Elementary Theory of Computation
CMSC 452 — Spring 2026

Binghui Peng

Course information

- **Course webpage:** https://www.cs.umd.edu/class/spring2026/cmsc452/
- **Instructor:** Binghui Peng (binghuip@umd.edu)
- **TA:** Mattias Ehatamm (mehatamm@umd.edu)
- **Lecture time:** Tuesday and Thursday, 11:00 AM – 12:15 PM
- **Lecture location:** IRB 1116
- **Office hours:**
  - Binghui: Thursday 10:00 AM – 11:00 AM, IRB 5130
  - Mattias: Tuesday 2:00 PM – 3:00 PM, AVW 4160

Topics (tentative)

Part 1: Regular languages

- DFA, NFA, regex; equivalence of definitions
- Closure properties and useful proof techniques
- Non-regular languages

Part 2: Grammars (CFG and CSG)

- Grammars generate sets of strings
- CFGs beyond regular languages; CSGs beyond CFGs
- When grammars are more concise than automata

Part 3: Decidability and undecidability

- Decidable vs. undecidable problems (we do not care how long it takes for decidability)
- The HALT problem and reductions to other undecidable problems

Part 4: Complexity — P and NP

- P: languages decidable in polynomial time ("easy")

- NP: languages verifiable in polynomial time

- NP-completeness; SAT is NP-complete; reductions to other NP-complete problems

- PSPACE and the P vs. NP conjecture (as covered in class)

(Time permitting) Quantum computing

Materials

- **Main course material:** instructor slides (posted on the course webpage).

- **Optional textbook:** *Introduction to the Theory of Computation* (Michael Sipser).

- **Advanced:** *Computational Complexity* (Christos Papadimitriou).

Assessment and grading

- **Homework (4 total):** 30%

- **Two exams (midterm + final):** 70% (closed book, you may bring **one page** of cheatsheet.)

Homework logistics

- There are 4 homework assignments in total.

- Homework and slides are posted on the course webpage.

- Submit homework on Gradescope.

- **Late policy:** You may submit late **2 times**; each late submission may be at most **1 week** late.

- **Regrade policy:** regrade requests are due within **1 week** of the homework being graded.

- Ask homework/regrading questions on Piazza and in office hours.

- You can use LLM for learning, but do **not** use it to write homework. **If the TA finds the answer is generated by GPT, the entire homework will be given a zero grade.**