MEDICAL LABORATORY SCIENCE, BS

Banner Code: SC-BS-MLAB

Academic Advising

1200 Exploratory Hall
Fairfax Campus

Website: https://science.gmu.edu/academics/departments-units/biology/medical-laboratory-science-bs

The BS in Medical Laboratory Science prepares students for careers in hospitals and clinics as well as in biotechnology and industrial laboratories. Medical Laboratory Science (MLS) is a profession of highly knowledgeable and skilled individuals who perform clinical laboratory tests on blood, other body fluids, or tissue samples. This is a critical part of health care, as the results obtained by these laboratory tests are vital tools for physicians in the diagnosis, treatment, and prevention of disease.

People trained as medical laboratory scientists may work in a variety of settings. Many work in clinical laboratories in large medical centers, hospitals, or clinics. Some do research in industrial, public health, or medical laboratories. Others teach in hospitals, colleges, or universities. An MLS may practice as a generalist, using knowledge in several of the scientific disciplines, or may specialize in one scientific area in larger hospitals. A successful MLS is an individual who enjoys studying the biological, chemical, and physical sciences. He or she may also find personal satisfaction and intellectual reward in applying scientific methods to the diagnosis and evaluation of disease.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Undergraduate Admissions Policies (https://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 (https://catalog.gmu.edu/policies/academic/undergraduate-policies/#text) including the Mason Core (https://catalog.gmu.edu/mason-core/)[1].

MLAB 300 Science Writing (Mason Core) (https://catalog.gmu.edu/mason-core/) fulfills this major's writing intensive requirement.

Important information and departmental policies are available with the Department of Biology (https://catalog.gmu.edu/colleges-schools/science/biology/#requirementspoliciestext).

This program requires the equivalent of three years of full-time pre-professional study at the college level preceding a senior year of professional education in an affiliated program of medical laboratory science. Affiliated schools (see below) are accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) (http://www.naacls.org/Home.aspx).

[1] Note: Because of the extensive pre-professional education requirements stipulated by NAACLS, students majoring in medical laboratory science are exempt from the Mason Core 'Arts' requirement.

Important Program Requirements

- Students must complete MLAB 200 Introduction to Medical Laboratory Science and present their biology coursework and supporting requirements with a minimum GPA of 2.00.
- A grade of 'C' or better must be earned in both BIOL 213 Cell Structure and Function and BIOL 215 Cell Structure and Function Laboratory in order to advance to other major requirements. Students may repeat BIOL 213 Cell Structure and Function and BIOL 215 Cell Structure and Function Laboratory once and a second time only with permission of the Department of Biology.
- Medical laboratory science majors must earn a minimum of 'C' in all biology core courses.

Major in Medical Laboratory Science as a Second Bachelor's Degree

While the standard program for medical laboratory sciences is three years on campus followed by a fourth year at a clinical affiliate (3+1), many students elect to complete a bachelor's degree before entering the clinical program (4+1). Students who have completed the Biology, BS (https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/) or Chemistry, BS (https://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-bs/) at Mason and then undertake a fifth year at a clinical affiliate may be eligible for a second bachelor's degree with a major in medical laboratory science. Students wishing to receive the second degree must apply before entering their fifth year. For further information, contact a laboratory sciences advisor.

Applying to Medical Laboratory Sciences Schools

Responsibility for applying to schools of medical laboratory sciences and gaining admission rests with the student; however, guidance is provided by the medical laboratory sciences program director. Admission to medical laboratory sciences schools is selective, so candidates should strive for strong academic standing (2.5 science GPA or higher). Students who fail to gain admission to a NAACLS-approved school are unable to complete this degree program. Such students may transfer to Biology, BA (https://catalog.gmu.edu/colleges-schools/science/biology/biology-ba/) or the Biology, BS (https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/) without loss of credits.

Application to medical laboratory sciences schools should be initiated about a year before the desired entrance date. This fact, coupled with the large number of required courses in the

pre-professional curriculum, makes it imperative that students in the program consult regularly with their faculty advisor. All medical laboratory sciences majors and prospective majors are urged to enroll in MLAB 200 Introduction to Medical Laboratory Science as early as possible. This course provides information on the profession, as well as the educational demands placed on candidates.

Senior Year

Students should be aware that the senior year spent off campus requires the following special interpretation of university policies:

- Students may present no more than 6 credits of 'D' grades in biology and chemistry courses required in three years of pre-professional study.
- No unsatisfactory grades (less than 'C') may be presented for courses in the senior year of professional study.
- Transfer students must present at least 16 credits of 300 to 400-level biology or chemistry coursework taken at Mason.
- Transfer students entering with more than 45 transfer credits are often unable to complete the pre-professional phase of their program in the usual three years of full-time study.

Senior students are registered at the university through special procedures. For details, consult the program director.

Affiliated NAACLS-Approved Schools

This program requires the equivalent of three years of full time professional study at the college level preceding a senior year of professional education in an affiliated school of medical laboratory sciences. All affiliated schools are accredited by the NAACLS:

- Augusta Health- School of Clinical Laboratory Science (https://www.augustahealth.com/cls)
- George Washington University- School of Medicine and Health Sciences: The Medical Laboratory Sciences Program (http://smhs.gwu.edu/medical-laboratory-sciences/)
- INOVA Fairfax Hospital- Medical Laboratory Science Program (https://www.inova.org/education/medical-laboratory-science)
- Sentara Rockingham Memorial Hospital- School of Medical Laboratory Science (https://www.sentara.com/hospitalslocations/school-of-medical-laboratory-science)

Requirements

Degree Requirements

Total credits: minimum 120

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

Students must complete the requirements outlined below, choosing one Professional Study/Concentration option:

- Not choosing a concentration ("Professional Study: Generalist Option") will provide students generalist training. Upon graduation, the board certification test may be taken and would allow graduates to practice in any area of a hospital or laboratory.
- Choosing a concentration will allow students to complete their clinical rotations in that specific area. Upon graduation, the Molecular Biology or Microbiology (depending upon the concentration chosen) board certification test may be taken.

Biology Core

Code	Title	Credits
BIOL 103 & BIOL 105	Introductory Biology II-Survey of Cell and Molecular Biology (Mason Core) (https://catalog.gmu.edu/mason-core/) and Introductory Biology II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
BIOL 213 & BIOL 215	Cell Structure and Function and Cell Structure and Function Laboratory	4
BIOL 214	Biostatistics for Biology Majors	4
BIOL 311 & BIOL 313	General Genetics and General Genetics Laboratory	4
Total Credits		**16**

Additional MLAB and BIOL Courses

Code	Title	Credits
MLAB 200	Introduction to Medical Laboratory Science	1
MLAB 300	Science Writing (Mason Core) (https://catalog.gmu.edu/mason-core/) [1]	3
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	4
BIOL 452 & BIOL 453	Immunology and Immunology Laboratory	4
Select two from the following:		5-8
BIOL 430	Advanced Human Anatomy and Physiology I [2]	
BIOL 431	Advanced Human Anatomy and Physiology II [2]	
BIOL 322	Developmental Biology	
BIOL 382	Introduction to Virology	
BIOL 385	Biotechnology and Genetic Engineering	
BIOL 404	Medical Microbiology	
BIOL 409	Medical Mycology	
BIOL 413	Histotechniques	
BIOL 420	Vaccines	
BIOL 424	Female Reproductive Biology Health	
BIOL 425	Human Physiology	
BIOL 429	Biological Foundations of Pharmacology	
BIOL 432	Clinical Applications in Human Physiology	
BIOL 465	Histology	
BIOL 484	Cell Signaling and Disease	

BIOL 486	Molecular Biology and Biotechnology Laboratory	
Total Credits		**17-20**

[1] Fulfills writing intensive requirement.
[2] These courses are highly recommended for fulfilling this requirement.

Chemistry

Code	Title	Credits
CHEM 211 & CHEM 213	General Chemistry I (Mason Core) (https://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
CHEM 212 & CHEM 214	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
CHEM 313	Organic Chemistry I	3
CHEM 315	Organic Chemistry Lab I	2
Select one from the following:		4-5
BIOL 483	General Biochemistry	
CHEM 314 & CHEM 318	Organic Chemistry II and Organic Chemistry Lab II	
Total Credits		**17-18**

Mathematics

Code	Title	Credits
Select one from the following:		4-6
MATH 111	Linear Mathematical Modeling (Mason Core) (https://catalog.gmu.edu/mason-core/)	
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
MATH 123 & MATH 124	Calculus with Algebra/Trigonometry, Part A and Calculus with Algebra/Trigonometry, Part B (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Total Credits		**4-6**

Information Technology and Computing

Code	Title	Credits
Select one from the following:		3
CDS 130	Computing for Scientists (Mason Core) (https://catalog.gmu.edu/mason-core/) [1]	
Any course(s) that fulfill the Mason Core: Information Technology and Computing Requirement (https://catalog.gmu.edu/mason-core/#information-technology)		
Total Credits		**3**

[1] Recommended course for this major

Professional Study: Generalist Option

Senior students are registered at the university through special procedures. For details, consult the medical laboratory science program director.

The senior year spent off campus requires the following special interpretation of university policies:

- Transfer students must present at least 16 credits of 300 to 400-level biology or chemistry coursework taken at Mason.
- No unsatisfactory grades (less than 'C') may be presented for courses in the senior year of professional study.
- Transfer students entering with more than 45 transfer credits are often unable to complete the pre-professional phase of their program in the usual three years of full-time study.

Students may have up to 30 credits of professional study during the senior year awarded for clinical education at an affiliated school of medical technology. No more than 30 professional credits may be applied toward the degree.

Code	Title	Credits
The distribution of credits in these courses varies with the school of medical technology. In consultation with the advisor, select from the following:		30
MLAB 401	Orientation to the Problems and Practices of the Clinical Laboratory	
MLAB 402	Clinical Hematology and Coagulation	
MLAB 403	Clinical Microscopy	
MLAB 404	Serology and Immunohematology	
MLAB 405	Clinical Microbiology	
MLAB 406	Clinical Chemistry	
MLAB 407	Clinical Molecular Biology	
Total Credits		**30**

Notes:

Students are encouraged to elect additional basic science courses during their pre-professional years. Recommended courses include:

Code	Title	Credits
BIOL 465	Histology	4
BIOL 483	General Biochemistry	4
BIOL 484	Cell Signaling and Disease	3
BIOL 485	Cell Signaling Laboratory	2-3
CHEM 321	Quantitative Chemical Analysis	4
PHYS 243	College Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	3

PHYS 244	College Physics I Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
PHYS 245	College Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 246	College Physics II Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	1

Professional Study: Molecular Biology Concentration (MOB)

Senior students are registered at the university through special procedures. For details, consult the medical laboratory science program director.

The senior year spent off campus requires the following special interpretation of university policies:

- Transfer students must present at least 16 credits of 300 to 400-level biology or chemistry coursework taken at Mason.
- No unsatisfactory grades (less than 'C') may be presented for courses in the senior year of professional study.
- Transfer students entering with more than 45 transfer credits are often unable to complete the pre-professional phase of their program in the usual three years of full-time study.

Students may have up to 30 credits of professional study during the senior year awarded for clinical education at an affiliated school of medical technology. No more than 30 professional credits may be applied toward the degree.

This concentration is a pathway leading to eligibility for categorical certification as a Certified Technologist by the American Society for Clinical Pathology (ASCP) (https://www.ascp.org/content) Board of Certification (BOC) (https://www.ascp.org/content/board-of-certification). The concentration is one year long, consisting of about 20% classroom and 80% hands-on laboratory experience.

Code	Title	Credits
In addition to the courses required for all Medical Laboratory Science students, the following are required:		30
MLAB 401	Orientation to the Problems and Practices of the Clinical Laboratory	
MLAB 407	Clinical Molecular Biology	
Total Credits		**30**

Notes:

Students are encouraged to elect additional basic science courses during their pre-professional years. Recommended courses include:

Code	Title	Credits
BIOL 465	Histology	4
BIOL 483	General Biochemistry	4
BIOL 484	Cell Signaling and Disease	3
BIOL 485	Cell Signaling Laboratory	2-3
CHEM 321	Quantitative Chemical Analysis	4
PHYS 243	College Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 244	College Physics I Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
PHYS 245	College Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 246	College Physics II Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	1

Professional Study: Microbiology Concentration (MIB)

Senior students are registered at the university through special procedures. For details, consult the medical laboratory science program director.

The senior year spent off campus requires the following special interpretation of university policies:

- Transfer students must present at least 16 credits of 300 to 400-level biology or chemistry coursework taken at Mason.
- No unsatisfactory grades (less than 'C') may be presented for courses in the senior year of professional study.
- Transfer students entering with more than 45 transfer credits are often unable to complete the pre-professional phase of their program in the usual three years of full-time study.

Students may have up to 30 credits of professional study during the senior year awarded for clinical education at an affiliated school of medical technology. No more than 30 professional credits may be applied toward the degree.

This concentration is a pathway leading to eligibility for categorical certification as a Certified Technologist by the American Society for Clinical Pathology (ASCP) (https://www.ascp.org/content) Board of Certification (BOC) (https://www.ascp.org/content/board-of-certification). The concentration is one year long, consisting of about 20% classroom and 80% hands-on laboratory experience.

Code	Title	Credits
In addition to the courses required for all Medical Laboratory Science students, the following are required:		30
MLAB 401	Orientation to the Problems and Practices of the Clinical Laboratory	
MLAB 405	Clinical Microbiology	
Total Credits		**30**

Notes:

Students are encouraged to elect additional basic science courses during their pre-professional years. Recommended courses include:

Code	Title	Credits
BIOL 465	Histology	4
BIOL 483	General Biochemistry	4
BIOL 484	Cell Signaling and Disease	3

BIOL 485	Cell Signaling Laboratory	2-3
CHEM 321	Quantitative Chemical Analysis	4
PHYS 243	College Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 244	College Physics I Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
PHYS 245	College Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 246	College Physics II Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	1

Professional Study: Histotechnology Concentration (HISO)

Code	Title	Credits
In addition to the courses required for all Medical Laboratory Science students, the following are required:		30
MLAB 401	Orientation to the Problems and Practices of the Clinical Laboratory	
MLAB 408	Clinical Histology	
MLAB 409	Clinical Histology Practicum	
Total Credits		**30**

MLAB 401 Topics

The following topics will be covered under MLAB 401 Orientation to the Problems and Practices of the Clinical Laboratory:

1. Introduction to CLS and Laboratory Operations

This course is a brief introduction to the Clinical Laboratory Science professions and Laboratory Operations. Topics include: Introduction to Laboratory Operations, Pre-analytics and Specimen Types, Quality Management Concepts, Quality Control, Laboratory Professions, Professional Ethics, Laboratory Mathematics, Proper use of Laboratory Equipment, Introduction to Laboratory Instrumentation.

2. Board Exam Preparation

This course is a structured review and practice in preparation for the American Society for Clinical Pathology (https://www.ascp.org/) Technologist in Molecular Biology Board of Certification Exam. Practice tests and questions from a variety of published and authoritative sources are used to reinforce the content of the Technologist in Molecular Biology program.

MLAB 405 Topics

The following topics are covered under MLAB 405 Clinical Microbiology:

1. Introduction to Clinical Microbiology

This course is a brief introduction to the discipline of Clinical Microbiology, and laboratory diagnostic techniques. Topics include: Overview of Microbiology Theory, Methods and Applications, Instrumentation, Staining, and Media, Immunology, Serology, and Molecular Diagnostics.

2. Medical Virology

This course is a survey of the characteristics, pathogenicity, and laboratory diagnosis of important human viruses. Topics include viral taxonomy and classical virology. Special emphasis is placed on the epidemiology and the laboratory's role in influenza pandemics.

3. Medical Mycology

This course is a comprehensive presentation of medically important fungi. Emphasis is placed on clinical presentation and laboratory identification of pathogenic species and opportunistic pathogens. Topics include general mycology methods, yeasts, susceptibility testing, molds (Hyaline, Mucor, Dematiaceous), Dermatophytes, Systemic infections, and Pneumocystis.

4. Medical Parasitology

This course is a comprehensive presentation of human parasites. Emphasis is placed on clinical presentation and laboratory identification. Topics include Flagellates, Ciliates, Coccidians, Malaria and Babesia, Other Blood Born and Tissue Born parasites, Nematodes, Cestodes, Trematodes, and Arthropods.

5. Molecular Detection of Infectious Disease

This course examines the advances in using molecular methods to detect human infectious disease. Careful attention is given to the comparison of molecular technologies with traditional microbiology methods. Topics include molecular methods and applications, including PCR, sequencing, TMA, and PEGE, specimens of choice, sample preparation, Quality Control, primer selection, Molecular methods in selecting antimicrobial agents, molecular epidemiology, and target organisms: fungi, bacteria, parasites, and viruses.

6. Medical Bacteriology

This course is a comprehensive presentation of bacteria isolated in the clinical laboratory. Emphasis is placed on the laboratory identification of isolates from a variety of specimen sources, and pathogenic species. Topics include Instrumentation and MALDI, Gram Positive Cocci, Gram Positive Baccili, Enterics, non-fermenters, *Moraxella, Neisseria, Pasteurella, Haemophilus and HACEK, Camphylobacter, Helicobacter, Legionella*, CDC Select Agents, *Chlamdydia, Mycoplasm, Ureaplasm*, Spirochetes, Anaerobes, Antibiotics and Susceptibility testing, and Acid Fast Bacilli.

7. Microbiology Clinical Correlations

Designed as the capstone for the Technologist in Microbiology program, this course takes a body system view of the pathogenicity of infectious disease. Attention is given to integrating clinical presentation and case history to laboratory investigation and diagnosis. Topics include UTI/Genital, Food Borne/GI, Cystic Fibrosis, Blood, CSF, Body Fluids, and Wounds.

MLAB 407 Topics

The following topics will be covered under MLAB 407 Clinical Molecular Biology:

1. Introduction to Clinical Molecular Biology

This course presents the fundamentals of nucleic acid testing in the clinical laboratory and the underlying human genetics. Topics include: Fundamentals of Nucleic Acid Biochemistry, Common Techniques in Molecular Biology (Extraction, Resolution and Detection of Nucleic Acids, Analysis and Characterization,

Amplification, Chromosomal Structure and Mutations, Gene Mutations, and DNA Sequencing).

2. Advanced Methods in Clinical Molecular Biology

This course applies the fundamentals of nucleic acid testing to advanced methods commonly used in the contemporary clinical and research laboratory. Topics include: PCR, Transcription-Based Amplification, Probe Amplification, Branched DNA, Hybrid Capture, Amplification: Signal, Cleavage-Based, Cycling Probe, Sequencing: Direct, Next Gen, Pyrosequencing, Bisulfite, RNA Sequencing, Bioinformatics, Human Genome Project.

3. Molecular Detection of Infectious Disease

This course examines the advances in using molecular methods to detect human infectious disease. Careful attention is given to the comparison of molecular technologies with traditional microbiology methods. Topics include: Molecular methods and applications, including PCR, sequencing, TMA, and PEGE, specimens of choice, sample preparation, Quality Control, primer selection, Molecular methods in selecting antimicrobial agents, molecular epidemiology, and target organisms: fungi, bacteria, parasites, and viruses.

4. Human Molecular and Chromosomal Applications and Pathology

This course presents advanced methods in nucleic acid testing to human medico-legal, forensic, and pathology applications. Topics include: Polymorphisms, RFLP, Paternity Testing, Linkage, Single Nucleotide Polymorphisms, Bone Marrow Engraftment, Mitochondrial DNA Polymorphisms and Disorders, Chromosomal Abnormalities, Patterns of Inheritance, Single Gene Disorders, Lysosomal Storage Disorders, Cystic Fibrosis, Trinucleotide Repeats, Genomic Imprinting, Array CGH, Molecular Oncology, HLA and Transplantation.

Mason Core and Electives

In order to meet a minimum of 120 credits, this degree requires an additional 27-33 credits, which may be applied toward any remaining Mason Core (https://catalog.gmu.edu/mason-core/) requirements (outlined below), Requirements for Bachelor's Degrees (https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2), and electives. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

Mason Core

Some Mason Core (https://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 (https://catalog.gmu.edu/mason-core/) requirements.

All Integration-level requirements must be completed at George Mason and cannot be satisfied through transfer credit. These courses are integral to the university's educational philosophy and ensure that all graduates demonstrate proficiency in writing, critical thinking, and integrative learning consistent with the university's standards. Rare exceptions to this policy may only be granted by the Provost's Office.

Students who have completed the following credentials are eligible for a waiver of the Foundation and Exploration (lower level) requirement categories with the exception of Written Communication, which must be met by transferring in or taking an approved coruse at George Mason University. The Integration category (upper level) is not waived under this policy. See Admissions (https://catalog.gmu.edu/admissions/undergraduate-policies/#transfertext) for more information.

- VCCS Uniform Certificate of General Studies
- VCCS or Richard Bland Associate of Science (A.S.), Associate of Arts (A.A.), Associate of Arts and Sciences (A.A.&S.), or Associate of Fine Arts (A.F.A.)

Code	Title	Credits
Foundation Requirements		
	Written Communication (lower-level) (https://catalog.gmu.edu/mason-core/#written)	3
	Oral Communication (https://catalog.gmu.edu/mason-core/#oral)	3
	Quantitative Reasoning (https://catalog.gmu.edu/mason-core/#quantitative)	3
	Information Technology and Computing (https://catalog.gmu.edu/mason-core/#information-technology)	3
Exploration Requirements		
	Arts (https://catalog.gmu.edu/mason-core/#arts)	3
	Global Contexts (https://catalog.gmu.edu/mason-core/#global-contexts)	3
	Global History (https://catalog.gmu.edu/mason-core/#global-history)	3
	Literature (https://catalog.gmu.edu/mason-core/#literature)	3
	Natural Science (https://catalog.gmu.edu/mason-core/#natural-science)	7
	Social and Behavioral Sciences (https://catalog.gmu.edu/mason-core/#social-behavioral-science)	3
	Just Societies (optional) (https://catalog.gmu.edu/mason-core/#justsocieties) [1]	
Integration Requirements		
	Written Communication (upper-level) (https://catalog.gmu.edu/mason-core/#written-upper)	3
	Writing Intensive (https://catalog.gmu.edu/mason-core/#wi) [2]	3
	Mason Apex (https://catalog.gmu.edu/mason-core/#apex) [3]	3
Total Credits		**40**

1. In addition to covering content related to the designated category, Exploration level courses marked with a Just Societies "flag" are specifically designed to help students learn how to interact effectively with others from all walks of life, including those with backgrounds and beliefs that differ from their own. Students who wish to increase their knowledge and skills in this area may choose to enroll in a Just Societies-flagged course. Students interested in this approach to completing their Mason Core Exploration Requirements should work closely with their advisor to identify the appropriate Just Societies-flagged courses.
2. 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.

[3] Minimum 3 credits required.

Accelerated Master's

Bachelor's Degree (selected)/Quantum Science and Engineering, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the combined bachelor's and accelerated master's degree pathway program (BAM Pathway) and obtain a Bachelor of Science degree in any College of Science major and a Master of Science in Quantum Science and Engineering in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.

This accelerated option is offered jointly by undergraduate Bachelor of Science programs in the College of Science and the Quantum Science and Engineering, MS program, which is jointly offered by the College of Science (https://catalog.gmu.edu/colleges-schools/science/) and the College of Engineering and Computing (https://catalog.gmu.edu/colleges-schools/engineering-computing/).

Students in an accelerated master's degree program must fulfill all university
requirements for the master's degree. See AP.6.7 Bachelor's/Accelerated Master's Degree (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program. For policies governing all graduate degrees, see AP.6 Graduate Policies (https://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 (https://catalog.gmu.edu/admissions/graduate-policies/) and accelerated master's degree policies (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7).

Students must major in a College of Science Bachelor of Science program and will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits.

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.

Accelerated Master's Admission Requirements

Undergraduate students already admitted to the BAM Pathway will be admitted to the intended master's program if they have met the following criteria that will be verified:

- Submission of BAM Transition Form by stated deadline.
- Sufficient minimum 3.0 cumulative GPA for conferred undergraduate degree (which does not include any earned reserve graduate credits).
- Completion of approved advanced standing courses and any reserve graduate courses; please refer to policy A.P. 6.7 (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7).
- Successful completion of required minimum of 120 credits needed for undergraduate degree conferral (after exclusion any satisfactory reserve graduate credits earned).
- Successfully meeting George Mason's requirements for undergraduate degree conferral (graduation) and timely submitting the application for graduation.

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing Courses

Students must complete at least 3 credits from the following list of graduate-level courses while in undergraduate status, up to a maximum of 12.

Students are encouraged to consult with both their undergraduate advisor and the Quantum Science and Engineering, MS advisor:

Code	Title	Credits
Select from the following options:		**3-12**
Up to one 500-600 level specialized course from the following:		
ASTR 601	Computer Simulation in Astronomy	
BINF 690	Numerical Methods for Bioinformatics	
CS 583	Analysis of Algorithms	
CS 630	Advanced Algorithms	
CS 635	Foundations of Parallel Computation	
CSI 690	Numerical Methods	
ECE 511	Computer Architecture	
ECE 547	Applied Cryptography	
ECE 633	Error Control Coding	
ECE 647	Post-Quantum Cryptography	
GGS 579	Remote Sensing	
MATH 625	Numerical Linear Algebra	
MATH 685	Numerical Analysis	
MATH 686	Numerical Solutions of Differential Equations	
OR 541	Operations Research: Deterministic Optimization	
OR 542	Operations Research: Stochastic Models	
OR 646	Stochastic Optimization	
PHYS 510	Computational Physics I	
PHYS 613	Computational Physics II	
Remaining credits are selected from the following:		
QSE 500	Ideas in Quantum Science and Technology	
QSE 501	Mathematical Foundations of QSE [1]	
QSE 502	Programming Foundations of QSE [1]	

QSE 505	Classical and Quantum Information Theory
QSE 511	Quantum Algorithms
QSE 520	Applications of Quantum Technology
QSE 570	Quantum Computing System Design
or ECE 570	Quantum Computing System Design

Reserve Credit Courses

Students may complete up to 6 credits while in undergraduate student status, of graduate-level coursework from the list below that will only count toward the graduate degree program.

Code	Title	Credits
Select up to 6 credits of not previously completed courses from the following:		**6**
QSE 500	Ideas in Quantum Science and Technology	
QSE 501	Mathematical Foundations of QSE [1]	
QSE 502	Programming Foundations of QSE [1]	
QSE 505	Classical and Quantum Information Theory	
QSE 511	Quantum Algorithms	
QSE 520	Applications of Quantum Technology	
QSE 570	Quantum Computing System Design	
or ECE 570	Quantum Computing System Design	

[1] As only one of these courses count for Quantum Science and Engineering, MS, credit, and these courses may not be necessary for all students, consult with an academic advisor prior to enrolling in QSE 501 Mathematical Foundations of QSE or QSE 502 Programming Foundations of QSE.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degree (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) and AP.1.4.4 Graduate Course Enrollment by Undergraduates (https://catalog.gmu.edu/policies/academic/registration-attendance/#ap-1-4-4).