Dr. Charles Rocca
Higgins Hall 101D
roccac@wcsu.edu
http://sites.wcsu.edu/roccac

MAT 141-01: Foundational Discrete Mathematics
TF 2-3:15 pm, Higgins 117
Credits: 3 credits
Grading: Standard A-F

Office Hours:

Office hours for the Spring 2016 Semester are on ground in Higgins 101D.

- MTWF 12:45-1:45 pm
- W 3:30-4:30 pm
- 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://westconn.webex.com/meet/roccac)

Course Materials:

- Textbook: *Discrete Mathematics with Applications 5th Edition* by Susanna Epp (ISBN-13: 978-1337694193)
- A three ring binder (2 inch should be sufficient)
- Loose leaf college ruled paper, and
- A calculator that you need to bring to every class.

Course Description:

An in-depth introduction to discrete structures and processes such as counting techniques, sequences, indexed summations, introductory propositional and predicate logic, introductory induction and recursion, sets, relations, functions, graph theory and connections among these topics. Prerequisite: MAT 133 or MAT 170. MAT 170 can be taken concurrently with MAT 141.

Learning Outcomes:

After completing this course students will be able to

- Solve real-world problems using combinatorial techniques such as addition and multiplication principles, permutations, and combinations.
- Evaluate arithmetic and geometric summations.
- Interpret recursive definitions and Solve basic recurrence relations.
- Communicate mathematics using conventional terminology and notation related to combinations, permutations, summations, sets, functions, and relations.
- Demonstrate fluency with propositional and predicate logic, including computation of normal forms.
- Model real-life situations with propositional and predicate logic
- Describe strengths and limitations of propositional and predicate logic

- Determine whether mathematical statements are equivalent.
- Determine whether a statement is a tautology, contradiction, or neither.
- Negate mathematical statements precisely using logical principles such as De Morgan's laws.
- Use rules of inference to construct formal deductions in symbolic logic, and apply these to real problems.
- Demonstrate computational fluency with operations on sets.
- Determine whether a given function is one-to-one, onto.
- Determine whether a given relation is reflexive, symmetric, transitive.
- Describe the equivalence classes for a given equivalence relation.
- Model practical situations using sets, functions, and relations.

Course Content:

- Unit 1 Logical Statements: Sections 1.1-1.4, 2.1-2.3, & 3.1-3.4
- Unit 2 Sequences & Sums: Sections 5.1, 5.6, & 5.7
- Unit 3 Sets, Relations, & Functions: Sections 6.1, 7.1-7.3, & 8.1-8.3
- Unit 4 Combinatorics & Graph Theory: Sections 9.2-9.7, 10.1, 10.2, & 10.4

Grading:

- 4% Writing Up Math Exercise
- 16% Four Practice Unit Exams (4% each)
- 80% Four Unit Exams (20% each)

Quality of Work Guidelines: All of your out of class work must be neat and professional; answers must be in complete sentences. The quality of your out of class work (practice exams and redos) counts for 10% of your grade. You can earn 5% extra on each piece of out of class work by typing it up using LaTeX.

Writing Math Exercise (4%): In order to help you understand what it means to write up mathematics in a neat and professional manner, you are required to complete the ***Exercises in Writing Up Mathematics*** packet. After this is completed, you will be expected to use what you learned when writing up out of class work.

Practice Unit Exams (16%): You will have four practice exams, one for each unit; practice exams are posted on the class website. The grades for these are based on completing all the questions (90%) and on the quality of your work (10%). The practice exams are due the class period prior to the exam (see calendar for specifics). On the days you turn in practice exams, we will spend 20-30 minutes answering questions before starting new material. Practice exams turned in after their due date but prior to the exam will receive at most 75% credit. Practice exams will not be accepted after the exam.

Unit Exams (80%): Unit exam dates are listed on the class calendar. Each unit exam will have questions similar, but not identical, to questions on the practice exams. Eighty percent of each exam will be based on fairly routine questions. The other twenty percent of each exam will be from two challenge questions intended to check the depth of your knowledge. You will be given a list of potential challenge questions ahead of time so that you can prepare.

Exam Collaboration: At the start of each exam you will be given 10 minutes during which you can look it over and discuss the exam with your fellow students. During this time you cannot write down anything on the exam, or other paper, and you cannot use your calculator; your desk must be completely cleared off. Once the 10 minutes are up you will need to complete the exam on your own.

Exam Redos: For unit exams 1-3 you will be allowed to redo some specific questions in order to earn back up to 40% of the points you lost. Which questions you redo and how many questions you redo will depend on how you did on the exam.

- Redos are due within one week of when the exams are handed back,
- You must turn in the original exam stapled on top of the redos,
- For each question you redo you must include a sentence or two explaining what you did wrong, and
- As out of class work, the quality of your work on redos counts for 10% of the grade.

Course Calendar:

Friday	Tuesday
1/23 **1** Syl., Intro., & Chapter 1: Notation	1/27 **2** Chapter 1: Notation
1/30 **3** Sections 2.1, 2.2: Logical Statements and Conditionals	2/3 **4** Sections 2.2, 2.3: Conditionals and Arguments ***Turn in Writing Up Math Assignment***
2/6 **5** Sections 3.1, 3.2: Predicates and Quantified Statements	2/10 **6** Sections 3.3, 3.4: Multiple Quantifiers and Arguments - ***End Unit 1***
2/13 Presidents' Day - No Class	2/17 **7** ***Practice Exam 1 Due!*** Section 5.1: Sequences & Sums - Start Unit 2
2/20 **8** ***Exam 1: Notation, Basic Sets, & Logic***	2/24 **9** Section 5.1: Sequences & Sums (Cont')

Friday	Tuesday
2/27 **10** Section 5.6: Recursively Defined Sequences	3/3 **11** Section 5.7: Recurrence Relations and Iteration
3/6 **12** Section 5.8: Second Order Recurrence Relations - ***End Unit 2***	3/10 **13** ***Practice Exam 2 Due!*** Sections 6.1, 8.1: Sets and Relations - Start Unit 3
3/13 **14** ***Exam 2: Sequences & Sums***	3/17 Spring Break - No Class
3/20 Spring Break - No Class	3/24 **15** Sections 8.1, 8.2: Relation Properties
3/27 **16** Sections 8.2, 8.3: Equivalence Relations	3/31 **17** Sections 7.1, 7.2: Functions and their Properties
4/3 Day of Reflection - No Class	4/7 **18** Sections 7.2, 7.3: Function Properties and Composition - ***End Unit 3***
4/10 **19** ***Practice Exam 3 Due!*** Sections 9.2, 9.3: Addition, Multiplication, Inclusion/Exclusion Principles - Start Unit 4	4/14 **20** ***Exam 3: Sets, Relations, & Functions***
4/17 **21** Sections 9.3, 9.4: More Inclusion/Exclusion and Pigeon Hole Principles	4/21 **22** Section 9.5, 9.6: Factorials, Permutations, and Combinations
4/24 **23** Section 9.6, 9.7: More Combinations, Pascal, Binomials, and Multinomials	4/28 **24** Section 10.1: Basic Definitions, Walks, Paths, and Trails
5/1 **25** Section 10.2: Matrix Representations	5/5 **26** Section 10.4: Properties of Trees - ***End Unit 4***
5/8 **27** ***Practice Exam 4 Due!*** & Clean Up and Review	5/12 **28** ***Exam 4: Combinatorics, Graph Theory, & Review***, Exam Period 3: 2:00pm – 4:30pm

Please note that 3/24/2026 is the day when midterm grades are submitted, 4/13/2026 is the last day students can withdraw from a class, 5/8/2026 is the last day of classes, and 5/11/2026 through 5/15/2026 is final exam week.

Departmental Outline:

I. Counting

1. Fundamental Counting Principle
   (a) Multiplication and addition principles
   (b) Permutations
   (c) Combinations
   (d) Applications to discrete probability
2. Pascal's triangle
   (a) Pascal's identity
   (b) The Binomial Theorem

II. Sequences and Series

1. Summation and product notation
2. Summation formulas
   (a) Sum of binomial coefficients
   (b) Sum of finite arithmetic sequence
   (c) Sum of finite geometric sequence

III. Logic

1. Propositional Logic
   (a) Statements
   (b) Boolean logical operators and truth tables
   (c) Tautologies and contradictions
   (d) Logical equivalence
   (e) Conjunctive and disjunctive normal forms
   (f) Negating statements and De Morgan's laws
   (g) Conditional Statements
      i. Converse and contrapositive
      ii. Negations of conditional statements
      iii. Biconditional statements and equivalents
   (h) Valid and invalid arguments
      i. Use of truth tables to determine whether an argument form is valid
      ii. Rules of inference, including Modus Ponens and Modus Tollens
      iii. Other rules of inference
2. Formal Deduction - Predicate Logic
   (a) Predicates and quantifiers
   (b) Negations of quantified statements
3. Limitations and extensions of propositional and predicate logic
   (a) First-order logic
   (b) Higher-order logics

IV. Sets

1. Sets: basic definitions, terminology, and notation
2. Set operations
   (a) Venn diagrams and membership tables
   (b) De Morgan's laws
   (c) Cartesian Products
   (d) Power Sets
3. The subset relation
   (a) Number of subsets of a finite set
   (b) Number of subsets of a particular size

V. Discrete Functions and Relations

1. Functions
   (a) Examples: cardinality, Boolean functions, sequences, summations
   (b) Recursive definitions
      i. Power functions
      ii. Factorial functions
      iii. Recursive defined sequences
   (c) One-to-one and onto functions, bijections
2. Relations
   (a) Properties of relations
   (b) Order relations
   (c) Equivalence relations and equivalence classes

VI. Graph Theory

1. Terminology and Notation
2. Euler Circuits
3. Trees
4. Adjacency Matrix

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, and
- complete assignments and readings on time.

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

- Work done outside of class must always look neat, legible, and professional, adhering to given guidelines. 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.
- 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 tablets, computers, or voice recorders in the classroom to support the learning of the content, i.e. for note taking, recording, taking pictures of the board etc.. ***Cell phones are not allowed as they are a consistent distraction***. Technology use will be further 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 a 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. If you fail to show up for your makeup exam, you will not be given a second opportunity.

Time on Task: As a 3 credit class you should expect to average 7.5 to 8.5 hours of work a week including class time. Some weeks you may get away with less and some may require more.

Attendance: Unless otherwise stated, there is no specific policy for attendance in this course. However, if you have **three consecutive unexcused absences** I am required to report to the University that you have **stopped attending**. Also, if you arrive late to class, after I have taken attendance, you are responsible for sending me an email to let me know you were there but late.

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).

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.
- "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.
- "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.
- "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.
- "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.

Inspire Your Professors:

What to do:

- Show up, on time, ready to learn.
- Ask, and try to answer, questions.
- Put in the time and do the scut work.
- Seek help when you need it, utilize the resources available to you.
- Be an active participant in class and in your own education.
- Be curious about everything and be here to learn.

What not to do:

- Don't ask "What is this good for?" or "Did I miss anything?" or "Does this have to be so hard?"
- Don't say "I don't get *it*."
- Don't fiddle with your phone or computer.
- Don't wander in late and rush out early.
- Don't disappear for extended periods of time in the middle of class.
- Try not to repeat questions that have just been asked and answered, sometimes multiple times.
- Don't just grub for points.
- Don't be a passive passenger to your own education.