

# CS 538 - Introduction to the Theory and Design of Programming Languages

Use the document below as a reference for all the basic course related questions you might encounter. During the course of the semester, content and deadlines might shift as needed.

## Topics and Schedule:

1. Introduction to Functional Programming
  - a. Basic functional paradigms
    - i. Using JavaScript
    - ii. Introduction to Lambda Calculus
  - b. Understanding the Environment Model
2. Introduction to Type Systems
  - a. Using Haskell
  - b. Type Inference & Static Analysis
3. Polymorphism
  - a. Ad hoc through Type Classes
  - b. Object Oriented Design
    - i. Dynamic polymorphism through virtual pointers
  - c. Using Modern Smalltalk
4. Advanced Topics in PL
  - a. Control Flow
    - i. Using Continuation Passing Style
    - ii. Writing Imperative Proofs
  - b. Solving Security Flaws at the Language Level
  - c. Intro to Program Synthesis

Week	Sunday	Monday	Wednesday
0			Syllabus
1	PA1-JS; HW1-JS Release	JavaScript	JavaScript
2	PA2-Lazy/Eager; HW2 Release	Lambda Calculus	Lambda Calculus
3	HW3 Release	Environment Model	Wrap JS + LC
4	PA3-Warmup.hs; HW4 Release	Haskell Types	Types

5		Catch-up	Midterm 1
6	PA4-HMTI pt 1; HW5 Release	Type-Classes	Dictionaries
7	HW6 Release	OOP	Virtual Tables
8	PA5-HMTI pt 2; HW7 Release	More OOP	Modern Smalltalk
9	HW8 Release	Control Flow	Continuations
10	PA6-BF; HW9 Release	Imperative Proofs	Interpreter
11		Catch-up	Midterm 2
12		Thanksgiving Topics	Thanksgiving Topics
13	Final PA + HW	PL x Security	PL x Security
14	Final PA + HW	Synthesis	Closing thoughts

## Grades and Weights

The weight of each course activity is as follows:

45% assignments (3% per assignment, 15 assignments total)

15% midterm 1

15% midterm 2

10% participation (12 weeks of normal class, drop 2)

10% final PA

5% final HW

Grade Received	Percent Range
A	≥93%
AB	≥87%
B	≥83%
BC	≥77%

C	$\geq 70\%$
D	$\geq 60\%$
F	Otherwise

The course will be curved if the average drifts too far from a BC letter grade. It will never be “curved down.”

## Assignment Release, Due Dates and Extra Credit

Written homeworks (HW) will be released on Sundays each week. The assignment will be due in 10 days, i.e. the following Wednesday at 11:59pm on Gradescope. There are no late days. HWs may be submitted early, before Thursday at 11:59pm to receive an additional 10% of the assignment grade as extra credit. For example, an assignment which receives an 80% and is submitted early will receive a final score of 88% ( $80 + 0.1 \cdot 80$ ).

Programming assignments (PA) will be released on alternating Sundays, except after PA1 and PA3 which are considered “short PAs.” PA 2, 4, 5, and 6 will be due two weeks after their release on Sunday at 11:59pm on Gradescope. PA 1 and 3 will be due one week after their release. Each assignment will have an “early submission date” listed in the assignment README file, which will provide a 10% extra credit opportunity. PAs may be submitted late for partial credit. You will receive a -10% penalty for each late week since the original due date, up to a maximum penalty of -50%.

## Collaboration

HWs must be submitted to Gradescope in groups of 2-4 students (except HW1, which may be 1-4 students). Each group submits **one** copy of the assignment and adds all the group members to the submission. Groups will not be assigned, and you are not required to remain in the same group the entire semester.

PAs must be submitted solo, and the code should be written by the individual submitting. You are free to discuss ideas, and help your classmates debug their issues, but you may not share code directly or write another student’s submission.

## Language Models and Copilot

At times, we will suggest and even encourage the use of language models on assignments. On those assignments, I will make it clear which tools will help and how to use them. Though I cannot prevent you from using these tools on all the assignments, I heavily discourage their usage on the early assignments (PA/HW 1-4). These assignments create a foundation which the rest of the course builds upon, and using Copilot will rob you of the critical thinking required to understand new perspective shifts used in this class.

## Class Contact

Use Piazza for Q&A. I expect most of your questions to be answered by other students, but the teaching staff is regularly online to answer as well.

We will be experimenting with a language model for personalized and anonymous Q&A. This bot will be hosted on <https://pister.dev/538>.

## Office Hours

Kaiser - CS 4224, M+W after class for roughly 2.5 hours (9:30 - 12p ish), [kaiser@cs.wisc.edu](mailto:kaiser@cs.wisc.edu)  
Shengyuan - ...