



University of
New Haven

Discrete Mathematics

SECTION I: Course Overview

Course Code: CS270PRG

Subject Area(s): Computer Science

Prerequisites: See Below

Language of Instruction: English

Total Contact Hours: 45

Recommended Credits: 3

COURSE DESCRIPTION

In this course you will cover material concerning propositional and predicate logic; sets, relations, and functions; estimating, counting, and probability; proof techniques; recursive definitions; relations, orders, and graphs; and algorithm analysis.

In addition to the cognitive and knowledge skills listed above, students in this course will explore practical applications of math and science to the field of engineering.

LEARNING OBJECTIVES

Upon successful completion of this course, you will be able to:

- Identify the tools to construct correct mathematical arguments with different proof methods.
- Use proposition and predicate logic, truth table analysis, probability, and algorithms.
- Translate between logic statements and English.
- Solve basic counting and combinatoric problems.
- Demonstrate skills in induction and recursion relations as well as graphs, sets, and function relations.

PREREQUISITES

Prior to enrollment, this course requires you to have completed a course in Algebra.

SECTION II: Instructor & Course Details

INSTRUCTOR DETAILS

Name:	TBD
Contact Information:	TBD
Term:	SUMMER

GRADING & ASSESSMENT

The instructor will assess your progress towards the above-listed learning objectives by using the forms of assessment below. Each of these assessments is weighted and will count towards your final grade. The following section (Assessment Overview) will provide further details for each.

Engagement	20%
Homework	20%
Quizzes	20%
Midterm Examination	20%
Final Examination	20%

ASSESSMENT OVERVIEW

This section provides a brief description of each form of assessment listed above. Your course instructor will provide further details and instructions during class time.

Engagement (20%): Engagement in class is expected of all CEA CAPA students. Guidelines for engagement can be found on the list of academic policies.

Homework (20%): Homework is assigned on average once a week, to be handed in one week later. Please write the homework question before showing, in complete steps, the solution and do not forget to consider any modifications to problem sets announced in class. The homework is due at the date scheduled. It will be graded on effort and neatness, rather than correct answers.

Quizzes (20%): Students will take periodic quizzes throughout the term. Quizzes are taken from homework problems.

Midterm Examination (20%): The midterm exam will cover all concepts from the first half of the term.

Final Examination (20%): A comprehensive final examination during the last week of the course.

ACTIVE LEARNING

CEA CAPA courses are designed to include a variety of active learning component that will take you out of the classroom and allow you to explore your local, host city. This course includes:

- Technical Museum

REQUIRED READINGS

The reading assignments for this course are listed below. All required readings must be completed according to the due date assigned by the course instructor. You will not need to purchase these readings; the instructor will provide these selected readings to you in class (either in paper or electronic format) and/or through CEA CAPA's online Moodle classroom.

REQUIRED TEXT(S): You may purchase the required text(s) prior to departure or upon program arrival. The required text(s) are listed below:

Rosen, Kenneth H., *Discrete Mathematics and Its Applications*, 7th Edition, McGraw Hill, 2012.

KEY RESOURCES

In order to ensure your success abroad, CEA CAPA has provided the academic resources listed below.

- **UNH Online Library:** As a CEA CAPA student, you will be given access to the online library of the University of New Haven (UNH). You may access the UNH online library [here](#). You must comply with [UNH Policies](#) regarding library usage.
- **CEA CAPA Classroom – Moodle**

COURSE CALENDAR
Discrete Mathematics

SESSION	TOPICS	ACTIVITY	READINGS & ASSIGNMENTS
1	<p style="text-align: center;">Course Introduction: Review Syllabus, Classroom Policies</p> <p style="text-align: center;">Ch. 1 – Foundations: Logic & Proofs</p>	<p>Course Overview</p> <p>Lecture: 1.1 Propositional Logic 1.2 Applications of Proposition Logic</p> <p>HW 1 Issued</p>	<p>Exercises pg. 12 – 16: 1, 7, 11, 17, 21, 31, 37 pg. 22 – 24: 3, 7, 17, 25, 29, 41</p>
2	<p style="text-align: center;">Ch. 1 – Foundations: Logic & Proofs</p>	<p>Lecture: 1.3 Propositional Equivalences 1.4 Predictors & Quantifiers 1.5 Nested Quantifiers 1.6 Rules of Inference 1.7 Introduction to Proofs 1.8 Proof Methods</p> <p>HW 1 Due, HW 2 Issued</p>	<p>Exercises pg. 34 – 36: 5, 9, 21, 35, 43, 61 pg. 53 – 57: 3, 15, 21, 27, 39, 47 pg. 64 – 69: 1, 9, 13, 29, 37 pg. 78 – 80: 3, 17, 23, 31 pg. 91 – 92: 3, 9, 15, 27, 35 pg. 108 – 109: 1, 7, 15, 29, 35</p>
3	<p style="text-align: center;">Ch. 2 – Basic Structures: Sets, Functions, Sequences, Sums, & Matrices</p>	<p>Lecture: 2.1 Sets 2.2 Set Operations 2.3 Functions 2.4 Sequences & Summations 2.5 Cardinality of Sets 2.6 Matrices</p> <p>HW 2 Due, HW 3 Issued</p>	<p>Exercises pg. 111 – 114: Choose 10 pg. 125 – 126: 5, 9, 13, 19, 23, 29, 41 pg. 136 – 138: 5, 9, 13, 19, 23, 33, 37 pg. 152 – 155: 5, 11, 17, 23, 35, 47 pg. 167 – 170: 3, 9, 15, 21, 33, 45 pg. 176 – 177: 5, 9, 13, 19, 23, 33, 37 pg. 183 – 185: 5, 9, 13, 19, 23, 33, 37 pg. 186 – 189: Choose 10</p> <p>Prepare for Quiz #1</p>

4	Ch. 4 – Number Theory & Cryptography	Lecture: 4.1 Divisibility and Modular Arithmetic 4.2 Integer Representations and Algorithms 4.3 Primes and Greatest Common Divisors 4.4 Solving Congruences 4.5 Applications of Congruences 4.6 Cryptography HW 3 Due, HW 4 Issued Quiz #1 on Ch. 1 & 2	Exercises pg. 244 – 245: 1, 9, 13, 21, 25, 33, 45 pg. 255 – 256: 3, 5, 7, 15, 21, 31, 35, 41 pg. 272 – 276: 1, 3, 5, 17, 25, 33, 47 pg. 284 – 286: 5, 9, 21, 24, 33 pg. 292 – 293: 3, 7, 9, 13, 19, 29 pg. 304 – 305: 1, 5, 15, 21, 31
5	Ch. 5 – Induction & Recursion	Lecture: 5.1 Mathematica Induction 5.2 Strong Induction & Well-Ordering HW 4 Due, HW 5 Issued	Exercises pg. 350 – 354: 3, 11, 19, 31, 39 pg. 350 – 354: 1, 5, 11, 25, 33 Revise previous exercises Prepare for Quiz #2
6	Ch. 6 – Counting	Lecture: 6.1 The Basics of Counting 6.2 The Pigeonhole Principle 6.3 Permutations and Combinations 6.4 Binomial Coefficients and Identities Quiz #2 on Ch. 4 & 5 HW 5 Due, HW 6 Issued Midterm Review	Exercises pg. 396 – 399: 1, 5, 17, 29, 33, 53 pg. 405 – 407: 3, 7, 13, 27, 37, 41 pg. 413 – 415: 1, 7, 11, 15, 25 pg. 421 – 423: 1, 7, 13, 27, 37, 41 pg. 440 – 444: Choose 10
7	Field Study I HW 6 Due, Prepare for Midterm Exam		

8	MIDTERM EXAMINATION		
9	Ch. 7 – Discrete Probability	Lecture: 7.1 Introduction to Discrete Probability 7.2 Bayes' Theorem 7.3 Expected Value Variance HW 6 Due, HW 7 Issued	Exercises pg. 451 – 452: 1, 3, 11, 15, 33 pg. 466 – 468: 3, 7, 13, 29, 35 pg. 475 – 477: 1, 5, 7, 9, 15, 19 pg. 492 – 495: 3, 7, 13, 29, 37 Prepare for Quiz #3
10	Ch. 9 – Relations	Lecture: 9.1 Relations & Their Properties 9.2 n-ary Relations & Their Applications 9.3 Representing Relations 9.4 Closures of Relations 9.5 Equivalence Relations Partial Orderings Quiz #3 on Ch. 6 & 7 HW 7 Due, HW 8 Issued	Exercises pg. 581 – 583: 3, 11, 15, 18, 27, 35 pg. 589 – 590: 3, 5, 13, 17, 21, 23 pg. 596 – 597: 3, 7, 13, 15, 23, 31 pg. 606 – 607: 1, 5, 7, 17, 21, 25, 27 pg. 615 – 618: 7, 11, 21, 35, 41, 43 pg. 630 – 633: 1, 5, 7, 17, 21, 25, 27
11	Ch. 10 – Graphs	Lecture: 10.1 Graphs & Graph Models 10.2 Graph Terminology 10.3 Representing Graphs & Graph Isomorphism 10.4 Connectivity 10.5 Euler & Hamilton Paths 10.6 Shortest Path Problems HW 8 Due, HW 9 Issued	Exercises pg. 649 – 651: 1, 3, 7, 13, 21, 25, 29 pg. 665 – 668: 1, 7, 9, 15, 21, 25, 29 pg. 675 – 678: 1, 5, 11, 15, 19, 23, 57 pg. 689 – 693: 5, 11, 15, 21, 23, 31 pg. 703 – 707: 1, 3, 7, 15, 19, 21, 31, 29 pg. 716 – 718: 1, 7, 9, 15, 21, 25, 27 Prepare for Quiz #4

12	Ch. 3 – Algorithms	Lecture: Review Ch. 10 3.1 Algorithms 3.2 Growth of Functions 3.3 Complexity of Algorithms Quiz #4 on Ch. 9 & 10 HW 9 Due, HW 10 Issued	Exercises pg. 737 – 738: odd problems pg. 202 – 204: 3, 5, 13, 21, 29 pg. 216 – 218: 1, 5, 11, 19, 21, 28 pg. 229 – 231: 3, 5, 13, 21, 29 Prepare for Quiz #5
13	Ch. 8 – Advanced Counting Techniques	Lecture: 8.1 Applications of Recurrence Relations 8.2 Solving Linear Recurrence Relations 8.3 Divide & Conquer Algorithms Quiz #5 on Ch. 3 HW 10 Due	Exercises pg. 510 – 514: 3, 9, 11, 19, 21, 27 pg. 524 – 527: 3, 7, 15, 21, 35 pg. 535 – 536: 1, 5, 11, 19, 21, 35
14	Final Review Session Review & Examples		
15	Field Study II, Prepare for Final Exam		
16	FINAL EXAMINATION		

SECTION III: CEA CAPA Academic Policies

To see all CEA CAPA academic policies outlined, please follow the following links. Students are expected to review and understand all CEA CAPA student policies, including the academic policies outlined online. CEA CAPA reserves the right to change, update, revise, or amend existing policies and/or procedures at any time.

Class & Instructor Policies can be found [here](#)

General Academic Policies can be found [here](#)