CSCI-UA 490  Fall 2018
Special Topics In
Programming Languages
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What is this course?

It is NOT “Let’s learn how to write Java and C++ and Haskell and JavaScript and…”

(though, there will be some of that!)
What is this course?

Languages are a conceptual universe

The original quote is: "A good programming language is a conceptual universe for thinking about programming."

Concepts over Syntax and Sales Pitch
HEAVENLY REALM OF

Mathematics

Concepts

APPROACH 1
Build languages from first principles to eliminate superficial differences

APPROACH 2
Distill concepts from diverse existing languages.

EARTHLY MATTERS

Real World Languages
HEAVENLY REALM OF Mathematics

APPROACH 1
Build languages from first principles to eliminate superficial differences

↑
but there's something to be said for this approach too!

Concepts

This class

APPROACH 2
Distill concepts from diverse existing languages.

EARTHLY MATTERS
Real World Languages
Themes:

Concepts: understand history, diversity of ideas in programming

Critical Thought: basis to draw comparisons, assess properties of language

Implementation: all features have trade-offs and costs

↑ you don’t really understand something until you build it!
Why should you care?

My algorithms instructor said: "Recursion is a good idea though inefficient. You can use the idea in Fortran by storing the stack in an array."

My PhD advisor!
Why should you care?

Futuristic ideas may be useful problem-solving methods now and part of languages you use in the future.

More recently: higher-order functions, continuations, monads, memory models...
Syllabus: The Big Ideas

Say more with less!

First-class functions  Pattern matching
Type inference  Type classes
Monads  Continuations

Reliability and Reuse!

Objects & Inheritance  Modules  Generics

Cross-cutting concerns

Memory management  Concurrency
Syllabus: The Big Ideas

Say more with less!

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Type inference  
Monads
Pattern matching  
Type classes  
Continuations

Reliability and Reuse!

Objects & Inheritance  
Modules  
Generics

Cross-cutting concerns

Memory management  
Concurrency

Midterm  
October 24

December 17  
Final
Logistics

40%  Weekly homework due Wednesday immediately before class.

3 Late Days: No questions asked (But you can only use one a week)

Collaboration: Yes!

You may submit solutions in pairs. (But try to do it on your own first!)

25%  Midterm & Final  35%

Open book / Pencil & Paper
Course website:

https://cs.nyu.edu/courses/fall18/CSCI-UA.0490-001/

We'll be using the Piazza discussion board for announcements and homework.