Scientific Computing

INTERDISCIPLINARY

Faculty

Nuh Aydin
Assistant Professor of Mathematics

Scott D. Cummings
Associate Professor of Chemistry

Bradley A. Hartlaub
Associate Professor of Mathematics

John D. Idoine
Professor of Physics

Robert S. Milnikel
Assistant Professor of Mathematics

Andrew J. Niemiec
Associate Professor of Psychology

Michael D. Radmacher
Assistant Professor of Biology and Mathematics

Benjamin W. Schumacher
Director, Professor of Physics

Carol S. Schumacher
Professor of Mathematics

Timothy S. Sullivan
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 Introduction to Computer Science (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 Advanced Scientific Computing (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
MATH 318 Artificial Intelligence
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)
B. Schumacher

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.