

Domain-Specific Languages



Κατερίνα Καμπράνη | The Uncomfortable
www.kkstudio.gr/#the-uncomfortable/files/238-025.jpg

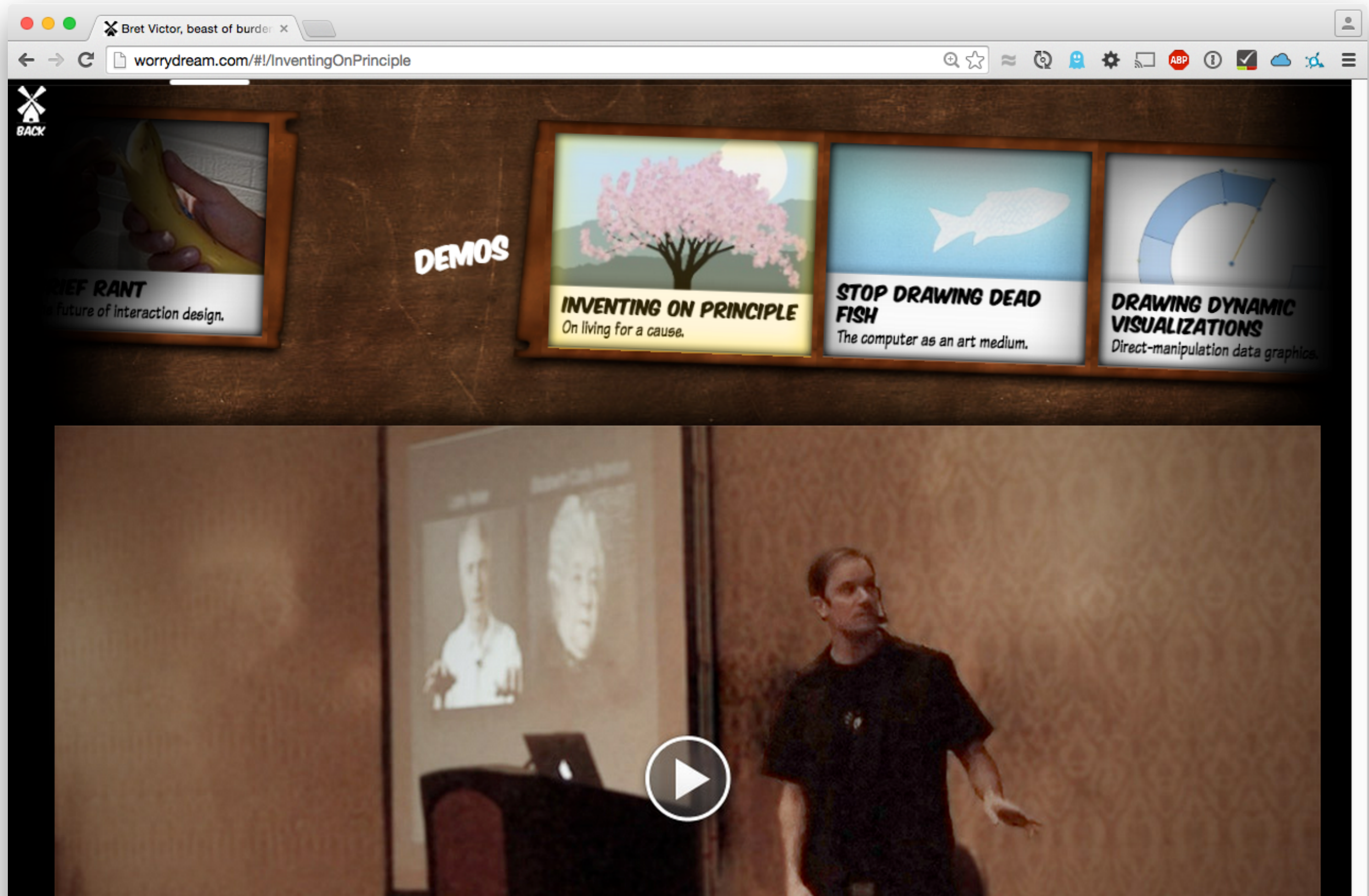
[T]he fundamental principles of designing for people: (1) provide a good conceptual model and (2) make things visible. — The Design of Everyday Things , *Donald A. Norman*

[E]very large scale programming project involves the design, use, and implementation of a special-purpose programming language, with its own data concepts and primitive operations, specifically oriented to that particular project.

— Hints on Programming Language Design, C. A. R. “Tony” Hoare

Inventing on Principle

Brett Victor



A studio is:

1. People

2. Process

3. Place

All work in progress is public.

Exercise: Set up our studio

(3 groups of 4 people) + Prof. Ben = 13 people

Discussion space

everyone can see each other's face

Discussion + presentation space

everyone can see each other's face

everyone (except presenter) can see the side screen and front board

Work space

space for each person to write or work on a computer

no need to see boards easily, but it might be nice to use the boards

Easy set-up and recovery

should take no more than two minutes for all of us to set-up / reset
(perhaps after some practice :))

The plan

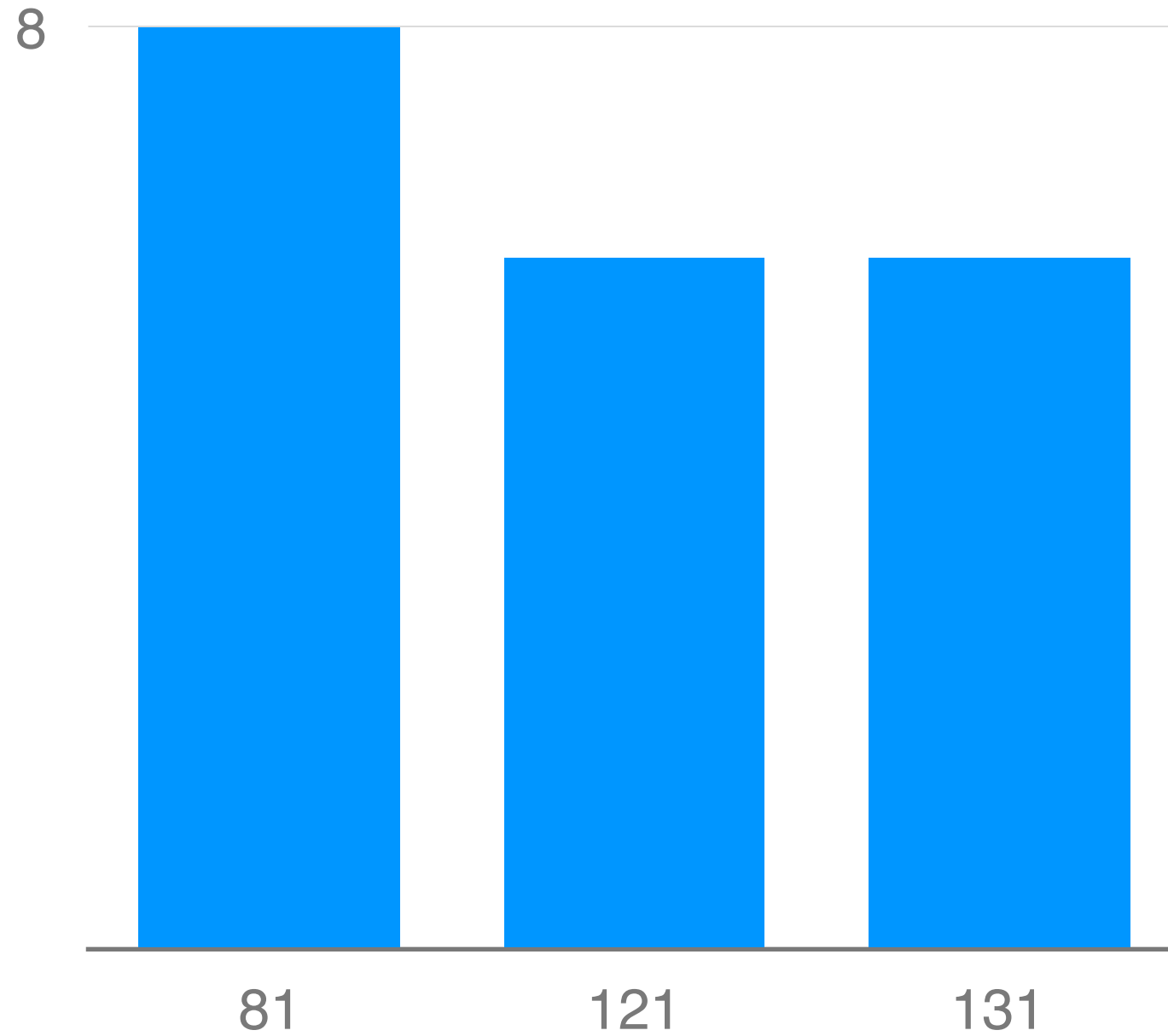
This course is two half-courses

A tour of
DSL design &
implementation
techniques

Project

Spring 2016					
CS 111: Domain-Specific Languages					
MW 1:15pm–2:30pm in SHAN 3425					
Piazza · Syllabus · GitHub Repo · Wiki					
	Monday		Wednesday		
(0)	01 · 18	(no class)	DSLs: What, why, and how?	01 · 20	What is a DSL? Due: Sunday 1/24 at 11:59pm Critique: Tuesday 1/26 at 11:59pm
(1)	01 · 25	What is a DSL? <i>writup</i>	Mini-lab: library design <i>writup</i>	01 · 27	Language design Due: Wednesday 2/3 at 11:59pm Critique: Friday 2/5 at 11:59pm
(2)	02 · 01	Scala intro <i>writup</i>	Projects: interviews <i>writup</i>	02 · 03	Practice Scala Due: Wednesday 2/10 at 11:59pm Critique: Friday 2/12 at 11:59pm
(3)	02 · 08	Functional Scala <i>writup</i>	Lab: Internal control flow <i>writup</i>	02 · 10	Project ideas Due: Wednesday 2/17 at 11:59pm Critique: Friday 2/19 at 11:59pm
(4)	02 · 15	Object-oriented Scala <i>writup</i>	Extensibility: Traits <i>writup</i>	02 · 17	Internal DSL Due: Wednesday 2/24 at 11:59pm Critique: Friday 2/26 at 11:59pm
(5)	02 · 22	Extensibility: The Expression Problem <i>writup</i>	Language architecture & parser combinators <i>writup</i>	02 · 24	Language design: Piconot Due: Wednesday 3/4 at 11:59pm Critique: Friday 3/6 at 11:59pm
(6)	02 · 29	Models of computation <i>writup</i>	Lessons and plans <i>writup</i>	03 · 02	
(7)	03 · 07	Language features, part 1	Language features, part 2	03 · 09	Project: description and plan & Repository Due: Friday 3/11 at 11:59pm Critique: Tuesday 3/22 at 11:59pm
(8)	03 · 14	Spring Break (no class)	Spring Break (no class)	03 · 16	
(9)	03 · 21	critique	studio	03 · 23	Project: design and implementation Due / notebook: Sunday 3/27 at 11:59pm Critique: Tuesday 3/29 at 11:59pm
(10)	03 · 28	critique	studio	03 · 30	Notebook: Sunday 4/3 at 11:59pm Critique: Tuesday 4/5 at 11:59pm
(11)	04 · 04	critique	studio	04 · 06	Project: prototype Due / notebook: Sunday 4/10 at 11:59pm Critique: Tuesday 4/12 at 11:59pm
(12)	04 · 11	critique	studio	04 · 13	Project: preliminary evaluation Due / notebook: Sunday 4/17 at 11:59pm Critique: Tuesday 4/19 at 11:59pm
(13)	04 · 18	critique	studio	04 · 20	Project: demo / presentation Due / notebook: Sunday 4/24 at 11:59pm Critique: in class
(14)	04 · 25	Presentations	Presentations	04 · 27	Project: final product and writup Due / notebook: Friday 4/29 at 11:59pm

$$111 = \frac{1}{3} \bullet (81 + 121 + 131)$$





Skills

Scala

GitHub

Testing

Build system (sbt)

Concepts

Language design
Parsing
Semantic models
Software engineering
Extensibility
...

Skills

Scala
GitHub
Testing
Build system (sbt)

Philosophies

- People first
- Programming *as* language design
- How does language influence thought?
- The end of PLs

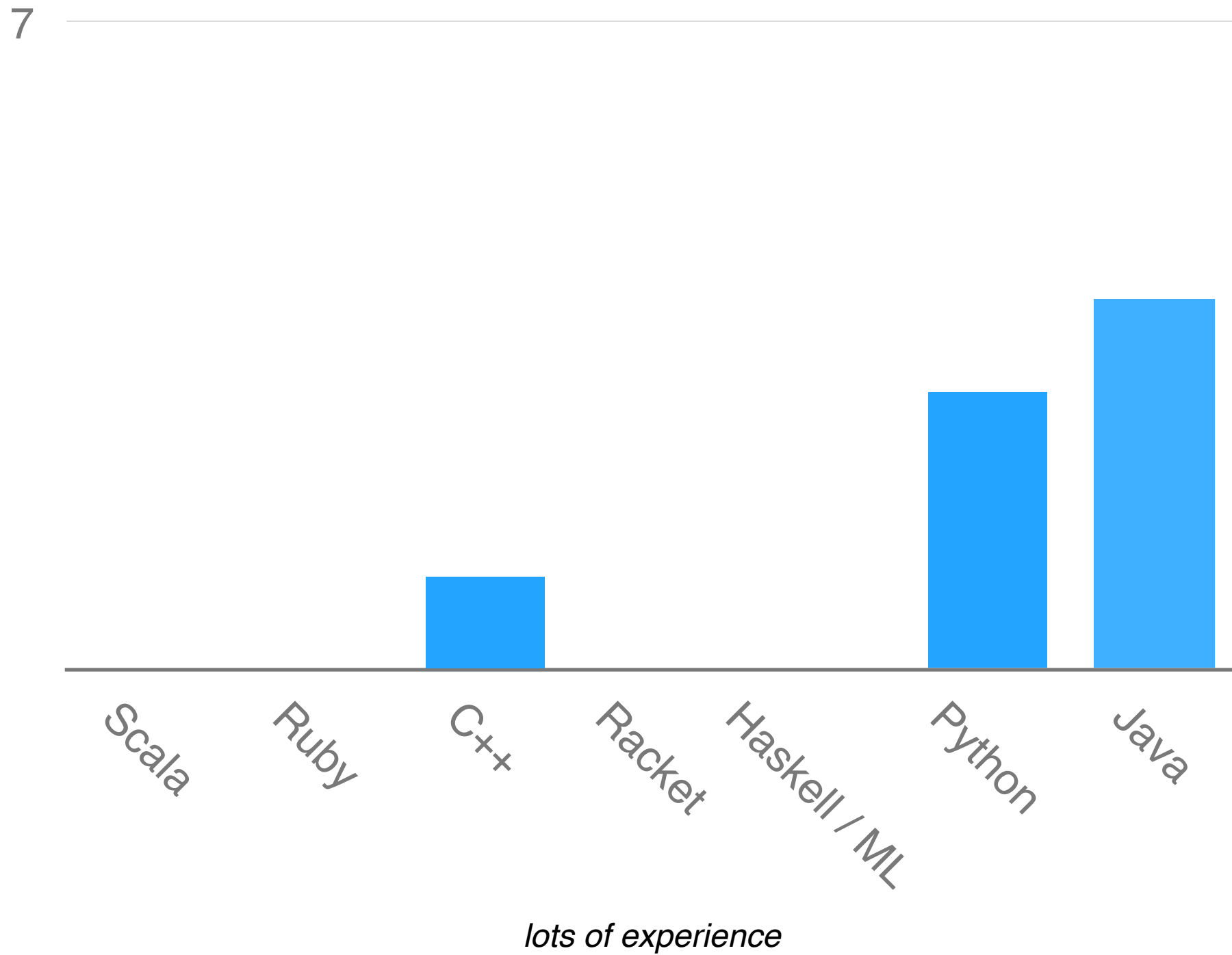
Concepts

- Language design
- Parsing
- Semantic models
- Software engineering
- Extensibility
- ...

Skills

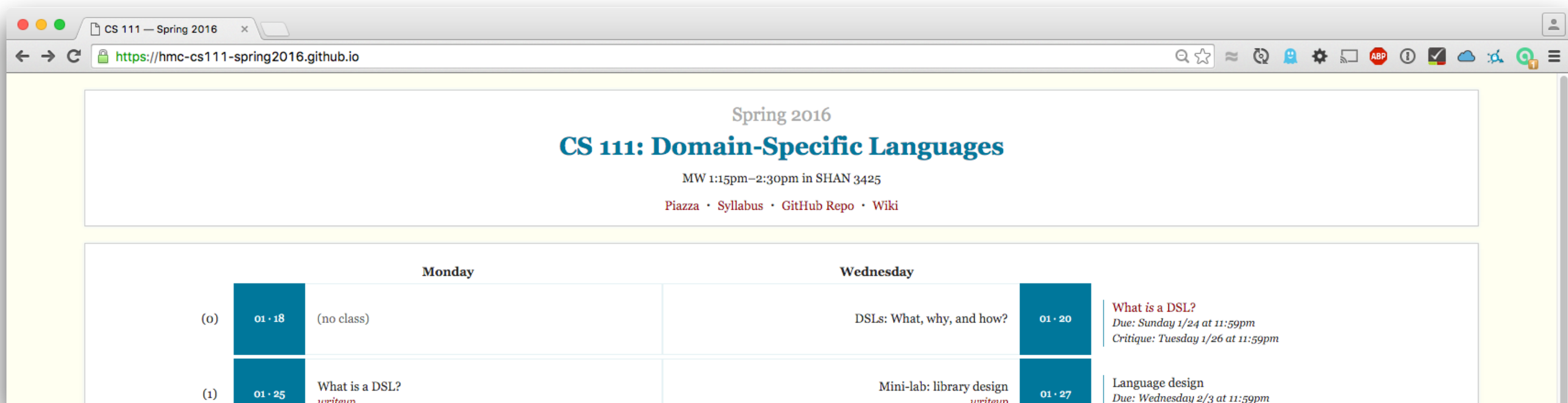
- Scala
- GitHub
- Testing
- Build system (sbt)

Scala as a lens



Soundbite syllabus

or is it “soundbyte”?



The screenshot shows a web browser window with the URL <https://hmc-cs111-spring2016.github.io>. The page title is "Spring 2016 CS 111: Domain-Specific Languages". Below the title, it says "MW 1:15pm–2:30pm in SHAN 3425" and provides links for "Piazza", "Syllabus", "GitHub Repo", and "Wiki". The main content is a table with two columns: "Monday" and "Wednesday".

	Monday	Wednesday
(0)	01 · 18 (no class)	DSLs: What, why, and how? 01 · 20
(1)	01 · 25 What is a DSL? <i>writeup</i>	Mini-lab: library design <i>writeup</i> 01 · 27

Additional details from the screenshot:

- For (0) Wednesday: **What is a DSL?**
Due: Sunday 1/24 at 11:59pm
Critique: Tuesday 1/26 at 11:59pm
- For (1) Wednesday: **Language design**
Due: Wednesday 2/3 at 11:59pm

- One-stop shop: www.cs.hmc.edu/cs111
schedule, assignments, repository, syllabus, etc.
- All course communication happens on [Piazza](#)
- Come to class and participate fully.
- Concentrate more on problems than solutions

A typical week

6-9 hours / week
outside of class

Class on Monday and Wednesday

we'll need a scribe each day — sign up on the Wiki

Assignment due Wednesday at 11:59pm

Critique due Friday at 11:59pm

treat your critique partner as your collaborator

New assignment available no later than Wednesday evening

Office hours in the LAC

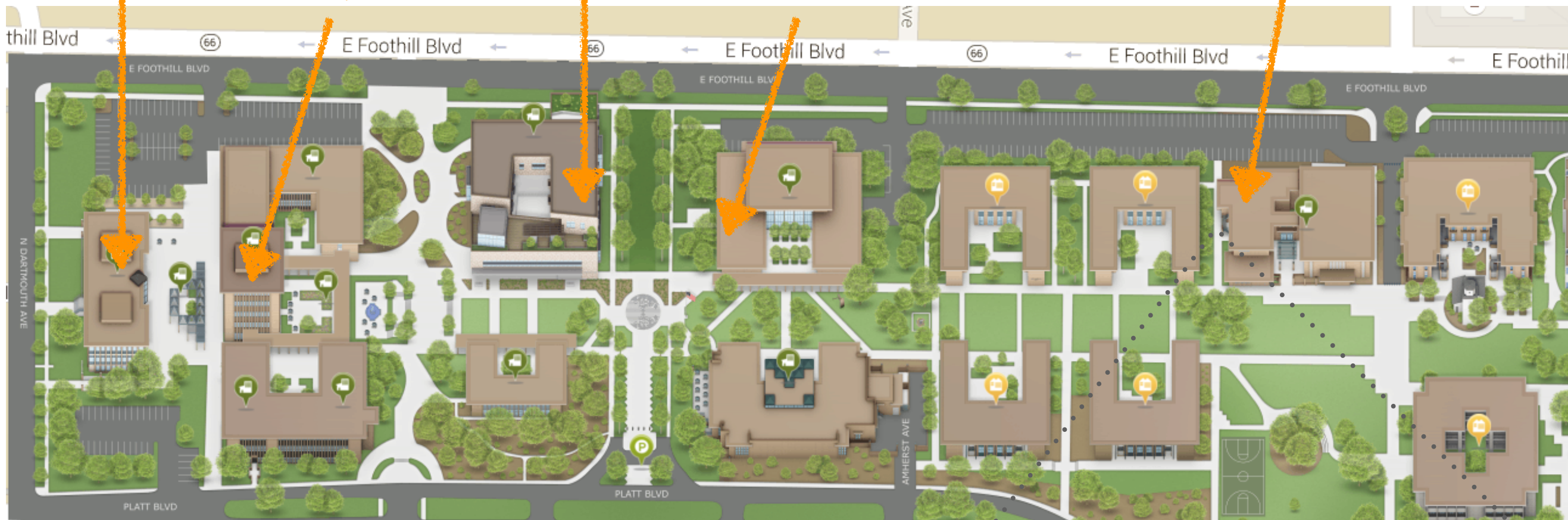
Mondays 10:30–noon & Tuesdays 2:45–4:30pm

Important places

OLIN Sprague
(CIS)

Platt
(F&M)

LAC



Physical access: F&M
Electronic access: CIS

Grading

More details next week

Participation: 20%

critiques • in-class discussion • class writeup(s)

Assignments: 40%

Project: 40%

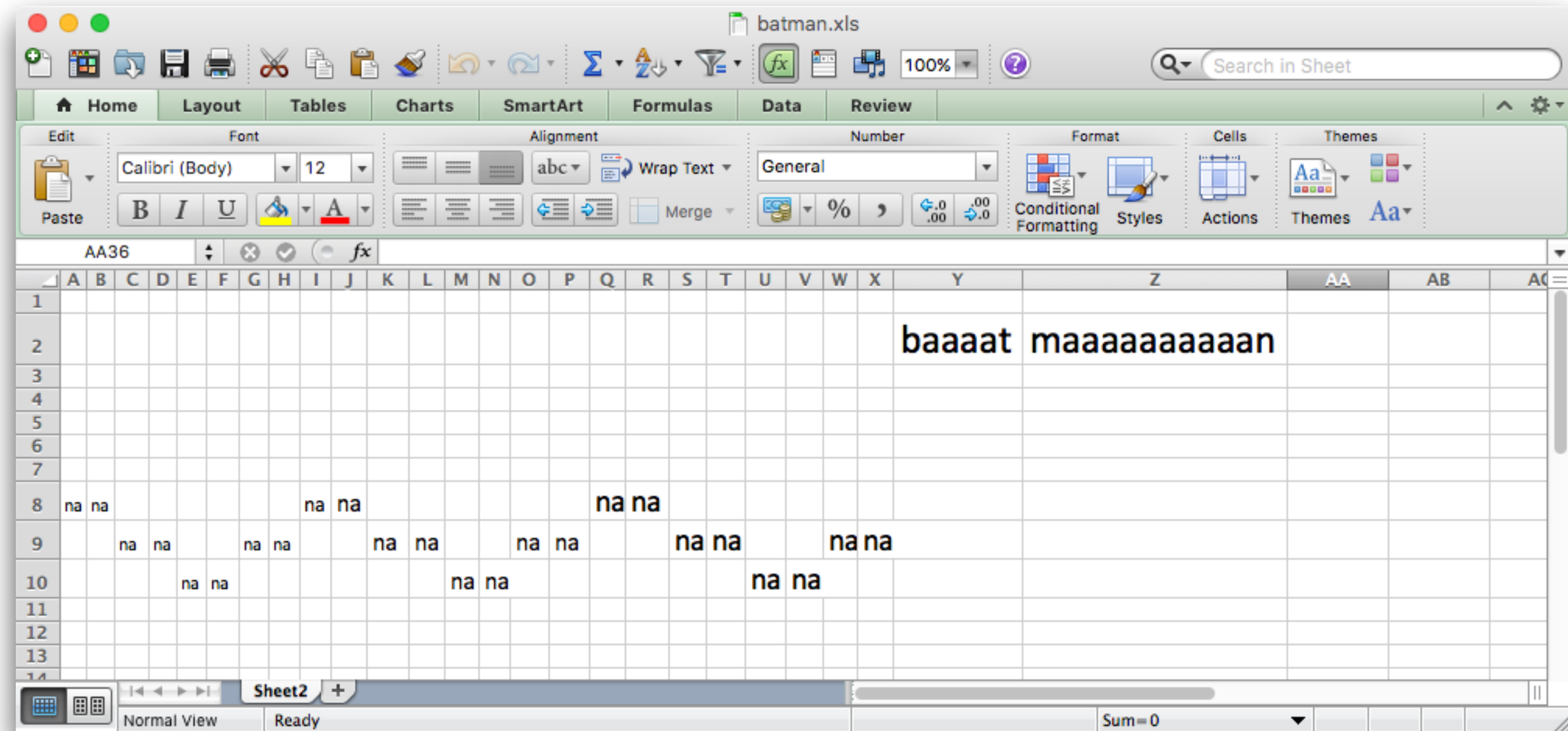
there will be milestones, but it's mostly on you

Key point

The primary responsibility is
yours.

Music Maker

Emily Blatter — DSLs Fall 2014



Construct

Alex Ozdemir — DSLs Fall 2015

```
ben:construct ben$ sbt 'runMain construct.ConstructGREPL'
[info] Loading global plugins from /Users/ben/.sbt/0.13/plugins
[info] Set current project to Construct (in build file:/Users/ben/Documents/work/teaching/courses/DSLs/fall15/projects/construct/)
[info] Running construct.ConstructGREPL
Construct $
```



Before Monday

- Activate your Piazza account
use Piazza (or GitHub)—not email—for course communication
- Join our GitHub organization
- Assignment 1
submission due Sunday
critique due next Tuesday
all the details are in the assignment
ask questions on Piazza!
- Sign up to scribe a class
- Restore the room