



Program Guide

**Department of Computational and Data Sciences
Masters in Computational Science (including Bachelors Accelerated
Masters)**

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Welcome to CDS

Dear Student,

Welcome to the Computational Science Masters program at Department of Computational and Data Sciences (CDS) at George Mason University.

In this guide, we explain some of the basics of being a student of the program, including both the regular masters (MS) as well as the bachelors/accelerated masters (BAM). Below, you will find general guidance on what the program is about in practice, what you should expect and prepare for, and how to maximize the benefit of being here. There are also some suggested programs of study to help you get started.

It is important that you understand the official rules of the program as laid out in the University Catalog that corresponds to your term of admission or any subsequent change of catalog year you may request. Another important source of information is contained in the University Graduate Policies, which outline general rules that all graduate students at George Mason University must follow. Our program complies with both the College of Science and George Mason University rules. Students should also be mindful of the university calendar, updated regularly, which specifies a variety of information including dates for finals, dates for submission of important documents.

Important supplementary documents/links:

[University Catalog for MS and BAM](#)

[GMU Academic Graduate Policies](#)

[COS graduate/faculty Handbook](#)

[University Calendars \(part of the University Registrar's website\)](#)

The CDS department website contains additional information

[Department website](#)



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Quick Start Guide

Newly admitted students about to start the CSI PhD should take the steps below to get going quickly. Any doubts or question should be addressed to either the program administrator or the director of graduate studies.

1) Before you start in the program:

- Read and understand this handbook, posted online
- Register for classes
- Core classes should be prioritized to the first two semesters from starting the program.

2) Either before you start or in the first few months from starting:

- Structure a program of study (suggested starting templates below).
- Discuss your proposed program of study with the Director of Graduate Studies.



Where to start each process

Process	First point of contact
Filing program of study (preliminary)	CDS Academic Programs Administrator
Reduction of credit	CDS Academic Programs Administrator
General academic questions (e.g. more appropriate course)	Director of Graduate Studies or Research Advisor
General administrative questions (e.g. procedures to follow)	CDS Academic Programs Administrator



Explanation of Course Requirements (MS and BAM)

The Masters course credit requirements are divided in the following categories: core courses (6 credits), computational extended core (15 credits), and electives (9 credits).

A minimum of 30 credits are needed to complete the credit requirements of the MS. It is allowed to complete more than 30 credits, but not advisable (cost, time).

Core courses (6 credits)

Choose two among CSI 690, CSI 695, CSI 702, and CSI 703

Computational Extended Core (15 credits)

Any graduate level courses (500 or above) offered by the CDS department can be chosen (codes CDS, CSI, and CSS), with a small number of exceptions indicated in the catalog including independent activities such as thesis and research (<https://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/#coursestext>). These excepted courses do count into the electives category. Courses offered can change over time (but not often). After choosing two core courses, the other courses that could be chosen as core can count towards computational extended core.

Electives, including Research Projects and Master's Thesis (9 credits)

These classes can be taken from among the list of classes that count towards the computational extended core, from other departments in the university, from universities that belong to the Consortium of Universities of the Washington Metropolitan Area, or be satisfied as part of a reduction (or transfer of credits). Combinations of these choices are valid to complete the needed credits. No more than 6 credits can be taken from outside the graduate courses offered by the CDS department, including courses valid for the computational extended core, Directed Reading and Research (CSI 796), Research Project (CSI 798), Master's Thesis (CSI 799), Research Colloquium in Computational Sciences and Informatics (CSI 898), Colloquium in Computational and Data Sciences (CSI 899), and Seminar in Scientific Computing (CSI 991).

Remedial Courses (500-level count towards area of emphasis)

Due to the diversity of backgrounds in the department, some students require preparatory courses to undertake the MS program. Students needing to quickly improve their programming skills are encouraged to take CSI 500 (Computational Science Tools) and CSI 501 (Introduction to Scientific Programming). Students needing to improve their general mathematical skills are encouraged to take CSI 600 (Quantitative Foundations of Computation Science).



Accelerated Masters Course Requirements (BAM) for both CDS Majors and Mechanical Engineering BS

General University policies on BAM programs can be found at:

<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>

Admissions conditions before taking graduate courses:

Undergraduate students working towards the completion of the BAM in Computational Science must have been admitted to the program for the comments below to apply (application can only take place after the student has completed 60 undergraduate credits). Please note also the undergraduate classes that are required before applying to the BAM program for both CDS majors and Mechanical Engineering BS. Please find details for both programs here:

<https://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-sciences-ms/#acceleratedmasterstext>

Advanced standing graduate courses (between 3 and 12 credits)

After completion of 75 undergraduate credits, undergraduate students can earn between 3 to 12 credits in graduate courses in the Computational Science MS (see Explanation of Course Requirements (MS and BAM)) with codes below the 700-level. These courses apply to both the undergraduate and graduate degrees. Students must obtain a grade of B or better for the courses to count.

Reserve credits (up to 6 credits)

Undergraduate students can earn up to 6 credits in reserve graduate courses with codes below the 700-level, which count **only** towards the MS but not the Bachelors. Students must obtain a grade of B or better for the courses to count.

Graduate status and 700-level courses

Once student complete their undergraduate degree while in good standing, their status will change to graduate, at which point they will be able to register for 700-level or above courses.

Waiver from permission to enroll graduate classes as an undergraduate student

Although in general undergraduate students require written permission to enroll in 500- and 600-level classes, BAM students are exempt from this.

Timelines

Accelerated master's students must apply to graduate and have their degree conferred from their undergraduate program in the semester during which their final undergraduate degree requirements are fulfilled. Advanced standing and reserve graduate credit courses must be completed by the semester or term of graduation specified on their transition [form](#) for the accelerated degree program. Students in the accelerated programs must submit their transition [form](#) to their undergraduate local academic unit by the last day to add classes of their final undergraduate semester. Transition forms must be approved by the student's intended graduate program. Students should enroll in the related master's program in the academic semester or summer session that immediately follows the term of undergraduate degree conferral. If students elect to delay enrollment in the chosen master's program, they can defer for up to one semester following the term of undergraduate degree conferral, subject to the constraints of their master's program. Deferrals and changes to the timeline must be approved by the graduate program director. Students must also adhere to all timelines specified in [AP.6.5](#) and [AP.6.9.2](#). Note that the relevant form is called "Bachelor's/Accelerated Master's Transition."



Mason Korea MS

The CDS department and the Mason Korea campus are in the process of setting up the MS there. Although the rules of the MS still apply, further limitations will apply to the program in Korea to satisfy Korean rules. Advising will generally occur locally to the Korea campus.



Reductions and Transfers of Credit

Reductions of credit are a process by which a student who has *completed another graduate degree* before joining the MS can request that credits from that prior degree be accepted in lieu of required credits in the MS.

Transfers of credit are a process by which a student who has *taken graduate level courses that do not form part of a graduate degree* before joining the MS can request that those credits be accepted in lieu of required credits in the MS.

Rules for reductions and transfers:

- 1) limited to a maximum of 12 credits,
- 2) for every course used as part of a reduction or transfer request, the course syllabus must be submitted,
- 3) any material not in English needs to be officially translated,
- 4) only courses in which the student has obtained a grade of B (or equivalent) or better are accepted,
- 5) for reductions of credit of more than 6 credits, each additional 3 credits must be comparable to a course eligible to be part of computational extended core (otherwise the credits would impinge upon the computational extended core course requirement), and
- 6) the process should be done in the first year of the student's study, typically during the second semester.
- 7) No reductions of credit will be processed for provisionally admitted students until provisions have been removed.

This process should be initiated with the Academic Programs Administrator.



Forms

Where to find department forms

All department forms can be obtained from the CDS academic administrator upon request or on the CDS department [website](#).

Some frequently used forms

Re-enrollment form:

Required if a PhD student misses two consecutive semesters

<https://registrar.gmu.edu/wp-content/uploads/GRE-Graduate-Re-Enrollment-8.8.18-1.pdf>

Reduction of Credit:

Students with a conferred MS/MA degree from a regionally accredited U.S. academic institution may be eligible for a reduction of credit

<https://registrar.gmu.edu/wp-content/uploads/ROC.pdf>

Substitution/Waiver:

Request that a requirement in an academic program be met by:

- 1) a transfer course even though not considered equivalent to a Mason course
or
- 2) a Mason course not usually applied to meet the requirement. Also, to request that, on some clearly detailed basis, a requirement in the student's academic program be waived (does not waive or give credit hours).

https://registrar.gmu.edu/wp-content/uploads/SWF_0514.pdf

For additional registrar forms, <https://registrar.gmu.edu/forms/>



Suggested Preliminary Programs of Study by student's areas of interest

HOW TO USE THESE TEMPLATES:

Two templates (below) are provided in this guide to help students begin the process of creating their own Programs of Study. One template is for students with interest in Data Science, and the other for students interested in Modeling and Simulation.

Once the tentative plan is completed, fill it out in a blank Form 1 and hand it in to the Program Administrator for processing. Any academic questions should be addressed to the Director of Graduate Studies.

Complete this template within the first 4 weeks in the PhD.

The **core courses** in each template are aligned with each of the two possible areas of interests and are therefore suggested to be taken as indicated.

The **area of emphasis** courses allow more flexibility and depend on the student's research interests. The courses in each template are those with widest general interest for each area. *However, before advancement to candidacy, the courses can be substituted by others that more closely match the student's research interests, and should be discussed and revised with the student's research advisor.* Changes are possible and even encouraged on the basis of research direction. In some cases, it may be decided that a student should take more than 18 credits of area of emphasis, which would reduce the credits needed in electives and also credits that can be reduced or transferred from graduate work prior to joining the CSI PhD. **An updated list of the courses** with CSI codes taught in recent years is attached and updated every term to help create a program of study.

Elective courses: Elective courses should generally be used to emphasize or complement training in relevant areas and techniques that students require for their dissertation. Reduced/transferred credits are almost always counted towards electives and are explicitly written into the program of study. **Taking CSS courses counts as elective courses.**

Remedial skills courses: Students requiring courses to improve or refresh their programming/quantitative skills should consider CSI 500 (Computational Science Tools) which teaches scientific packages such as R, and CSI 501 (Introduction to Scientific Programming) which focuses on programming languages. **Only one 500 level course will count towards the 48 coursework credits. CSI 600 and undergrad level courses will not count for credit. However, if the material is needed it is advisable to take such courses even if credits are not counted.**

Admissions with Provisions: The proposed program of study of students provisionally admitted needs to include all the courses in the provisions in the first 2 semesters. Follow the rest of this guidance for all other courses.

Semester each course is to be taken: The list of courses taught in recent years should help frame a tentative timeframe. Some courses are taught in the Fall, some in Spring, and some are taught in non-consecutive years. All such details must be considered. Please also consider this on courses from other departments.



Sample Coursework Data Science Template

Core Requirements (6 credits)	Cred Hrs	Institution	Semester	Grade
CSI 695 Scientific Databases	3	GMU		
CSI 703 Scientific & Statistical Viz	3	GMU		
Computational Extended Core (15 credits)				
CSI 501 Introduction to Scientific Program	3	GMU		
CSI 672 Statistical Inference	3	GMU		
STAT 544 Applied Probability	3	GMU		
Electives (9 credits)				

Modeling Template

Core Requirements (6 credits)	Cred Hrs	Institution	Semester	Grade
CSI 690 Numerical Methods	3	GMU		
CSI 702 High Performance Computing	3	GMU		
Computational Extended Core (15 credits)				
CSI 500 Computational Science Tools	3	GMU		
CSI 501 Intro Sci Programming	3	GMU		
CSI 600 Quant Fndt for Comp Sci	3	GMU		
Electives (9 credits)				

Mechanical Engineering/Computational Science BAM

Core Requirements (6 credits)	Cred Hrs	Institution	Semester	Grade
CSI 690 Numerical Methods	3	GMU		
CSI 702 High Performance Computing	3	GMU		
Computational Extended Core (15 credits)				
CSI 500 Computational Science Tools	3	GMU		
CSI 501 Intro Sci Programming	3	GMU		
CSI 600 Quant Fndt for Comp Sci	3	GMU		
STAT 544 Applied Probability	3	GMU		
Electives (9 credits)				



CSI Course Offering Rota

The following list is the active list of courses for CSI. Other courses that may appear in the catalog are likely to be inactive and therefore should not be assumed available unless confirmation that they will be offered is obtained. The CSI program offers courses under various frequencies due to demand, lecturer availability, gradual changes in interest of students, and other factors. Some courses are offered by other departments, but cross-listed with CSI.

Color scheme:

1. Regular black (courses satisfying the extended computational core),
2. **Black** (core courses),
3. **Red** (courses from other departments crosslisted with CSI),

Note: CSI 709 is taught on initiative from individual faculty members and could be taught in any term

Regularity	Course Code	Course Title	Even, odd year
All semesters	CSI 500	Computational Science Tools	
	CSI 501	Introduction to Scientific Programming	
Fall yearly	CSI 590/600	Quantitative Foundations for Computational Sciences	
	CSI 639	Ethics in Scientific Research	
	CSI 672	Statistical Inference	
	CSI 690	Numerical Methods	
	CSI 695	Scientific Databases	
	CSI 711	Chemical Thermodynamics and Kinetics	
	CSI 777	Principles of Knowledge Mining	
	CSI 780	Principles of Modeling and Simulation in Science	
Spring yearly	CSI 674	Bayesian Inference and Decision Theory	
	CSI 678	Time Series Analysis and Forecasting	
	CSI 702	High-performance Computing	
	CSI 703	Scientific and Statistical Visualization	
	CSI 739	Topics in Bioinformatics	
	CSI 742	The Mathematics of the Finite Element Method	
	CSI 783	Computational Quantum Mechanics	
	CSI 786	Molecular Dynamics Modeling	
	CSI 973	Mathematical Statistics II	
CSI 986	Large Scale Molecular Simulations		
Fall bi-yearly	CSI 685	Fundamentals of Materials Science	even
	CSI 721	Computational Fluid Dynamics I	even
	CSI 782	Statistical Mechanics for Modeling and Simulation	even
	CSI 873	Computational Learning and Discovery	odd
Spring bi-yearly	CSI 747	Nonlinear Optimization and Applications	odd
	CSI 758	Visualization and Modeling of Complex Systems	odd
	CSI 789	Image Operators and Analysis	even



CSI Courses by Topic

Modeling and Simulation	Data Science	General	Other	Remedial
CSI 780	CSI 672	CSI 678	CSI 639	CSI 500
CSI 782	CSI 674	CSI 690	CSI 685	CSI 501
CSI 786	CSI 695	CSI 702	CSI 711	CSI 590/600
CSI 986	CSI 703	CSI 747	CSI 721	
	CSI 747		CSI 742	
	CSI 758		CSI 783	
	CSI 777		CSI 789	
	CSI 873			
	CSI 973			

Other types of courses:

Topics course: The course **CSI 709** is a general topics code, used by faculty to offer courses that are new or have been requested by students. A CSI 709 course taught in the past on a particular topic does not guarantee the same topic will be taught again in the future, and if it is, its schedule and timing is uncertain.

Directed Reading and Research (1-6 credits): **CSI 796** is an individualized course for students to perform research study or projects under the supervision of a faculty member. A section and a supervising faculty member must be arranged, and a section created by the program’s academic administrator.

Research Project (1-3 credits): **CSI 798** is an individualized course for students to perform a research project under the supervision of a faculty member. A section and a supervising faculty member must be arranged, and a section created by the program’s academic administrator.

Master’s Thesis (1-6 credits): **CSI 799** is an individualized course for students to perform a research project under the supervision of a faculty member leading to technical report of thesis and an oral defense. A section and a supervising faculty member must be arranged, and a section created by the program’s academic administrator.



CSS Course Offering Rota

The following list is the active list of courses for CSS. Other courses that may appear in the catalog are likely to be inactive and therefore should not be assumed available unless confirmation that they will be offered is obtained. The CSS program offers courses under various frequencies due to demand, lecturer availability, gradual changes in interest of students, and other factors.

Note: CSS 739 is taught on initiative from individual faculty members and could be taught in any term

Regularity	Course Code	Course Title	Even, odd year
Fall yearly	CSS 600	Introduction to Computational Social Science	
	CSS 605	Object-Orient Programming in Social Science	
	CSS 620	Origins of Social Complexity	
Spring yearly	CSS 610	Agent-Based Modeling and Simulation	
	CSS 635	Cognitive Foundations of CSS	
	CSS 645	Spat Agent-Based Models of Hum-Env Interaction	
	CSS 692	Social Network Analysis	
Fall bi-yearly	CSS 695	Agent-Based Computational Economics	odd
	CSS 710	Advanced Agent-Based Modeling and Simulation	even
Spring bi-yearly	CSS 625	Complexity Theory in Social Science	even
	CSS 655	Social Systems Dynamics	even



CDS Course Offering Rota

The following list is the active list of graduate courses for CDS. The CDS program offers courses under various frequencies due to demand, lecturer availability, gradual changes in interest of students, and other factors.

Regularity	Course Code	Course Title	Even, odd year
All semesters	CDS 501	Scientific Information and Data Visualization	
Spring yearly	CDS 502	Introduction to Scientific Data and Databases	



Useful Contacts and Resources

Graduate admissions

masongrad@gmu.edu

703-993-9700

Office Location: 213 Johnson Center (2nd Floor)

Director of Graduate Programs, College of Science

Melissa Hayes

cosgrad@gmu.edu

Suite 1450 Exploratory Hall

703-993-9532

mhayes5@gmu.edu

Office of International Programs and Scholars

(703) 993 2970

<https://oips.gmu.edu/>

Student Health Services

703-993-2831

<https://shs.gmu.edu/>

Counseling and Psychological Services

703-993-2380

<https://caps.gmu.edu/>

Disability Services

703-993-2474

<https://ds.gmu.edu/>

Office of Compliance, Diversity, and Ethics

(703) 993-1000

<https://diversity.gmu.edu/title-ix>

Office of the University Registrar (including FERPA)

703-993-2441

<https://registrar.gmu.edu/>

University Library

703-993-2240

<https://library.gmu.edu/>

Stearn Center Student Support Resources Webpage

Many of the links above, as well as many other University offices and resources useful students can be found in the link below

<https://stearnscenter.gmu.edu/knowledge-center/knowing-mason-students/student-support-resources-on-campus/>