St. Francis Xavier University
Department of Computer Science

CSCI 435: Algorithms and Complexity
Final Examination Review
Winter 2025

1 Topics Covered

The following list gives an overview of every topic covered in CSCI 435. You should ensure you have a good understanding of each topic. All final examination questions will test some topic on this list, but not all topics will be tested on the final examination.

Although the final examination is a comprehensive examination, there will be a greater emphasis placed on topics covered after the midterm examination.

- **Pre-Midterm Material**
    - Space complexity
    - Extending tractability
    - Approximation algorithms
    - Local search
- **Randomized Algorithms**
    - Contention resolution
    - Global min cut
    - Linearity of expectation
    - Max 3-satisfiability
    - Universal hashing
- **Online Algorithms**
    - Competitive ratio/competitive analysis
    - Secretary problem
    - Paging problem
    - Randomized online paging
- **Amortized Analysis**
    - Aggregate method
    - Accounting method
    - Potential method
    - Binary counter
    - Multi-pop stack
    - Dynamic table

- **Linear Programming**
    - Standard form
    - Geometry
    - Linear algebra
    - Simplex algorithm
    - Dual linear programs
    - Weak and strong duality
    - Ellipsoid algorithm
- **Quantum Computing**
    - *Only basic definitions about quantum computing will be covered on the final examination*

2   Format

The final examination is 150 minutes (2.5 hours) long. It consists of 6 questions worth a total of 70 marks.

The first question is divided into ten multiple-choice style parts covering general course material. Multiple-choice questions test both pre- and post-midterm material.

The second question is divided into five short answer style parts covering general course material. Short answer questions test both pre- and post-midterm material.

The third question is about randomized algorithms.

The fourth question is about online algorithms.

The fifth question is about amortized analysis.

The sixth question is about linear programming.

3   Tips and Tricks

- Double-check the date, time, and room of the final examination. You will not get extra time to write if you arrive late.

- Use your time wisely. Short and long answer questions will likely take more time than multiple choice questions, so make sure you allocate the appropriate amount of time for each question.

- Use the resources you are given. The lecture notes contain everything you need to know. The assignment questions are similar in content and difficulty to the final examination questions. The course textbook serves as great supplementary material.

- Don't leave your questions until the last minute. Seek help before the final examination if you have questions. Send an email or make a post on Moodle.

- Don't try to memorize concepts. Instead, focus on understanding the meaning behind a concept and how it is applied.

- Don't panic!