NORTHWESTERN POLYTECHNIC

SCIENCE DEPARTMENT

COURSE OUTLINE – FALL 2022

CS 2040: Algorithms I-3 (3-0-1) 60 Hours for 15 Weeks

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

INSTRUCTOR:	Franco Carlacci	**PHONE:**	780-539-2091
OFFICE:	C-422	**E-MAIL:**	fcarlacci@polytech.ca
OFFICE HOURS:	appointment by email		

CALENDAR DESCRIPTION:

The first course of a two-course sequence on algorithm design and analysis stream, with the emphasis on the fundamentals such as searching, sorting and graph algorithms. Examples include divide and conquer, dynamic programming, greedy method, backtracking, and local search methods. Analysis techniques are develop to aid in judging program efficiency.

PREREQUISITE(S)/COREQUISITE: CS1150, CS2720, MA1130

REQUIRED TEXT/RESOURCE MATERIALS:

Introduction to the Design and Analysis of Algorithms, 3nd Edition, Anany V. Levitin, Addision-Wesley; 2012.

DELIVERY MODE(S):

This course includes 3-hours of lecture per week and a 1-hour seminar per week

Lectures:	H211	M W	10am -1120am
Labs:	G112	W	1pm – 150pm

COURSE OBJECTIVES:

Be able to analyze and design algorithms. This course introduces the classic algorithms in various domains, and techniques for designing efficient algorithms.

LEARNING OUTCOMES:

Students will be able to illustrate, define and generalize problems definitions. Students will be able to understand preconditions and post conditions, and use these to define computational problems in a reasonably precise way. Students will be able to give a proof that a (reasonably simple) algorithm solves a computational problem correctly. Students will be able to analyze the running time of a (reasonably simple) algorithm using summations and recurrences, and express this running time using asymptotic notation. Students will be able to design algorithms using Greedy, Dynamic Programming and Divide and Conquer design approaches. By the end of the course, students will be able to suggest a promising design approach given a problem, initial algorithm and target run-time.

TRANSFERABILITY:

Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at the Alberta Transfer Guide main page http://www.transferalberta.ca.

** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. **Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

EVALUATIONS:

Your final grade will be determined in the following manner:

Assignments	**20%**
Quizzes	**20%**
Midterm Exam	**25%**
Final Exam	**35%**

GRADING CRITERIA: (The following criteria may be changed to suite the particular course/instructor)

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	90-100		C+	2.3	67-69
A	4.0	85-89		C	2.0	63-66
A-	3.7	80-84		C-	1.7	60-62
B+	3.3	77-79		D+	1.3	55-59
B	3.0	73-76		D	1.0	50-54
B-	2.7	70-72		F	0.0	00-49

COURSE SCHEDULE/TENTATIVE TIMELINE:

Weeks	Topics
1	Introduction and Outline
2	Graphs, Weighted Graphs and Applications
3	Algorithm Fundamentals and Problem Solving
4	Analysis of Algorithm and Efficiency
5	Asymptotic Notations and Basic Efficiency Classes
6	Analysis of Recursive & Non Recursive Algorithms
7	Algorithm Design Techniques- Brute Force and Exhaustive Search
8	Decrease and Conquer
9	Divide and Conquer
10	**Midterm**
11	Transform and Conquer
12	Balanced Search Trees and Problem Reduction
13	Space and Time Tradeoff
14	Dynamic Programming
15	P, NP and NP Complete Problems

STUDENT RESPONSIBILITIES:

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the College Calendar at

https://www.nwpolytech.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at https://www.nwpolytech.ca/about/administration/policies/index.html

**Note: all Academic and Administrative policies are available on the same page.