St. Francis Xavier University
Department of Computer Science

CSCI 435: Algorithms and Complexity
Midterm Examination Review
Winter 2023

1 Topics Covered

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

- **Introduction**
  - Review of algorithm design techniques
  - Greedy algorithms
  - Recursion
  - Divide and conquer
  - Master theorem
  - Dynamic programming
- **Online Algorithms**
  - Difference between online/offline
  - Competitive ratios
  - Secretary problem
  - Paging problem
  - Min algorithm
  - FIFO and LRU algorithms
  - Marking algorithm
- **Randomized Algorithms**
  - Generating random bits
  - Minimum cuts
  - Determinism/max-flow min-cut theorem
  - Karger's algorithm
  - Karger–Stein algorithm
  - Maximum cuts
  - The probabilistic method
  - Derandomization
  - Method of conditional probabilities
  - Las Vegas algorithms
  - Monte Carlo algorithms
  - Randomized complexity classes
  - RP, coRP, and ZPP
  - PP and BPP

2 Format

The midterm examination is fifty minutes long. It consists of 4 questions worth a total of 25 marks.

The first question is divided into 5 multiple-choice style questions. The second, third, and fourth questions are short-answer style questions.

3 Tips and Tricks

- Double-check the date, time, and room of the midterm examination. You will not get extra time to write if you arrive late.
- Use your time wisely. Short 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 midterm examination questions. The course textbooks serve as great supplementary material.
- Don't leave your questions until the last minute. Seek help before the midterm examination if you have questions. Attend office hours or send an email.
- Don't try to memorize concepts. Instead, focus on understanding the meaning behind a concept and how it is applied.
- Don't panic!