

## CIS 500

Mon, Wed 3:00-4:30PM  
Levine Hall Auditorium

<http://www.seas.upenn.edu/~cis500/>

Instructor: Benjamin C. Pierce (bcpierce@cis.upenn.edu)  
Office hours: Tuesdays 4-6pm in Levine 562

Teaching Assistants:

- Chris Casinghino (ccasin@cis.upenn.edu)  
Office hours: Thursdays 3-4pm in Levine 565
- Michael Greenberg (mgree@cis.upenn.edu)  
Office hours: Mondays 11-12am in Levine 571

This course introduces basic concepts and techniques in the foundational study of programming languages, as well as their formal logical underpinnings. The central theme is the view of individual programs and whole languages as mathematical objects about which precise claims may be made and proved. Particular topics include operational techniques for formal definition of language features, type systems and type safety properties, polymorphism and subtyping, and foundations of object-oriented programming.

### Syllabus

#### I Foundations

- Functional programming
- Constructive logic
- Inductive definitions and proof techniques for informal and formal proof
- The Coq proof assistant

#### II Basics

- Operational semantics
- Semantics of the imperative WHILE language

#### III Type systems

- Simply typed  $\lambda$ -calculus
- Type safety
- Subtyping
- Dependently typed programming

**Textbook:** *Types and Programming Languages*. Benjamin C. Pierce. MIT Press, 2002.

### Prerequisites:

An undergraduate-level course in programming languages or compilers; significant programming experience.

**Note:** CIS500 this year is slightly different from last year, and very different from the year before.

## **Grading**

Breakdown for the course grade is as follows:

- Homework: 20%
- Midterm 1: 20%
- Midterm 2: 20%
- Final Exam: 40%

## **Homework**

Homework can be submitted via Blackboard (<https://courseweb.library.upenn.edu/>). If you are taking the course but cannot access the CIS 500 Blackboard, please contact one of the TAs.

When submitting Coq files as homeworks, please make sure that Coq accepts your file in its entirety. If it does not, it will not be graded. You can use Admitted to force Coq to accept incomplete proofs.

Late homework submissions will be accepted for up to three days, with a 25% reduction in possible credit per late day (25% for one day, 50% for two, and 75% for three).