STATISTICAL SCIENCE, MS

Banner Code: EC-MS-STAT

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Statistical science is regarded as one of the oldest and most successful information technology (IT) subjects. It focuses on the conversion of raw data into information. In this graduate program, students are trained in the theory and practice of statistical methodology, particularly as it relates to high-technology applications.

Students that aim to pursue a career in data science have the option to select the concentration in Statistical Data Science.

Admissions & Policies

Admissions

In addition to satisfying general admission requirements for graduate study, all applicants are expected to have basic computer literacy. They must hold a bachelor's degree from an accredited institution in a field that includes one year coursework in calculus, and one semester coursework in matrix or linear algebra. Applicants with degrees in such fields as mathematics, statistics, and some engineering programs usually meet these requirements. For applicants with degrees in other fields, these requirements are normally satisfied if students have successfully completed courses equivalent to the listed Mason courses.

Note that coursework taken to correct deficiencies in undergraduate preparation are not counted toward the degree.

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 203	Linear Algebra	3
Or MATH 321 Abstract Algebra		

The general admissions requirements also apply to the Statistical Data Science Concentration.

Specific application deadlines and requirements (https://admissions.gmu.edu/grad/application-deadlines-and-requirements/?academicUnit=VS&_ga=1.107632321.273102085.1480697294) are available through the Office of Graduate Admissions.

Requirements

Degree Requirements

Total credits: 30

Degree Requirement

In addition to meeting general requirements that apply to master's degrees at Mason, all students must complete the 15-credit core requirements for the degree. Grades of B- or better are required in three of the core courses: STAT 544 Applied Probability, STAT 554 Applied Statistics I and STAT 654 Applied Statistics II. Students build on these core requirements by choosing 9 credits of methodology courses and 6 credits of electives.

Students select either the professional or research option, depending on career ambitions. The professional option provides MS degree qualifications to those seeking an expanded knowledge base in modern statistical theory and practice but do not wish to pursue a research career. The research option is for students planning to continue with a PhD degree, or begin/continue careers in statistical methodology research.

Professional Option

The professional option focuses on completing coursework in modern statistical theory and practice. 30 credits are required for the degree: 15 credits of core courses (taken by all MS students), 9 credits of methodology courses, and 6 credits of electives.

Students who select the professional option may elect to complete a master's research project resulting in a technical report. This report is not an original research report but a scholarly essay on a topic of current interest in the statistical science discipline. The technical report is usually about 20 to 25 pages long and demonstrates the student's ability to read and synthesize current technical literature into a scholarly essay. The report is evaluated by the student's advisor, taking into account the comprehensiveness of the coverage of the scientific literature, the accuracy of presentation and interpretation, and the literary style. Students are notified of their evaluations, and they may be required to revise their report to further develop their skills in preparing reports on technical subjects. The report is usually written in the context of 3 credits of STAT 798 Master's Research Project, which count as elective credits. Students opting not to complete a research project must take 30 credits of coursework.

Research Option

The research option requires 30 credits, including 6 credits that must be in independent research (thesis). Research is done with approval under the guidance of a faculty member. Research may be carried out at Mason or, if appropriate, at nearby facilities. For example, students may pursue research at their place of employment on topics of interest to their employer, provided the research meets the standards of the university. The thesis is usually written in the context of 6 credits of STAT 799 Master's Thesis, which count as elective credits. The remaining 24 credits include the 15 core credits and 9 methodology credits.

In addition to satisfying general university requirements for a master's degree, candidates who select the research option must submit a thesis based on the research to the student's thesis committee, which must give preliminary approval. The composition and appointment of this committee follows graduate program policies.

Candidates also must pass a final oral exam that concentrates on, but is not limited to, the area on which the thesis is written. The exam is administered by the student's thesis committee, and all interested members of the graduate faculty are invited to attend and participate in the questioning. The thesis committee makes the final decision on whether the candidate passes or fails.

Core Courses

The core coursework covers the basic elements of statistics at the graduate level. STAT 544 Applied Probability covers the major mathematical framework for statistical theory and practice. STAT 652 Statistical Inference provides basic statistical theory. After completing this course, students have the theoretical basis from which statistical methods are derived.

STAT 554 Applied Statistics I is a survey of statistical methods that have become the backbone of statistical practice. Focus in this course is on techniques that quantify random behavior. STAT 654 Applied Statistics II, provides an overview of principles of statistical modeling.

The final core course is STAT 634 Case Studies in Data Analysis, which is a writing intensive course that serves as a capstone experience. Students synthesize methods and ideas acquired in their coursework in a statistical consulting environment.

Code	Title	Credits
STAT 544	Applied Probability	3
STAT 554	Applied Statistics I	3
STAT 634	Case Studies in Data Analysis	3
STAT 652	Statistical Inference	3
STAT 654	Applied Statistics II	3
Total Credits		15

Methodology Courses

Code	Title	Credits
Methodology courses may be chosen from any STAT courses numbered 540-778 (http://catalog.gmu.edu/courses/stat/)		9

Electives

Code	Title	Credits
Select 6 credits of electives from the following:		6
STAT 500	Special Topics	
STAT 515	Applied Statistics and Visualization for Analytics	
STAT 517	Experimental Design	
STAT 540 - 799 (http://catalog.gmu.edu/courses/stat/)		
ECE 535	Digital Signal Processing	
ECE 630	Principles of Digital Communications	
ECON 637	Econometrics I	
MATH 551	Regression and Time Series	
MATH 553	Advanced Mathematical Statistics in Actuarial Sciences	
MATH 555	Actuarial Modeling I	
MATH 556	Actuarial Modeling II	
MATH 653	Construction and Evaluation of Actuarial Models I	
MATH 654	Construction and Evaluation of Actuarial Models II	
OR 531	Introduction to Analytics and Modeling	
OR 541	Operations Research: Deterministic Models	
OR 542	Operations Research: Stochastic Models	
OR 645	Stochastic Processes	
OR 647	Queuing Theory	
OR 675	Reliability Analysis	
or SYST 675	Reliability Analysis	
OR 719	Graphical Models for Inference and Decision Making	
or CSI 775	Graphical Models for Inference and Decision Making	
SYST 664	Bayesian Inference and Decision Theory	
or CSI 674	Bayesian Inference and Decision Theory	
Total Credits		6

Notes:

- Credit toward the MS in Statistical Science will not be given for both STAT 515 Applied Statistics and Visualization for Analytics and STAT 663 Statistical Graphics and Data Visualization .
- Credit toward the MS in Statistical Science will not be given for both MATH 654 Construction and Evaluation of Actuarial Models II and STAT 668 Survival Analysis.
- A student concurrently enrolled in the Actuarial Sciences Graduate Certificate (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/actuarial-sciences-graduate-certificate/) and the MS in Statistical Science may count MATH 551 Regression and Time Series and MATH 553 Advanced Mathematical Statistics in Actuarial Sciences as elective courses and may count MATH 555 Actuarial Modeling I and MATH 653 Construction and Evaluation of Actuarial Models I as methodology courses. The Graduate Certificate in Actuarial Sciences must be completed prior to or concurrently with the MS in Statistical Science. Otherwise, at most two of MATH 551 Regression and Time Series, MATH 553 Advanced Mathematical Statistics in Actuarial Sciences, MATH 555 Actuarial Modeling I, and MATH 653 Construction and Evaluation of Actuarial Models I can be counted toward the MS in Statistical Science as elective courses; none can be applied as methodology courses.

Statistical Data Science Concentration (SDSC)

The Statistical Data Science concentration prepares students for making contributions in statistical data science for positions in industry and government. In addition to the five common MS core courses, the students in the Statistical Data Science Concentration must take five courses from the following categories: three 3-credit required concentration courses, and two 3-credit elective courses.

Code	Title	Credits
STAT 572	Applied Statistical Learning	3
STAT 663	Statistical Graphics and Data Visualization	3
STAT 778	Statistical Computing	3
Two 3-credit elective courses [1]		6
Total Credits		15

[1]

These courses can come from any courses numbered: STAT 500, STAT 517, and STAT 540-778 (http://catalog.gmu.edu/courses/stat/). The electives can also include courses offered by other departments, including CS 504 Principles of Data Management and Mining, INFS 580 Analytics: Big Data to Information , and, subject to prior approval from the Department of Statistics, other graduate level courses offered by other departments.

Dual Degree Options

Mathematics and Statistical Science Dual-Degree MS

This program allows students to earn an MS in Mathematics (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ms/) and an MS in (http://catalog.gmu.edu/colleges-schools/engineering/statistics/statistical-science-ms/)Statistical Science by completing 48 credits of coursework in both areas instead of the 60 that would be required if the degrees were sought independently.

Admission Requirements

Applicants must satisfy admission requirements for both the MS in Mathematics (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ms/) and the MS in Statistical Science programs. A joint faculty committee from the Department of Mathematical Sciences (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/) and the Department of Statistics (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/) make final admission decisions into the dual-degree program.

MS-MATH/STAT Dual-Degree Requirements

Total credits: 48

Code	Title	Credits
MATH 621	Algebra I	3
MATH 675	Linear Analysis	3
MATH 677	Ordinary Differential Equations	3
or MATH 678	Partial Differential Equations	
MATH 685	Numerical Analysis	3
STAT 544	Applied Probability	3
STAT 554	Applied Statistics I	3
STAT 634	Case Studies in Data Analysis	3
STAT 652	Statistical Inference	3
STAT 654	Applied Statistics II	3
Total Credits		27

Electives

Code	Title	Credits
Select 12 elective credits in MATH courses numbered 615 or higher (http://catalog.gmu.edu/courses/math/) [1]		12
Select any STAT courses numbered 540-775 (http://catalog.gmu.edu/courses/stat/)		9
Total Credits		21

[1]

Excluding MATH 653 Construction and Evaluation of Actuarial Models I, MATH 654 Construction and Evaluation of Actuarial Models II, MATH 655 Pension Valuation, and MATH 799 MS Thesis

Notes:

- Students in either the BS/Accelerated MS in Mathematics (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ms/#acceleratedmasterstext) program or the BS(selected)/Accelerated MS in Statistical Science program cannot get a reduction of 6 credits toward this dual degree. Students

who want to proceed to a PhD degree will only be able to waive the number of credits specified in the associated PhD degree requirements, even though they will have 48 credits at the MS level.

- If a student decides not to complete the required 48 credits, a single MS degree will not be granted unless the student fulfills the requirements for either the MS in Mathematics (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ms/) or the MS in Statistical Science.

- Once a student receives one of the MS degrees from either department, the student will no longer be eligible for the reduction in credit (i.e., will need to complete 30 credits) if the student later decides to earn the other MS degree.

Operations Research and Statistical Science Dual-Degree MS

This program allows students to earn an MS in Operations Research (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) and an MS in Statistical Science by completing 48 credits of coursework in both areas instead of the 60 that would be required if the degrees were sought independently.

Admission Requirements

Applicants must satisfy admission requirements for the MS in Operations Research (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) Program and the MS in Statistical Science Program. A joint faculty committee from the Statistics and Systems Engineering and Operations Research Departments make final admission decisions into the dual-degree program.

MS-OPRS/STAT Dual Degree Requirements

Total credits: 48

Required Courses

Code	Title	Credits
OR 541	Operations Research: Deterministic Models	3
OR 542	Operations Research: Stochastic Models	3
OR 635	Discrete System Simulation	3
OR 699	Masters Project	3
STAT 544	Applied Probability	3
STAT 554	Applied Statistics I	3
STAT 634	Case Studies in Data Analysis	3
STAT 652	Statistical Inference	3
STAT 654	Applied Statistics II	3
Total Credits		27

Elective Credits in OR Courses

Code	Title	Credits
Select 12 elective credits in OR courses at the 600 level, including at least one deterministic methods course and at least one stochastic methods course:		12
Deterministic Methods Courses:		
OR 641	Linear Programming	
OR 642	Integer Programming	
OR 643	Network Modeling	

OR 644	Nonlinear Programming	
OR 670	Metaheuristics for Optimization	
Stochastic Methods Courses:		
OR 645	Stochastic Processes	
OR 646	Stochastic Optimization	
OR 647	Queuing Theory	
OR 674	Dynamic Programming	
OR 675	Reliability Analysis	
SYST 664	Bayesian Inference and Decision Theory	
Total Credits		12

Elective Credits in STAT Courses

Code	Title	Credits
Select 9 elective credits from any STAT courses numbered 540-775		9
Total Credits		9

Notes

- Students currently enrolled in one of the MS programs must declare pursuit of the dual MS within one year of matriculation into the first MS program.
- A maximum of 6 credits across the two disciplines may be in independent research (thesis). The requirements for independent research are the same as detailed for the associated MS program.
- Students in either the BS (selected)/Operations Research, Accelerated MS program (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/#acceleratedmasterstext) or the BS (selected)/Statistical Science, Accelerated MS program cannot get a reduction of 6 credits toward this dual degree. Students who want to proceed to a PhD degree will only be able to waive the number of credits specified in the associated PhD degree requirements, even though they will have 48 credits at the MS level.
- If a student decides not to complete the required 48 credits, a single MS degree will not be granted unless the student fulfills the requirements for the MS in Operations Research (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) or the MS in Statistical Science.
- Once a student receives one of the MS degrees from either department, the student will no longer be eligible for the reduction in credit (i.e., will need to complete 30 credits) if the student later decides to earn the other MS degree.

Accelerated Master's

BS (any)/Statistical Science, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program (BAM) and obtain an undergraduate BS degree and the Statistical Science, MS in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

No specific undergraduate BS degree is required. Students enrolled in any BS degree may apply to the accelerated Statistical Science, MS program **if such an accelerated** Statistical Science, MS **pathway is allowable from the student's BS program, which will be determined by the academic advisors of both the BS and MS programs.**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of 3.0.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific prerequisites.

Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the Statistical Science, MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- Completion of Mason's requirements for undergraduate degree conferral (graduation) and completion of application for graduation.
- An overall GPA of 3.00.
- Completion of the following Mason courses each with a grade of C or better:

Code	Title	Credits
MATH 213	Analytic Geometry and Calculus III	3
MATH 203	Linear Algebra	3
or MATH 321	Abstract Algebra	
STAT 250	Introductory Statistics I (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
or STAT 344	Probability and Statistics for Engineers and Scientists I	
STAT 346	Probability for Engineers	3
or MATH 351	Probability	
STAT 362	Introduction to Computer Statistical Packages	3

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, students complete all credits satisfying degree requirements for the BS and MS programs, with up to twelve credits overlap chosen from the following graduate courses:

Code	Title	Credits
STAT 544	Applied Probability	3
STAT 554	Applied Statistics I	3
STAT 560	Biostatistical Methods	3
STAT 574	Survey Sampling I	3
STAT 663	Statistical Graphics and Data Visualization	3

All graduate course prerequisites must be completed prior to enrollment. Each graduate course must be completed with a grade of B or better to apply toward the MS degree.

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master's program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) policies.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and Graduate Recruitment and Enrollment Services. At the completion of MS requirements, a master's degree is conferred.

Statistics, BS/Statistical Science, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program (BAM) and obtain the Statistics, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/statistics-bs/) and the Statistical Science, MS in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of 3.0.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific prerequisites.

Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the Statistical Science, MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- Completion of Mason's requirements for undergraduate degree conferral (graduation) and completion of application for graduation.
- An overall GPA of 3.00,
- Completion of the following Mason courses each with a grade of C or better:

Code	Title	Credits
MATH 114	Analytic Geometry and Calculus II	4
MATH 203	Linear Algebra	3
STAT 334	Introduction to Probability Models and Simulation	3
or STAT 346	Probability for Engineers	
STAT 354	Probability and Statistics for Engineers and Scientists II	3
or STAT 360	Introduction to Statistical Practice II	
STAT 362	Introduction to Computer Statistical Packages	3

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, students complete all credits that satisfy requirements for the BS and MS programs, with up to twelve credits overlap chosen from the following graduate courses:

Code	Title	Credits
STAT 544	Applied Probability [1]	3
STAT 554	Applied Statistics I [1]	3
STAT 560	Biostatistical Methods [2]	3
STAT 574	Survey Sampling I [3]	3
STAT 663	Statistical Graphics and Data Exploration I [1]	3

[1] May be counted as a Technical Elective towards the BS program requirements.

[2] Replaces the corresponding undergraduate version STAT 460 as a Statistical Elective. Credit may not be received for both STAT 460 and STAT 560.

[3] Replaces the corresponding undergraduate version STAT 474 as a Statistical Elective. Credit may not be received for both STAT 474 and STAT 574.

All graduate course prerequisites must be completed prior to enrollment. Each graduate course must be completed with a grade of B or better to apply toward the MS degree.

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the

master's program. These can be chosen from STAT 500-519 and STAT 540-799. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) policies.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions and Enrollment Services. At the completion of MS requirements, a master's degree is conferred.