Founded in 1992, the program addresses the role of computation in science, mathematics, and engineering, and is designed around the emphases of Computer Modeling and Simulation and of Data Science. Computational science, focused on modeling and simulation, is defined as the systematic development and application of computing systems and computational solution techniques for modeling and simulation of scientific and engineering phenomena. Informatics, focused on data science, is defined as the systematic development and application of computing systems and computational solution techniques for analyzing data obtained through experiments, modeling, database searches, and instrumentation. The resulting interdisciplinary approach leads to understanding that traditional theory or experimentation alone cannot provide. The close relationship of the PhD to the research and development activities in federal laboratories, scientific institutions, and high-technology firms affords students opportunities for continued or new employment. Scheduled courses and sequences accommodate part-time students, with most courses meeting once a week in the late afternoon or early evening. The research and teaching activities associated with the program reflect the recognized role of computation and data analysis as part of a triad with theory and experiment, leading to a better understanding of nature. The program is designed to be completed in four to five years.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies section of this catalog.

To apply for this program, please complete the George Mason University Admissions Application (https://www2.gmu.edu/admissions-aid/apply-now).

Eligibility

Students interested in applying for admission should have a bachelor's degree in computational science, any natural science, mathematics, engineering, or computer science with a minimum GPA of 3.00 in their last 60 credits of study. Applicants to the PhD program should have a mathematics background up to and including differential equations and should also have knowledge of a computer programming language such as C, C++, Fortran, Python, etc.

Application Requirements

The GRE is required, unless the applicant holds a master's degree from a regionally-accredited school in the United States. A TOEFL score of 570 (paper-based test) or 230 (computer-based test) or 88 points total and a minimum of 20 points in each section (Internet-based test) is required for international students. The ETS code for Mason is 5827.

Students should submit a completed George Mason University Admissions Application (https://www2.gmu.edu/admissions-aid/apply-now) along with three letters of recommendation, an expanded goals statement, and application fee in addition to the items listed above.

Application deadlines can be found on the Office of Admissions website (https://admissions.gmu.edu/grad/application-deadlines-and-requirements/?academicUnit=SC&ga=1.13682175.956654242.1443444993). Applications requesting financial support must be received by February 1 for the fall semester. Applications from local applicants may be accepted after these general deadlines.

For additional information, please contact the CSI graduate coordinator.

Policies

For policies governing all graduate degrees, see AP.6 Graduate Policies.

Reduction of Credit

For students entering the doctoral program with a master's degree in a related field from a regionally accredited institution, the required coursework may be reduced up to 24 credits, subject to approval of the graduate coordinator and the college's associate dean.

Transfer of Credit

Students who have prior graduate coursework that has not been applied to any degree may request to have a maximum of 30 of those graduate credits transferred, with approval of the graduate coordinator, the college's associate dean, and in accord with university policy. Research-based courses and seminar courses are not eligible for reduction or transfer.

Requirements

Degree Requirements

Total: 72 credits

Students should refer to the Admissions & Policies tab for specific policies related to this program.

General Core Courses

Select two courses (6 credits) from the following: 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSI 690</td>
<td>Numerical Methods</td>
</tr>
<tr>
<td>CSI 695</td>
<td>Scientific Databases</td>
</tr>
<tr>
<td>CSI 702</td>
<td>High-Performance Computing</td>
</tr>
<tr>
<td>CSI 703</td>
<td>Scientific and Statistical Visualization</td>
</tr>
</tbody>
</table>

Total Credits 6

Areas of Emphasis Courses

From the list below, students are advised to select six courses that correspond to areas of emphasis in:

• Computer Modeling and Simulation- Including applications to the natural sciences
Select six courses (18 credits) from the following:\(^1\)  
CSI 500  Computational Science Tools  
CSI 501  Introduction to Scientific Programming  
CSI 672  Statistical Inference  
CSI 674  Bayesian Inference and Decision Theory  
CSI 676  Regression Analysis  
CSI 678  Times Series Analysis and Forecasting  
CSI 685  Fundamentals of Materials Science  
CSI 690  Numerical Methods  
CSI 695  Scientific Databases  
CSI 701  Foundations of Computational Science  
CSI 702  High-Performance Computing  
CSI 703  Scientific and Statistical Visualization  
CSI 709  Topics in Computational Sciences and Informatics  
CSI 721  Computational Fluid Dynamics I  
CSI 739  Topics in Bioinformatics  
CSI 740  Numerical Linear Algebra  
CSI 742  The Mathematics of the Finite Element Method  
CSI 744  Linear and Nonlinear Modeling in the Natural Sciences  
CSI 747  Nonlinear Optimization and Applications  
CSI 754  Earth Science Data and Advanced Data Analysis  
CSI 758  Visualization and Modeling of Complex Systems  
CSI 771  Computational Statistics  
CSI 772  Statistical Learning  
CSI 773  Statistical Graphics and Data Exploration  
CSI 777  Principles of Knowledge Mining  
CSI 780  Principles of Modeling and Simulation in Science  
CSI 782  Statistical Mechanics for Modeling and Simulation  
CSI 783  Computational Quantum Mechanics  
CSI 786  Molecular Dynamics Modeling  
CSI 787  Computational Materials Science  
CSI 788  Simulation of Large Scale Systems  
CSI 873  Computational Learning and Discovery  
CSI 876  Measure and Linear Spaces  
CSI 877  Geometric Methods in Statistics  

Electives

Electives should be chosen to bring the total number of credits to 72. Courses must be approved by the student's advisor and the graduate coordinator. Additionally,

- A maximum of 2 credits of CSI 898 Research Colloquium in Computational Sciences and Informatics and/or CSI 991 Seminar in Scientific Computing may be applied as electives.
- A maximum of two 500-level courses may be applied between both the 'Areas of Emphasis Courses' requirement and the 'Electives' requirement.
- CSI 796 Directed Reading and Research and CSI 996 Doctoral Reading and Research are the only allowable research-based courses that can be used as electives.
- Students may pursue interdisciplinary research that supplements the 'Areas of Emphasis Courses' and 'Electives' requirements with each other and also with bioinformatics, climate dynamics, computational chemistry, computational social science, geoinformation sciences, and several other autonomous PhD program areas within the College of Science.

Doctoral Research

No more than 24 combined credits from CSI 998 Doctoral Dissertation Proposal and CSI 999 Doctoral Dissertation may be applied toward satisfying doctoral degree requirements, with a minimum of 6 credits of CSI 999 Doctoral Dissertation.

Students become eligible to register for CSI 998 Doctoral Dissertation Proposal upon having an approved dissertation committee. Upon advancement to candidacy, students will be eligible to register for CSI 999 Doctoral Dissertation.

Select 24 credits from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSI 998</td>
<td>Doctoral Dissertation Proposal</td>
<td>24</td>
</tr>
<tr>
<td>CSI 999</td>
<td>Doctoral Dissertation</td>
<td></td>
</tr>
</tbody>
</table>

Candidacy Examination

The student must successfully complete separate written, computational, and oral candidacy examinations prepared and administered by the student’s dissertation committee.

Dissertation Proposal and Advancement to Candidacy

Students advance to doctoral candidacy by fulfilling the following requirements:

- The student must successfully complete all coursework and candidacy examinations as stated above.
- The student prepares a dissertation proposal describing in detail the planned dissertation research. The proposal must be approved by the dissertation committee.
• Following successful completion of the research proposal and candidacy exams, the committee will recommend the student for advancement to doctoral candidacy to the graduate coordinator and the college’s associate dean.

**Dissertation Research and Defense**

After advancing to candidacy, the student will work on a doctoral dissertation while enrolled in CSI 999 Doctoral Dissertation. The dissertation is a written piece of original contribution that demonstrates a doctoral candidate’s mastery of the subject matter. A student is expected to produce new and original research worthy of publication in peer-reviewed journals. After the dissertation is completed, the committee will review the dissertation and examine the student in a public oral dissertation defense.