Presentation of the Computer Science Major
What is the major?

300-level Course

Intermediate (3 or 4 courses)
- Systems
- Programming
- Theory
  +1 if only one intro

Core (3 courses)
- 212
- 231
- 250

Intro (1 or 2 courses)
- 111
- 109
- 102/3
- 151

Math (2 courses)
- MTH 111
- MTH 153
What is the major?

Systems
- CSC 223: Software Engineering
- CSC 230: Database Systems
- CSC 249: Networks
- CSC 251: Network Security
- CSC 262: Operating Systems
- CSC 270: Circuits

Programming
- Core (3 courses)
  - 212
  - 231
  - 250

Math (2 courses)
- Intro (1 or 2 courses)
  - 111
  - 109
  - 102/3
  - 151
- 'b', 102/3

Intermediate (3 or 4 courses)
- Theory
- +1 if only one intro

Intro (1 or 2 courses)
- MTH 111
- MTH 153
What is the major?

Systems

- CSC 205: Modeling for the Sciences
- CSC 235: Visual Analytics
- CSC 240: Graphics
- CSC 252: Algorithms
- CSC 253: Applied Algorithms
- CSC 266: Compiler Design
- CSC 274: Discrete & Computational Geometry
- CSC 290: Artificial Intelligence
- CSC 294: Computational Machine Learning

Theory

- 300-level Course

Intermediate (3 or 4 courses)
- Systems
- Programming
- Theory
  +1 if only one intro

Core (3 courses)
- 212
- 231
- 250

Intro (1 or 2 courses)
- 111
- 109
- 102/3
- 151

Math (2 courses)
- MTH 111
- MTH 153

Programming
What is the major?

**Systems**

- CSC 205: Modeling for the Sciences
- CSC 220: Advanced Programming
- CSC 235: Visual Analytics
- CSC 240: Graphics
- CSC 253: Applied Algorithms
- CSC 256: Intelligent User Interfaces
- CSC 262: Operating Systems
- CSC 266: Compiler Design
- CSC 274: Discrete & Computational Geometry
- CSC 290: Artificial Intelligence
- CSC 294: Computational Machine Learning

**Theory**

**Programming**

- CSC 205: Modeling for the Sciences
- CSC 220: Advanced Programming
- CSC 235: Visual Analytics
- CSC 240: Graphics
- CSC 253: Applied Algorithms
- CSC 256: Intelligent User Interfaces
- CSC 262: Operating Systems
- CSC 266: Compiler Design
- CSC 274: Discrete & Computational Geometry
- CSC 290: Artificial Intelligence
- CSC 294: Computational Machine Learning
What is the major? - Spring Offerings

300-level Course

Intermediate (3 or 4 courses)
- Systems
- Programming
  - Theory
  - +1 if only one intro

Core (3 courses)
- 212
- 231
- 250

Intro (1 or 2 courses)
- 111
- 109
- 102/3
- 151

Math (2 courses)
- MTH 111
- MTH 153

Systems
- CSC 223: Software Engineering
- CSC 262: Operating Systems

Theory
- CSC 205: Modeling for the Sciences
- CSC 253: Applied Algorithms
- CSC 274: Discrete & Computational Geometry
- CSC 294: Computational Machine Learning

Programming
- CSC 205: Modeling for the Sciences
- CSC 253: Applied Algorithms
- CSC 262: Operating Systems
- CSC 274: Discrete & Computational Geometry
- CSC 294: Computational Machine Learning
All Spring 2022 Courses

CSC 111  Intro CompSci through Programming (Shinyoung Cho, Alicia Grubb, Pablo Frank)
CSC 151  Programming Languages Concepts (Johanna Brewer)
CSC 205  Modeling in the Sciences (Ileana Streinu)
CSC 212  Data Structures (Jordan Crouser, Nick Howe)
CSC 223  Software Engineering (Johanna Brewer)
CSC 231  Microprocessors & Assembly (Jamie C. Macbeth)
CSC 250  Theory of Computation (Pablo Frank)
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CSC 294  Computational Machine Learning (Katherine Kinnaird)
CSC 327  Internet Censorship (Shinyoung Cho)
CSC 370  Computer Visions & Image Processing (Nick Howe)

(Course Search now available.)
Computer Science Liaisons

• Ananda Montoly
• Eleni Partakki
• Kathleen Hablutzel
• Mariem Snoussi
Faculty

NEW HIRES

Johanna Brewer

Judith Cardell
Professor of Engineering and of Computer Science

Shinyoung Cho
Visiting Assistant Professor of Computer Science

R. Jordan Crouser
Assistant Professor of Computer Science

Alicia M. Grubb
Assistant Professor of Computer Science

Nicholas Howe
Professor of Computer Science

Katherine M. Kinnaird
Clare Boothe Luce Assistant Professor of Computer Science and of Statistical & Data Sciences

Jamie Macbeth
Assistant Professor of Computer Science

Mihaela Malita
Visiting Associate Professor of Computer Science

Joseph O’Rourke
Spencer T. and Ann W. Olin Professor of Computer Science and Professor of Mathematics & Statistics

Ileana Streinu
Charles N. Clark Professor of Computer Science

To Amherst

Pablo Frank Bolton
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(Course Search now available)
Introductory courses

CSC 111  Intro CompSci through Programming (Shinyoung Cho, Alicia Grubb, Pablo Frank)
CSC 151  Programming Languages Concepts (Johanna Brewer)
CSC 205  Modeling in the Sciences (Ileana Streinu)
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CSC 294  Computational Machine Learning (Katherine Kinnaird)
CSC 327  Internet Censorship (Shinyoung Cho)
CSC 370  Computer Visions & Image Processing (Nick Howe)
CSC 111 - Intro to Computer Science through Programming

Instructors (Spring 22): Shinyoung Cho, Pablo Frank Bolton, and Alicia M. Grubb

- Write your first computer program in Python!
- Introduction to programming concepts (e.g., if-then statements, loops, functions, lists, input-output)
- Learn how to organize your ideas into steps (algorithms)
- Understand the high-level internal operation of a computer
- Explore other core computer science topics (e.g., sorting, objects)

No Prerequisite or Experience Needed

Come make friends & learn together!
CSC 151: Programming Languages Concepts

Mondays(???) | 1:20-4PM (7-9:30 PM once a month)
Instructor: Johanna Brewer
Prerequisite: CSC111 or equivalent

How do we become “fluent programmers”?

• Develop awareness of how theoretical concepts are expressed in code
• Gain experience with diverse languages (Python, JavaScript, Java, and Ruby)
• Understand the differences between imperative, declarative, functional, and object-oriented programming
• Build confidence with learning new ways of "speaking in code"
Core Courses

CSC 111  Intro CompSci through Programming (Shinyoung Cho, Alicia Grubb, Pablo Frank)
CSC 151  Programming Languages Concepts (Johanna Brewer)
CSC 205  Modeling in the Sciences (Ileana Streinu)
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CSC 327  Internet Censorship (Shinyoung Cho)
CSC 370  Computer Visions & Image Processing (Nick Howe)
CSC212: Data Structures

MWF | 9:25am – 10:40am
Instructors: Nicholas R. Howe & R. Jordan Crouser
Prerequisites: CSC111

Check out the syllabus here!

KEEP CALM and javac -xLint

Check out the syllabus here!

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CSC 231: Microprocessors & Assembly Language

Instructor: Prof. Jamie C. Macbeth
Prerequisites: CSC 212

Tues/Thursday 10:50AM-12:05PM

An introduction to assembly language in the Linux environment. Students write programs in assembly and explore the architectural features of microprocessors, including their use of memory, the data formats used to represent information, the implementation of high-level language constructs, integer and floating-point arithmetic, and how the processor deals with I/O devices and interrupts.

```assembly
msg db "x was 0", 10
msglen equ $-msg
msg2 db "x was not 0", 10
msglen2 equ $-msg2
x dd 10

cmp dword[x], 0 ; x==0? Zero
jnz L1 ; Jumps if
mov ecx, msg ; println()
mov edx, msglen
call _printString
;; WHAT'S MISSING HERE?

L1:
mov ecx, msg2 ; println()
mov edx, msglen2
call _printString
```
CSC 250 - Theory of Computation
Prereqs: CSC 111 and MTH 153

We’ll be thinking about computation

- Can this task be done with this computer?

In 250 we will think about computation under different models in order to answer this question!

Regular Expressions

\[ \sum^* 0 \sum^* 0 \sum^* \]

Finite Automata

Context-Free Grammars

\[ V = \{ S \} \]
\[ \Sigma = \{ 0, 1 \} \]
\[ R = \{ S \rightarrow_G 0S1, \]
\[ S \rightarrow_G 0, \]
\[ S \rightarrow_G 1, \]
\[ S \rightarrow_G \varepsilon \} \]

Turing-Machines!

...And More!
Theory Electives

CSC 111  Intro CompSci through Programming (Shinyoung Cho, Alicia Grubb, Pablo Frank)
CSC 151  Programming Languages Concepts (Johanna Brewer)
CSC 205  Modeling in the Sciences (Ileana Streinu)
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CSC 294  Computational Machine Learning (Katherine Kinnaird)
CSC 327  Internet Censorship (Shinyoung Cho)
CSC 370  Computer Visions & Image Processing (Nick Howe)
MTH/CSC205 Modeling in the Sciences

Meeting times: MWF 1:20-2:35
Instructor: Prof. Ileana Streinu
Prerequisites: Calculus. Recommended: CSC 111 or previous high-school exposure to programming.

Learn how to:
❖ Model a scientific problem
❖ Develop a simulation model
❖ Code it in Mathematica
❖ Run experiments
❖ Draw scientific conclusions

Problems selected from:
Physics, Chemistry, Biology, Geology, Materials Science, Social Sciences. The topics vary each year and are adapted to students’ interests.
CSC253 Applied Algorithms

Meeting times: MWF 9:20-10:35 AM
Instructor: Prof. Ileana Streinu
Prerequisites: CSC 111, 212, Discrete, Calculus

- Applied problems with graphs and networks.
- Design techniques: graph traversal, divide-and-conquer, dynamic programming, greedy algorithms.
- Object-oriented implementation in Java.
- Comparative efficiency analysis and applications of algorithms, rather than theoretical analysis.
CSC 274 Discrete & Computational Geometry

Joseph O’Rourke --- TR 9:25-10:40 --- Counts as Theory or Programming. Assignments include programming (CSC) or theory/proofs (MTH 2 crs). Any language: Java, Python, Javascript, Mathematica, Matlab, …

Prereqs:
- For CSC:111
- For MTH:153

Emmely Rogers

Zoe Riell

Jessica Tin

Julie Kim & Risa Yamada
CSC 294: Computational Machine Learning

How do we find patterns in data? How do we group data? What is deep learning? Is there also shallow learning?

Class in python (via hands-on jupyter labs) deployed through GitHubClassroom and practice with continuous integration

Mon/Wednesday 10:50AM-12:05PM
Instructor: Prof. Katherine M. Kinnaird
Prerequisites: CSC 212, CSC 250, MTH 112 or MTH 211, & knowledge of Python
Systems Electives

CSC 111  Intro CompSci through Programming (Shinyoung Cho, Alicia Grubb, Pablo Frank)
CSC 151  Programming Languages Concepts (Johanna Brewer)
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CSC 370  Computer Visions & Image Processing (Nick Howe)
CSC 223: Software Engineering

Tuesdays(???) | 1:20-4PM (7-9:30 PM once a month)
Instructor: Johanna Brewer
Prerequisite: CSC212

How do we build software for use “in the wild”? 

- Compare engineering methodologies
- Practice rapid prototyping & agile development
- Model complex system architectures
- Design software that satisfies needs & constraints
- Build & maintain a real system
CSC 262: Operating Systems

Tues/Thursday 2:45 PM-4:00 PM  
Instructor: Prof. Jamie C. Macbeth  
Prerequisites: CSC 212, CSC 231

An introduction to the functions of an operating system and their underlying implementation.

Topics include file systems, CPU and memory management, concurrent communicating processes, deadlock, and access and protection issues.

Programming projects will implement and explore algorithms related to several of these topics.
Programming Electives

CSC 111  Intro CompSci through Programming (Shinyoung Cho, Alicia Grubb, Pablo Frank)
CSC 151  Programming Languages Concepts (Johanna Brewer)
CSC 205  Modeling in the Sciences (Ileana Streinu)
CSC 212  Data Structures (Jordan Crouser, Nick Howe)
CSC 223  Software Engineering (Johanna Brewer)
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CSC 262  Operating Systems (Jamie C. Macbeth)
CSC 274  Discrete & Computational Geometry (Joseph O'Rourke)
CSC 294  Computational Machine Learning (Katherine Kinnaird)
CSC 327  Internet Censorship (Shinyoung Cho)
CSC 370  Computer Visions & Image Processing (Nick Howe)
CSC 327: Seminar: Internet Censorship

Meeting times: Thursday 1:40 PM - 4:30 PM
Instructor: Shinyoung Cho
Prerequisite: CSC 249

- History of information controls
- Ethical/legal issues around Internet censorship
- Methods used for implementing Internet censorship around the globe
- Tools and techniques for detecting censorship and traffic differentiation
- Censorship of social media
- Circumvention/anonymization technologies
CSC 370 Computer Vision

Prerequisites: CSC 212, MTH 153
Questions?