

<http://www.cs.cornell.edu/courses/cs1110/2020sp>

## Life after CS 1110

CS 1110  
Introduction to Computing Using Python

[E. Andersen, A. Bracy, D. Fan, D. Gries, L. Lee, S. Marschner, C. Van Loan, W. White]

### Obvious Next Step: CS 2110

- **Programming in Java**
  - Basic Java syntax
  - Static vs. Dynamic Types
  - Adv. Java Topics (e.g. Threads)
- **OO Theory**
  - More design patterns
  - Interface vs. Implementation
- **Data Structures**
  - Binary Trees
  - Linked Lists
  - Graphs

Java Specific

Language Independent

Major CS Topic

### CS 2110 Immediately Opens your Options

### CS 2800: The Other Important Course

- CS requires a lot of math
  - Analyzing code performance
  - Analyzing data
  - Proving code correctness
- Calculus not the only math
  - Data often not "continuous"
  - Limited to specific uses (e.g. spatial data)
- "Grab-bag" course
  - All math needed for CS
  - Includes writing proofs

### CS 2110 + CS 2800 = Even More Options

### Computer Science Course Numbers

• Programming Languages	x1xx	(e.g. 1110, 2110)
• Scientific Computing	x2xx	(e.g. 3220, 4210)
• Data Management	x3xx	(e.g. 3300, 4320)
• Systems	x4xx	(e.g. 3410, 4410)
• Computational Biology	x5xx	(e.g. 5555)
• Graphics and Vision	x6xx	(e.g. 4620)
• Artificial Intelligence	x7xx	(e.g. 4758, 4700)
• Theory	x8xx	(e.g. 4810, 4820)
• Research	x9xx	(e.g. 4999)

Level Area

### Computer Science Course Numbers

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- Programming Languages     x1xx (e.g. 1110, 2110)
- Scientific Computing        x2xx (e.g. 3220, 4210)
- Data Management            x3xx (e.g. 3320, 4320)
- Systems                      x4xx (e.g. 4410)
- Computer Architecture      x5xx (e.g. 5510)
- Graphics                     x6xx (e.g. 4620)
- Artificial Intelligence      x7xx (e.g. 4758, 4700)
- Theory                        x8xx (e.g. 4810, 4820)
- Research                     x9xx (e.g. 4999)

Level Area

Separation not perfect;  
there is a lot of overlap

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### Programming Languages

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- **Adv. Language Topics**
  - Functional languages
  - Streaming languages
  - Parallel programming
- **Language Theory**
  - New languages/compilers
  - Software verification
- **Software Engineering**
  - Design patterns
  - Architecture principles

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### Scientific Computing

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- **Calculus + Computing**
  - Problems from other science domains
  - Process with computer
- **Applications**
  - Complex simulations
  - Physics (games!)
- **Challenge: Performance**
  - Programs can run for days!
  - How do we make faster?

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### Data Management

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- **Modern Web Apps**
  - Storing user/session data
  - Coordinating users
- **Databases**
  - Query languages
  - Database optimization
  - Organizing your data
- **Information Retrieval**
  - Searching
  - Data analysis

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### Systems

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- **Building BIG software**
  - Operating systems
  - Distributed applications (e.g. online, networked)
  - Cloud computing
- **Also System Security**
  - Though that is spread about
- **Senior/masters level classes**
  - Bulk of the 5xxx courses
  - But great project courses!

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### Computational Health/Biology

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- **No undergrad classes**
  - Too much to learn
  - Masters/PhD level
- **Undergrad options**
  - **BTRY 4840:** Comp. Genomics
  - BSCB department
- **Stay tuned for more...**

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## Graphics and Vision


- **Not** modeling/art!
- **Rendering & Animation**
  - Illumination/reflection
  - Cloth/hair simulation
  - Water and fluids
- **Processing Images**
  - Recognizing shapes
  - Assembling 3D models from 2D pictures
  - Smart cameras

CS 4620

CS 5625

CS 5643

CS 4670



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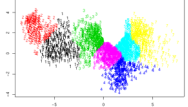
## Artificial Intelligence

- **Not** sentient computers
- **Machine learning**
  - Discovering patterns
  - Making predictions
- **Natural Language Proc.**
  - Automatic translation
  - Searching text/books
  - Voice-control interfaces
- **Robotics**
  - Autonomous control

CS 4700


CS 4780

CS 4740



CS 4750

CS 4758



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## Theory

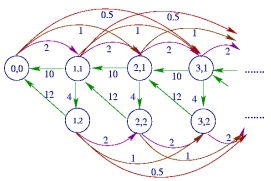
- **Analysis of Algorithms**
  - What is *possible*?
  - What is *feasible*?
- **Analysis of Structures**
  - Social network theory
  - Complex data structures
- **Cryptography**
  - Theory side of security

CS 4810

CS 4820

CS 4830

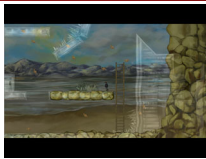

CS 4860



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## What About Games?

- CS 3152, Spring only
  - Prereq: CS 2110
  - But CS 3110 a big help
- Build game from scratch
  - Want it to be innovative
  - You own the IP
- Interdisciplinary teams
  - 5 to 6 people on a team
  - With artists/designers
- **Final:** public showcase

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## Games and the Designer Track

- Coding not your thing?
- INFO 3152 (co-meets)
  - Artists/designer track
  - No formal training needed
  - Submit a portfolio
- Recommend: INFO 2450
  - Start of the HCI sequence
  - How design affects the user experience
  - Fall course; no prereqs




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## CS Undergraduate Prerequisite Structure

**bold & colored courses** (with corresponding arrows) indicate prerequisites

**core classes**

**starred (\*) courses** have at least 1 MATH pre- or co-requisite. See Foster.

**Practicums** in small font: +: optional &: required

**3110:** Introduction to Computing Using Python  
**3112:** Introduction to Computing Using MATLAB  
**1132:** Short Course in MATLAB  
**1133:** Short Course in Python  
**1380:** Data Science for All  
**2024:** C++ Programming

**2110:** Object-Oriented Programming and Data Structures  
**2112:** Object-Oriented Design and Data Structures - Honors  
**2770:** Excursions in Computational Sustainability  
**2800:** Discrete Structures  
**2802:** Discrete Structures - Honors  
**2850:** Networks

**3110:** Data Structures and Functional Programming  
**3152:** Introduction to Computer Game Architecture  
**3220:** Introduction to Scientific Computation  
**3410:** Computer System Organization and Programming  
**3420:** Embedded Systems (prereq: ENGRD 2300, not shown)  
**4110:** Programming Languages and Logics  
**4120:** Introduction to Compilers  
**4152:** Advanced Topics in Computer Game Architecture  
**4154:** Analytics-driven Game Design  
**4160:** Formal Verification  
**4220:** Numerical Analysis: Linear and Nonlinear Problems  
**4320:** Introduction to Database Systems  
**4410:** Operating Systems  
**4450:** Introduction to Computer Networks  
**4620:** Introduction to Computer Graphics  
**4670:** Introduction to Computer Vision  
**4700:** Foundations of Artificial Intelligence  
**4740:** Natural Language Processing  
**4750:** Foundations of Robotics  
**4780:** Machine Learning for Intelligent Systems  
**4786:** Machine Learning for Data Science  
**4787:** Principles of Large-Scale Machine Learning  
**4810:** Introduction to Theory of Computing  
**4820:** Introduction to Analysis of Algorithms  
**4850:** Mathematical Foundations for the Information Age  
**4860:** Applied Logic

Dorell CS Computer Science

## Computer Science not your ?

Try one of our neighbors!

- Information Science
- Statistics
- Operations Research & Information Engineering
- Electrical and Computer Engineering
  - ECE 2400 is a good next step



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It's been a challenging semester given the state of the world and everyone's individual situation.

**Thank you for persevering!!!!**

Hope you've found some parts of CS1110 interesting and will find some parts useful in the future!

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