

Constructive Logic (15-317/657)

Karl Crary

Fall 2020

This undergraduate course provides an introduction to constructive logics, such as intuitionistic and linear logic, with an emphasis on their application in computer science. This includes basic means for defining logics (for example, natural deduction and sequent calculus), establishing properties of logics (for example, cut elimination), and for investigating their computational interpretations (for example, via proof reduction or proof search).

Prerequisites: 15-317 is an introductory undergraduate course with a minimum grade of C in 15-150 as prerequisite. For the cross-listed graduate version, 15-657, some experience with functional programming is recommended.

Instructors

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Sessions

Lecture	MW	11:40 AM–1:00 PM	Remote
Section A	T	9:20 AM–10:10 AM	3SC 265
Section B	T	10:40 AM–11:30 AM	CUC DANFOR
Section C	T	Noon–12:50 PM	HL A4
Section D	T	8:00 PM–8:50 PM	Remote

Online resources

The course web page (location TBA) will give a tentative schedule of topics, sometimes with lecture notes. (Do not make the mistake of viewing the lecture notes as a substitute for lecture.) We will also distribute assignments through the web page.

In addition, we will also use a Piazza forum for questions and discussion.

Homework and grading

Homework will be assigned weekly and collected using Autolab and Gradescope. You will have five late days to use as you see fit, with at most two late days on any single assignment. These late days are intended to address all normal circumstances that obstruct getting work done, include mild illness and interviews.

The weighting in assigning grades will be 50% homework, 18% midterms, 20% final, 8% quizzes, 4% attendance.

Software

In the first part of the course, we will be using a proof checker called Tutch. You can build and install it locally, but it is easiest to run on Andrew. In the middle part of the course, we will be writing programs in Prolog. Two good, free Prolog interpreters are GNU-Prolog and SWI-Prolog.

Course policies during the pandemic

The following are the policies for students whose situation is typical. Exceptions will be made for students for whom they pose an unusual hardship.

Please make sure that your internet connection and equipment are able to run Zoom and share audio and video during class meetings. See this page from Computing Resources for information on the technology you are likely to need:

www.cmu.edu/computing/start/students.html

If you have technical problems, please contact me as soon as possible and we can see about finding solutions. Also, there may be financial support for addressing technology shortfalls available from the University. The initial contact point for such assistance is your HUB liaison, who will then refer applicants to Student Affairs or other resources.

Lectures Lectures will be remote, using Zoom. Students are expected to attend the class synchronously. (Being in the Pacific time zone will not be considered to pose an unusual hardship.) Attendance will be taken. All students will be expected to have cameras on. Students should have microphones connected, but should mute them when not actively speaking.

Unless the instructor indicates otherwise, students are welcome to interrupt with a question. They may also use the “raise hand” button, or ask questions in chat.

Lectures will be recorded, for the benefit of students for whom attending synchronously poses an unusual hardship (*e.g.*, because of a distant time zone or illness). Lecture recordings will *not* be made generally available.

Recitation Recitations will be offered both in-person and remote, except for section D, which will be offered remote only. In Sections A through C, remote students will be able to hear discussions in the classroom, although students far from the microphone may be muffled.

Students attending recitation in person are required to wear a face covering and maintain social distancing. For more information, see the University’s document *A Tartan’s Responsibility* at:

In a departure from normal practice, we will have several quizzes in recitation. Quizzes will be taken using a web form. Although we hope that all students will attend recitation regularly, students will be warned when a quiz is upcoming.

Office hours The directions we have received from the University strongly discourage in-person office hours, so office hours will take place on Zoom. We will hold regularly scheduled office hours, and additional office hours will be available by appointment.

Homework The procedures for homework are unaffected by the pandemic. Students will hand their homework in remotely, using Autolab or Gradescope, as appropriate. Students will have five late days to use on homeworks, with a maximum of two late days on any single homework.

Exams Exams will seek to simulate the normal exam experience. Exams will take place synchronously, during lecture. (Again, exceptions will be made for students for whom this poses an unusual hardship.)

Students are not to communicate with anyone about the exam until everyone has taken the exam. Students may use notes that they have prepared themselves during the exam, and we recommend that students limit themselves to two pages. (These limits on notes are for the students' benefit; our experience suggests that students with access to more material during an exam perform worse, not better.) All students will be expected to sign a statement that they did not receive any unauthorized assistance on the exam.

The exam questions will be made available on a web page. Students will write their answers on paper. (Students will need to provide the paper.) At the end of the exam, students will scan their answer pages and submit them to Gradescope. There is a good, free document scanning app (Genius Scan) available for both iOS and Android. Instructions on how to use the app to submit your exam will be made available before the first exam. Students without access to an iOS or Android phone should contact the instructor.

We reserve the right to change these procedures for later exams if the first exam does not go smoothly.

Note taking

Research has shown that taking notes, by hand, using a pen/pencil is a vital part of learning for most students. Taking notes on a laptop is a poor substitute. In fact, research has shown that you are better off taking notes by hand and then throwing those notes away, than taking notes on a laptop. It seems that the act of processing material into handwritten notes involves the parts of the brain responsible for learning, while the act of transcribing class material on a laptop largely bypasses those parts.

You can learn about this research, which some people find counterintuitive, here:

www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-with-a-laptop/

It does seem reasonable that taking notes on a laptop or tablet using a stylus probably is similar to taking notes with pen/pencil, although I am not aware of any research that actually confirms this intuition. Conversely, it seems reasonable that simply taking screenshots of the lecture is probably even worse than taking notes on a laptop.

Accommodations for students with disabilities

If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

Support for students' health and well-being

This semester is unlike any other. We are all under a lot of stress and uncertainty at this time. Attending Zoom classes all day can take its toll on our mental health. Make sure to move regularly, eat well, and reach out to your support system or me if you need to. We can all benefit from support in times of stress, and this semester is no exception.

There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is almost always helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

Diversity

We must treat every individual with respect. We are diverse in many ways, and this diversity is fundamental to building and maintaining an equitable and inclusive campus community. Diversity can refer to multiple ways that we identify ourselves, including but not limited to race, color, national origin, language, sex, disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Each of these diverse identities, along with many others not mentioned here, shape the perspectives our students, faculty, and staff bring to our campus. We, at CMU, will work to promote diversity, equity and inclusion not only because diversity fuels excellence and innovation, but because we want to pursue justice. We acknowledge our imperfections while we also fully commit to the work, inside and outside of our classrooms, of building and sustaining a campus community that increasingly embraces these core values.

Each of us is responsible for creating a safer, more inclusive environment.

Unfortunately, incidents of bias or discrimination do occur, whether intentional or unintentional. They contribute to creating an unwelcoming environment for individuals and groups at the university. Therefore, the university encourages anyone who experiences or observes unfair or hostile treatment on the basis of identity to speak out for justice and support, within the moment of the incident or after the incident has passed. Anyone can share these experiences using the following resources:

- Center for Student Diversity and Inclusion: csdi@andrew.cmu.edu, (412) 268-2150
- Report-It online anonymous reporting platform: reportit.net username: `tartans` password: `plaid`

All reports will be documented and deliberated to determine if there should be any following actions. Regardless of incident type, the university will use all shared experiences to transform our campus climate to be more equitable and just.