

CS 220 - Discrete Mathematics

K. Subramani
LDCSEE,
West Virginia University,
Morgantown, WV
ksmani@csee.wvu.edu

1 General Information

- (a) Instructor: K. Subramani
- (b) Meeting Times: Tu-Th 08:00 am - 9:15 am
Location: 207 ESB
- (c) Contact Information: 749 ESB, ksmani@csee.wvu.edu
- (d) Office Hours: Mon, Tu - 10:00 am - 11:00 am
- (e) Textbook - [Ger99]
- (f) URL - <http://www.csee.wvu.edu/~ksmani/courses/sp05/dm/dm.html>
- (g) Assessment:
 - (a) Homework Assignments (2) - You will be handed a homework on January 27, due on February 3 and a second homework on March 24, due on March 31. Each homework is worth 15%, for a total of 30% of your grade.
 - (b) Quizzes (2) - The first quiz will be held on February 10, while the second quiz will be held on April 14. Each quiz is worth 15% (for a total of 30%) of your grade and is closed-book.
 - (c) Midterm - The midterm will be held on March 1 (in-class, closed book) and is worth 20% of your grade.
 - (d) Final - The final will be held on May 3 (in-class, closed book, 03 : 00 – 5 : 00 pm) and is worth 20% of your grade.
- (h) Grade Boundaries
 - (a) **A**: 75 and up
 - (b) **B**: 65 – 74
 - (c) **C**: 50 – 64
 - (d) **D**: 45 – 49
 - (e) **F**: 0 – 44
- (i) Grading policy - If you have any questions about the grading, you must contact the instructor within two days of your paper being returned.
- (j) Makeup Policy - If for some reason, you are unable to attend a test or an exam, please meet me at the earliest and I will set an alternate date.

- (k) **Course Objectives** - The objectives of this course are as follows:
- (a) Introduce Mathematical Logic, especially First Order Logic to students intending to graduate in Computer Science.
 - (b) Introduce proof techniques such as Mathematical Induction and Contradiction. These techniques will come in handy for courses such as Analysis of Algorithms and Automata Theory.
 - (c) Develop an understanding of counting, functions and relations.
- (l) **Expected Learning Outcomes** - Upon successful completion of this course, students will be able to:
- (i) Distinguish between Propositional Logic and First Order Logic.
 - (ii) Understand how to check if a proposition is satisfiable.
 - (iii) Apply induction and other proof techniques towards solving recurrences and other problems in elementary algebra.
 - (iv) Distinguish between functions and relations.

2 Syllabus Sketch and Weekly Schedule

2.1 Formal Logic

Connectives, Tautologies, Logical Connectives, Valid Arguments, Derivation Rules, Deduction, Quantifiers and Predicates, Validity, Universal Instantiation and Generalization, Existential Instantiation and Generalization. These topics will be covered from sections 1.1, 1.2, 1.3 and 1.4 of [Ger99] (5 Lectures).

2.2 Proofs and Recursion

Theorems and Informal Proofs, Exhaustive Proofs, Direct Proofs, Contraposition, Contradiction, Serendipity, First Principle of Induction, Proof by Mathematical Induction, Second Principle of Induction, Recursively defined sequences, sets and operations. These topics will be covered from sections 2.1, 2.2, 2.3 and 2.4 of [Ger99] (7 Lectures).

2.3 Sets and Combinatorics

Notation, Relationships, Operations, Countability, Multiplication Principle, Addition Principle, Inclusion and Exclusion, Pigeonhole principle, Permutations, Combinations, Repetitive Patterns, Binomial Theorem. These topics will be covered from sections 3.1, 3.2, 3.3, 3.4 and 3.5 of [Ger99] (7 Lectures).

2.4 Relations, Functions and Matrices

Binary relations, Partial Orderings, Equivalence Relations, function definitions, onto functions, one-to-one functions, Bijections, Compositions of functions, Inverse Functions. These topics will be covered from sections 4.1 and 4.4 of [Ger99] (7 Lectures).

I would like to reiterate that this is a sketch of the topics that we will be covering. For various reasons, I may choose to drop a mentioned topic or cover a new topic. In such cases, advance notice will be given.

3 Social Justice Statement

West Virginia University is committed to social justice. I concur with that commitment and expect to foster a nurturing learning environment, based upon open communication, mutual respect and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type accommodation, in order to participate in this class, please advise me of the same and make appropriate arrangements with Disability Services (293 – 6700).

If you feel that you are being treated inappropriately or unfairly in any way, please feel free to bring your concerns to my attention; rest assured that doing so will not prejudice the grading process. In return, I expect you to behave professionally and ethically.

References

[Ger99] Judith L. Gersting. *Mathematical Structures for Computer Science*. W.H. Freeman and Company, 1999. Fourth Edition.