GRADUATE SCHOOL OF ENGINEERING AND MANAGEMENT
Department of Electrical and Computer Engineering
CSCE 531: Discrete Mathematics
Course Syllabus
Fall 2018

Meeting Times	MW 0800-0950
Location	B646 R302
Instructor	Dr. Laurence D. Merkle
Office Location	B640 R305C
Office hours	Open door (Outlook Meeting Requests recommended but not required)
Contact Information	laurence.merkle@afit.edu, 937-255-3636 x4526

Course description

This course provides in-depth coverage, analysis, and application of set theory, binary relations, counting, probability theory, functions, and first-order logic, graphs and trees. Emphasis is placed on using logic and proof techniques in these areas. Students will apply predicate calculus in order to practice writing both deductive and inductive proofs. This course also provides examples of how discrete mathematics is applied in other graduate courses in computer science and engineering.

Credits	4
Prerequisites	None

Course Learning Objectives:

Students who successfully complete the course will be able to:

1	Translate between English statements and predicate logic. Generate equivalent statements and new conclusions by applying the rules and methods of propositional calculus. Construct and assess the validity of logical arguments. Apply a variety of direct and indirect proof techniques to problems (examples: contradiction, contraposition, and by cases).
2	Correctly determine the cardinality of a set and identify different forms of infinite cardinality. Comprehend the different forms of functions and use mapping as a tool for developing proofs.
3	Solve congruences, find modular inverses, and use other number theory techniques to efficiently solve modular arithmetic problems in preparation for data security applications.
4	Apply recursion to solve problems related to countably infinite sequences of mathematical objects. Use inductive techniques to prove properties of such objects.
5	Apply counting & combinatorics techniques to determine the size and complexity of a problem. Use recurrence relationships to assess the size of complex problems.
6	Apply discrete probability methods to determine the probability of events and use Bayes Law to convert between causal and evidence-based frames of reference in preparation for empirical scientific exploration.
7	Determine recurrent relationships among phenomena and apply techniques to convert recurrent relationships to closed form solutions.
8	Apply closures, equivalence, and partial orderings as tools to determine properties of relations in problems.

Required Books and Resource Materials:

Kenneth H. Rosen, *Discrete Mathematics and Its Applications*, Seventh Edition, McGraw-Hill, 2011. ISBN: 9780073383095 (Do not purchase the international edition!)

~~Recommended~~ Optional Books and Resource Materials:

Kenneth H. Rosen, Student's Solutions Guide to accompany Discrete Mathematics and Its Applications, McGraw-Hill, 2011.

Library services:

One copy of the textbook is on the CSCE 531 reserve shelf.

Educational Support Services:

The primary means of communication outside of the classroom will be

- The course Canvas site. Students should ensure have access to the site. They should check it on at least a daily basis.
- afit.edu e-mail. Students should ensure their afit.edu e-mail account is working properly and that they can access it remotely. They should check their accounts on at least a daily basis.

Grading Scale:

Grades will be determined according to the following points:

Homework	30%
Midterm	30%
Final Exam	30%
Participation	10%

Grading Breakdown:

[92,∞)	A
[90,92)	A-
[88,90)	B+
[82,88)	B
[80,82)	B-

[78,80)	C+
[72,78)	C
[70,72)	C-
[60,70)	D
[0,60)	F

Policies:

1. **Attendance:** Attendance at all class sessions and exams is mandatory for military and civilians assigned to AFIT as full-time students except for extenuating circumstances. Scheduled classes and exams are defined by the instructor and they are documented in the course schedule. Part-time students are expected to attend scheduled classes, and absences should be explained to the instructor. The student should provide advance notice, if possible. (References: Student Handbook, Graduate School Catalog)
2. **Academic Integrity:** All students must adhere to the highest standards of academic integrity. Students are prohibited from engaging in plagiarism, cheating, misrepresentation, or any other act constituting a lack of academic integrity. Failure on the part of any individual to practice academic integrity is not condoned and will not be tolerated. Individuals who violate this policy are subject to adverse administrative action including disenrollment from school and disciplinary action. Individuals subject to the Uniform Code of Military Justice may be prosecuted under it. Violations by government civilian employees may result in administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions for violations of related laws. (References: Student Handbook, ENOI 36 – 107, *Academic Integrity*)

3. **Academic Grievance:** AFIT and the Graduate School of Engineering and Management affirm the right of each student to resolve grievances with the Institution. Students are guaranteed the right of fair hearing and appeal in all matters of judgment of academic performance. Procedures are detailed in ENOI 36 – 138, *Student Academic Performance Appeals*.
4. **Topics covered:** The schedule below is tentative, and this document will not be updated during the course. Readings, homework, and exams are listed in the course schedule on Canvas, which will be updated as necessary throughout the course.
5. **Homework:** Homework will be assigned and collected. At least portions of it will be graded. Students are strongly encouraged to discuss with each other general approaches for solving homework problems. However, the solutions that are turned in for grading are expected to be the original work of the individual student.
6. **Testing Policy:** The midterm exam and final exam will be given in class in a closed book format. Collaboration on exams is prohibited.
7. **Late Assignments and Make-Ups:** Late assignments will not be accepted except under approved extenuating circumstances. Failure to plan will not be an approved extenuating circumstance.

Course Schedule

Course assignments, due dates and other requirements may be subject to change.

TOPIC	ASSIGNMENTS
Logic	§§ 1.4-1.6
Proofs	§§ 1.7-1.8
Sets, Functions, Sequences, Cardinality	§§ 2.3-2.5
Number Theory	§§ 4.4-4.5
Induction and Recursion	§§ 5.2-5.4
Counting	§§ 6.4-6.5
Discrete Probability	§§ 7.2-7.4
Advanced Counting	§§ 8.1-8.6
Relations	§§ 9.1-9.6
Graphs	§§ 10.3-10.8
Trees	§§ 11.4-11.5

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.