Life after CS 1110

CS 1110
Introduction to Computing Using Python

http://www.cs.cornell.edu/courses/cs1110/2018sp

[E. Andersen, A. Bracy, 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
CS 2110 Immediately Opens your Options

- Introduction to Computer Game Development
- Computer System Organization and Programming
- Introduction to Computer Graphics
- Natural Language Processing
CS 2800: The Other Important Course

- CS requires a lot of math
  - Analyzing code performance
  - Analyzing data
  - Proving code correctness
- Calculus is “wrong math”
  - Data is rarely “continuous”
  - Limited to specific uses (e.g. spatial data)
- “Grab-bag” course
  - All math needed for CS
  - Includes writing proofs
CS 2110 + CS 2880 = Even More Options

CS 2110

CS 2800

CS 3110
Data Structures and Functional Programming

CS 4670
Introduction to Computer Vision

CS 47xx
Artificial Intelligence, Robotics, Machine Learning (some non-cs pre-reqs)

CS 4810
Introduction to Theory of Computing
# Computer Science Course Numbers

<table>
<thead>
<tr>
<th>Level</th>
<th>Area</th>
<th>Code</th>
<th>Examples</th>
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<tbody>
<tr>
<td>1</td>
<td>Programming Languages</td>
<td>x1xx</td>
<td>(e.g. 1110, 2110)</td>
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<tr>
<td>2</td>
<td>Scientific Computing</td>
<td>x2xx</td>
<td>(e.g. 4210)</td>
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<tr>
<td>3</td>
<td>Data Management</td>
<td>x3xx</td>
<td>(e.g. 3300, 4320)</td>
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<tr>
<td>4</td>
<td>Systems</td>
<td>x4xx</td>
<td>(e.g. 3410, 4410)</td>
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<tr>
<td>5</td>
<td>Computational Biology</td>
<td>x5xx</td>
<td>(e.g. 5555)</td>
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<tr>
<td>6</td>
<td>Graphics and Vision</td>
<td>x6xx</td>
<td>(e.g. 4620)</td>
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<tr>
<td>7</td>
<td>Artificial Intelligence</td>
<td>x7xx</td>
<td>(e.g. 4758, 4700)</td>
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<td>8</td>
<td>Theory</td>
<td>x8xx</td>
<td>(e.g. 4810, 4820)</td>
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<tr>
<td>9</td>
<td>Research</td>
<td>x9xx</td>
<td>(e.g. 4999)</td>
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</table>
Computer Science Course Numbers

- Programming Languages \( x_{1xx} \) (e.g. 1110, 2110)
- Scientific Computing \( x_{2xx} \) (e.g. 4210)
- Data Management \( x_{3xx} \) (e.g. 4320)
- Systems \( x_{4xx} \) (e.g. 4410)
- Computational Biology \( x_{5xx} \) (e.g. 5555)
- Graphics and Vision \( x_{6xx} \) (e.g. 4620)
- Artificial Intelligence \( x_{7xx} \) (e.g. 4758, 4700)
- Theory \( x_{8xx} \) (e.g. 4810, 4820)
- Research \( x_{9xx} \) (e.g. 4999)

Separation not perfect; there is a lot of overlap
Programming Languages

• Adv. Language Topics
  ▪ Functional languages
  ▪ Streaming languages
  ▪ Parallel programming

• Language Theory
  ▪ New languages/compilers
  ▪ Software verification

• Software Engineering
  ▪ Design patterns
  ▪ Architecture principles
Scientific Computing

- **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?
Data Management

• **Modern Web Apps**
  - Storing user/session data
  - Coordinating users

• **Databases**
  - Query languages
  - Database optimization
  - Organizing your data

• **Information Retrieval**
  - Searching
  - Data analysis
Systems

• **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!
Computation Biology

• No undergrad classes
  ▪ Too much to learn
  ▪ Masters/PhD level
• Undergrad options
  ▪ \textbf{BTRY 4840}: Comp. Genomics
  ▪ BSCB department
• Hoping to improve…
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 4670
CS 5643
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 4740
CS 4780
CS 4750
CS 4758
Theory

• **Analysis of Algorithms**
  - What is *possible*?
  - What is *feasible*?

• **Analysis of Structures**
  - Social network theory
  - Complex data structures

• **Cryptography**
  - Theory side of security

• Perhaps the most famous group in the department
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
Games and the Designer Track

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

Try one of our neighbors!

• Information Science
• Statistics
• Operations Research & Information Engineering
• Electrical and Computer Engineering
InfoSci Classes you could have already taken

INFO 1300: Introductory Design and Programming for the Web
INFO 2040: Networks
INFO 2770: Excursions in Computational Sustainability
INFO 3140: Computational Psychology
InfoSci Classes you can take after some CS

Not a complete list!
Good Bye!