Alexander College
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CURRICULUM GUIDE: OFFICIAL COURSE OUTLINE

<table>
<tr><td>Course Code</td><td>CPSC 215</td><td>Course Title</td><td colspan="4">Discrete Structures II</td></tr>
<tr><td>Credit Value</td><td>3</td><td>Department</td><td colspan="4">Mathematics and Science</td></tr>
<tr><td rowspan="2">No. of weeks</td><td rowspan="2">14</td><td rowspan="2">Hrs. per week</td><td>Lecture</td><td>Tutorial</td><td>Laboratory</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Description</td><td colspan="6">This course is a continuation of CPSC 115 – discrete structures. It covers widely applicable mathematical tools for computer science. Topics include inclusion-exclusion, generating functions, recurrence relations, graphs and trees, cycles and paths, shortest-path algorithms, minimal spanning trees, tree traversal and applications of trees and graphs. It is primarily designed for Computer Science, and it is a required course for the associate of science degree in computing.</td></tr>
<tr><td>Prerequisite(s)</td><td colspan="6">ENGL 098, CPSC 115 or MATH 115</td></tr>
<tr><td rowspan="3">Initial Articulation Targets</td><td>UBC</td><td>SFU</td><td>UVic</td><td>UNBC</td><td colspan="2">TRU</td></tr>
<tr><td>CPSC 2nd (3)</td><td>MACM 201 (3)
Q/B-Sci</td><td>MATH 222 (1.5)</td><td>CPSC 241 (3)</td><td colspan="2">MATH 1700 (3)</td></tr>
<tr><td colspan="6">For updated information on the transferability of this course, please consult the BC Transfer Guide, www.bctransferguide.ca</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Upon successful completion of this course, the student will be able to:
List the terms in a sequence, write a sequence in closed form, compute the sum of a finite sequence, compute the product of a finite sequence, and express sequences in terms of recursive or non-recursive forms.
Solve problems using recurrence relations and recursion to analyze algorithms and programs.
Use elementary number theory including the divisibility properties of numbers to determine prime numbers and composites, the greatest common divisor, and the least common multiple.
Solve discrete probability problems and use sets to solve problems in combinatorics and probability theory.
Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph.
Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to application problems such as computer networks.
Determine if a graph has an Euler or a Hamilton path or circuit.
Determine if a graph is a binary tree, N-ary tree, or not a tree; use the properties of trees to classify trees, identify ancestors, descendants, parents, children, and siblings; determine the level of a node, the height of a tree or subtree and apply counting theorems to the edges and vertices of a tree.</td></tr>
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<tr><td></td><td colspan="3">Demonstrate different traversal methods for trees. Perform tree traversals using preorder, in-order, and post-order traversals and apply these traversals to application problems; use binary search trees or decision trees to solve problems.
To develop an understanding of how graph and tree concepts are used to solve problems arising in the computer science.</td></tr>
<tr><td>Content</td><td colspan="3">Core topics – all of the following will be covered:
Advanced Probability: Review of finite probability and conditional probability
Inclusion-Exclusion: Generalizations of the principle of Inclusion and Exclusion, and derangements: nothing is in its right place
Advanced Enumeration: Introduction to generating functions: calculational techniques, and partitions of integers
Recurrence relations: First-order linear recurrence relations, second-order linear homogeneous recurrence relations with constant coefficients, nonhomogeneous recurrence relations, and the method of generating functions.
Graph theory: Definitions, subgraphs, complements, and graph isomorphism, vertex degree: Euler trails and circuits, planar graphs, Hamilton paths and cycles, and graph coloring and chromatic number
Optimization and matching: Review of trees, Dijkstra's shortest-path algorithm, minimum spanning trees: Kruskal's and Prim's algorithms, and matching theory
Additional topics may also be covered, at the discretion of the instructor.</td></tr>
<tr><td>Methods of Instruction</td><td colspan="3">Lectures, assignments, assigned reading, quizzes, examinations</td></tr>
<tr><td>Required Textbook(s)</td><td colspan="3">The following textbook(s) is/are required, or approved equivalent(s).

Ralph P. Grimaldi. Discrete and Combinatorial Mathematics (Classic Version) (5th Edition), Addison-Wesley, 2018.

Rosen, Kenneth. Discrete Mathematics and its Applications. 8th Ed. New York: McGraw-Hill, 2019.</td></tr>
<tr><td>Required Equipment and Technology</td><td colspan="3">Students are required to have a computer with internet access.
The following resources are provided by the College:
Office 365
Student email</td></tr>
<tr><td>Homework Hours</td><td colspan="3">At minimum, students can expect one hour of homework for every hour of instructional time.</td></tr>
<tr><td rowspan="4">Evaluation</td><td>Component</td><td colspan="2">% Value</td></tr>
<tr><td>Assignments and quizzes</td><td colspan="2">20-30%</td></tr>
<tr><td>Midterm examinations (1-2)</td><td colspan="2">20-40%</td></tr>
<tr><td>Final examination</td><td colspan="2">30-35%</td></tr>
<tr><td>Completion Requirements</td><td colspan="3">The minimum grade to pass this course is D (50%). Unless otherwise stated, a minimum grade of C- (55%) is required for this course to fulfil a prerequisite.</td></tr>
<tr><td>Course Designer(s)</td><td>Ahmed Malki, Ph.D., Department of Computer Science, Alexander College</td><td>Consultant(s), if applicable</td><td>John Edgar, M.Sc. School of Computing Science, Simon Fraser University</td></tr>
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Dean's Approval	Barbara Moon, Ph.D., Dean of Arts and Sciences, Alexander College	Dean's Approval Date	October 16, 2019
Curriculum Committee Approval Date	October 16, 2019	First Term Offered	Fall 2020
Last Review Date	July 29, 2024	Next Review Date	July 29, 2029
Revision History	July 29, 2024 - Added one tutorial hour per week, Kelly Cheung.		