



Dr. Charles Rocca  
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<http://sites.wcsu.edu/roccac>

MAT 304-01: Discrete Math for Comp Sci  
M: 5:30 pm - 8:00 pm,  
Higgins 116



## Office Hours:

Office hours for the Fall 2024 Semester are on ground in Higgins 101D.

- Monday & Thursday: 11am - 12pm & 3:30pm - 4:30pm
- Wednesday & Friday: 1pm - 2pm
- or by appointment

If you need to meet virtually we can make an appointment to do so via my WebEx Virtual Office: [Higgins 101-DV \(https://wcsu.webex.com/meet/roccac\)](https://wcsu.webex.com/meet/roccac)

## Course Materials:

- Textbook: *Discrete Mathematics with Applications; 5<sup>th</sup> Edition* by Susanna Epp  
(ISBN-13: 978-1337694193)

## Course Description and Objectives:

A continuation of MAT 141 Foundational Discrete Mathematics, intended for students majoring in Computer Science and other computing-related disciplines. Review and extension of the topics from the areas of sets, relations and functions, logic, and graph theory. In-depth introduction to proof techniques with computing-related examples.

After successful completion of this course students should be able to:

- Apply formal methods of symbolic propositional and predicate logic to computing contexts such as software analysis (e.g., program correctness), database queries, and algorithms.
- Apply proof techniques correctly in the construction of a sound argument.
- Apply the terminology of graph theory, explain properties and special cases of graphs, model computer science problems with graphs.

## Course Content:

Unit	Chapters/Sections
Review of Foundational Discrete Mathematics	1, 2, 3
Proof Techniques	4.1,4.2,4.4,4.5,4.7, 5.2-5.4, 5.9
Graph Theory	1.4, 4.9, 10

## Grading:

10 × “Daily” Quizzes	28% (The top 7 count 4% each)
3 × Unit Exams	42% (14% each)
3 × Unit Assignments	30% (10% each)

**Daily Quizzes:** On the days when we do not have an exam, there will be a quiz. The content of the quiz will be based on the material covered in the most recent lecture. Quizzes will have three to five questions focusing on basic knowledge and skills.

**Unit Exams:** Unit exams will be comprehensive exams covering all the material from the unit. Questions on exams will focus on basic knowledge and skills. You will be allowed to redo selected problems on each exam in order to recover up to 33% of the points you lost on the exam. **All redo work must be typed and be in complete sentences; 10% of the grade is for quality.**

**Unit Assignments:** Unit assignments will consist of exercises from the text. Assignment questions will involve problem solving; you won't generally be able to solve these simply by plugging numbers into a formula or reciting a definition. Assignment answers **must be typed and in complete sentences.** For each question a reader should be able to tell what the question was without having to look it up; do not just repeat the question. Proper presentation and formatting will account for up to 10% of each assignment grade. **All text assignments must be typed and be in complete sentences; 10% of the grade is for quality.**

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## Course Calendar:

MONDAY	
9/9 Syl., Intro., Review, & Notation, Chapter 1	<b>1</b>
9/16 Logical Statements, Equivalencies, and Arguments, Sections 2.1 - 2.4	<b>2</b>
9/23 Quantified Statements and Arguments, Sections 3.1 - 3.4	<b>3</b>
9/30 Review and <b>Unit 1: Review Exam</b>	<b>4</b>
10/7 Direct Proofs, Sections 4.1, 4.4, & 4.5 <b>Unit 1 Assignment: §2.4 - 28, 31, §3.4 20,22,27</b>	<b>5</b>
10/14 Indirect Proofs, Sections 4.7 & 4.8	<b>6</b>
10/21 Induction, Sections 5.2 - 5.4	<b>7</b>
10/28 Recurrence & Recursive Definitions, Sections 5.7 & 5.9	<b>8</b>
11/4 Review and <b>Unit 2: Proofs Exam</b>	<b>9</b>

MONDAY	
11/11 Graph Theory Terminology & Applications of Proofs, Sections 1.4, 10.1, & 4.9 <i>Unit 2 Assignment §4.4: 28, 29, §4.7: 18, §5.3: 36, §5.9: 17,20b</i>	<b>10</b>
11/18 Matrix Representations & Isomorphisms, Section 10.2 & 10.3	<b>11</b>
11/25 Trees, Sections 10.4 - 10.5	<b>12</b>
12/2 More on Trees, Sections 10.5 - 10.6	<b>13</b>
12/9 Review and <i>Unit 3: Graphs Exam + some key material from previous exams</i>	<b>14</b>

*12/13/2024: Unit 3 Assignment §4.9: 15, §10.2: 21, (23 for extra credit) §10.4: 29, §10.5: 3, Due by 3pm*

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## Departmental Course Outline:

### 1. Prerequisite Knowledge

- (a) Sets, relations and functions
- (b) Propositional and predicate logic
  - i. Logical connectives
  - ii. Normal forms (conjunctive and disjunctive)
  - iii. Tautologies and contradictions
  - iv. Logical equivalence
  - v. Negations of statements
  - vi. Notions of implication, converse, inverse, and contrapositive.
  - vii. Propositional inference rules
  - viii. Predicate logic
  - ix. Limitations and extensions of propositional and predicate logic
- (c) Graph Theory
  - i. Terminology and Notation
  - ii. Euler Circuits
  - iii. Trees
  - iv. Adjacency Matrix

### 2. Proof techniques

- (a) The structure of mathematical proofs
- (b) Disproof by counterexample
- (c) Direct proof

- (d) Proof by contraposition
- (e) Proof by contradiction
- (f) Recursive mathematical definitions
- (g) Well ordering principle
- (h) Induction over natural numbers
- (i) Complete (“strong”) induction
- (j) Structural induction

### 3. Graphs and Trees

- (a) Trees:
  - i. Properties
  - ii. Spanning trees/forests
  - iii. Traversal strategies
- (b) Graphs:
  - i. Undirected graphs
  - ii. Directed graphs
  - iii. Weighted graphs
  - iv. Graph isomorphism
  - v. Graph coloring
- (c) Inclusion-exclusion principle and its applications
  - i. Counting intersections
  - ii. Bipartite graph perfect matchings
  - iii. Permutations with forbidden positions

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## You and Your Grades:

- “A” (Exceptional) range 90% to 100%:  
The student has demonstrated significant mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve standard formulaic exercises and most nonstandard problems which require deeper insight.
  - “A”  $\iff 92.5\% \leq \textit{Grade} \leq 100\%$
  - “A-”  $\iff 90\% \leq \textit{Grade} < 92.5\%$
- “B” (Good) range 80% to 90%:  
The student has demonstrated mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve standard formulaic exercises and some nonstandard problems which require deeper insight.
  - “B+”  $\iff 87.5\% \leq \textit{Grade} < 90\%$
  - “B”  $\iff 82.5\% \leq \textit{Grade} < 87.5\%$
  - “B-”  $\iff 80\% \leq \textit{Grade} < 82.5\%$
- “C” (Adequate) range 70% to 80%:  
The student has demonstrated adequate mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve most standard formulaic exercises but struggles with nonstandard problems which require deeper insight.
  - “C+”  $\iff 77.5\% \leq \textit{Grade} < 80\%$
  - “C”  $\iff 72.5\% \leq \textit{Grade} < 77.5\%$
  - “C-”  $\iff 70\% \leq \textit{Grade} < 72.5\%$
- “D” (Inadequate) range 60% to 70%:  
The student has demonstrated inadequate or incomplete mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve some standard formulaic exercises but few if any nonstandard problems which require deeper insight.
  - “D+”  $\iff 67.5\% \leq \textit{Grade} < 70\%$
  - “D”  $\iff 62.5\% \leq \textit{Grade} < 67.5\%$
  - “D-”  $\iff 60\% \leq \textit{Grade} < 62.5\%$
- “F” (Unacceptable) below 60%:  
The student has demonstrated essentially no mastery of the appropriate knowledge and skills relevant to the course. The student is unable to solve most standard formulaic exercises and essentially no nonstandard problems which require deeper insight.

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## End User Agreement:

**General Expectations:** As a student in this class you are expected to:

- attend class and take notes,
- actively read material in each section, taking notes,
- review your notes on a regular basis,
- check your university email every day,
- check the class site *at least* every other day,
- begin studying for exams in a timely fashion,
- ask questions early and often,
- attend office hours,
- seek help in the math clinic or tutoring center, and
- complete assignments and readings on time.

**Assignment Guidelines:** (These apply to *all out of class work*.)

- Work handed in must always look neat, legible, and professional. Work must be very neatly written or preferably typed. The quality of your work will be factored into your grade, up to 10%. In extreme cases work may be rejected and then counted as late.
- Answers on all assignments should be given in complete sentences. I should be able to tell what your answer means without re-reading the problem. This does not mean you simply rewrite the question.
- An assignment is considered late after I have handed it back or gone over it in class. Late assignments are accepted but may receive at most 75% credit. Late assignments go to the absolute bottom of the stack of papers to be graded; *all on time work is graded before any late work*.
- If you work on an assignment as part of a group, then there may be no more than three individuals in the group and all your names must be on the assignment. You should hand in only one copy of the work.
- All work must be submitted in the manner directed.

**Email Etiquette Guidelines:** When sending an email you must include the course number and semester in the subject line. For example, if you are taking MAT 314 in Fall 1592 then the the subject line should begin with “[MAT 314 Fall 1592].” Also, you should always begin with a salutation such as “Dear Dr. Rocca” and end with a closing such as “Sincerely, I. Newton.”

**Technology Use:** You are free to use technology in the classroom to support the learning of the content, i.e. for note taking, recording, taking pictures of the board etc.. Technology use will be restricted if it becomes disruptive, a distraction, or invades others privacy.

**Exam Makeup Policy:** To qualify for a makeup exam you must have a valid reason for missing the exam and, if at all possible, let me know ahead of time that you are missing the exam. You will need to meet with me in order to arrange a time for the make up exam. If you do not have a valid reason, do not give prior notice when possible, or simply do not show up for an exam, you are not entitled to a makeup and will not be given one. If you fail to show up for your makeup exam, you will not be given a second opportunity.

**The 2% Exception:** If a class has any quiz or class work which is ultimately worth no more then 2% of your final grade can not be made up.

**Time on Task:** As a 2 credit class you should expect to average 5 to 6 hours of work a week including class time. Some weeks you may get away with less and some may require more.

**Attendance:** There is no specific policy for attendance in this course. However, if you have *three consecutive unexcused absences* within the first half of the semester I am required to report to the University that you have *stopped attending*.

**Academic Honesty:** If on any assignment, quiz, or exam you turn in someone else’s work, regardless of the source, as if it were your own you will receive a zero on that assignment, quiz, or exam. If you are caught doing this three times you will receive an F in the course and the Dean will be informed of your academic dishonesty.

(<https://www.wcsu.edu/faculty-handbook/2019-2020/policies-pertaining-to-students/academic-honesty-policy/>)

**Accommodations:** If you have need of an accommodation for testing or note taking, please visit AccessAbility Services, located in the HAAS Library room 406 (<http://www.wcsu.edu/accessability>).