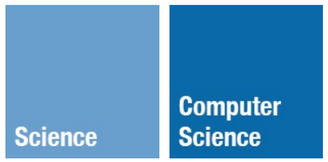
Preliminaries



CS 440: Programming Languages
Michael Lee <lee@iit.edu>

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- Hours: Tue/Thu 10AM-12PM
  (make appointments on homepage)

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- Hours: TBA

Agenda

- Course overview
- Administrivia
  - Grading
  - Assessments
  - Resources

§ Programming Languages

Programming Languages …

- Theoretically all the same, yet practically very different!
  - "Same" in a deep sense: *Turing completeness*
- Learning different languages and language features can vastly expand your repertoire of programming techniques
- PLs are among our most important and fundamental tools!

PL features

- Must learn to precisely dissect and discuss PLs
  - Terminology: imperative, functional, compilers, interpreters, types, type checking, etc.
    - Many terms are used imprecisely in conversation!

Reasoning about PLs

- What does a program (or PL construct) *mean*?
  - Can we prove a program's correctness?
- Many different ways of modeling and reasoning about program *semantics*
  - Goal: inject mathematical rigor into programming

Not just a consumer!

- You will modify and create your own PLs
  - Understand how PLs tick
    - Where is the overhead? Is it useful/necessary/worthwhile?
  - Fun and useful skill!

We will …

1. Use a new language, *Racket*, to learn about different programming language constructs and ideas.
2. Learn different methods of language specification, focusing on *semantics* and *verification*.
3. Understand how programs are *interpreted*, *compiled*, *represented*, *evaluated*, and *optimized*.
4. Implement our own programming language interpreters

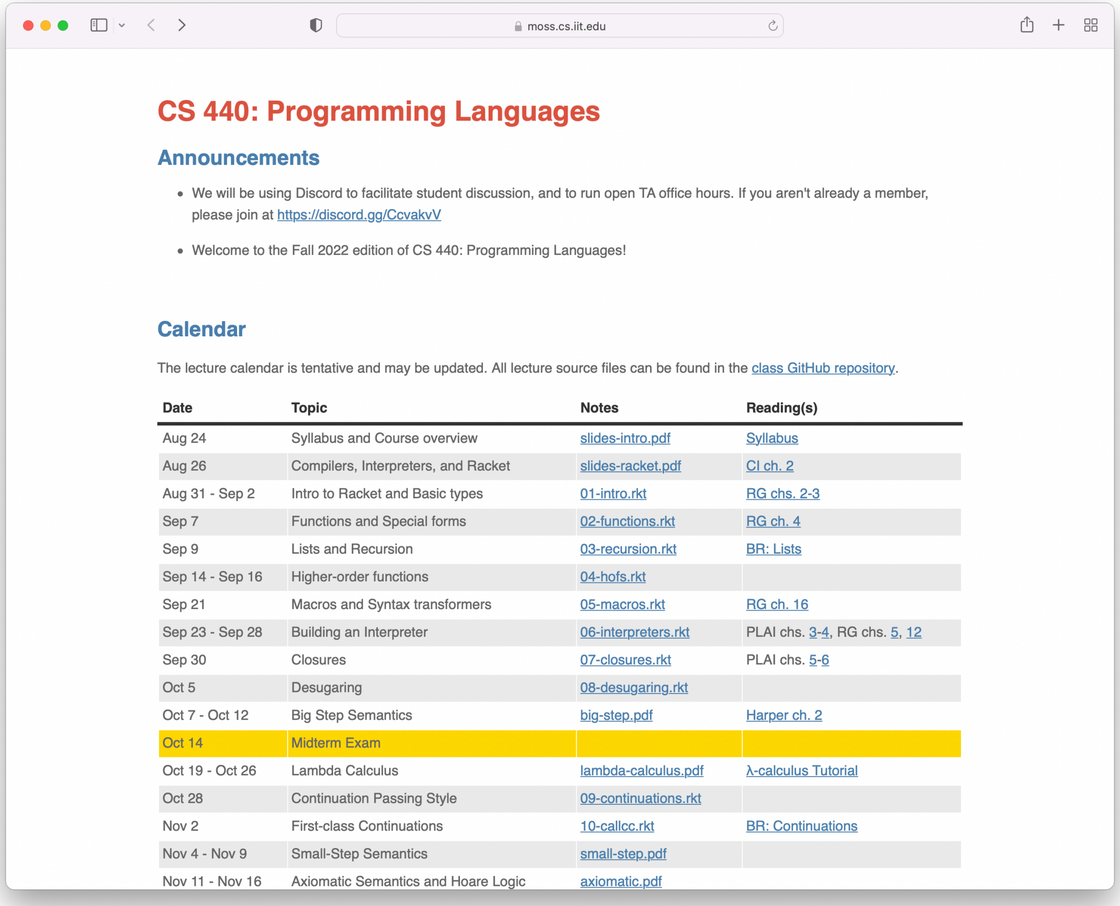
Topics

- Racket
- Syntax
- Higher order functions
- Recursion
- Closures
- Metaprogramming
- Continuations
- Grammars and Languages
- Semantics
  - Operational / Axiomatic
- Evaluation strategies
- Interpreters and Compilers
- Type inference and Unification
- Memory management

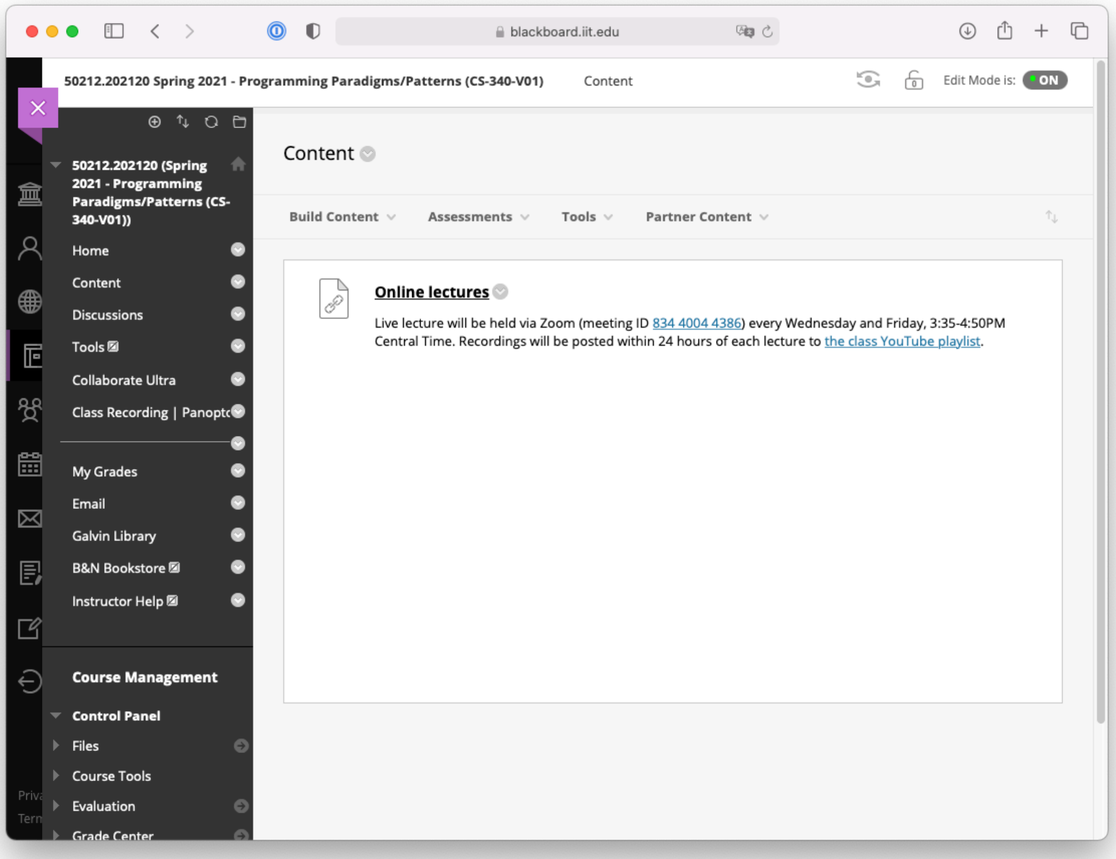
§ Administrivia

Prior knowledge

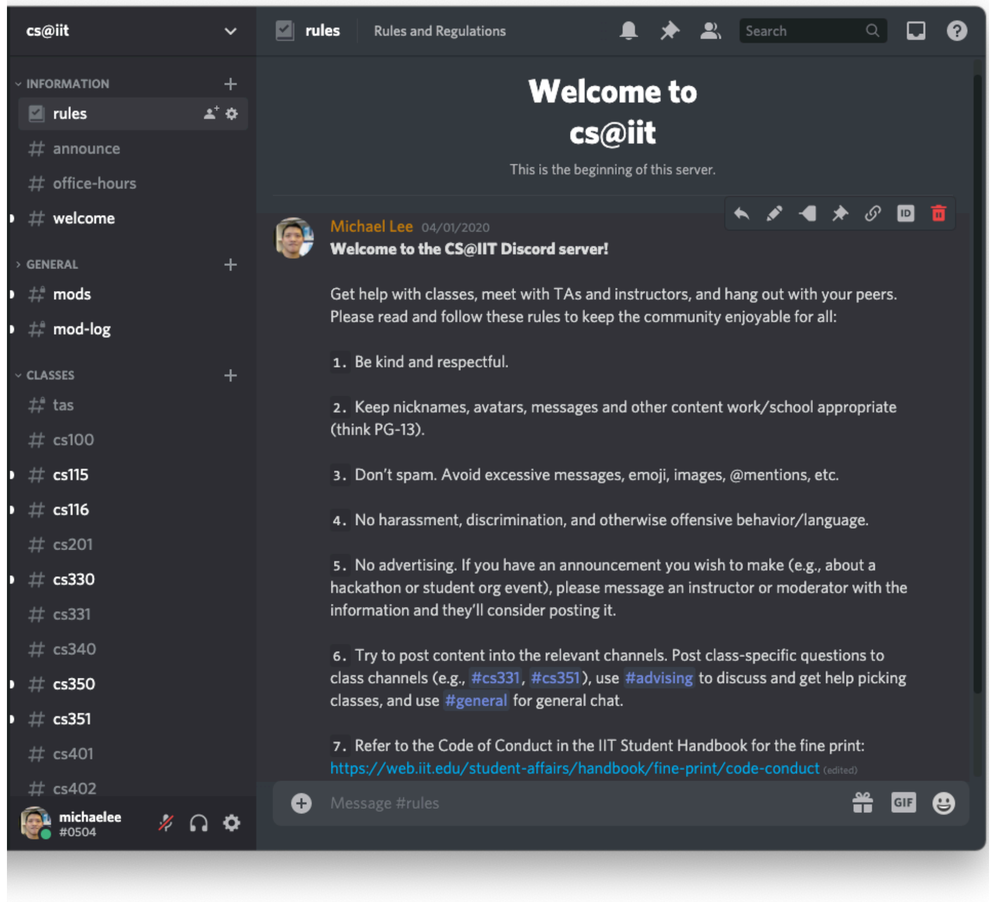
- Programming experience (CS 115/116/201)
- First-order / Predicate logic (CS 330)
- Rules of inference and logical proofs (CS 330)
- Formal languages and Grammars (CS 330)
- Analysis of algorithms (CS 331 / 430)



Course website: http://moss.cs.iit.edu/cs440



Blackboard: http://blackboard.iit.edu



Discord: TA class discussion and Q/A (invite on course website)

References (in addition to notes)

- Programming Languages: Application and Interpretation, by Shriram Krishnamurthi
- Crafting Interpreters, by Robert Nystrom
- Compilers: Principles, Techniques, & Tools, 2nd edition, by Aho, Lam, Sethi & Ullman, 2007.

Grading

- 50% Assignments
- 25% Midterm Exam
- 25% Final Exam (Cumulative)

Assignments

- 5-7 total
  - Some written, some machine problems (coding problems)
    - Written submitted via Blackboard, MPs via GitHub

Late Policy

- 7-day late pool, distributed however you like across labs (a day at a time)
- If you're out of late days, late submissions will not be accepted for a grade!

Exams

- Scores may be linearly scaled so that median/mean (whichever lower) is 75%
- Midterm tentatively scheduled for **March 8**

A: ≥ 90%

B: 80-89%

C: 70-79%

D: 60-69%

E: < 60%

For Friday

- Read chapter 2 of *Crafting Interpreters*: "A Map of the Territory"
- Download and install DrRacket (https://racket-lang.org)
- Clone the class lecture repository from GitHub (https://github.com/cs440lang/lectures/)