### ESTR 2004: Discrete Mathematics for Engineers

Handout 0: Information Sheet

Instructor: Anthony Man–Cho So

September 6, 2021

2021–22 First Term

# 1 General Information

- INSTRUCTOR: Anthony Man–Cho So
  - Office: ERB 604
  - Office Hours: By appointment
  - EMAIL: manchoso@se.cuhk.edu.hk
- TEACHING ASSISTANTS:

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Xiaolu Wang	xlwang@se.cuhk.edu.hk
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- Office: ERB 905
- Office Hours: Tuesdays 2:00pm 3:30pm
- Lecture Hours & Venue:
  - Mondays 10:30am 12:15pm, in SC L3
  - Wednesdays 1:30pm 2:15pm, in ERB 803  $\,$
  - Thursdays 10:30am 12:15pm, in MMW 710
- CLASS WEBSITE: http://www.se.cuhk.edu.hk/~manchoso/2122/estr2004
- ONLINE Q&A FORUM: http://piazza.com/cuhk.edu.hk/fall2021/estr2004

## 2 Course Description

Just as calculus is the mathematical foundation for natural sciences, discrete mathematics is the mathematical foundation for computing sciences. In this course, we will cover the basic techniques of discrete mathematics, which are essential for manipulating and reasoning about finite or countable sets of objects. Applications from various disciplines, such as computer science, operations research, and probability, will be used to illustrate the theory.

## 3 Topics to be Covered

- Mathematical induction
- Sums: Exact and asymptotics
- Recurrences and generating functions
- Sets and combinatorial counting
- Discrete probability
- Graph theory

## 4 Learning Outcomes

At the conclusion of this course, students should be able to (i) manipulate and reason about various discrete structures, and (ii) model simple structures and processes arising in practice with discrete mathematics and apply the techniques learned in this course to analyze them.

Class Dates	Topics
Week 1 (Sep $6, 8, 9$ )	Introduction, Mathematical induction
Week 2 (Sep 13, 15, 16)	Evaluating sums
Week 3 (Sep 20)	Floors and ceilings
(Sep 22)	No class (Day following the Chinese Mid–Autumn Festival)
(Sep 23)	Recurrences and generating functions
Week 4 (Sep 27, 29, 30)	Recurrences and generating functions (cont'd)
Week 5 (Oct $4, 6, 7$ )	Asymptotics
Week 6 (Oct 11, 13)	Inexact summation
(Oct 14)	No class (Day following the Chung Yeung Festival)
Week 7 (Oct 18)	Inexact summation (cont'd)
$(Oct \ 20)$	Midterm review
$(Oct \ 21)$	Midterm examination
Week 8 (Oct 25, 27, 28)	Sets and combinatorial counting
Week 9 (Nov 1, 3, 4)	Sets and combinatorial counting (cont'd)
Week 10 (Nov 8, 10, 11)	Sets and combinatorial counting (cont'd)
Week 11 (Nov 15, 17, 18)	Elements of discrete probability
Week 12 (Nov 22, 24, 25)	Introduction to graph theory
Week 13 (Nov 29, Dec 1, 2)	Introduction to graph theory (cont'd)

## 5 Tentative Course Schedule

#### 6 Grading

• HOMEWORK (35%): There will be about 6 homeworks during the term. Unless otherwise specified, they are due on Thursday. Late homeworks will incur a penalty of 10 points per day. However, no homework will be accepted after the solution is distributed.

You are allowed, and even encouraged, to discuss the homeworks with your classmates. However, **you must write up the solutions on your own**. Plagiarism and other anti–scholarly behavior will be dealt with severely.

- MIDTERM EXAMINATION (20%): There will be a midterm examination, tentatively scheduled in the seventh week of the course. The date, format, and scope of the examination will be announced later.
- ESSAY (25%): A short (4–5 pages), complete account of a result in discrete mathematics. The topic will be announced later in the course.
- FINAL EXAMINATION (20%): There will be a final examination. The date, format, and scope of the examination will be announced later.

#### 7 Learning Resources

The main text for this course is

• Eric Lehman and F. Thomson Leighton, Albert R. Meyer, *Mathematics for Computer Science*, 2015.

It can be obtained by following the link on the course website.

Students may find the following textbooks useful for this course:

- Richard A. Brualdi, Introductory Combinatorics (5th Edition), Pearson Education, Inc., 2010.
- Susanna S. Epp, *Discrete Mathematics with Applications (4th Edition)*, Brooks/Cole Cengage Learning, 2011.
- Kenneth H. Rosen, Discrete Mathematics and Its Applications (7th Edition), McGraw-Hill, 2012.

Supplementary material will also be posted on the course website as the course progresses.

#### 8 Academic Honesty

Students are strongly advised to read the University's guideline on academic honesty (http: //www.cuhk.edu.hk/policy/academichonesty/) and the Faculty's guideline on academic honesty (https://www.erg.cuhk.edu.hk/erg/sites/default/files/Guidelines\_to\_Academic\_Honesty. pdf). In particular, no form of plagiarism or anti-scholarly behavior will be tolerated. A student caught plagiarizing in homework sets or cheating during tests/examinations will be reported to the Faculty Disciplinary Committee for further action.