

Computational Methods Minor  
Department of Computer Science  
Union College  
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## Introduction

Computational approaches and tools are now an essential part of many fields, having already helped to provide solutions to problems in areas such as DNA sequencing, drug design, financial analysis and weather forecasting. The computational methods minor will help students at Union, across a range of disciplines, understand the importance of computation within their major field and develop the ability to apply computational techniques and tools to solve discipline specific problems. This will expand their options as they move on to graduate study and into jobs. The minor in computational methods will provide students with a coherent group of courses that develop their knowledge and skills, as well as provide potential employers and graduate schools with evidence that the students are informed about and skilled in computational methods and tools.

## Requirements

The minor includes six courses as follows:

1. an introductory course in computational methods (CSC-103);
2. 2-3 intermediate level applications oriented courses offered in the computer science department, chosen in consultation with the major and minor advisor;
3. 2-3 additional courses from cognate departments, chosen in consultation with the major and minor advisor.

Students pursuing the computational methods minor are also encouraged to incorporate a significant computation component into their senior project.

The specific requirements are:

1. *an introductory course in computational methods*: There are six introductory courses offered by the computer science department, each of which covers a common set of computing skills and concepts. We recommend CSC-103 for the computational methods minor, though others would be acceptable based on a student's background, major, and areas of interest. Note that all introductory courses are also open to students interested in pursuing a major or minor in computer science. The six introductory courses are as follows:

- Introduction to Computational Science (CSC-103): should be taken by science and social science students, particularly those who work in fields that use large data sets.
- Robots Rule! (CSC-104): should be taken by students with specific interest in robotics or broader interest in engineering and hardware.
- Game Development (CSC-105): should be taken by students interested in the technical side of computer game development.
- Can Computers Think? (CSC-106): required of all neuroscience majors, but is

open to any student. Addresses topics of artificial intelligence and machine intelligence.

- Creative Computing (CSC-107): particularly appropriate for students interested in visual arts, digital art, web programming, image and sound processing. Recommended for the Digital Media minor.
- Programming for Engineers (CSC-109): This course is required of Mechanical Engineering majors but is open to all students. Appropriate for students who will be working with MatLab.

2. *intermediate level applications courses in CS department:* Listed here are courses that have no prerequisite other than a CS introductory course. However, students with sufficient math background could also take CSC-150 Data Structures and higher level courses such as CSC-280 User Interfaces. More courses will be added to this category in 2009-2010, and students are welcome to pursue additional areas through independent study.

- CSC-206 Natural Language Processing
- CSC-240 Web Programming
- CSC-245 The Computer Science of Computer Games
- CSC-283 Introduction to Bioinformatics

3. *sample courses in cognate departments:*

- AVA-160 Introduction to Digital Art
- AVA-270 Processed Pixel
- AVA-363 3D Computer Modeling
- BIO-320 Ecology
- BIO-384 Molecular Genetics
- ECO-352 Contemporary Problems in Macroeconomics
- ECO-353 Seminar in Econometrics
- ECO-377 Modeling & Simulation of Economic Policies
- GEO-204 Geographic Information Systems
- MTH-110 Calculus 1 or equivalent
- MTH-127 Numerical Methods
- MTH-197 Discrete Mathematics for Computer Science
- PHL-231 Symbolic Logic
- PHY-120 Matter in Motion
- PHY-121 Principles of Electromagnetics
- PHY-230 Intermediate Classical Mechanics
- PSC-220, SOC 201 Social Data Analysis

### **Examples of how a student would satisfy the minor:**

The set of courses used by students to satisfy the computational methods minor will depend on their background, their major, and their areas of interest. Students majoring in science and engineering disciplines will likely pursue a set of courses for the minor

that mirror the computational science minor offered at other institutions, spread across mathematics, computer science, and science disciplines. Students majoring in social sciences would likely construct a different set of courses that is more focused on application areas, covered by computer science courses and courses within the social science disciplines.

Example 1: A Biology major might count the following courses toward the computational methods minor.

- MTH-110 Calculus 1
- MTH-127 Numerical Methods
- CSC-103 Introduction to Computational Science
- CSC-283 Introduction to Bioinformatics
- BIO-320 Ecology
- depending on the student's interest, the final course could be visualization or data mining.

Example 2: An Economics major might count the following courses toward the computational methods minor (note that this requires taking two ECO courses beyond those counted toward the major).

- MTH-110 Calculus 1
- CSC-103 Introduction to Computational Science
- ECO-352 Contemporary Problems in macroeconomics
- ECO-377 Modeling and Simulation of Economic Policies
- PSC-220 Social Data Analysis
- depending on the student's interest, the final course could be visualization or data mining