

Scientific Computing

INTERDISCIPLINARY

Faculty

Nuh Aydin

Assistant Professor of Mathematics

Scott D. Cummings

Associate Professor of Chemistry

Bradley A. Hartlaub

Professor of Mathematics

John D. Idoine

Professor of Physics

Robert S. Milnikel Jr.

*Assistant Professor of Mathematics
(on leave, second semester)*

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

Programming

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)

Staff

This capstone 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. This year the course will be taught concurrently with MATH 391: Computer Graphics. Prerequisites: MATH 118, junior or senior standing, and permission of the instructor and the program director. 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.