CAMOSUN COLLEGE	**School of Arts & Science** **MATHEMATICS DEPARTMENT** **MATH 126** **BASIC DISCRETE MATHEMATICS** **Winter 2013**

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/math.html

Ω *Please note: the College electronically stores this outline for five (5) years only.*
*It is **strongly recommended** you keep a copy of this outline with your academic records.*
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1. Instructor Information

(a)	Instructor:	
(b)	Office Hours:	
(c)	Location:	
(d)	Phone:	Alternative Phone:
(e)	Email:	
(f)	Website:	

SEE BELOW

2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

Upon completion of this course the 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.

3. Required Materials

SEE BELOW

(a) Texts

(b) Other

4. Course Content and Schedule

(This section can include: class hours, lab hours, out of class requirements and/or dates for quizzes, exams, lectures, labs, seminars, practicums, etc.)

5. Basis of Student Assessment (Weighting)

(This section should be directly linked to the Intended Learning Outcomes.)

(a) Assignments

(b) Quizzes

(c) Exams

SEE BELOW

(d) Other (e.g., Attendance, Project, Group Work)

6. Grading System

(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services, or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy.

The policy is available in each School Administration Office, at Student Services, and the College web site in the Policy Section.

ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED

Mathematics 126
Basic Discrete Mathematics
Winter, 2013

Instructor: George Ballinger
Office: Ewing 256
E-mail: ballinger@camosun.bc.ca
Website: ballinger.disted.camosun.bc.ca (click the MATH 126 link for course information)
Telephone: (250) 370-3116

Timetable:

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:30 am – 9:20 am	MATH 100-001 Room Y217	MATH 100-001 Room Y217	MATH 100-001 Room Y217	MATH 100-001 Room Y217	MATH 100-001 Room Y217
9:30 am – 10:20 am					
10:30 am – 11:20 am					
11:30 am – 12:20 pm	MATH 126-001 Room Y217	MATH 126-001 Room Y217	MATH 126-001 Room Y217		MATH 126-001 Room Y217
12:30 pm – 1:20 pm	Office Hour E256	Office Hour E256	Office Hour E256	Office Hour E256	Office Hour E256
1:30 pm – 2:20 pm	MATH 100-002 Room Y217	MATH 100-002 Room Y217	MATH 100-002 Room Y217	MATH 100-002 Room Y217	MATH 100-002 Room Y217

Important Dates:

January 7	First day of class
January 21	Tuition fees due date
February 11	Family Day (no class)
February 21-22	Reading Break (no class)
March 12	Withdrawal date deadline
March 29	Good Friday holiday (no class)
April 1	Easter Monday holiday (no class)
April 12	Last day of class
April 15-20, 22-23	Final exam period

Prerequisites: C in MATH 100 or MATH 110 or MATH 125.

Exit grade: D (50%) or better in MATH 126 will earn you transfer credit for 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 236 "Introduction to Real Analysis"
MATH 222 "Discrete and Combinatorial Mathematics"	CSC 225 "Algorithms and Data Structures 1"

Programs

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

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 2012-2013 Calendar camosun.ca/learn/calendar/current/web/math.html)

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

Course Content:

Chapter 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

Chapter 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

Chapter 3 Algorithms
- 3.2 The Growth of Functions

Chapter 4 Number Theory and Cryptography
- 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

Chapter 5 Induction and Recursion
- 5.1 Mathematical Induction
- 5.2 Strong Induction and Well-Ordering
- 5.3 Recursive Definitions and Structural Induction

Chapter 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

Chapter 7 Discrete Probability
- 7.1 An Introduction to Discrete Probability

Chapter 8 Advanced Counting Techniques
- 8.1 Applications of Recurrence Relations
- 8.3 Divide-and-Conquer Algorithms and Recurrence Relations
- 8.5 Inclusion-Exclusion

Chapter 10 Graphs
- 10.1 Graphs and Graph Models
- 10.2 Graph Terminology and Special Types of Graphs
- 10.3 Representing Graphs and Graph Isomorphism
- 10.4 Connectivity
- 10.5 Euler and Hamilton Paths

Chapter 11 Trees
- 11.1 Introduction to Trees
- 11.2 Applications of Trees

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).

Study Time: It is recommended that approximately 6-8 hours per week be spent studying for this course outside of class time.

Calculator Policy: As per Math Department policy, the only calculator permitted for use on tests and the final exam is the Sharp EL-531X (or the discontinued EL-531W) scientific calculator. No other make/model of calculator is permitted, nor are other electronic devices such as cell phones, iPods, electronic translators, etc.

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 final exam will take place during the final exam period of April 15-20, 22-23. The specific date, time, and location will be announced in early February. 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/pdf/academic-policies.pdf.

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

Assignments:	15%*
Term Tests:	35%
Comprehensive 3-hour Final Exam:	50% (or 100%)**

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

** *Note:* If your term work is COMPLETE and SATISFACTORY and your mark on the final exam is higher than your term work, then your final exam mark will count for 100% of your grade.

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 Sec E-1.5 on the policy webpage camosun.ca/about/policies/policies.html.