

COMPUTATIONAL AND DATA SCIENCES, BS

Banner Code: SC-BS-CDS

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The aim of this degree is to provide students with technical skills and knowledge for rigorously investigating physical and social phenomena. The BS is a transformative approach that integrates science at George Mason University based on the combination of real-world computer science skills, data acquisition and analysis, scientific modeling, applied mathematics, and simulation. As an interdisciplinary STEM-designated program, this degree addresses the current central role of computation in the areas of "big data," modeling, and simulation. Graduates of the program will possess the computational, scientific, and mathematical skills necessary for participating effectively as members of the scientific simulation and data analysis groups that are of increasing importance in the federal and public sectors, and in high technology firms. Additionally, graduates of the program will be well prepared to pursue graduate studies.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Undergraduate Admissions Policies (<http://catalog.gmu.edu/admissions/undergraduate-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/>).

Policies

Students must fulfill all Requirements for Bachelor's Degrees (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), including the Mason Core (<http://catalog.gmu.edu/mason-core/>).

The university's writing intensive requirement for the major will be met upon successful completion of CDS 302 Scientific Data and Databases.

For policies governing all undergraduate programs, see AP.5 Undergraduate Policies (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/>).

Requirements

Degree Requirements

Total credits: minimum 120

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

Core Required Courses

Code	Title	Credits
CDS 130	Computing for Scientists	3
CDS 151	Data Ethics in an Information Society (Mason Core) (http://catalog.gmu.edu/mason-core/)	1
CDS 230	Modeling and Simulation I	3
CDS 301	Scientific Information and Data Visualization	3
CDS 302	Scientific Data and Databases ¹	3
CDS 303	Scientific Data Mining	3
Total Credits		16

¹ Fulfills the writing intensive requirement.

Extended Core Courses

Code	Title	Credits
Select 18 credits from the following:		18
CDS 101 & CDS 102	Introduction to Computational and Data Sciences (Mason Core) (http://catalog.gmu.edu/mason-core/) and Introduction to Computational and Data Sciences Lab (Mason Core) (http://catalog.gmu.edu/mason-core/)	
CDS 201	Introduction to Computational Social Science	
CDS 205	Introduction to Agent-based Modeling and Simulation	
CDS 251	Introduction to Scientific Programming	
CDS 290	Topics in Computational and Data Sciences	
CDS 292	Introduction to Social Network Analysis (Mason Core) (http://catalog.gmu.edu/mason-core/)	
CDS 403	Machine Learning Applications in Science	
CDS 411	Modeling and Simulation II	
CDS 486	Topics in Computational and Data Sciences	
CSI 500	Computational Science Tools	
CSI 501	Introduction to Scientific Programming	
Total Credits		18

Mathematics Courses

Code	Title	Credits
Select 10-11 credits from the following:		10-11
MATH 113	Analytic Geometry and Calculus I (Mason Core) (http://catalog.gmu.edu/mason-core/)	
MATH 114	Analytic Geometry and Calculus II	
MATH 125	Discrete Mathematics I (Mason Core) (http://catalog.gmu.edu/mason-core/)	
MATH 203	Linear Algebra	

MATH 446	Numerical Analysis I	
Total Credits		10-11

Statistics Courses

Code	Title	Credits
Select 6 credits from the following:		
STAT 250	Introductory Statistics I (Mason Core) (http://catalog.gmu.edu/mason-core/)	6
STAT 350	Introductory Statistics II	
STAT 344	Probability and Statistics for Engineers and Scientists I	
STAT 346	Probability for Engineers	
Total Credits		6

Science and Engineering Courses

Code	Title	Credits
Select 6 credits from either one of the following:		
Additional Mason Core: Natural Science or Mason Core: Information Technology courses. (http://catalog.gmu.edu/mason-core/#information-technology)		
Any course offered by the College of Science or the Volgenau School of Engineering.		
Total Credits		6

Mason Core and Elective Credits

In order to meet a minimum of 120 credits, this degree requires an additional 63-64 credits, which may be applied toward any remaining Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements (outlined below), Requirements for Bachelor's Degrees (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), and elective courses. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

Elective Course Suggestions

Code	Title	Credits
CDS 410 or MATH 447	Numerical Analysis II	3
CDS 421	Computational Data Science	3
CDS 461	Molecular Dynamics and Monte Carlo Simulations	3
CDS 487	Electronic Structure Computations	3
CDS 490	Directed Study and Research	1-3
CDS 491	Internship	1-3
CDS 492	Capstone in Data Science (Mason Core) (http://catalog.gmu.edu/mason-core/)	3

Mason Core

Some Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements may already be fulfilled by the major requirements listed above. Students are strongly encouraged to consult their advisors to ensure they fulfill all remaining Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements.

Code	Title	Credits
Foundation Requirements		
Written Communication (ENGH 101) (http://catalog.gmu.edu/mason-core/#written)		3

Oral Communication (http://catalog.gmu.edu/mason-core/#oral)	3
Quantitative Reasoning (http://catalog.gmu.edu/mason-core/#quantitative)	3
Information Technology and Computing (http://catalog.gmu.edu/mason-core/#information-technology)	3
Exploration Requirements	
Arts (http://catalog.gmu.edu/mason-core/#arts)	3
Global Understanding (http://catalog.gmu.edu/mason-core/#global)	3
Literature (http://catalog.gmu.edu/mason-core/#literature)	3
Natural Science (http://catalog.gmu.edu/mason-core/#natural-science)	7
Social and Behavioral Sciences (http://catalog.gmu.edu/mason-core/#social-behavioral-science)	3
Western Civilization/World History (http://catalog.gmu.edu/mason-core/#western-civilization-world-history)	3
Integration Requirements	
Written Communications (ENGH 302) (http://catalog.gmu.edu/mason-core/#written)	3
Writing-Intensive (http://catalog.gmu.edu/mason-core/#wi) ¹	3
Synthesis/Capstone (http://catalog.gmu.edu/mason-core/#synthesis-capstone) ²	3
Total Credits	40

¹ Most programs include the writing-intensive course designated for the major as part of the major requirements; this course is therefore not counted towards the total required for Mason Core.

² Minimum 3 credits required.

Accelerated Master's

Computational and Data Sciences, BS/ Computational Science, Accelerated MS Overview

This option enables enthusiastic, highly qualified, undergraduates to obtain the Computational and Data Sciences, BS and the Computational Science, MS (<http://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-sciences-ms/>) within the accelerated time frame of five years. The program requires 144 credits total, allowing students to undertake graduate coursework during their final year in the bachelor's degree. Upon completion of this 144 credit BS/MS combined program, students are exceptionally well prepared for undertaking doctoral studies or entering the professional workforce.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>).

Application Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies (<http://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog¹. Application information for this Accelerated Master's program

can be found on the Department of Computational and Data Sciences (<http://cos.gmu.edu/cds/academic-programs/>) website. Applicants must have an overall undergraduate GPA of at least 3.00 and have completed at least 90 credits. Additionally, applicants will have completed the following courses with a GPA of 3.00 or better:

Code	Title	Credits
CDS 230	Modeling and Simulation I	3
CDS 205	Introduction to Agent-based Modeling and Simulation	3
or CDS 251	Introduction to Scientific Programming	
CDS 301	Scientific Information and Data Visualization	3
CDS 302	Scientific Data and Databases	3
CDS 303	Scientific Data Mining	3
CDS 411	Modeling and Simulation II	3
Select one from the following:		3
CDS 461	Molecular Dynamics and Monte Carlo Simulations	
CDS 490	Directed Study and Research	
CSI 500	Computational Science Tools	
Total Credits		21

Students must maintain an overall GPA of 3.00 or higher in graduate coursework and should consult with their faculty advisor to coordinate their academic goals within the modeling and simulation or data science emphases of the Computational Science, MS (<http://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-sciences-ms/>).

¹ GRE-general scores are waived for graduates of BS degrees from any program in the College of Science or the Volgenau School of Engineering at George Mason University.

Reserve Graduate Credit

While in undergraduate status, a student may take a maximum of six graduate credits as reserve graduate credits and apply those credits to a master's program. Reserve graduate credits are not counted toward the 120 credits required in the undergraduate degree.

Bachelor's Degree (selected), Bioinformatics Management, Accelerated PSM

Overview

This degree option allows highly qualified George Mason University bachelor's students to earn a Bioinformatics Management, PSM (<https://catalog.gmu.edu/colleges-schools/science/systems-biology/bioinformatics-management-professional-science-masters/>) degree in less time than if they had first graduated with a BS degree and then applied to the PSM program sequentially.

Admission and Processing Requirements

Students in the Biology, BS (<https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/>); Chemistry, BS (<https://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-bs/>); Computational and Data Sciences, BS ([<https://catalog.gmu.edu/colleges-schools/science/neuroscience-program/neuroscience-bs/>\); Neuroscience, BS \(<https://catalog.gmu.edu/colleges-schools/science/neuroscience-program/neuroscience-bs/>\); or Physics, BS \(<https://catalog.gmu.edu/colleges-schools/science/physics-astronomy/physics-bs/>\) with an overall GPA of at least 3.00 in their last 60 credits are welcome to apply to the Bioinformatics Management, PSM \(<https://catalog.gmu.edu/colleges-schools/science/systems-biology/bioinformatics-management-professional-science-masters/>\) accelerated master's program. Applicants to this accelerated master's should have previously taken courses in molecular biology, computer science, calculus, physical chemistry, and statistics. Students with deficiencies in one or more of these areas may be required to take additional courses from the undergraduate curriculum.](https://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-data-</p>
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The GRE requirement is waived for students accepted into this accelerated program.

By the beginning of the undergraduate student's senior year, they should submit a Graduate Application for Accelerated Master's Program form (obtained from the College of Science's Office of Academic and Student Affairs (<https://cos.gmu.edu/about/contact-us/>)).

By at least the beginning of their senior year, students should seek out the Bioinformatics Management, PSM (<https://catalog.gmu.edu/colleges-schools/science/systems-biology/bioinformatics-management-professional-science-masters/>) Program Director who will aid the student in choosing the appropriate graduate courses to take and help to prepare the student for graduate studies.

In their senior year, accelerated master's students must complete the two graduate courses indicated on their Accelerated Master's Program Application with a minimum grade of 3.00 in each course. They must maintain a minimum GPA of 3.00 in all coursework and in coursework applied to their major. In the semester specified on the application (around the completion and conferral of the undergraduate degree), students must submit the Bachelor's/Accelerated Master's Transition form (found on the Office of the University Registrar website (<http://registrar.gmu.edu/forms/>)) and will subsequently be admitted into graduate status.

Reserve Graduate Credits

Students admitted to this program may take graduate courses after completing 90 undergraduate credits, and up to 6 credits of appropriate graduate coursework may be used in partial satisfaction of the requirements for the undergraduate degree. If students earn at least a 3.00 GPA in these classes, they are granted advanced standing in the master's program and must then complete an additional 25 credits to receive the master's degree.

To apply these credits to the master's degree, students must request that the credits be moved from the undergraduate degree to the graduate degree using the Bachelor's/Accelerated Master's Transition form found on the Office of the University Registrar website (<http://registrar.gmu.edu/forms/>) (as noted above).

Students may take up to 6 additional approved graduate credits as reserve graduate credit. These credits do not apply to the undergraduate degree but will reduce the subsequent master's degree credits accordingly (e.g., with 6 credits counted towards undergraduate degree plus the maximum 6 reserve credits, the PSM could be completed with 19 post-bachelor's credits). The ability to take courses for reserve graduate credit is available to all high achieving undergraduates with the permission of the School of Systems Biology (<https://catalog.gmu.edu/colleges-schools/science/systems-biology/>).

Policies

For more detailed information on accelerated master's in general, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

For policies governing all graduate programs, see AP.6 Graduate Policies (<https://catalog.gmu.edu/policies/academic/graduate-policies/>).