



Computer Science 601.231
AUTOMATA and COMPUTATION THEORY
Spring, 2022 (3 credits, EQ)

Instructor

Professor Xin Li, xli1113@jhu.edu, www.cs.jhu.edu/~lixints
Office hours: Tuesdays 4pm–5pm or by appointment. Zoom link same as class.

Course Assistants

TA: Yu Zheng, yzheng48@jhu.edu, Office hours: Fridays 4pm–5pm.
CA: Jiahua Guo, jguo69@jhu.edu, Office hours: Wednesday 11 am–12 pm
Yi Hong, [y hong29@jhu.edu](mailto:yhong29@jhu.edu), Office hours: Monday 1:30 pm–2:30 pm
Mung Yao Jia, mjia8@jhu.edu, Office hours: Thursday 6 pm–7 pm
Ege Seyithanoglu, eseyith1@jhu.edu, Office hours: Wednesday 1:30 pm–2:30 pm

Meetings

Tuesday and Thursday, 1:30–2:45 pm, by Zoom: <https://wse.zoom.us/j/149159926> Meeting ID: 149 159 926 (password sent privately)

The meetings will be recorded and available in Blackboard. You will need your JHU account to access it. If you are concerned, you may opt-out from identification in the recording by muting your audio, not enabling video, and not typing into the chat window. However, I encourage your active participation in the meeting to make the lectures more interactive.

Class meetings recorded by the instructor may be shared with students in the class for instructional purposes related to this class. Students are not permitted to copy or share the recording or transcriptions with others.

Textbook

Required: Michael Sipser, *Introduction to the Theory of Computation, Third Edition*.

Online Resources

Any related online material will be posted at the course website <http://www.cs.jhu.edu/~lixints/class/spring22.html> or in Blackboard.

Course Information

- This course is an introduction to the theory of computing. Topics include design of finite state automata, pushdown automata, linear bounded automata, Turing machines and phrase structure grammars; correspondence between automata and grammars; computable functions, decidable and undecidable problems, P and NP problems, NP-completeness, and randomization. Students may not receive credit for 601.231 and 601.631 for the same degree.

- **Prerequisites**
Discrete Math or permission.
- **Selective Elective**

Course Goals

Specific Outcomes for this course are that:

- Students will learn to establish a formal foundation of the theory of computation.
- Students will learn to analyze and solve problems formally and mathematically.

This course will address the following CSAB ABET Criterion 3 Student Outcomes

Graduates of the program will have an ability to:

- (1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- (2) Communicate effectively in a variety of professional contexts.
- (3) Apply computer science theory and software development fundamentals to produce computing-based solutions.

Course Topics

- Finite automata and regular languages; context-free languages; Turing machines and computability; Diagonalization; Reductions; Time complexity.

Detailed topics covered and textbook correspondence will be posted on the course website <http://www.cs.jhu.edu/~lixints/class/spring22.html>.

Course Expectations & Grading

There will be approximately eight homework problem sets, two mid-term exams and one final exam. Grading will be based on the following rule:

- Learning paragraph writing (approximately every week or two weeks): 10%.
- Homework: 30%.
- Two Mid-term exams: 30%.
- Final exam: 30%.

Grades will be given approximately according to the following rules:

- A grade (A- to A+): overall grade above 85 OR top 30%.
- B grade (B- to B+): overall grade above 75 OR top 60%.
- C grade (C- to C+): overall grade above 60 OR top 90%.
- Below C grade: overall grade below 60 AND bottom 10%.

Key Dates

The two mid-term exams will be held on March 3 and Apr 5. The format will be a 2 hour test time (which you can choose) within a 24 hour time frame, in Gradescope. The class time on these dates will be reserved for exams (but you can choose a different time if you wish). The final exam will be cumulative and will be a 4 hour test time (which you can choose) within a 24 hour time frame, from 5pm, May 16 to 5pm, May 17. No make-up exams will be given, unless you have legitimate reasons, so plan accordingly. All exams are open note.

Assignments & Readings

Assignments and further readings will be posted on the course website <http://www.cs.jhu.edu/~lixints/class/spring22.html>

Gradescope: <https://gradescope.com/> **coursecode:** V8KJN4

CampusWire: <https://campuswire.com/p/GA9E2558D> Code: 4140

Ethics

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful, abiding by the *Computer Science Academic Integrity Policy*:

Cheating is wrong. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion. Offenses may be reported to medical, law or other professional or graduate schools when a cheater applies.

Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse.

Academic honesty is required in all work you submit to be graded. Except where the instructor specifies group work, you must solve all homework and programming assignments without the help of others. For example, you must not look at anyone else's solutions (including program code) to your homework problems. However, you may discuss assignment specifications (not solutions) with others to be sure you understand what is required by the assignment.

If your instructor permits using fragments of source code from outside sources, such as your textbook or on-line resources, you must properly cite the source. Not citing it constitutes plagiarism. Similarly, your group projects must list everyone who participated.

Falsifying program output or results is prohibited.

Your instructor is free to override parts of this policy for particular assignments. To protect yourself: (1) Ask the instructor if you are not sure what is permissible. (2) Seek help from the instructor, TA or CAs, as you are always encouraged to do, rather than from other students. (3) Cite any questionable sources of help you may have received.

On every exam, you will sign the following pledge: "I agree to complete this exam without unauthorized assistance from any person, materials or device. [Signed and dated]". Your course instructors will let you know where to find copies of old exams, if they are available.

In addition, the specific ethics guidelines for this course are:

- (1) *Collaboration policy:* While you should first think about homework problems on your own, I encourage you to discuss homework problems with your classmates. However, you must write up your own solutions. Students found sharing the same paragraph in their homework will receive 0 point for the homework, and risk further punishment such as automatic failure and report to the University. Furthermore, you must acknowledge any collaboration by writing the names of your collaborators on the front page of the assignment. You don't lose points by having collaborators.
- (2) *Using other resources:* You can use other resources (e.g., online resources) to help you understand the topics generally. However, using resources other than those provided in class (textbook, notes, homework solutions) in your homework solutions is prohibited. Using unauthorized solutions from other resources in homework is considered plagiarism and will result in 0 point for the homework and potential further punishment as in (1).

- (3) *Late Policy*: Homework will be submitted in Gradescope. No late homework will be accepted, unless you have legitimate reasons and have obtained approval from the instructor.

Report any violations you witness to the instructor.

You can find more information about university misconduct policies on the web at these sites:

- For undergraduates:
<http://e-catalog.jhu.edu/undergrad-students/student-life-policies/>
- For graduate students:
<http://e-catalog.jhu.edu/grad-students/graduate-specific-policies/>

Personal Wellbeing

- If you are sick please notify me by email so that we can make appropriate accommodations should this affect your ability to attend class, complete assignments, or participate in assessments. The Student Health and Wellness Center(<https://studentaffairs.jhu.edu/student-health/>) is open and operational for primary care needs. If you would like to speak with a medical provider, please call 410-516-8270, and staff will determine an appropriate course of action based on your geographic location, presenting symptoms, and insurance needs. Telemedicine visits are available only to people currently in Maryland. See also <http://studentaffairs.jhu.edu/student-life/support-and-assistance/absences-from-class/illness-note-policy/>
- The Johns Hopkins COVID-19 Call Center (JHCCC), which can be reached at 833-546-7546 seven days a week from 7 a.m. to 7p.m., supports all JHU students, faculty, and staff experiencing COVID-19 symptoms. Primarily intended for those currently within driving distance of Baltimore, the JHCCC will evaluate your symptoms, order testing if needed, and conduct contact investigation for those affiliates who test positive. More information on the JHCCC and testing is on the coronavirus information website <https://covidinfo.jhu.edu/health-safety/johns-hopkins-covid-19-call-center/>. COVID-19 testing information: <https://covidinfo.jhu.edu/diagnostic-testing/testing-locations-and-schedules/>.
- All students with disabilities who require accommodations for this course should contact me at their earliest convenience to discuss their specific needs. If you have a documented disability, you must be registered with the JHU Office for Student Disability Services (Shaffer 101; 410-516-4720; <http://web.jhu.edu/disabilities/>) to receive accommodations.
- Students who are struggling with anxiety, stress, depression or other mental health related concerns, please consider connecting with resources through the JHU Counseling Center. The Counseling Center will be providing services remotely to protect the health of students, staff, and communities. Please reach out to get connected and learn about service options based on where you are living this fall at 410-516-8278 and online at <http://studentaffairs.jhu.edu/counselingcenter/>
- Student Outreach & Support will be fully operational (virtually) to help support students. Students can self-refer or refer a friend who may need extra support or help getting connected to resources. To connect with SOS, please email deanofstudents@jhu.edu, call 410-516-7857, or students can schedule to meet with a Case Manager by visiting the Student Outreach & Support website and follow “Schedule an Appointment”.

Classroom Climate

I am committed to creating a classroom environment that values the diversity of experiences and perspectives that all students bring. Everyone here has the right to be treated with dignity and respect. I believe fostering an inclusive climate is important because research and my experience show that students who interact with peers who are different from themselves learn new things and experience tangible educational outcomes. Please join me in creating a welcoming and vibrant classroom climate. Note that you should expect to be

challenged intellectually by me, the TAs, and your peers, and at times this may feel uncomfortable. Indeed, it can be helpful to be pushed sometimes in order to learn and grow. But at no time in this learning process should someone be singled out or treated unequally on the basis of any seen or unseen part of their identity. If you ever have concerns in this course about harassment, discrimination, or any unequal treatment, or if you seek accommodations or resources, I invite you to share directly with me or the TAs. I promise that we will take your communication seriously and to seek mutually acceptable resolutions and accommodations. Reporting will never impact your course grade. You may also share concerns with the Department Head (Randal Burns, randal@cs.jhu.edu), the Director of Undergraduate Studies (Joanne Selinski, joanne@cs.jhu.edu), the Assistant Dean for Diversity and Inclusion (Darlene Saporu, dsaporu@jhu.edu), or the Office of Institutional Equity (oiie@jhu.edu). In handling reports, people will protect your privacy as much as possible, but faculty and staff are required to officially report information for some cases (e.g. sexual harassment).