

Math 1271/3071 Course Outline

Fall 2020

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

Office Hours: By appointment only. All communications for this course will be electronic, not in person. If you need to talk to me outside of class, send me an email and we will set up a zoom appointment.

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 8) Properties of Numbers.

Week 2. (Sept 14) Sets and Data Structures.

Week 3. (Sept 21) Boolean Algebras and Circuits.

Week 4. (Sept 28) Relations and Functions.

Test # 1 on Friday October 2

Week 5. (October 5) Theory of Counting.

Study Week October 12-16

Week 6. (October 19) More Theory of Counting.

Week 7. (October 26) Probability.

Test # 2 on Friday October 30

Week 8. (November 2) More Probability.

Week 9. (November 9) Graph Theory.

Week 10. (November 16) More Graph Theory.

Test # 3 on Friday November 20

Week 11. (November 23) Number Theory and Cryptography.

Week 12. (November 30) Theory of Voting.

Grading Scheme: There will be three term tests worth 15% each. The homework will count for 15%, and the final exam will be worth 40%.

Homework: Each week, a homework assignment will be circulated by email and posted on the D2L site. They will be due at 10pm Thunder Bay time on Friday evenings, unless otherwise announced. Solutions to the homework assignments are to be submitted via D2L. Late assignments will not be accepted. Solutions to the problems will be distributed by email and posted on the D2L site.

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 or assignment, **put your complaint in writing in an email to the instructor**. Do not resubmit it to the D2L site.

Drop Date: The final date to withdraw from this course without academic penalty is Friday November 6.

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 Code of Student Behaviour and Disciplinary Procedures.

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>