Discrete Mathematics and Its Applications

Lecture 0: Course introduction

MING GAO

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Outline

Required sources

Required sources

- Kenneth H. Rosen et al.: Discrete Mathematics and Its Applications. (Seventh Edition in Chinese)

References

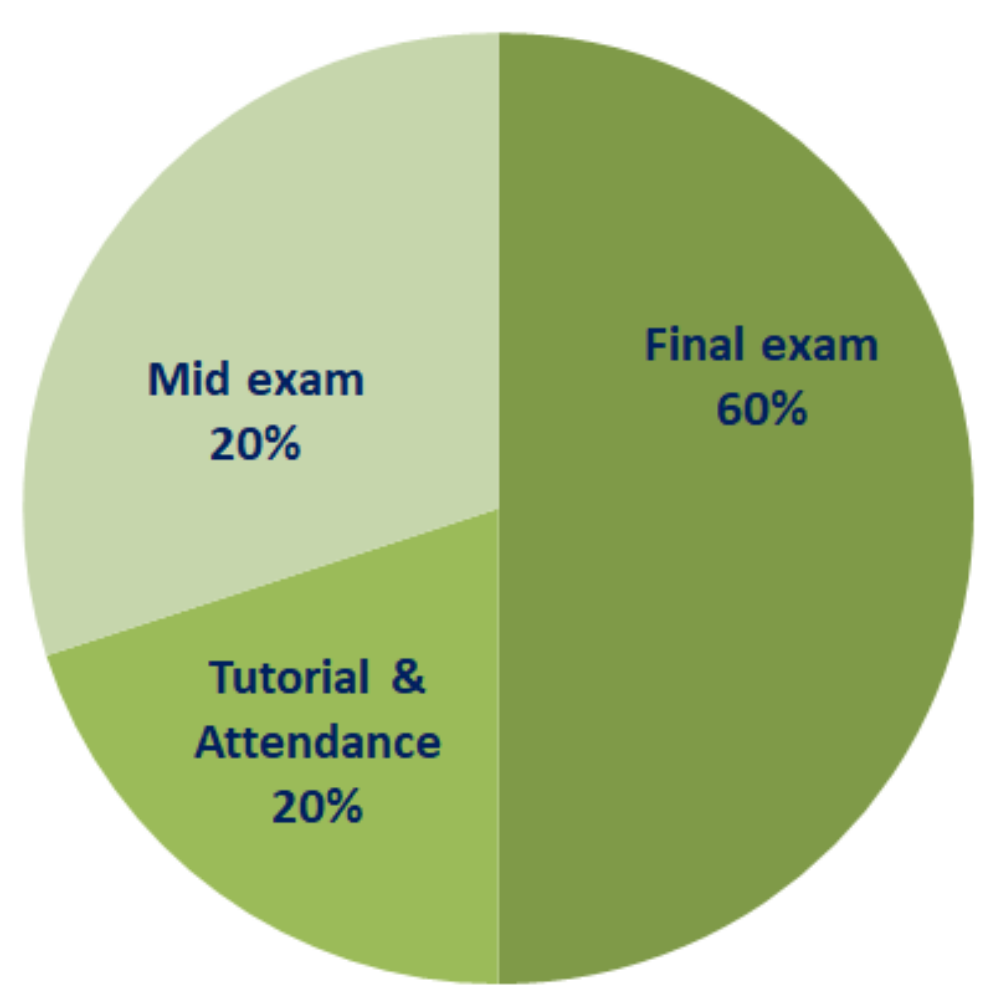
- Ronald L. Graham, Donald E. Knuth, and Oren Patashnik, Concrete Mathematics: a Foundation for Computer Science, 2nd ed., 1994.
- Chung Laung Liu, Elements of Discrete Mathematics, McGraw-Hill, 1985.
- Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, 5th ed., 2004.

Requirements

1. Slides will be posted 1-2 days before lecture, but
2. Students are expected to
   - do not look at your **mobile phone**
   - take notes during lecture (no lecture note will be provided)
   - read the assigned readings before and after the lecture
   - address homework assignments individually
   - think through the answers of tutorial (a set of questions) after every lecture
3. Examinations: monthly quiz, midterm, and final term (honestly and independently)

Course homepage: http://dase.ecnu.edu.cn/mgao/teaching/DM_2018_Fall/DM.html

Grading policy



Contact information

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- Research focus:
  - Social data mining
  - User profiling
  - Knowledge graph and knowledge engineering
  - Streaming data management and mining

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It's like learning a new language

- Do you remember the time when you start learning English?
- There are a few things you have to learn and get used to.
- They might not make so much sense in the beginning, but over time, you will get comfortable with how the language is used.
- As your knowledge of the language gets better, everything becomes more natural. Learning a new language sometimes expands your view of the world.
- I hope it is also true with this course.

The goals of this course

There are three goals:

- To learn how to make mathematical arguments.
- To learn various fundamental mathematical concepts that are very useful in computer science.
- To learn how to model a real problem in mathematical manner.

Why care about discrete mathematics?

- Digital computers are based on discrete atoms (bits)
- Therefore, both a computer's
  1. structure (circuits)
  2. operations (execution of algorithms)

  can be described by discrete mathematics.

Discrete mathematics

Discrete mathematics

- Study of mathematics structures and objects that are fundamentally discrete rather than continuous.
- Examples of objects with discrete values are **integers**, **graphs**, or **statements** in logic

Discrete mathematics and **computer science**

Concepts from discrete mathematics are useful for describing objects and problems in computer algorithms and programming languages. It can be applied to many applications, such as **cryptography, automated theorem proving**, and **software development**, etc.

Examples

```
Initialization;
while (condition)
   {
   Statement 1 ;
   Statement 2 ;
   Statement 3 ;
   ..........
   ..........
   if ( If Condition)
     break;

   Statement N-1 ;
   Statement N ;
   Increment;
   }

OutsideStatement 1;
```

Examples Cont'd

Course syllabus

Tentative topics

1. Logic and proofs
2. Sets
3. Functions
4. Sequences
5. Counting
6. Probability
7. Relations
8. Graphs

Take-aways

Advices to learning DM

- Not a reading course.
- More than a mathematics course, it is therefore workload-heavy.

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