CS 530 - Mathematical Foundations in Computer Science

Spring 2019

Course Description

This course covers mathematical foundations of Computer Science focusing on basic mathematical structures, mathematical logic and probability theory. It is designed to provide students with proficiency in applying these concepts to problem solving and formal reasoning. To achieve this, the course provides students with significant hands-on practice with the use of computational tools.

Instructor

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Office hours: by appointment

Teaching Assistant

TBA

Class

Innovation Hall, Room 136
Wednesday, 7:20 PM - 10:00 PM (see exceptions below)

Prerequisites

- MATH 125 or INFS 501
- STAT 344

Text Book

- *Mathematics for Computer Science* by E. Lehman, F.T. Leighton and A.R. Meyer; see https://courses.csail.mit.edu/6.042/spring18/mcs.pdf, or the full text on the Blackboard

- Supplemental materials:
  - Lecture Notes on Mathematical Logic by Vladimir Lifschitz (https://www.cs.utexas.edu/users/vl/teaching/388Lnotes.pdf)
  - Probability course notes by Richard Weber (http://www.statslab.cam.ac.uk/~rrw1/prob/prob-weber.pdf)

Grading

- 5 Homeworks (5 points each) - 25%
- Midterm exam (35 points) - 35%
- Final exam (40 points) - 40%
- Bonus points:
  - Class participation - 3
  - Midterm exam - 3
  - Final exam - 4

A+: 100+: *A*: [93, 100); *A*-: [88, 93); *B*+: [83, 88); *B*: [78, 83); *B*-: [73, 78); *C*: [65, 73); *F*: [0,65)

Bonus Points

- Class Participation
  - Students are strongly encouraged to participate in lectures by asking and answering questions, and taking part in discussions.
  - One bonus point is awarded for providing a correct answer to a question posed by the instructor.
  - One check mark is awarded when a student is active in one class by trying to answer questions. Three check marks result in one bonus point.
- Exams
  - Additional points are awarded for answering one problem of extra complexity. Students are advised to attempt such problem after trying all other questions.

Suggested Exercises

- After each class, suggested exercises from the textbook will be posted in the updated schedule below
- Students are strongly encouraged to attempt those and cooperate with other students as needed
- The cooperation on solutions can be achieved using Piazza (see below). The instructors will provide feedback on correctness of solutions as much as possible

Tentative Schedule

Date	Topic	Test
Jan 23	Foundations 1. Sets and relations. Sections: 4.1, 8.3, 4.3, 4.4.	
Jan 30	Foundations 2. Induction. Sections: 5.1, 5.2, 7.1.	HW1 assigned
Feb 6	Foundations 3. Recursion. Sections: 7.2, 7.3.	HW1 due
Feb 13	Foundations 4. Directed graphs. Sections: 10.1, 10.2, 10.3.	HW2 assigned
Feb 20	Foundations 5. Number Theory. Sections: 9.1, 9.2.	HW2 due
Feb 27	Mathematical Logic 1. Propositional logic: propositional formulas, equivalence, validity.	
Mar 6	Midterm Exam	Midterm
Mar 13	Spring Break - NO CLASS	
Mar 20	Mathematical Logic 2. Propositional algebra. Sections: 3.4, 3.5.	HW3 assigned
Mar 27	Mathematical Logic 3. Predicate algebra. Section: 3.6.	HW3 due
Apr 3	Mathematical Logic 4. Practice with computing applications; see class notes	HW4 assigned
Apr 10	Probability Theory 1. Classical probability. Sections: 15.1, 15.3, 15.4, 15.5, 15.7	HW4 due
Apr 17	Probability Theory 2. Probability spaces. Sections: 17.1, 17.2, 17.5.1, 17.5.2, 17.5.3, 17.5.4.	HW5 assigned
Apr 24	Probability Theory 3. Conditional probability. Sections: 18.2, 18.3, 18.4, 18.5, 18.7.	HW5 due
May 1	Probability Theory 4. Random variables. Sections: 19.1, 19.2, 19.3, 19.4.	
May 8	Final Exam - 7:30 PM	Final

Communication

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/gmu/spring2019/cs530/home

Policies

Please note that all coursework should be done independently. Plagiarizing the homework and cheating on the exam will be penalized; see Honor Code at http://cs.gmu.edu/resources/honor-code.