

# SCIENTIFIC COMPUTING

## Introduction

The scientific computing option is available to any student in an approved Rackham doctoral program at the University of Michigan. This option is based on the concept that scientific computing requires a firm knowledge of the specific discipline being studied, and the use of computers and computing methods is simply a tool, albeit a sophisticated and powerful tool, to develop new solutions to complex problems that arise in the scientific discipline. Accordingly, the scientific computing option is combined with an existing doctoral degree program in the student's "home" department.

The PhD degree name is changed by appending "and Scientific Computing", e.g., "Nuclear Engineering and Radiological Sciences and Scientific Computing." The graduation and examination requirements for students in the scientific computing option are different; the following section summarizes the requirements for NERS students, including sample schedules for students in the fission or fusion options. Students in other options can also elect the scientific computing option. For more information, students interested in the scientific computing option are encouraged to contact one of the relevant professors: Professors Martin, Larsen, or the Graduate Program Coordinator, Garnette Roberts at garnette@umich.edu.

## Course Requirements for Scientific Computing Option

The course requirements are divided into three categories – courses in nuclear engineering and radiological sciences, courses in basic numerical analysis, and courses in computer science and applied computation outside the home department (extra-departmental applications).

### **Division I: Home Department Requirements (24 credits)**

Students must satisfy the course requirements for the Ph.D. program in NERS. Prospective students should refer to the detailed requirements for the appropriate NERS graduate option.

### **Division II: Numerical Analysis (9 credits)**

Nine credit hours must be elected in basic graduate level numerical analysis. Students should refer to the Scientific Computing Option document, *Courses in Scientific Computing*, available from Pam Derry in 1919 Cooley. For example, the following courses could be used to fulfill this requirement.

Math 571	Numerical Methods for Scientific Computing I	3
Math 572	Numerical Methods for Scientific Computing II	3
Math 671	Analysis of Numerical Methods I	3

### **Division III: Computer Science and Extra-Departmental Applications (9 credits)**

As with Division II courses, nine credit hours must be elected in computer science or computational applications areas outside nuclear engineering and radiological sciences. Some example courses are:

Aero 523	Numerical Methods in Fluid Dynamics I	3
Aero 623	Numerical Methods in Fluid Dynamics II	3
EECS 587	Parallel Computing	3

## **Preliminary/Candidacy Exam Requirements**

In addition to the standard written NERS candidacy and thesis prospectus, students who elect the Scientific Computing Option must take an additional two-hour exam that will cover fundamental numerical analysis and scientific computing methods and techniques, with applications to the student's option, such as fission or fusion.

For more information: <http://micde.umich.edu/example-course-choices-for-ph-d-in-scientific-computing/>

Contact Professor Kenneth Powell or Ms. Bonnie Bryant at [blbryant@umich.edu](mailto:blbryant@umich.edu) who oversee the program.