

**CSE 114A**

# **Foundations of Programming Languages**

*Lecture 1: Course Overview*

So why study PL ?

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Programming language

shapes

Programming thought

# Learn New Languages/Constructs

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Lorenzo da Ponte  
English version by  
Ruth and Thomas Martin

## Overture

Wolfgang Amadeus Mozart

Andante

The image displays a musical score for the Overture of 'The Marriage of Figaro' by Wolfgang Amadeus Mozart. The score is written for piano and strings. It begins with a tempo marking of 'Andante'. The piano part features a melodic line in the right hand and a supporting bass line in the left hand. The string part consists of six staves, each with a different instrument (Violin I, Violin II, Viola, Cello, Double Bass, and Contrabass). The tempo changes to 'Presto' in the middle of the score. The score is presented in a standard musical notation format with treble and bass clefs, time signatures, and various musical symbols.

New ways to:

- describe
- organize
- think about computation

# Course Goals

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*“Free your mind”*  
-Morpheus

# Imperative Programming

$$x = x + 1$$

**WTF?**

$$x = x + 1$$

**Imperative = Mutation**



**Imperative = Mutation**

**Bad!**

# Don't take my word for it

## John Carmack Creator of FPS: Doom, Quake,...



**John Carmack**  
@ID\_AA\_Carmack



I am starting to remove `op=` operator overloads to discourage variable mutation.

**39**  
RETWEETS

**16**  
FAVORITES



2:55 PM - 28 Feb 12 via web · Embed this Tweet

[← Reply](#) [↻ Retweeted](#) [★ Favorite](#)

# Don't take my word for it

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**Tim Sweeney (Epic, Creator of UNREAL)**

*“In a concurrent world,  
imperative is the wrong default”*



# Functional Programming

# Functional Programming ?

**No Assignment.**

**No Mutation.**

**No Loops.**

**OMG! Who uses FP?!**

So, Who Uses FP ?

The Google logo is displayed in its characteristic multi-colored font: blue 'G', red 'o', yellow 'o', blue 'g', green 'l', and red 'e'.

**MapReduce**

# So, Who Uses FP ?



***Microsoft***<sup>®</sup>

**Linq, F#**



So, Who Uses FP ?

The Facebook logo, consisting of the word "facebook" in white lowercase letters on a blue rectangular background.

**facebook**

**Erlang**

# So, Who Uses FP ?



twitter

**Scala**

So, Who Uses FP ?

**Wall Street**

**(all of the above)**

So, Who Uses FP ?

**...CSE 114A**

# **Course Mechanics and Logistics**

# Logistics

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**Course website:**

<https://ucsc-cse-114a.github.io/Winter23/>

# Resources

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## Course texts (optional):

- [An Introduction to Functional Programming Through Lambda Calculus](#) by Greg Michaelson. Free pre-print.
- [Thinking Functionally with Haskell](#) by Richard Bird. Available online (free via library).
- [Programming in Haskell](#) (2nd ed.) by Graham Hutton.
- [Real World Haskell](#) by Bryan O'Sullivan. Available online (free via library).
- [Learn You a Haskell for Great Good](#) by Miran Lipovača. Available free online
- [Write You a Haskell](#) by Stephen Diehl. (incomplete, but useful) Available free online

# Recommended IDE: VS Code

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- Nice IDE setup for Haskell
  - Devcontainer: A Haskell dev environment is built in a docker container
  - VS Code automatically mounts the container volume



**Peer Instruction (ish)**

# Peer Instruction

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- Make class interactive
  - Help YOU and ME understand whats tricky
- Respond to in-class quizzes
  - 5% of your grade
  - Respond to 75% questions
- Bring laptop/phone if you have one

# In Class Exercises

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1. Solo Vote: Think for yourself, select answer
2. Discuss: Analyze Problem with neighbors
  - Practice analyzing, talking about tricky notions
  - Reach consensus
  - Have questions, raise your hand!
3. Group Vote: Everyone in group votes
4. Class-wide Discussion

# In Class Exercises

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Let's try it out (if you have a device):

Indoctrination (a test)

\* Required

$x = x + 1$  \*

1 point



This is fine



This is fine.

<http://tiny.cc/cse116-trial>

Make your individual choice

# In Class Exercises

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Let's try it out (if you have a device):

Indoctrination (a test)

\* Required

$x = x + 1$  \*

1 point



This is fine

This is fine.

<http://tiny.cc/cse116-trial>

Now “confer” with a neighbor and agree on a choice for your group

# Requirements and Grading

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- In-Class Exercises: 5%
- Midterms: 30%
- Programming Assignments (6): 30%
- Final: 35%

# Resources

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- Online lecture notes
- Readings and exercises
- Lectures recorded on Yuja
- Discussion sections
- TA and Tutor Office hours

# Programming Assignments

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All assignments are managed through GitHub Classroom (link on course page).

- **You must *push* your submitted code.**

## Deadline Extension:

- Eight “late days”, used as “whole unit”
- 5 mins late = 1 late day
- Plan ahead, **no other extensions**

See course webpage for HW deadlines



# Programming Assignments

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Unfamiliar languages  
+ Unfamiliar environments

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**Start Early!**

# Weekly Programming Assignments

Scoring = Test suite

**No Compile, No Score**

# Weekly Programming Assignments

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- Programming Assignments done **ALONE** or in (official) **groups of two** (as permitted)
- We use plagiarism detection software
  - MOSS is fantastic, plagiarize at your own risk
- **Zero Tolerance**
  - offenders punished ruthlessly
- Please see academic integrity statement:
  - <https://ue.ucsc.edu/academic-misconduct.html>

# Weekly Programming Assignments

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**Forget** Java, C, C++ ...  
... other 20<sup>th</sup> century PLs

**Don't complain**

... that Haskell is hard

... that Haskell is @!%@#

# Immerse yourself in new language

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