

# Scientific Computing

INTERDISCIPLINARY

## Faculty

Scott D. Cummings  
*Assistant Professor of Chemistry*

Bradley A. Hartlaub  
*Associate Professor of Mathematics*

John D. Idoine  
*Professor of Physics*

Andrew J. Niemiec  
*Associate Professor of Psychology*

Benjamin W. Schumacher  
*Associate Professor of Physics*

Carol S. Schumacher  
*Associate Professor of Mathematics*

Timothy S. Sullivan  
*Director, Associate Professor of Physics*

Paula C. Turner  
*Associate Professor of Physics*

The Scientific Computing Concentration is an interdisciplinary program in the application of computers to scientific work. A longer title for the program might be "Computing within a scientific context."

The concentration focuses on four major areas: (1) computer program development, including the construction and implementation of data structures and algorithms; (2) mathematical modeling of natural phenomena (including cognitive processes) using quantitative or symbolic computer techniques; (3) analysis and visualization of complex data sets, functions, and other relationships using the computer; and (4) computer hardware issues, including the integration of computers with other laboratory apparatus for data

acquisition. The overall aim is to prepare the student to use computers in a variety of ways for scientific exploration and discovery.

## Curriculum and Requirements

The Scientific Computing Concentration requires a total of 3 units of Kenyon coursework. MATH 118 (1/2 unit) serves as a foundation course for the program, introducing students to programming and other essential ideas of computer science.

Since computational methods are of increasing importance in every scientific discipline, students in the scientific computing program will take at least 1 unit of "contributory" courses in one or more scientific disciplines. Contributory courses have been identified in chemistry, economics, mathematics, and physics (see list below). In these courses, computational methods form an essential means for attacking scientific problems of various kinds.

Students in the concentration will also take at least 1 unit of "intermediate" scientific computing courses. These courses have computational methods as their main focus and develop these methods extensively.

In addition to regular courses that are identified as "contributory" or "intermediate," particular special-topics courses or independent studies in various departments may qualify in one of these two categories. Students who wish to credit such a course toward the Scientific Computing Concentration should contact the program director at the earliest possible date.

The capstone course of the program is SCMP 401 (1/2 unit), a project-oriented, seminar-style course for advanced students.

## Required courses (1 unit)

MATH 118 Introduction to Computer Science  
SCMP 401 Advanced Scientific Computing

## Contributory courses (1 unit)

CHEM 336 Quantum Chemistry  
ECON 375 Introduction to Econometrics  
MATH 206 Data Analysis  
MATH 226 Design and Analysis of Experiments  
MATH 347 Mathematical Models  
PHYS 140,141 Classical Physics  
PHYS 240,241 Fields and Spacetime  
PHYS 280,281 Electronics  
PHYS 480,481 Experimental Physics

## Intermediate courses (1 unit)

MATH 218 Data Structures and Program Design  
MATH 237 Numerical Analysis  
PHYS 218 Dynamical Systems and Scientific Computing  
PHYS 219 Complex Systems and Scientific Computing  
SCMP 493 or 494 Individual Study in Scientific Computing

## First-Semester Course

### Individual Study

SCMP 493 (1/2 unit)  
*Staff*

Students conduct independent research projects under the supervision of one of the faculty members in the scientific computing program. Prerequisites: permission of the instructor and the program director.

---

## Second-Semester Courses

### **Advanced Scientific Computing**

**QR** SCMP 401 (1/2 unit)

*T. Sullivan*

This capstone seminar course is intended to provide an in-depth experience in computational approaches to science. Students will work on individual computational projects in various scientific disciplines, exchanging ideas and information in weekly discussion meetings, formal oral presentations, and papers. This year the course will focus on the use of parallel computers for large-scale computations.

Prerequisites: MATH 118 and junior or senior standing. Enrollment limited.

### **Individual Study**

SCMP 494 (1/2 unit)

*Staff*

Students conduct an independent research project under the supervision of one of the faculty members in the scientific computing program.

Prerequisites: permission of the instructor and the program director.