Computer Science EN.601.631  
Theory of Computation  
Fall, 2020 (3 credits, E)

Instructor
Professor Xin Li, lixints@cs.jhu.edu, www.cs.jhu.edu/~lixints  
Office: Malone Hall 215, 410-516-5847  
Office hours: Wednesdays 11am–12 pm or by appointment. Zoom link same as class.

Teaching Assistant
Zhengzhong Jin, zjin12@jhu.edu  
Office hours: Fridays 11am–12 pm. Zoom: https://wse.zoom.us/j/93058584262 Meeting ID: 930 5858 4262

Meetings
Tuesday and Thursday, 12:00–1:15 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. The recordings have copyright so please don’t share them outside the class, and please don’t try to make your own recordings.

Textbook

Online Resources
Any related online material will be posted at the course website http://www.cs.jhu.edu/~lixints/class/fall20.html or in Blackboard.

Course Information
- This is a graduate-level course studying the theoretical foundations of computer science. Topics covered will be models of computation from automata to Turing machines, computability, complexity theory, randomized algorithms, inapproximability, interactive proof systems and probabilistically checkable proofs. Students may not take both 601.231 and 601.631, unless one is for an undergrad degree and the other is for a graduate degree.
- Prerequisites  
  Discrete Math or permission. Probability theory strongly recommended.
- 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

- The computational model and computability; Time complexity; Diagonalization; Space complexity;
  The Polynomial Hierarchy; Boolean circuits; Interactive proofs.

Detailed topics covered and textbook correspondence will be posted on the course website http://www.cs.jhu.edu/~lixints/class/fall20.html.

Course Expectations & Grading

There will be four or five homework problem sets, one mid-term exam and one final exam. Grading will be based on the following rule:

- Homework: 40%.
- Mid-term exam: 30%.
- Final exam: 30%.

Key Dates

The mid-term exam will be held on October 15. The final exam will be cumulative and will take place at time TBD. The specific forms of the exams will be decided later. No make-up exams will be given, unless you have legitimate reasons, so plan accordingly.

Assignments & Readings

Assignments and further readings will be posted on the course website http://www.cs.jhu.edu/~lixints/class/fall20.html

Gradescope: https://gradescope.com/ coursecode: M3VV23
Piazza: https://piazza.com/jhu/fall2020/en601631

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) **Citation policy:** Try to solve the problems without reading any published literature or websites, besides the class text. If, however, you do use a solution or part of a solution that you found in the literature or on the web, you must cite it. Furthermore, you must write up the solution in your own words. You will get at most half credit for solutions found in the literature or on the web. Using solutions from other resources without citation is considered plagiarism and will result in 0 point and potential further punishment as in (1).

(3) **Late Policy:** Homework are due at the beginning of class (via Gradescope). You have a total of two late days without penalty for the homework. A day here means 24 hours (i.e., from 12pm to 12pm next day). Any time after 12pm the first day until 12pm the next day is counted as one day. You can use your two late days freely, e.g., one late day for one homework and one for another, or two late days for one homework. Once you use up your late days, your late homework will not be graded, unless you have legitimate reasons.

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/](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/](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 7 p.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/](https://covidinfo.jhu.edu/health-safety/johns-hopkins-covid-19-call-center/).
- 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/](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/](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 (oie@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).
**Family Accommodations Policy**

You are welcome to bring a family member to class on occasional days when your responsibilities require it (for example, if emergency child care is unavailable, or for health needs of a relative). Please be sensitive to the classroom environment, and if your family member becomes uncomfortably disruptive, you may leave the classroom and return as needed.

**University Policy on Incompletes**

The university recognizes that the Fall 2020 semester is surrounded with uncertainty and many students may find themselves in unexpected situations where study is difficult if not impossible. Students who are confronted with extraordinary circumstances that interfere with their ability perform their academic work may request an incomplete grade from the instructor. While approval of such a request is not automatic, it is expected that faculty will make every effort to accommodate students dealing with illness in the family and other pandemic-related hardships. The instructor and student must establish a timetable for submitting the unfinished work with a final deadlineno later than the end of the third week of the Spring 2021 semester (February 12, 2021). Exceptions to this deadline require a petition from the instructor to the student’s academic advising office by February 12, 2021. When entering an Incomplete grade in SIS, faculty must include a reversion grade which represents the grade the student will receive if s/he does not complete the missing work by the agreed-upon deadline.

**Deadlines for Adding, Dropping and Withdrawing from Courses**

Students may add a course up to September 11, 2020. They may drop courses up to October 12, 2020 provided they remain registered for a minimum of 12 credits. Between October 12 and November 13, 2020, a student may withdraw from a course with a W on their academic record. A record of the course will remain on the academic record with a W appearing in the grade column to indicate that the student registered and then withdrew from the course.

For more information on these and other academic policies, see [https://e-catalogue.jhu.edu/engineering/full-time-residential-programs/undergraduate-policies/academic-policies/grading-policies/](https://e-catalogue.jhu.edu/engineering/full-time-residential-programs/undergraduate-policies/academic-policies/grading-policies/)