NORTHWESTERN POLYTECHNIC

DEPARTMENT of Science

COURSE OUTLINE – Winter 2026

CS 2720 (A3, S1, S2, L1, L2): Formal Systems and Logic in Computing Science
3 (3-1-1.5) 82.5 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: Dr. Brian Redmond
OFFICE: J206
OFFICE HOURS: MW 1:00 – 2:30 PM
PHONE: 780 296 2724
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CALENDAR DESCRIPTION:
An introductory course to present the tools of set theory, logic and induction, and their use in the practice of reasoning about algorithms and programs. Basic set theory. The notion of a function. Counting. Propositional and predicate logic and their proof system will be studied. Inductive definitions and proofs by induction will be covered along with program specification and correctness.

PREREQUISITE:
CS1140

REQUIRED TEXT/RESOURCE MATERIALS:
Al Doerr, Ken Levasseur: Applied Discrete Structures, 3rd Edition – version 12 (2025)

DELIVERY MODE(S):
On campus, in-person.

Lectures:	Tuesdays (A3) and Thursdays (A3)	8:30 AM – 9:50 AM	in E303
Labs:	Mondays (L2) or Wednesdays (L1)	2:30 PM – 3:50 PM	in G112
Seminars:	Mondays (S2) or Wednesdays (S1)	4:00 PM – 4:50 PM	in G112

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

1. Apply fundamental set theory concepts (sets, subsets, set operations, power sets, Cartesian products) to model and reason about computational problems.
2. Analyze and construct functions and relations, including properties such as injectivity, surjectivity, equivalence relations, and partial orders, and interpret their relevance in computing contexts.
3. Solve counting and combinatorics problems using basic principles such as permutations, combinations, and the pigeonhole principle.
4. Formulate, interpret, and evaluate propositional and predicate logic statements, including the use of logical connectives, quantifiers, truth tables, and logical equivalence.
5. Construct formal proofs using appropriate techniques, including direct proof, proof by contradiction, proof by contrapositive, and proof by cases.
6. Apply mathematical induction and recursive reasoning to define structures, analyze algorithms, prove correctness, and solve recurrence relations.
7. Analyze Boolean algebras and logic circuits using Karnaugh maps, and relate Boolean reasoning to computation and program logic.
8. Specify algorithms and programs formally, using preconditions, postconditions, and invariants to reason about correctness.
9. Implement discrete mathematical concepts computationally by writing and testing simple programs in Python and SageMath to explore sets, relations, logic, recursion, and counting.
10. Communicate logical and mathematical reasoning clearly, using precise notation, well-structured arguments, and appropriate computational representations.

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:

Assignments: 15%
Labs: 15%
Midterm(s): 30%
Final: 40%

GRADING CRITERIA:

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:

Tentative Timeline (subject to change):

Week	Topics	Important Dates
5 January – 11 January	Introduction	Course begins on Tuesday, January 6
12 January – 18 January	Set Theory	
19 January – 25 January	Functions & Relations	
26 January – 1 February		
2 February – 8 February	Combinatorics	
9 February – 15 February		
16 February – 22 February	**Winter Break**	
23 February – 1 March	Logic & Boolean Algebra	Midterm 1 (Monday, February 23)
2 March – 8 March		
9 March – 15 March		
16 March – 22 March	Induction	
23 March – 29 March	Recursion & Recurrence Relations	
30 March – 5 April	Program Correctness	Midterm 2 (Monday, March 30)
6 April – 12 April		
13 April – 19 April		Monday, April 13 (Last day of classes) Thursday, April 16 (First day of exams)
20 April – 26 April	Final exam period	Thursday, April 23 (Last day of exams)

STUDENT RESPONSIBILITIES:

Regular attendance and participation (including homework) is required for the successful completion of this course. Please expect to spend a minimum of 10 hours per week doing homework.

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 Northwestern Polytechnic Calendar at https://www.nwpolytech.ca/programs/calendar/ or the Student Rights and Responsibilities policy which can be found at https://www.nwpolytech.ca/about/administration/policies/index.html.

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