**Math 1271/3071 Course Outline**
Fall 2023

**Instructor:** A. J. Dean email: andrew.j.dean@lakeheadu.ca

**Office Hours:** Tuesdays 2:30-4:30, or by appointment or happenstance.

**Text:** *A Beginner's Guide to Discrete Mathematics*, W.D. Wallis, 2nd edition, Birkhäuser, Boston. (Note: This book is available for free download from the Lakehead Library.)

**Learner Outcomes:** Successful students of this course will be able to: Understand terminology of set theory and perform basic operations with sets including taking unions, intersections, and relative complements, and construct double inclusion arguments; Use the propositional calculus to construct and determine the truth values of compound propositions; Perform basic operations of Boolean algebra including conjunction, disjunction, complement, and dual, and prove simple identities; Find prime implicants and minimal forms for Boolean expressions, and apply these to problems of circuit design; Use Karnaugh maps to find minimal forms of Boolean expressions; Understand what an algorithm is, and be able to execute simple examples; Understand the basic concepts of probability including sample space and event, and formulate concrete problems in these terms; Solve counting problems involving combinations and permutations, the principle of inclusion/exclusion, and the pigeonhole principle, and apply these to problems in discrete probability; Understand the terminology of graph theory, and be able to formulate concrete problems in terms of graph theory; Execute basic algorithms of graph theory, such as Dijkstra's algorithm for finding shortest paths and Prim's algorithm for finding minimal spanning trees; Understand the properties of different systems of voting in elections.

**Schedule**

Week 1. (Sept 4) Theory of Voting.

Week 2. (Sept 11) Properties of Numbers.

Week 3. (Sept 18) Sets and Data Structures.

Week 4. (Sept 25) Boolean Algebras and Circuits.

Week 5. (October 2) Relations and Functions.

**Test # 1 on Tuesday October 3**

**Study Week October 9-13**

Week 6. (October 16) Theory of Counting.

Week 7. (October 23) More Theory of Counting.

**Test # 2 on Tuersday October 24**

Week 8. (October 30) Probability.

Week 9. (November 6) More Probability.

Week 10. (November 13) Graph Theory.

**Test # 3 on Tuesday November 14**

Week 11. (November 20) More Graph Theory.

Week 12. (November 27) Number Theory and Cryptography.

**Grading Scheme:** There will be three term tests worth 20% each. The final exam will be worth 40%.

**Problems:** Each week, a set of practice problems will be circulated by email and posted on the D2L site. We will do some of these in the lab and during the lectures. At the end of the week, solutions to the practice problems will be distributed by email and posted on the D2L site. At the end of the week, a set of review problems will be circulated, and solutions to these will be circulated and posted the following week.

**Term Tests and Final Exam:** The three term tests will be held during the scheduled lab hour (the dates are on the schedule). The material the tests will cover will be announced in class, by email, and on the D2L site, as the dates draw near. The final exam will cover the whole course, and is scheduled by the registrar's office.

**Marking Disputes:** If you feel you have been treated unfairly in the marking of a test, **put your complaint in writing on the paper and return it to the instructor**.

**Drop Date:** The final date to withdraw from this course without academic penalty is Friday November 3.

**Special Exams:** Students who fail this course but attain a mark of 40% may be entitled to write a special exam. See the calendar for details.

**Academic Dishonesty:** All cases of academic dishonesty will be dealt with according to the university's Academic Integrity Code.

**Accommodations:** Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. if you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please visit: http://studentaccessibility.lakeheadu.ca