Scientific Computing

Interdisciplinary

Requirements

The Scientific Computing Concentration is an interdisciplinary program in the application of computers to scientific inquiry. 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 concentration in scientific computing requires a total of 3 units of Kenyon coursework. SCMP 118 Introduction to Computer Science (.5 unit) serves as a foundation course for the program, introducing students to programming and other essential ideas of computer science.

Contributory courses have been identified in biology, chemistry, economics, environmental studies, mathematics, political science, and physics (see list below). In these courses, computational methods form an essential means for attacking problems of various kinds.

Students in the concentration will also take at least 0.5 units 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 concentration in scientific computing should contact the program director at the earliest possible date.

The capstone course of the program is SCMP 401 Advanced Scientific Computing (.5 unit), a project-oriented, seminar-style course for advanced students.

Required courses

MATH 118/SCMP 118 Introduction to Programming or PHYS 270 Computational Physics
SCMP 401 Advanced Scientific Computing

Contributory courses

BIOL 109Y Introduction to Experimental Biology
BIOL 328 Global Ecology and Biogeography
CHEM 126 Introductory Chemistry Laboratory II
CHEM 336 Quantum Chemistry
CHEM 341 Instrumental Analysis
CHEM 370 Advanced Lab: Computational Chemistry
CHEM 374 Advanced Lab: Spectroscopy
ECON 205 Introduction to Econometrics
ECON 337 Portfolio Allocation and Asset Pricing
ECON 375 Advanced Econometrics Seminar
ENVS 261 Geographic Information Science
MATH 106 Elements of Statistics
MATH 116 Statistics in Sports
MATH 206 Data Analysis
MATH 216 Nonparametric Statistics
PHYS 140, 141 Classical Physics
PHYS 146 Introduction to Experimental Physics II
PHYS 240, 241 Fields and Spacetime
PHYS 345 Astronomy and Particle Physics
PHYS 380 Introduction to Electronics
PHYS 381, 382 Projects in Electronics 1, 2
PHYS 385, 386, 387 Advanced Experimental Physics 1, 2, 3
PSCI 280 Political Analysis

Intermediate courses

MATH 218 Data Structures and Program Design
MATH 228 Mathematical Biology
MATH 328 An Introduction to Coding Theory and Cryptography
MATH 347 Mathematical Models
MATH 416 Linear Regression Models
PHYS 218 Dynamical Systems and Scientific Computing
PHYS 219 Complex Systems and Scientific Computing
SCMP 493 or 494 Individual Study in Scientific Computing

Courses

The Scientific Computing Concentration requires a total of 3 units of Kenyon coursework. SCMP 118 Introduction to Programming (1 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 discipline, students in the scientific computing program will take:

- SCMP 118 Introduction to Scientific Computing (or PHYS 270)
- SCMP 401 Seminar in Scientific Computing

In addition, each student will take at least 2 units of coursework from "contributory" and "intermediate" courses.

Contributory courses have been identified in biology, chemistry, economics, environmental studies, mathematics, political science, and physics (see list below). In these courses, computational methods form an essential means for attacking problems of various kinds.

At least 1/2 unit (out of the 2 units) must be from "intermediate" scientific computing courses. These courses have computational methods as their main focus and develop these methods extensively.

Required Courses (1 unit)

- SCMP 118 Introduction to Programming or PHYS 270 Computational Physics
- SCMP 401 Advanced Scientific Computing

Contributory courses

- BIOL 109Y Introduction to Experimental Biology
- BIOL 328 Global Ecology and Biogeography
- CHEM 126 Introductory Chemistry Laboratory II
- CHEM 336 Quantum Chemistry
- CHEM 341 Instrumental Analysis
- CHEM 370 Advanced Lab: Computational Chemistry
- CHEM 370 Computational Chemistry
- CHEM 374 Advanced Lab: Spectroscopy
- ECON 205 Introduction to Econometrics
- ECON 337 Portfolio Allocation and Asset Pricing

- ECON 375 Advanced Econometrics Seminar
- ENVS 261 Geographic Information Science
- MATH 106 Elements of Statistics
- MATH 116 Statistics in Sports
- MATH 206 Data Analysis
- MATH 216 Nonparametric Statistics
- PHYS 140, 141 Classical Physics
- PHYS 146 Introduction to Experimental Physics II
- PHYS 240, 241 Fields and Spacetime
- PHYS 345 – Astronomy and Particle Physics
- PHYS 380 Introduction to Electronics
- PHYS 381, 382 Projects in Electronics 1, 2
- PHYS 385, 386, 387 Advanced Experimental Physics 1, 2, 3
- PSCI 280 Political Analysis

Intermediate courses

- MATH 218 Data Structures and Program Design
- MATH 228 Mathematical Biology
- MATH 328 An Introduction to Coding Theory and Cryptography
- MATH 347 Mathematical Models (please note that this course is being re-designated from Contributing to Intermediate)
- MATH 416 Linear Regression Models
- PHYS 218 Dynamical Systems and Scientific Computing
- PHYS 219 Complex Systems and Scientific Computing
- SCMP 493 or 494 Individual Study in Scientific Computing

Last updated 3/21/14 (CMM)