

Discrete Mathematics

Course Overview

Shin Hong

26 Aug, 2019

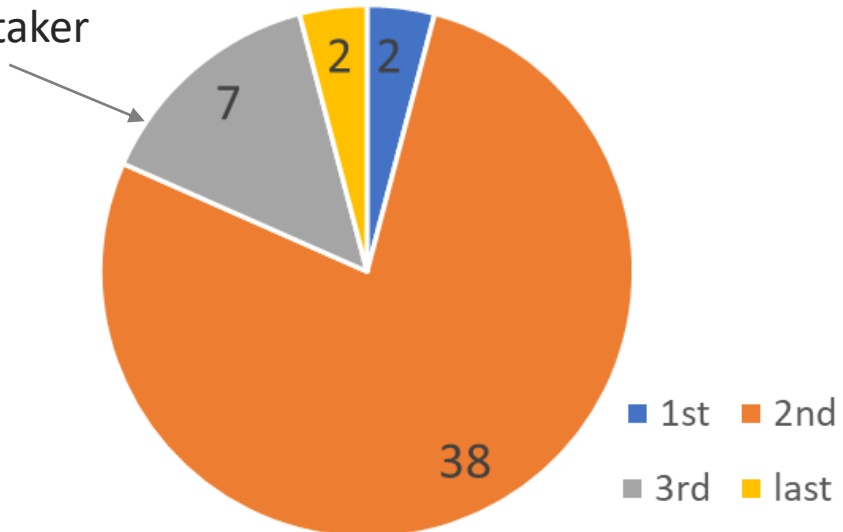
Class

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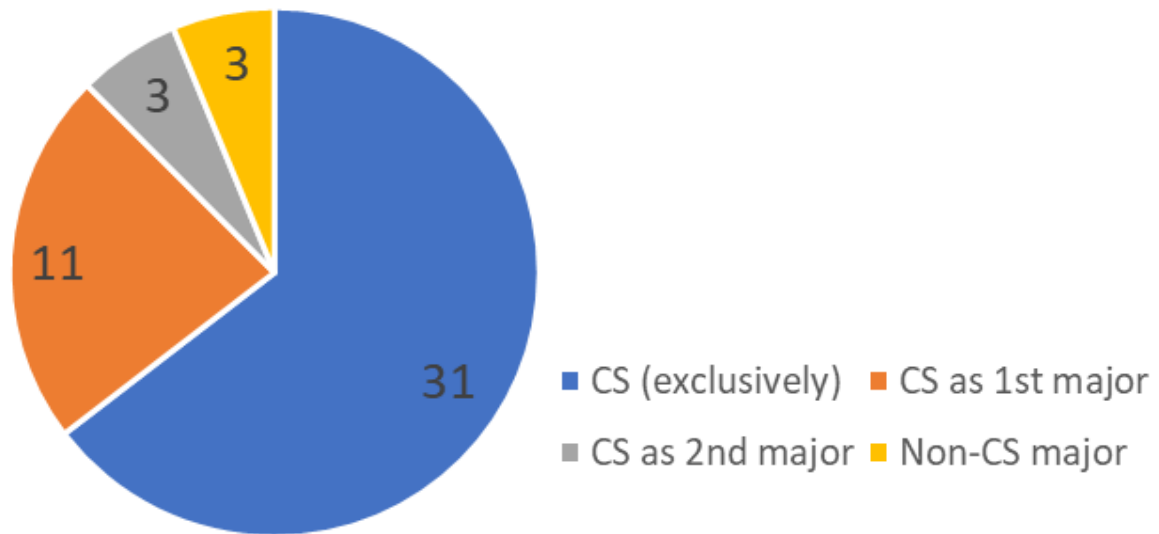
- **81 students** (50 in ITP 20002-01 + 31 in ITP 20002-02)
- Shin Hong as instructor
 - hongshin@handong.edu / <https://hongshin.github.io> / OH 313
- 3 teaching assistants
 - Jeewoong Kim / Juyoung Jeon / Hyerin Leem

Which Year

1 retaker



Which Major



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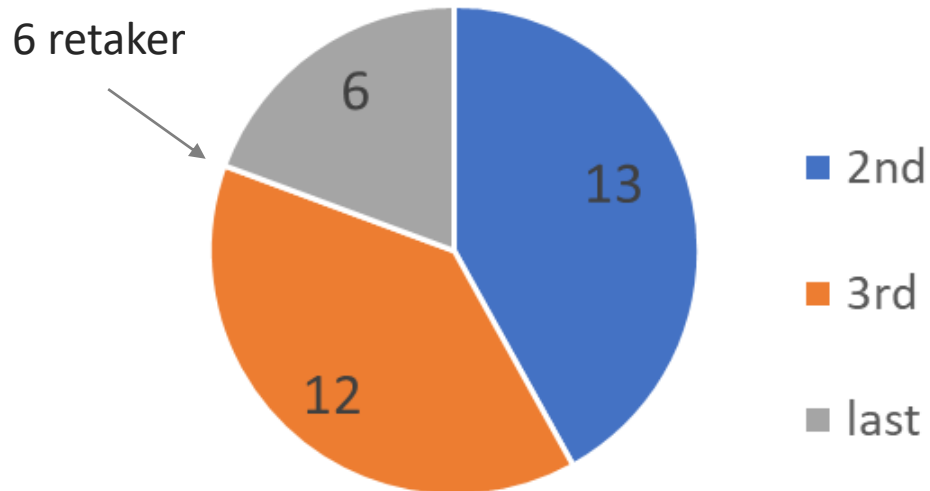
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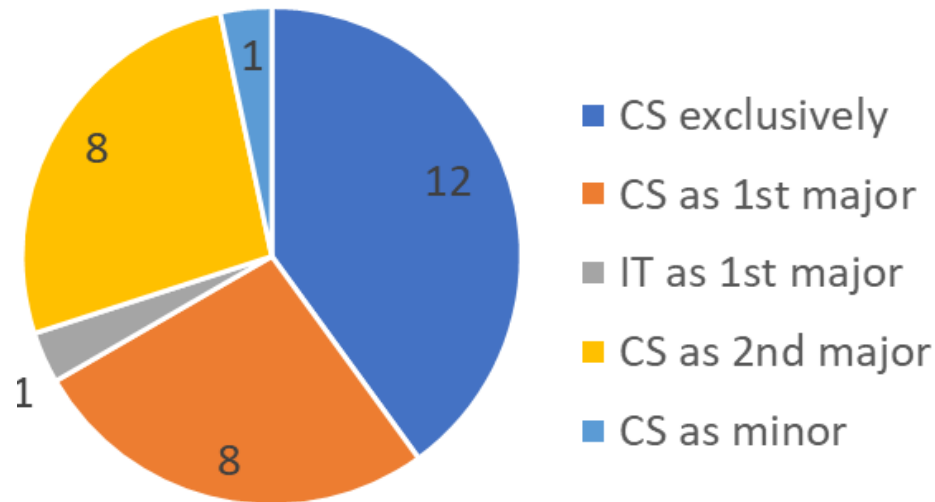
3

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Which Major



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Course Objectives

4

- Equip beginner-level Computer Science major students with mathematics foundations for studying in Computer Science
 - read, write, and discuss scientific facts
 - represent, count, and enumerate computational objects
 - reason scientific facts with discrete structures (e.g., sets, relations, permutations, graphs, trees)
- Understand fundamental approaches to solving real-world problems with computation

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Syllabus & Course Material

5

<https://github.com/hongshin/DiscreteMath>

- Class Attributes
- Class Policies
- Learning resources
 - lecture notes

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Topics

- Coverage of textbook chapters

Ch. 1. The Foundations: Logic and Proofs

Ch. 2. Basic Structures: Sets, Functions, Seq ...

Ch. 3. Algorithms **only first few sections**

Ch. 4. Number Theory and Cryptography

Ch. 5. Induction and recursion

Ch. 6. Counting

Ch. 7. Discrete Probability **as last**

Ch. 8. Advanced Counting Techniques

Ch. 9. Relations

Ch. 10. Graphs

Ch. 11. Trees

Ch. 12. Boolean algebra

Ch. 13. Modeling Computation

Topic and lecture schedule (tentative)

7

| | | | |
|-------------|--|-------------|-----------------------------------|
| Aug 26 (M) | Course overview | Oct 21 (M) | Ch 6. Counting basics |
| Aug 29 (Th) | No class – Shin's attending ESEC/FSE '19 | Oct 24 (Th) | Ch 6. Permutation and Combination |
| Sep 02 (M) | Ch 1. Logic | Oct 28 (Th) | Ch 6. Permutation and Combination |
| Sep 05 (Th) | Ch 1. Logic | Oct 31 (Th) | Ch. 9. Relations |
| Sep 09 (M) | Ch 1. Logic | Nov 4 (M) | Ch. 9. Equivalence, Partial order |
| Sep 12 (Th) | No class – Chooseok | Nov 7 (Th) | Ch. 10. Graphs |
| Sep 16 (M) | Ch 1. Proof | Nov 11 (M) | Ch. 10. Graphs |
| Sep 19 (Th) | Ch 1. Proof | Nov 14 (Th) | Ch. 10. Graphs |
| Sep 23 (M) | Ch 2. Set | Nov 17 (M) | Ch. 13. Language and grammar |
| Sep 26 (Th) | Ch 2. Functions, Sequence | Nov 20 (Th) | Ch. 13. Finite-state machine |
| Sep 30 (M) | Ch 2. Set cardinality | Nov 24 (M) | Ch. 13. Language recognition |
| Oct 3 (Th) | No class – National Foundation Day | Nov 27 (Th) | Ch. 13. Turing machine |
| Oct 7 (M) | Ch. 4. Mathematical Induction | Dec 2 (M) | Ch. 7. Discrete Probability |
| Oct 10 (Th) | Ch. 4. Strong induction | Dec 5 (Th) | Ch. 7. Bayes Theorem |
| Oct 14 (M) | Ch. 4. Structural induction | Dec 9 (M) | wrap-up |
| Oct 17 (Th) | Midterm exam: 7 PM -9 PM | Dec 12 (Th) | Final exam: TBD |

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Study Guidelines

8

- Read, read, read textbook
 - read regularly
 - never move on once you face a unknown word or sentence
 - use your hands to repeat examples
 - memorize definitions
 - peruse stories in boxes
 - never expect that all materials will be covered at the meeting
- Solve exercise problems by yourself
 - read the problem sentence carefully
 - write down an answer completely, and never stop at a middle
 - do have a group study
- Try best to think together (i.e., discuss) at a meeting time
 - participate or loss the time

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2019-08-26

Team

9

- You will have 3 teams along this semester
 - 4-5 students in a team
 - turnover at 1/3 and 2/3 points
 - first team will be announced at the Sep 2 meeting
- Activities
 - Seat together at the meetings
 - Programming projects
 - Homework: solve text exercises together with the team
 - Collaborative quiz (total 3 to 5 times)
 - each student takes a quiz individually
 - every member of a team can achieve extra points ($\leq 20\%$) if their average/minimum score exceeds given a challenge bar

Class Policies

10

<https://github.com/hongshin/DiscreteMath/blob/master/POLICY.md>

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Ground Rules

11

- Primary, students study course subjects by reading textbooks and doing assignments and homework
 - the primary purpose of a meeting is for having discussions
- Students are expected to spend at least 6 hours in a week by oneself for following up 3 hours meeting in the week
 - beside the time for homework and meetings
- Given an assignment, finding and understanding its obligations is a crucial task to accomplish by oneself
- Given a programming assignment, each student must thoroughly understand all parts of programming assignments
 - each member may take a part, and must study all aspects

Grading

12

- Evaluation points

- Meeting attendance: 4%
- Discussion contribution: 5%
- Midterm exam: 25%
- Final exam: 28%
- Programming assignments: 18%
- Homework & quizzes: 20%

- Grade proportion

- $A : B : C+D+F \equiv 25-30\% : 40-60\% : 10-30\%$

- Professor to the rescue:

- 14th week
- for those who are suspected to get D or fails by 8+ absences
- by open make-up classes or give extra homework

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Assignments & Quizzes

13

- Assignments: 3 to 5 times
 - 3 programming assignments in teams
 - you may have personal programming assignments
- Quizzes: up to 5 times
 - problem set will be given before the quiz (it's called homework)
 - some of these will be conducted as collaborative quizzes

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2019-08-26

Optional Assignment

14

- Deadline: 11:59 PM, Dec 20
- Book critiques
 - Read one of the recommended books (that you have not read before) and then write a book critique
 - The write up should be at least 5 pages
 - You should give your genuine ideas that associate the book with the discrete math and your studies in computer science.
- Credit: upto 3 points are added to the grading score
 - Grading policy: A:B:C = 20-30:30-50:30-50

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2019-08-26

Recommended Books

15

- Godel, Escher, Bach: An Eternal Golden Braid, Douglas Hofstadter
(괴델, 에셔, 바흐: 영원한 황금 노끈)
 - acceptable even if you cover only Part I (GEB)
- Code: The Hidden Language of Computer Hardware and Software by Charles Petzold
(Code: 하드웨어와 소프트웨어에 숨어 있는 언어)
- Programming Pearls, 2/e, John Bentley (생각하는 프로그래밍)
- Once Upon an Algorithm by Martin Erwig
 - only for the English version
- Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science and Everyday Life (링크: 21세기를 지배하는 네트워크 과학)
- Godel's Proof, Ernest Nagel et al., (괴델의 증명)
- The Emperor's New Mind, Roger Penrose (황제의 새마음, 상/하)
- 컴퓨터 과학이 여는 세상, 이광근 (Korean only)
- 튜링&괴델: 추상적 사유의 위대한 힘 (Korean only)
- 역사 속의 소프트웨어 오류, 김종하 (Korean only)

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2019-08-26

Quiz #1 @ Sep 2

16

- 5 multiple-choice problems on the class policies and the syllabus
 - in 5 minutes
 - Example

Question

Not failing this class, what is the maximum number of absences you can have in this semester?

Answer: 7 times

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Discrete Math.

2019-08-26