

Computational Science at Wabash College

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Department of Mathematics & Computer Science

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Courses Offered

- CSC 111 Introduction to Computer Science (CS1)
- CSC 112 Advanced Programming (CS2)
- CSC 211 Introduction to Data Structures (CS3)
- CSC 311 Introduction to Machine Organization (CO1)
- CSC 321 Programming Languages (CO4)
- CSC 331 Analysis of Algorithms (CO2)
- CSC 341 Introduction to Automata, Computability, and Formal Languages (CO3)

Required for minor:

- Five computer science courses, including CSC 111, 112
- Discrete mathematics course (MAT 108 or 219)

Not a programming course

- CS0
- CSC 111 Introduction to Programming

Introduction to the field of computer science

- Data storage and manipulation
- Operating systems
- Networking
- Algorithms
- Programming languages
- Artificial Intelligence
- Theory of computation

Requirements

- Calculus I (111), Calculus II (112), Linear Algebra (223), and Abstract Algebra (331)
- Differential Equations (224)
- Numerical Methods (337) or Topics in Computational Mathematics (338)
- One additional course from 219, 226, 314, 337, and 338
- Electives to reach nine credit minimum

Pure Track

- Calculus I (111), Calculus II (112), Linear Algebra (223), and Abstract Algebra (331)
- Real Analysis (333) or Topology (341)
- Electives to reach nine credit minimum

Surveys

- Computer science alumni
- Computer science and mathematics students
- Wabash faculty
- Computer science educators (ACM SIGCSE)

Computer science education conferences

- ACM SIGCSE Technical Symposium
- Consortium for Computer Science in Colleges (CCSC)

Review curricular models

- IEEE/ACM
- Liberal Arts Computer Science Consortium (LACS)
- Other institutions

Curricular Model Changes

Language of CS1

- Java
- C++
- Scheme
- Python

Shift introductory sequence

- Introduction to Programming
- Introduction to Data Structures
- Advanced Programming (Second language?)

Combining and redistributing content of core courses

CO1, CO2, CO3, CO4

Alumni said...

Received good foundation

- Good general overview and theoretical foundation
- Emphasis on concepts, algorithms, logic, problem solving
- Ability think about problems and master tools at disposal
- Advantage over peers in graduate school and careers

Suggest more applications and courses (many applied)

- Artificial intelligence
- Databases
- Networks
- Parallel computing
- Electronics
- Physical devices
- Communications technologies
- Practical business applications

Suggest a computer science major

Students said...

Strong interest in computational track

- Long list of requirements
- CSC 111 hidden

Want more computer science and computational courses

- Robotics
- Modeling
- Web design
- Data security

Want a computer science major

Do not see computational mathematics as a substitute

Faculty said...

Many say computer science minor would be useful to their students

Other courses:

- Informatics
- Database management
- Modeling
- Simulation
- Hardware interfacing
- Interface with economics

Other languages:

- Perl
- Visual Basic
- R, Stata
- Javascript, Actionscript

Many project opportunities

- Database management
- Econometrics
- Collaborations with art and psychology students
- Historical simulations
- Cognitive science
- Linguistics
- Neural networks
- Hardware control GUI programming

Small liberal arts institutions

- Fewer than 2500 students
- More in Dept. of C.S. than in combined Dept. of Math. & C.S.
- Almost all offer a major
- More applied than theoretical
- Many offer CS0, but unrelated to the program
- Follow IEEE/ACM guidelines to varying degrees

Computational Mathematics

May cause department to move apart

Proposed changes

- Explicitly list CSC 111
- Eliminate requirement for MAT 224
- Eliminate requirement for additional course from 219, 226, 314, 337, and 338

Proposed Requirements

- Calculus I (111), Calculus II (112), Linear Algebra (223), and Abstract Algebra (331)
- Introduction to Programming (CSC 111)
- Numerical Methods (337) or Topics in Computational Mathematics (338)
- Electives to reach minimum of nine credits in mathematics

Recommendations – Computer Science Minor

Proposed changes

- Eliminate CSC 112
- Create CSC 121 Intro. to Additional Programming Languages
- Retain current CSC 3X1 courses
- Develop new 300-level courses through CSC 271

Proposed Requirements for Minor:

- Five CS courses, incl. CSC 111, 211, and at least half-credit of 121
- MAT 108 or 219

Long-term

- Expand our offerings
- Develop relationships with other programs
- Develop a computer science major