CSE 6341
Foundations of Programming Languages
3 credit hours
Autumn Semester 2020 – online (synchronous)
Online lectures: Tuesday and Thursday 12:45 – 2:05 pm (via Zoom; details announced on Carmen)
Instructor: Atanas (Nasko) Rountev, email: rountev.1@osu.edu, phone: 614-292-7203
Office hours: via Zoom; details announced on Carmen
Grader: Yu Hao, email address: hao.298@osu.edu
Grader’s office hours: via Zoom; details announced on Carmen

Course overview
Course description
This is a course on the theory of programming languages. The goal is to study formal ways of defining the syntax and semantics of programming languages. The main topics are attribute grammars, type systems, operational semantics, abstract interpretation, and language implementation via interpreters and compilers. This is a fairly theoretical course, and it requires understanding and applying various formalisms in the context of programming languages. To balance this theoretical material, the coursework includes substantial programming projects that demonstrate the actual implementation of such syntax and semantics definitions.

Prerequisites
CSE 3341/5341: Principles of Programming Languages. For reference, the official syllabus for this prerequisite course is provided at the 6341 web page under “Resources”. An equivalent undergraduate programming language is an acceptable substitute.

CSE 6341 is a course from the graduate foundational core and the level of difficulty is relatively high. If you are an undergraduate student with good math abilities, programming skills, and willingness to do graduate-level work, you should do fine; if not, you should probably not take this course. If you are a graduate student in another department, you must have in-depth experience with imperative and object-oriented programming, and background in formal languages and grammars.

Learning outcomes
By the end of this course, students should successfully be able to:

- Understand the role of certain theoretical formalisms, and apply them in the context of programming languages
- Use attribute grammars to specify context-sensitive conditions, compile-time analyses, and translational semantics
- Define the operational semantics and abstract interpretation of simple imperative languages
- Use type systems to specify compile-time properties and analyses
- Implement parts of programming language interpreters and compilers
How this course works

Mode of delivery
This course is 100% online using Carmen and Zoom. Each week there are two live lecture sessions via Zoom: Tuesday and Thursday, 12:45 pm to 2:05 pm. The live lectures will be recorded and links to the recordings will be available shortly thereafter on the Carmen page. You are welcome to attend the live lectures, but you can also choose to watch the recordings after the fact if that works better for your schedule. All live, scheduled events for the course, including lecture sessions and office hours, are optional.

Participating in online activities for attendance
You are expected to log in to the course in Carmen every week and will likely log in multiple times to complete the required work of the course. If you have a situation that might cause you to miss an entire week of class, discuss it with me as soon as possible.

Office hours
The instructor’s office hours will be held via Zoom (details announced on Carmen). The grader’s office hours will be held via Zoom (details announced on Carmen). Attending office hours is optional. If you cannot make it during the scheduled office hours, arrange an alternative meeting time via email.

Discussion forums
We will use Piazza for questions and discussions. Sign up at piazza.com/osu/autumn2020/cse6341. If you have a question, post it on Piazza instead of emailing me directly. If you prefer, you can post anonymously. When a question is posted and answered on Piazza, it benefits everyone. Participation in Piazza discussions is optional.

Pace of online activities
Lectures and Carmen materials will be organized by topic. Students are expected to keep pace with the weekly lectures, either via Zoom attendance during live lectures, or by watching the recordings before the next lecture. Students are also expected to keep pace with the deadlines for submission of written assignments (new assignment once a week) and programming projects.

Credit hours and work expectations
This is a 3-credit-hour course. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

Course materials

Textbooks
This course does not have a required textbook. We will use materials from several books, as described below, but these will be optional. Your most important reading will be the lecture notes and your own notes. Copies of the lecture notes will be available on the course web page, organized by topic. Most of the textbooks are fully or partially available online; see course web page under “Resources” for details.

• Kenneth Slonneger and Barry Kurtz, Formal Syntax and Semantics of Programming Languages, Addison-Wesley, 1995
• Benjamin C. Pierce, Types and Programming Languages, MIT Press, 2002
• Nielson and Nielson, Semantics with Applications: A Formal Introduction, Wiley, 1992

Written assignments, course projects, exams

Written assignments
• There will be weekly written assignments, typically due in 7 days. They will be posted via Carmen and your submissions will be uploaded via Carmen.
• Assignments should be done independently. General high-level discussion of assignments with other students in the class is allowed, but all actual work should be your own. Written assignments that show excessive similarities will be taken as evidence of cheating and dealt with accordingly. See mode details below under “Academic integrity”.
• Written assignments should be turned in by the beginning of the live lecture on the due day. You can submit up to 24 hours after the deadline; if you do so, your score will be reduced by 10%. If you submit more than 24 hours after the deadline, the submission will not be accepted.

Programming projects
• There will be several programming projects. They will be posted via Carmen. Your submissions must be submitted electronically via Carmen by midnight on the due date. The projects must compile and run on stdlinux. Some students prefer to implement the projects on a different machine, and then port them to stdlinux. If you decide to use a different machine, it is entirely your responsibility to make the code compile and run correctly on stdlinux before the deadline. In the past many students have tried to port to stdlinux too close to the deadline, leading to last-minute problems and missed deadlines.
• Projects should be done independently. General high-level discussion of projects with other students in the class is allowed, but you must do all design, programming, testing, and debugging independently. Projects that show excessive similarities will be taken as evidence of cheating and dealt with accordingly. Code plagiarism tools may be used to detect cheating. See mode details below under “Academic integrity”.
• The projects are due by 11:59 pm on the due day. No exceptions will be made to this deadline: if you submit at 12:00 am, your submission will be late. Please plan your time carefully and do not submit in the last minute. You can submit up to 24 hours after the deadline; if you do so, your score will be reduced by 10%. If you submit more than 24 hours after the deadline, the submission will not be accepted.

Exams
There will be a midterm exam and a final exam.
• The date of the midterm will be announced at least two weeks ahead of time. The midterm will be during a live lecture time slot. The date/time of the final will be decided by the university.
• Both exams will be online, via Carmen.
• You must complete the midterm and final exams yourself, without any external help or communication. See mode details below under “Academic integrity”.
• Both exams will be comprehensive (i.e., cover all material from the start of the semester up to and including the last lecture before the exam). Both exams will be open-book and open-notes.
• Exam questions will require creative application of approaches discussed in class. Memorizing things will not be enough; you need to have conceptual understanding of the techniques we have discussed, and how these techniques could be applied to small problems. Exam questions will be very similar to the questions from the written assignments; thus, you should make sure that you have solid understanding of all details in the solutions for written assignments.
• Missing the midterm or the final without prior written (e-mail) approval from me will result in a score of zero for that exam. To get my approval to reschedule an exam, e-mail me at least one week before the exam is scheduled. I will not give approval unless the reasons are justifiable.

Grading and faculty response

Grading
Written assignments: 15%; programming projects: 40%; midterm exam: 15%; final exam 30%. The course will be graded on a curve. I expect the median grade to be slightly above B+. Statistics will be provided to help you understand your standing in the class. I will grade the midterm and the final. The grader will grade the written assignments and the programming projects. The person who graded something will be responsible for handling grading disputes. A grade becomes final a week after being handed back. This should leave enough time to resolve grading disputes. If there are unforeseen emergencies that affect the planned grading scheme, appropriate adjustments will be made. I will provide as much advance notification of such changes as possible under the circumstances.

Instructor feedback and response time
I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call 614-688-HELP at any time if you have a technical problem.)
• Weekly written assignments: you can generally expect feedback within one week
• Programming projects: you can generally expect feedback within two weeks
• Email: I will reply to email within 24 hours
• Piazza: I will check Piazza and reply to messages (if necessary) every 24 hours

Other course policies

Discussion and communication guidelines
The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.
• Writing style: a common theme of this course is the application of theoretical principles to problems in programming languages. As with all theoretical foundations, your solutions must be precise and detailed: you must work out all details that are necessary to solve the problem using the approaches discussed in class. You must write your solutions in a way that convinces the reader that you understand all these details. Be careful, precise, and thorough.
• Tone and civility: maintain a supportive learning community where everyone feels safe and where people can disagree amicably and professionally. I am committed to making the classroom a comfortable space for all of us, and I ask that we all work toward this goal in all of
the course’s online spaces. We will respect each other and practice civility at all times. Disrespectful language including, but not limited to, sexist, racist, homophobic, or anti-ethnic slurs, or bigotry will not be tolerated.

- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.

- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into Carmen or Piazza.

**Academic integrity policy**

- **Midterm exam and final exam**: You must complete the midterm and final exams yourself, without any external help or communication.

- **Written assignments**: Your written assignments should be your own original work. General high-level discussion of assignments with other students in the class is allowed, but all actual work should be your own. Do not provide your own solutions to other students.

- **Programming projects**: Projects should be done independently. General high-level discussion of projects with other students in the class is allowed, but you must do all design, programming, testing, and debugging independently. Do not provide your own solutions to other students. Code plagiarism tools may be used to detect cheating.

- **Reusing past work by you or others**: You are prohibited from turning in work (by you or others) from a past class to your current class, even if you modify it. If you want to build on past work or revisit a topic you have explored in previous courses, please discuss the situation with me.

**General information not specific to this course**

**Ohio State University’s academic integrity policy**

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university’s [Code of Student Conduct](#), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university’s [Code of Student Conduct](#) and this syllabus may constitute “Academic Misconduct.”

The Ohio State University’s [Code of Student Conduct](#) (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the university or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university’s [Code of Student Conduct](#) is never considered an excuse for academic misconduct, so I recommend that you review the [Code of Student Conduct](#) and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university’s [Code of Student Conduct](#) (i.e., committed academic
misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me. Other sources of information on academic misconduct (integrity) to which you can refer include: Committee on Academic Misconduct web pages (COAM Home); Ten Suggestions for Preserving Academic Integrity (Ten Suggestions); Eight Cardinal Rules of Academic Integrity (www.northwestern.edu/uacc/8cards.htm)

Health and safety
Health and safety requirements: All students, faculty and staff are required to comply with and stay up to date on all university safety and health guidance (https://safeandhealthy.osu.edu), which includes following university mask policies and maintaining a safe physical distance at all times. Non-compliance will be warned first and disciplinary actions will be taken for repeated offenses.

Course technology
For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- Self-Service and Chat support: ocio.osu.edu/help
- Phone: 614-688-4357(HELP); Email: servicedesk@osu.edu
- TDD: 614-688-8743

Baseline technical skills for online courses
- Basic computer and web-browsing skills
- Navigating Carmen: for questions about specific functionality, see the Canvas Student Guide

Required technology skills specific to this course
- CarmenZoom virtual meetings

Required equipment
- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone/tablet) or landline to use for BuckeyePass authentication

Carmen access
You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click Enter a Passcode and then click the Text me new codes button that appears. This will text you ten passcodes good for 365 days that can each be used once.
• Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

**Copyright disclaimer**
The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

**Statement on Title IX**
All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options at titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information on OIE, visit equity.osu.edu or email equity@osu.edu.

**Accessibility accommodations for students with disabilities**
**Requesting accommodations:** The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.

**Accessibility of course technology:** This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor. Resources: (1) CarmenCanvas accessibility; (2) Streaming audio and video; (3) CarmenZoom accessibility

**Your mental health**
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you find yourself feeling isolated, anxious or overwhelmed, please know that there are resources to help: ccs.osu.edu. You can reach an on-call counselor when CCS is closed at (614) 292-5766 and 24
hour emergency help is also available through the 24/7 National Prevention Hotline at 1-(800)-273-TALK or at suicidepreventionlifeline.org. Also consider the OSU Wellness app: go.osu.edu/wellnessapp

Student support
The Student Advocacy Center staff members are continuing to serve students during normal business hours and are accepting online appointments. The Student Emergency Fund is available to students who may otherwise be at risk of dropping out of college due to an unexpected financial emergency. If you, or a student you know, are experiencing an unplanned expense, the Student Emergency Fund may be an option. Their office is accepting applications and may be able to award up to $1,000 to eligible students. Learn more and apply.

The Together As Buckeyes emergency grants program, funded primarily by the federal Coronavirus Aid, Relief and Economic Security (CARES) Act, is available to all students — undergraduate, graduate and professional — through the Student Financial Aid office. To apply for a grant, students need to complete a one-page Emergency Request form and provide any supporting documentation. The Office of Student Financial Aid will process applications after determining eligibility based on each student’s circumstances and guidance from the U.S. Department of Education.

Franklin County Department of Job and Family Services has amended its Prevention, Retention and Contingency Program to provide targeted relief for families impacted by the COVID-19 pandemic. The Franklin County COVID-19 Response PRC Program provides eligible families with $500 in one-time cash assistance to help address emergent needs and expenses brought about by the public health emergency. Families can apply online today.

The Student Wellness Center offers financial coaching through the Scarlet and Gray Financial nationally recognized peer financial coaching program. Through the program, students will learn about financial goal setting, banking basics, budgeting, credit education, debt repayment education and saving and retirement education. Learn more.

Food assistance: Buckeye Food Alliance food pantry (https://www.buckeyefoodalliance.org); MidOhio Foodbank (https://www.midohiofoodbank.org).