BIOINFORMATICS MANAGEMENT, PROFESSIONAL SCIENCE MASTER'S

Banner Code: SC-MSP-BNFM

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This Professional Science Master's (https://www.professionalsciencemasters.org/) (PSM) degree addresses the growing demand for trained bioinformatics professionals with solid management skills able to assume leadership roles in biotechnology, pharmaceutical and health care sectors. The flexible degree structure allows students to custom design a curriculum that best suits their needs and allows a focus on the biological big data analysis, genomics, or bioinformatics software development and management. Students will receive advanced training in bioinformatics and management through coursework and an external internship. The curriculum was developed with active input from the Program Advisory Board consisting of recognized leaders in the field. Many courses are offered in a distance-learning format, allowing students to participate in class without having to travel to campus.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies (http://catalog.gmu.edu/admissions/graduate-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/).

Applicants should have a bachelor's degree in biology, computer science, or a related field from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent with a GPA of at least 3.00 in their last 60 credits of study. Applicants should have 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. To apply, prospective students should submit the George Mason University Admissions Application (https://www2.gmu.edu/admissions-aid/apply-now/), supply an official transcript from each college and graduate institution attended, a current résumé, two letters of recommendation, and an expanded goals statement. TOEFL or IELTS scores are required of all international applicants.

The GRE is not required for admission into this program.

Policies

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

Requirements

Degree Requirements

Total credits: 31

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

Due to the varied course options and their associated prerequisites, students are encouraged to create a program of study with their faculty advisor by the end of their first semester of studies.

Bioinformatics Courses

Code	Title	Credits
BINF 630	Bioinformatics Methods	3
BINF 631	Molecular Cell Biology for Bioinformatics	3
BINF 702	Biological Data Analysis	3
Select two from the following or other BINF-prefixed courses in consultation with the faculty advisor:		6
BINF 633	Molecular Biotechnology	
BINF 634	Bioinformatics Programming	
BINF 650	Introduction to Bioinformatics Database Design	
BINF 731	Protein Structure Analysis	
BINF 732	Genomics	
BINF 740	Introduction to Biophysics	
Total Credits		15

Professional Skills Courses

Please note: MBA-prefixed courses are offered on an alternative semester schedule (view the Schedule of Classes (https://patriotweb.gmu.edu/pls/prod/bwckschd.p_disp_dyn_sched/) for details). Considering this, it may be advisable to take these courses in one semester rather than over several.

Code	Title	Credits
BINF 705	Research Ethics	1
MBA 712	Project Management	3
Select one course from the following that hasn't previously been taken:		3
BIOL 508	Selected Topics in Animal Biology [1]	
COS 500	Professional Preparation for STEM Disciplines	
COS 600	Multidisciplinary Problem Solving and Leadership	
EVPP 638	Corporate Environmental Management and Policy	

AIT 671	Information System Infrastructure Lifecycle Management	
COMM 641	Advanced Communication Skills for STEM	
GBUS 613	Financial Reporting and Decision Making	
GBUS 623	Marketing Management	
GBUS 643	Managerial Finance	
GBUS 653	Organizational Behavior	
GBUS 738	Data Mining for Business Analytics	
or MBA 738	Data Mining for Business Analytics	
GCH 691	Project Management in Public Health	
HAP 713	Project Management in Health Information Technology	
MBA 712	Project Management	
MBA 726	Negotiations	
PUAD 781	Information Management: Technology and Policy	
SWE 625	Software Project Management	
Or other courses in consultation with the faculty advisor		
Total Credits		7

[1]

When the topic is Research & Development in Biotechnology Companies.

Scientific Electives

Close attention should be paid to each course's prerequisites.

Code	Title	Credits
Select 6 credits in courses that haven't previously been taken, tailored to suit interests and goals in consultation with the faculty advisor.		6
Big Data Analysis:		
CSI 695	Scientific Databases	
AIT 580	Analytics: Big Data to Information	
AIT 581	Problem Formation and Solving in Big Data	
AIT 622	Determining Needs for Complex Big Data Systems	
Synthetic and Systems Biology:		
BIOS 701	Systems Biology	
CHEM 665	Protein-Protein Interactions: Methods and Applications	
Human Health and Personal Genomics:		
BINF 732	Genomics	
BIOL 562	Personalized Medicine	
BIOL 566	Cancer Genomics	
BIOL 665	Environmental Hazards to Human Health	
BIOS 740	Laboratory Methods in Functional Genomics and Biotechnology	
BIOS 741	Genomics	
Software Development and Analysis:		
BINF 634	Bioinformatics Programming	
SWE 510	Object-Oriented Programming in Java	
SWE 619	Object-Oriented Software Specification and Construction	
SWE 621	Software Design and Architecture	

SWE 626	Software Project Laboratory	
SWE 637	Software Testing	
SWE 645	Component-Based Software Development	
SWE 760	Software Analysis and Design of Real-Time Systems	
Colloquium: [1]		
BINF 704	Colloquium in Bioinformatics (may be repeated for up to 3 credits)	
Additional Internship Experience [2]		
BINF 795	Bioinformatics Internship	
Total Credits		6

[1]

If chosen, it is recommended that students take the colloquium course early in their studies so that they may be exposed to various possibilities and areas of research presented by the speakers.

[2]

The maximum amount of internship credits that can be applied to the degree is 6 credits.

Internship

The internship component is intended to provide students with the opportunity to put into practice all of the skills and knowledge accumulated throughout their studies in this program. Students must arrange an internship with a private company, a governmental agency, a non-governmental organization, or some other entity with an interest in bioinformatics *and* management. Students must identify a specific person within that outside entity who will be the contact and manager of the internship.

Internship credit is never given for work previously done, or for work that would have been done in any case due to an existing employment relationship.

The internship work must produce one or more products such as: a comprehensive report, a departmental presentation, a research project, or an article. Internship placement and product type must be approved by the student's faculty advisor.

Further details and procedures for completing the internship can be found with the faculty advisor.

Code	Title	Credits
Three credits of internship		3
BINF 795	Bioinformatics Internship	
Total Credits		3

Accelerated Master's

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

This bachelor's/accelerated master's degree program allows academically strong undergraduates with a commitment to advance their education to obtain both the Biology, BS (https://catalog.gmu.edu/

colleges-schools/science/biology/biology-bs/), or the Chemistry, BS (http://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-bs/), or the Computational and Data Sciences, BS (https://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-data-sciences-bs/), or the Physics, BS (https://catalog.gmu.edu/colleges-schools/science/physics-astronomy/physics-bs/), or the Neuroscience, BS (https://catalog.gmu.edu/colleges-schools/science/neuroscience-program/neuroscience-bs/) and the Bioinformatics Management, PSM (https://catalog.gmu.edu/colleges-schools/science/systems-biology/bioinformatics-management-professional-science-masters/) degrees within an accelerated timeframe. Upon completion of this 138 credit accelerated program, students will be exceptionally well prepared for entry into their careers or into a doctoral program in the field or in a related discipline.

Students are eligible to apply for this accelerated program once they have earned at least 60 undergraduate credits and can enroll in up to 18 credits of graduate coursework after successfully completing 75 undergraduate credits. This flexibility makes it possible for students to complete a bachelor's and a master's in five years.

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/). For more information on undergraduates enrolling in graduate courses, see AP.1.4.4 Graduate Course Enrollment by Undergraduates (https://catalog.gmu.edu/policies/academic/registration-attendance/#text).

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 catalog.

Important application information and processes for this accelerated master's program can be found here (https://www2.gmu.edu/admissions-aid/how-apply/accelerated-masters/).

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/computational-data-sciences/computational-data-sciences-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 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.

The GRE requirement is waived for students accepted into this accelerated program.

Students should seek out the graduate program's advisor who will aid in choosing the appropriate graduate courses and help prepare the student for graduate studies.

Accelerated Option Requirements

After the completion of 75 undergraduate credits, students may complete 3 to 12 credits of graduate coursework that can apply to both the undergraduate and graduate degrees.

In addition to applying to graduate from the undergraduate program, students in the accelerated program must submit a bachelor's/accelerated master's transition form (available from the Office of the University Registrar (https://registrar.gmu.edu/forms/)) to the College of Science's Office of Academic and Student Affairs (https://cos.gmu.edu/about/contact-us/) by the last day to add classes of their final undergraduate semester. Students should enroll for courses in the master's program in the fall or spring semester immediately following conferral of the bachelor's degree, but should contact an advisor if they would like to defer up to one semester.

Students must maintain an overall GPA of 3.00 or higher in all graduate coursework and should consult with their faculty advisor to coordinate their academic goals.

Reserve Graduate Credits

Accelerated master's students may also take up to 6 graduate credits as reserve graduate credits. These credits do not apply to the undergraduate degree, but will reduce the master's degree by up to 6 credits. With 12 graduate credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve graduate credits, the credits necessary for the graduate degree can be reduced by up to 18.

Graduate Course Suggestions

The following list of suggested courses is provided for general reference. To ensure an efficient route to graduation and post-graduation readiness, students are strongly encouraged to meet with an advisor before registering for graduate-level courses.

Code	Title	Credits
BINF 630	Bioinformatics Methods	3
BINF 631	Molecular Cell Biology for Bioinformatics	3
GBUS 623	Marketing Management	3
GBUS 643	Managerial Finance	3
GBUS 738	Data Mining for Business Analytics	3