High-Performance Computing for Scientific Applications, P.S.M.

About the Program

Computation, in tandem with theory and experiment, is highly regarded in the advance of scientific knowledge and engineering practice. In recognition of a growing need for experts cross-trained in relevant computational sciences, applied mathematics, statistics, and traditional scientific fields such as chemistry and physics, the Professional Science Master’s (P.S.M.) program in High-Performance Computing for Scientific Applications is targeted toward STEM graduates seeking to use high-performance computation as their primary research instrument in the physical sciences, life sciences, and engineering.

The core curriculum for the High-Performance Computing for Scientific Applications P.S.M. introduces students to the architecture of high-performance computing systems, mathematical techniques employed in high-performance computing, the software tools used in parallel calculations, and computational methods used in the sciences and engineering. A distinguishing feature of the program is its paired emphasis on the algorithms and technology of high-performance computing in applications to problems in science and engineering. Cross-disciplinary techniques are emphasized, and learning through applications and individually designed projects are prioritized over theory.

Time Limit for Degree Completion: 2 years

Campus Location: Main

Full-Time/Part-Time Status: The degree program can be completed on a full- or part-time basis. Most of the classes are offered in the evenings or on weekends to enable full-time working professionals to enroll in the program. International students are required to register as full-time students.

Interdisciplinary Study: The program is interdisciplinary by nature.

Accreditation: Temple University is fully accredited by the Middle States Commission on Higher Education.

Job Prospects: Students in the program are connected to internships in industry and government laboratories by the P.S.M. Scientific Advisory Committee. Graduates are then well prepared to compete for high-quality positions in industry, government laboratories, and academia.

Non-Matriculated Student Policy: Non-matriculated students may enroll in a total of three courses (9 credits) with permission of the instructor and the Department of Mathematics.

Financial Opportunities: Financial assistance in the form of Research or Teaching Assistantships is not offered.

Admission Requirements and Deadlines

Application Deadline:

Fall: March 1; December 15 international
Spring: Open only to non-matriculated students who successfully completed P.S.M. coursework in the Fall term

Late applications may be considered for admission.

APPLY ONLINE to this graduate program.

Letters of Reference:

Number Required: 2

From Whom: Letters should be obtained from college/university faculty or faculty who are familiar with the applicant’s competency. If the applicant has an established career in the field, the applicant’s immediate supervisor should provide one of the letters.

Coursework Required for Admission Consideration: Applicants should have a strong background in one or more STEM fields: Science, Technology, Engineering, and Mathematics.

Bachelor’s Degree in Discipline/Related Discipline: The P.S.M. program has been designed for recent graduates and professionals who have a bachelor's degree or equivalent in a STEM field.
**Statement of Goals:** In approximately 250 to 500 words, describe your interest in Temple’s program, research goals, and academic and research achievements.

**Standardized Test Scores:**

GRE: Optional

Applicants who earned their baccalaureate degree from an institution where the language of instruction was other than English, with the exception of those who subsequently earned a master’s degree at a U.S. institution, must report scores for a standardized test of English that meet these minimums:

- TOEFL iBT: 85
- IELTS Academic: 6.5
- Duolingo: 110
- PTE Academic: 58

**Interview:** An in-person or SKYPE interview with the Program Director or members of the P.S.M. Steering Committee is required.

**Transfer Credit:** Graduate credits from an accredited institution may be transferred into the P.S.M. program. The credits must be equivalent to coursework offered by the Department of Mathematics at Temple University. A grade of "B" or better must have been earned for the credits to transfer. The P.S.M. Steering Committee makes recommendations to the Department Chair for transferring credit on an individual basis. The maximum number of credits a student may transfer is 6.

**Program Requirements**

**General Program Requirements:**

*Number of Credits Required Beyond the Baccalaureate:* 30

**Required Courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 5003</td>
<td>Professional Development Seminar ¹</td>
<td>1</td>
</tr>
<tr>
<td>MATH 5005</td>
<td>Ethics in Computing ²</td>
<td>2</td>
</tr>
<tr>
<td>MATH 5061</td>
<td>Fundamentals of Computer Programming for Scientists and Engineers</td>
<td>4</td>
</tr>
<tr>
<td>MATH 5062</td>
<td>High Performance Computer Programming for Scientific Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5063</td>
<td>Introduction to High-Performance Computing Technology for Scientists</td>
<td>4</td>
</tr>
<tr>
<td>MATH 5066</td>
<td>Mathematical Methods for High Performance Computing ³</td>
<td>3</td>
</tr>
<tr>
<td><strong>Electives</strong></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Select three from the following:³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 5411</td>
<td>Structural Bioinformatics I</td>
<td></td>
</tr>
<tr>
<td>CHEM 5301</td>
<td>Quantum Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 5302</td>
<td>Statistical Thermodynamics</td>
<td></td>
</tr>
<tr>
<td>CIS 5524</td>
<td>Analysis and Modeling of Social and Information Networks</td>
<td></td>
</tr>
<tr>
<td>CIS 5525</td>
<td>Neural Computation</td>
<td></td>
</tr>
<tr>
<td>CIS 5526</td>
<td>Machine Learning</td>
<td></td>
</tr>
<tr>
<td>CIS 9669</td>
<td>Distributed and Parallel Computer Systems</td>
<td></td>
</tr>
<tr>
<td>MATH 8013</td>
<td>Numerical Linear Algebra I</td>
<td></td>
</tr>
<tr>
<td>MATH 8014</td>
<td>Numerical Linear Algebra II</td>
<td></td>
</tr>
<tr>
<td>MATH 8023</td>
<td>Numerical Differential Equations I</td>
<td></td>
</tr>
<tr>
<td>MATH 8024</td>
<td>Numerical Differential Equations II</td>
<td></td>
</tr>
<tr>
<td>MATH 8107</td>
<td>Mathematical Modeling for Science, Engineering, and Industry</td>
<td></td>
</tr>
<tr>
<td>MATH 8700</td>
<td>Topics Computer Program</td>
<td></td>
</tr>
<tr>
<td>MATH 8710</td>
<td>Topics Computer Program</td>
<td></td>
</tr>
<tr>
<td>MATH 9200</td>
<td>Topics in Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 9210</td>
<td>Topics in Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>PHYS 5001</td>
<td>Introduction to Quantum Computing</td>
<td></td>
</tr>
<tr>
<td>PHYS 8102</td>
<td>Statistical Mechanics</td>
<td></td>
</tr>
</tbody>
</table>

**Capstone Course**
MATH 9995 Capstone Project 4

Total Credit Hours 30

1 BIOL 5506 Professional Development Seminar for PSM in Biotechnology serves as an approved alternative to MATH 5003.
2 BIOL 5511 Ethics in Bioinformatics serves as an approved alternative for MATH 5005.
3 Alternately, other elective courses may be taken at the 5000-level or above, as approved by the program director.
4 With approval from their academic advisor, students may complete capstone credits over multiple academic terms.

Culminating Event:

Capstone Research Project:
The capstone research project (MATH 9995) provides students with the opportunity to develop, apply, and demonstrate their skills in a professional high-performance computing environment. The project must be approved in advance by the P.S.M. Steering Committee and requires a supervisor from either the Temple faculty or the P.S.M. Scientific Advisory Committee. Students can undertake their research projects in whole or in part during student internships.

Contacts

Program Web Address:
https://www.temple.edu/academics/degree-programs/high-performance-computing-for-scientific-applications-psm-st-hpc-psm

Department Information:
Dept. of Mathematics
638 Wachman Hall
1805 N. Broad Street
Philadelphia, PA 19122-6094
cst.psm@temple.edu
215-204-7842

Submission Address for Application Materials:
https://cst.temple.edu/academics/graduate-programs/apply-now

Department Contacts:

Graduate Chairperson:
Yury Grabovsky, Ph.D.
grad.math@temple.edu
215-204-1650

Chairperson:
Irina Mitrea, Ph.D.
mathematics@temple.edu
215-204-4650