1-2:00 p.m., F 11 - noon.

**The 260 staff will try to keep both sections of the course the same, including the time schedule as well as all other syllabus items. Students from either section are welcome to attend any staff office hours.**

**Grading:** The student's final average will be converted as follows:
**4.0 >= 90%; 3.5 85%; 3.0 80%; 2.5 75%; 2.0 70%; 1.5 65%; 1.0 60%**

**The student's final semester % grade will be computed using these weights**
Examinations: 60%; Quizzes: 20%; in-class exercises 10%; graded homework 10%

## Examinations and Quizzes

Exams will be closed book, closed notes **except** for one 8 1/2×11 sheet of notes that you may prepare and bring to the exams. You are **not** allowed any notes for quizzes. Calculators are not necessary for this class, and will **not** be allowed during quizzes or exams. There will be **NO** make-up exams except under special circumstances, which must be documented and approved by the instructor ahead of time, when possible. `There are no makeup quizzes: grades will be reweighted with an approved excused absence.`

Exam weights are as follows:
Exam 1: 13% Exam 2: 13% Exam 3: 14% Final Exam: 20%
Exams dates are scheduled on the syllabus. Midterm exam will cover all topics that have been discussed since the previous exam. The final exam will cover all course topics.

## In-Class Cooperative Exercises

In-class exercises make up 10% of your grade. These exercises are designed to help you solidify the concepts that have been presented in lecture or that you have read about. You will be working on problems in small groups and will turn in a common solution. The grade will be based on your reasoned attempt at solving the problem, not on the correctness of your solution. This grade is also a measure of your class attendance.

## Homework/Problem Solving

Homework will be assigned, but most will not be collected and graded. The surest way to succeed in this course is to work a lot of problems. Some of the assigned homework will be discussed in class (or during recitation), and you will have the opportunity to ask questions. You are expected to attend recitation session every Friday. If you do not attempt the problems on your own BEFORE they are discussed in class, you will likely not be able to handle problems on the exams and quizzes. Only a few special homeworks will be collected and graded.

## Academic Honesty

Michigan State University adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades and in the All-University Policy on Integrity of Scholarship and Grades. These policies are included in *Spartan Life: 1999 Student Handbook and Resource Guide*. See http://www.msu.edu/unit/ombud/honesty.html. Any student found guilty of academic dishonesty may receive a 0.0 for the course. In all such cases, a letter will be sent to the dean of the college in which the student is enrolled.

## Tentative Schedule of Topics

| Week | Mon | Wed | Fri | Topic | Ch. |
|---|---|---|---|---|---|
| 1 | | 9-2 | | Intro & Propositional Logic | 1.1 |
| | | | 9-4 | Discussion of problems | |
| 2 | 9-7 | | | Holiday | |
| | | 9-9 | | Propositional Logic | 1.2 |
| | | | 9-11 | Problems & Quiz 1 (20 min) | |
| 3 | 9-14 | | | Predicates and Quantifiers | 1.3 |
| | | 9-16 | | Predicates and Quantifiers | 1.3 |
| | | | 9-18 | Problems & Quiz 2 (20 min) | |
| 4 | 9-21 | | | Methods of Proof | 1.5 |
| | | 9-23 | | Methods of Proof | 1.6, 1.7 |
| | | | 9-25 | Discussion of problems | |
| 5 | 9-28 | | | Sets & set operations | 2.1, 2.2 |
| | | 9-30 | | Sets & operations | |
| | | | 10-02 | Exam 1 | |
| 6 | 10-5 | | | Functions | 2.3 |
| | | 10-7 | | Sequences and summation | 2.4 |
| | | | 10-9 | Discussion of exam 1 & problems | |
| 7 | 10-12 | | | Divisibility and Modular arithmetic | 3.4 |
| | | 10-14 | | Integer Representation (bases) | 3.6 |
| | | | 10-16 | Problems & Quiz 3 (20 min) | |
| 8 | 10-19 | | | Matrices | 3.8 |
| | | 10-21 | | Mathematical induction | 4.1-4.2 |
| | | | 10-23 | Problems & Quiz 4 (20 min) | |
| 9 | 10-26 | | | Recursive definitions, Algorithms | 4.3 |
| | | 10-28 | | Recursive structures | 4.4 |
| | | | 10-30 | Discussion of problems | |
| 10 | 11-2 | | | Binary relations ;Relation representation | 8.1 – 8.3 |
| | | 11-4 | | Closure of relations, Equivalence | 8.4, 8.5 |

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| | | | | Relations | |
| | | | 11-5 | Exam 2: topics since Exam 1 | |
| 11 | 11-9 | | | Discrete probability | 5.1-5.3 |
| | | 11-11 | | Discrete Probability | 5.4, 5.5 |
| | | | 11-13 | Discussion of exam 2 & Quiz 5 (20 min) | |
| 12 | 11-16 | | | Discrete Probability | 6.1 |
| | | 11-18 | | Discrete probability | 6.2 |
| | | | 11-20 | Problems & Quiz 6 (20 min) | |
| 13 | 11-23 | | | Languages and grammars | 12.1 |
| | | 11-25 | | Finite state machines | 12.2 |
| | | | 11-27 | Holiday | |
| 14 | 11-30 | | | Finite State Automata | 12.3 |
| | | 12-2 | | Language recognition | 12.4 |
| | | | 12-4 | Exam 3: topics since Exam 2 | |
| 15 | 12-07 | | | Turing Machines | 12.5 |
| | | 12-09 | | Turing Machines | 12.5 |
| | | | 12-11 | Review | |
| FINAL EXAM | | | | **Section 1: Friday, Dec 18, 10:00-12:00 noon**<br>**Section 2: Monday, Dec 14, 3:00-5:00 p.m.**<br>**Exam is in the lecture class room** | |