Mathematics 126
Basic Discrete Mathematics
Winter, 2017

Instructor: George Ballinger
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Timetable:

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:30 am – 9:20 am					
9:30 am – 10:20 am					
10:30 am – 11:20 am					Office Hour E256
11:30 am – 12:20 pm	MATH 101-003 Room Y217	MATH 101-003 Room Y217	MATH 101-003 Room Y217	MATH 101-003 Room Y217	MATH 101-003 Room Y217
12:30 pm – 1:20 pm	MATH 101-002 Room Y217	MATH 101-002 Room Y217	MATH 101-002 Room Y217	MATH 101-002 Room Y217	MATH 101-002 Room Y217
1:30 pm – 2:20 pm	Office Hour E256	Office Hour E256	Office Hour E256	Office Hour E256	
2:30 pm – 3:20 pm		A&S Chairs Meeting			
3:30 pm – 4:20 pm					
4:30 pm – 5:20 pm	MATH 126-001 Room Y227	MATH 126-001 Room Y227	MATH 126-001 Room Y227	MATH 126-001 Room Y227	

Important Dates:

January 9	First day of class
January 23	Fee deadline
February 13	Family Day (no class)
February 14-17	Reading Break (no class)
March 13	Withdrawal deadline
April 13	Last day of class
April 14	Good Friday
April 17	Easter Monday
April 18-22, 24-26	Final exam period

Calendar Description: This course, which primarily targets mathematics and computer science students, provides an introduction to discrete mathematics. Topics include logic, proof techniques including mathematical induction, basic set theory, functions, cardinality of sets, asymptotic notation, properties of integers, permutations and combinations, pigeonhole principle, recursive definitions, divide and conquer recurrence relations and a brief introduction to graphs. [3 Credits]

(Source: Camosun College Calendar camosun.ca/learn/calendar/current/web/math.html#MATH126)

Prerequisites: C in MATH 100 or MATH 125.

Transfer:

MATH 126 transfers to UVic's MATH 122 "Logic and Foundations" course, which is a prerequisite for several UVic courses and a requirement of many UVic major programs including:

Courses

MATH 212 - Introduction to Algebra
MATH 222 - Discrete and Combinatorial Mathematics
MATH 236 - Introduction to Real Analysis
CSC 225 - Algorithms and Data Structures 1

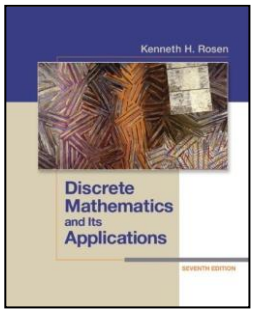
Programs

Computer Science	Financial Mathematics & Economics
Computer Science & Geography [Geomatics]	Mathematics
Computer Science & Health Information Science	Mathematics & Chemistry
Computer Science & Music	Mathematics & Computer Science
Computer Science & Physics	Mathematics & Physics
Computer Science & Psychology	Mathematics & Statistics
Computer Science & Statistics	Software Engineering
Computer Science & Visual Arts	Statistics (honours)

Textbook:

K.H. Rosen, *Discrete Mathematics and Its Applications*, Seventh Edition, McGraw-Hill, 2012.

Course Content:



Chapters and Sections

1. The Foundations: Logic and Proofs
   - 1.1 Propositional Logic
   - 1.2 Applications of Propositional Logic
   - 1.3 Propositional Equivalences
   - 1.4 Predicates and Quantifiers
   - 1.5 Nested Quantifiers
   - 1.6 Rules of Inference
   - 1.7 Introduction to Proofs
   - 1.8 Proof Methods and Strategy
2. Basic Structures: Sets, Functions, Sequences, Sums, and Matrices
   - 2.1 Sets
   - 2.2 Set Operations
   - 2.3 Functions
   - 2.4 Sequences and Summations
   - 2.5 Cardinality of Sets
3. Algorithms
   - 3.2 The Growth of Functions
4. Number Theory and Cryptography
   - 4.1 Divisibility and Modular Arithmetic
   - 4.2 Integer Representations and Algorithms
   - 4.3 Primes and Greatest Common Divisors
5. Induction and Recursion
   - 5.1 Mathematical Induction
   - 5.2 Strong Induction and Well-Ordering
   - 5.3 Recursive Definitions and Structural Induction
6. Counting
   - 6.1 The Basics of Counting
   - 6.2 The Pigeonhole Principle
   - 6.3 Permutations and Combinations
   - 6.4 Binomial Coefficients and Identities
   - 6.5 Generalized Permutations and Combinations
7. Discrete Probability
   - 7.1 An Introduction to Discrete Probability
8. Advanced Counting Techniques
   - 8.1 Applications of Recurrence Relations
   - 8.3 Divide-and-Conquer Algorithms and Recurrence Relations
   - 8.5 Inclusion-Exclusion
10. Graphs
    - 10.1 Graphs and Graph Models
    - 10.2 Graph Terminology and Special Types of Graphs
    - 10.4 Connectivity
    - 10.5 Euler and Hamilton Paths

Learning Outcomes: The Intended Learning Outcomes for this course, as approved by the Education Council, are as follows. Upon successful completion of this course a student will be able to:

1. Establish the equivalence of compound propositions using truth tables and basic laws of logic.
2. Use rules of inference to determine the validity of arguments.
3. Translate English statements into quantified logic statements and vice versa.
4. Prove statements using direct and indirect proofs and ordinary and strong mathematical induction.
5. Prove set equivalences using membership, basic set identities and logical equivalences.
6. Determine whether functions are surjective, injective or bijective.
7. Compare the cardinality of finite and infinite sets through the use of bijections and distinguish between countable and uncountable sets.
8. Describe the growth of functions using big-O, big-Omega and big-Theta notation.
9. Solve problems using the fundamental concepts of number theory and perform simple proofs involving divisibility, prime factorization and congruences.
10. Use the Euclidean algorithm to find greatest common divisors and use other algorithms to convert numbers between different bases.
11. Define functions and sequences recursively.
12. Use permutations and combinations to solve counting and probability problems, including those in which repetition is allowed.
13. Apply the pigeonhole principle to solve counting problems.
14. Prove identities involving the binomial theorem using both algebraic and combinatorial arguments.
15. Model counting problems using recurrence relations.
16. Solve divide and conquer recurrence relations for $n=b^k$ and give big-O estimates for increasing functions.
17. Identify and describe different types of graphs and their connectivity.

A&S Math Lab: Ewing 224: This drop-in centre is freely available for your use to work on math homework and to seek help from the tutor on staff (see hours posted on door).

Support and Services: There are a variety of learning support and services available that can assist you throughout your learning. For more information please see camosun.ca/services.

Academic Integrity: The Department of Mathematics and Statistics has prepared a red handout called *Student Guidelines for Academic Integrity* to help you interpret college policies involving student conduct, academic dishonesty, plagiarism, etc. It is your responsibility to become familiar with the contents of the document and the college policies it references.

Calculator Policy: As per department policy, the only calculator permitted for use on tests and the final exam is the Sharp EL-531 (or EL-510R) scientific calculator. No other calculator or any other electronic device including cell phones, electronic translators, smartwatches, iPods, etc. are allowed.

Homework: There will be periodic assignments to be handed in for marking, details for which will be posted on the course website. LATE ASSIGNMENTS WILL NOT BE ACCEPTED.

Final Exam: A comprehensive, 3-hour final exam will take place during the final exam period of April 18-22, 24-26. The specific date, time, and location will be announced on or about February 24. You must write the final exam at the scheduled time as per Camosun College's policy on final examinations. See camosun.ca/learn/calendar/current/procedures.html#academic.

Grade Calculation: The final grade will be calculated according to the following breakdown:

Assignments: 15%*
Term Tests: 35%
Final Exam: 50%

* *Note:* The lowest assignment mark will be dropped when calculating the assignment average. This allows you to miss one assignment without penalty.

Grade Scale: Final letter grades are assigned as follows:

0-49	50-59	60-64	65-69	70-72	73-76	77-79	80-84	85-89	90-100
F	**D**	**C**	**C+**	**B–**	**B**	**B+**	**A–**	**A**	**A+**

For information on Camosun College's grading policy, see policy E-1.5 on the webpage camosun.ca/about/policies/policies.html#education.