Programming Languages: Theory and Practice

CIS 352 at Syracuse University — Spring 2025

Instructor: Kris Micinski
Teaching Assistant: Neda Abdolrahimi

Note: Parts of this syllabus are subject to change with adequate notice to students.

1. Course Description

An introduction to the design and implementation of programming languages, focused on operational semantics and interpreters. This course is heavily project-focused, and a specific emphasis will be placed upon training in algorithmic thinking and programming strategy.

2. Instructors

Instructors:

- Kris Micinski, Asst. Prof at Syracuse ECS
  - Office hours: 1 hour before class on Tuesdays, and 1 hour after class on Thursdays
- Neda Abdolrahimi, teaching assistant
  - Office hours: TBA

3. Workload

- 4 individual projects (no collaboration, ChatGPT, etc...): 40%
- Exams: 40%
  - 2 midterms and 1 final, each worth 20%; the lowest exam grade drops.
- 4 group programming exercises (up to 3, can use ChatGPT, etc...): 10%
- Weekly (or more) attendance quizzes: 5%
- Homework (2–4 short assignments): 5%

This will be a *project-heavy* course. Approximately 3–5 hours per week outside of class is expected. It is recommended to avoid taking this course concurrently with other project-heavy courses.

3.1. Course Tags

The university recommends instructors label their courses with shared competencies. We intend for this course to fit the following:

- Critical and Creative Thinking
- Scientific Inquiry and Research Skills

3.2. Office Hours

- The professor will hold office hours for not less than 1 hour **before** class on Tuesdays, and not less than 1 hour **after** class on Thursday.
- TA office hours will be announced soon.

4. Grading

4.1. Exams – 40%

- **Midterms:** Two midterms, each worth 20%. Midterm 1 will be Feb 27th, and Midterm 2 will be on April 3rd (dates subject to change with notice). Focus topics will be announced via electronic announcement (Blackboard, email) several days before the exam. Students are allowed a handwritten, one-sided, US letter-sized note sheet.
- **Final Exam:** Comprehensive, slightly longer than the midterms, worth 20%. The lowest exam grade drops (effectively replaced); students are encouraged to skip the final if they are otherwise happy with their exam grades.

4.2. Autograder Projects/Exercises – 50%

- **4 individual programming projects** worth 10% each.
  - Collaboration/ChatGPT/... **is not allowed** on projects.
  - See the AI usage policy below.
- **4 autograder-based programming exercises**, worth 2.5% each.
  - Working in groups (up to three) is **explicitly allowed**.
  - It is required that all work on exercises be conducted together.
  - Collaboration/ChatGPT/... **is allowed** on exercises.
  - It is **not** permissible to share your coding exercise solutions outside of your group.

4.3. Attendance Quizzes – 5% (max)

- The lead instructor will give attendance quizzes during at least 10 class days.
- Each attendance quiz will be worth 0.5%, with the maximum category attainable of 5%.
- Quizzes are based on participation only, but the instructor reserves the right to nullify low-effort answers.
- Make-up or exceptions will be made only for valid reasons (e.g., religious observance, relevant conference, excused medical absence, etc.). The instructor must be notified (by email) before the absence unless otherwise unable for a justified reason.

4.4. Homework – 5%

There will be 2–4 homework exercises, assigned either on Blackboard or on paper. Altogether, these will count as 5% of the grade, weighted equally.

4.5. Bonus Points – Up to 4%

Several *bonus* handouts / exercises will be offered, taking various forms (e.g., short writeups, small extra coding tasks). These will be announced in class.

4.6. Final Letter Grading Bars

Final grades will be assigned as follows. A small "bump" (0–2 points usually) may be given in practice, but is not guaranteed. This will be announced at the end of the course. An approximate estimate of any bump will be provided on Slack before the second midterm.

- A – 92%
- A- – 90%
- B+ – 87%
- B – 83%
- B- – 78%
- C+ – 74%
- C – 70%
- C- – 65%
- D – 60%
- $<$ D – $<$ 60%

5. Topics

We will include roughly the follow topics, based on pacing and course progression:

- Functional programming in Racket/Scheme
- Forms and callsites
- Lexical environments and scoping
- Textual reduction semantics
- Structural recursion over inductively-defined lists
- Higher order functions (lambdas) and their properties
- Cons diagrams and boxes
- Quasiquoting and pattern matching
- Tail calls and tail recursion
- Metacircular interpreters
- Natural deduction
- Small-step semantics
- Lambda calculus
- Reduction strategies
- Closure-creating interpreters
- Church numerals, church encoding
- Fixed points and fixed point combinators
- Continuations and call/cc
- Principles of compilation
- Compilation of primitives, let, and if to pseudo-assembly
- Object orientation (in contrast to functional programming)
- Programming in Rust
- Runtime systems (garbage collection, etc...)

6. Autograder Exercises / Projects (50%)

There are four *individual programming projects* in Racket. Projects will be graded using an *autograder* at https://autograde.org. You will receive credentials for the autograder (let the professor know if not received by the second week of class). You must learn Git to use the autograder.

There will also be four *group programming exercises* in Racket. These exercises may be done in groups of up to three students. Groups **must** write their solution together (Zoom/video call is acceptable, but it must be synchronous).

Exercises and projects will be weighted at point values of 100 points (exercises) and 1000 points (projects). Projects are thus worth roughly 10x as much as exercises. Grading weights on the autograder are subject to change with sufficient notice, but they will never be disadvantageous relative to the bars specified here.

6.1. Project / Exercise Late Policy

- Projects and exercises turned in within 72 hours of the deadline will receive a 15% penalty. Projects turned in after 72 hours and until the end of the course will receive a 25% penalty.
- **No** one-off project extensions will be granted without a good reason. The late policy is already liberal. A single late submission likely will not change the final course grade.
- The instructor is happy to move project deadlines for religious observances, excused medical absence, or similar unforeseen circumstances. Please email to discuss.

7. Exams (40%)

Exams measure your ability to produce solutions regarding relevant course content in an open-ended fashion. There will be two midterms. Questions will be drawn from the learning objectives at the top of the page. A practice exam will be released several days before each midterm, which we will work through in class.

The final exam will occur during the time slot scheduled by the registrar.

Exams can be stressful. Students may wish to look into the resources provided by the Barnes Center (such as extended exam time). We are happy to accommodate exam-related needs but request at least 72 hours notice for each exam so that we can arrange for testing center materials if needed.

8. Collaboration and the Honor Code

- Projects and exams must be completed alone, without exception.
- You must *never* send your code to anyone or allow anyone to watch you code, obtain your code, or copy your code.
- The autograder uses advanced cheat-detection techniques (static analyses) to compare submissions across current and previous semesters. All apparent cases of academic dishonesty (with credible evidence) will be reported to the Syracuse University academic integrity council.

- In-class or self-study exercises may be collaborated on to any degree, but **not** the course projects.
- You may discuss the *project specification* with peers, but *never* share your code.
- *Hard coding* solutions to tests for projects is forbidden and considered a serious violation.
- Cite all help other than the professor, T.A., and required/recommended text. Proper citation is not sufficient to avoid potential dishonesty charges if the code used completes the substance of the project for you.
- Duplicate *project* submissions, even those arising from identical ChatGPT outputs, will be considered honor code violations.
- If a student is found to have violated academic integrity policy, the instructor reserves the right to impose any grade-related sanction, up to and including course failure.

9. Official AI Policy

University-Provided Language (Official):

> Based on the specific learning outcomes and assignments in this course, artificial intelligence is permitted on the following: autograder exercises (**not** projects), which are clearly labeled. See each assignment, quiz, or exam instructions for more information about what artificial intelligence tools are permitted and to what extent, as well as citation requirements. If no instructions are provided for a specific assignment, then no use of any artificial intelligence tool is permitted. Any AI use beyond that which is detailed in course assignments is explicitly prohibited except when documented permission is granted.

Instructor's Context/Justification:

Large Language Models and similar machine-learning-based tools have the potential to radically change the way in which humans perform their work. The course instructor does research in AI and understands the value in using ChatGPT and similar tools to help learn and study (henceforth we casually conflate ChatGPT and similar LLM-based tools). However, these tools should be used carefully, and never in a way that undermines the spirit of expending genuine mental energy to understand the material in the class. I (the instructor) have used ChatGPT myself for quick answers to routine tasks, particularly in shell scripting and usage of common development tools. However, I do not find ChatGPT sufficient in serious work. Thus, I prescribe the following guidelines (consistent with the official university-provided text above) for this class, CIS352. In the following "ChatGPT" refers to all tools based upon generative AI:

- **Usage of ChatGPT is permitted** to help study and understand course material.
- **Usage of ChatGPT is permitted on autograder programming exercises** (but *not* projects), provided you cite your usage (e.g., include the prompt).
- You **may not** submit any code generated by ChatGPT for programming projects.

- Duplicate project submissions, even if due to identical LLM outputs, will be considered honor code violations.

10. Email Policy

- Please keep all questions related to course projects on university email and include the text "CIS352" somewhere in your email.
- FERPA requirements prohibit discussing precise grades on any non-university platform.
- For official business (notifications of course absence due to illness, etc.), please email.
- The instructor aims to acknowledge emails within 24 hours. Feel free to follow up after 24 hours if there is no response.

11. Student Support

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to contact me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Center for Disability Resources (CDR) in this process.

If you would like to discuss disability accommodations or register with CDR, please visit Center for Disability Resources. Please call (315) 443-4498 or email `disabilityresources@syr.edu` for more detailed information.

12. Accreditation and Use of Student Work

As part of the regular ABET accreditation process for the undergraduate program in computer science, we may be collecting samples of students' work in each of our undergraduate classes. Some of your labs/homeworks/exams may be photocopied or electronically copied for accreditation at some later point.

13. Faith Tradition Observances

Syracuse University's Religious Observances Policy (link) recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their traditions. Under the policy, students are given an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance, provided they notify their instructors no later than the academic drop deadline. For observances occurring before the drop deadline, notification is required at least two academic days in advance. Students may enter their observances in MySlice under `Student Services/Enrollment/My Religious Observances/Add a Notification`.

14. Student Mental Health

Mental health and overall well-being are significant predictors of academic success. As such, it is essential that during your college experience you develop the skills and resources effectively to navigate stress, anxiety, depression, and other mental health concerns. Please familiarize yourself with the range of resources the Barnes Center provides at https://ese.syr.edu/bewell and seek out support as needed. Counseling services are available 24/7, 365 days a year, at 315.443.8000.

15. Discrimination and Harassment

The University does not discriminate and prohibits harassment or discrimination related to any protected category including creed, ethnicity, citizenship, sexual orientation, national origin, sex, gender, pregnancy, disability, marital status, age, race, color, veteran status, military status, religion, sexual orientation, domestic violence status, genetic information, gender identity, gender expression or perceived gender.

Any complaint of discrimination or harassment related to these protected bases should be reported to Sheila Johnson-Willis, the University's Chief Equal Opportunity & Title IX Officer:

- Office: Equal Opportunity, Inclusion, and Resolution Services, 005 Steele Hall, Syracuse University, Syracuse, NY 13244-1120
- Email: `titleix@syr.edu`
- Telephone: 315-443-0211

If you notice any incidents of harassment or discrimination in class or related venues (Zulip, other chats with students), however minor, please email me. You may use an anonymous email service such as anonymousemail.me if you wish. Note: I am a mandatory Title IX reporter and must report incidents such as sexual harassment, relationship violence, stalking, etc.