EMORY | LANEY GRADUATE SCHOOL

Computer Science Master of Science Program Handbook (Pending Approval)

(Updated August 2024)

1 Handbook Overview

The Computer Science Master of Science (CS MS) Program Handbook (handbook) outlines the policies of the CS MS Program at Emory University. Policies pertaining to the Computer Science and Informatics (CSI) PhD Program, which is administered separately, can be found in the companion CSI PhD handbook.[1]   The CS MS handbook complements the Laney Graduate School (LGS) Handbook, which contains general degree requirements and graduate school policies. In general, students should consult the latest version of the handbook. Should the CS MS handbook change with regards to course or graduation requirements, students can opt to satisfy the requirements of the version that prevailed upon their matriculation or the current version. If unsure about a policy or rule, students should consult the graduate program coordinator (GPC) or the Director of Graduate Studies (DGS).

2 Program Overview

The James T. Laney School of Graduate Studies is committed to graduate education that provides students with deep and broad expertise in their chosen fields, creativity to cross discipline boundaries, courage to challenge convention, and confidence to ask unexpected questions and articulate bold new perspectives.

The CS MS program is offered and administered by the Department of Computer Science (CS). It is primarily intended as a terminal Master's and a majority of its graduates pursue employment upon graduation. A few students continue on to PhD programs at Emory or elsewhere. The CS MS conducts its own admissions process, but almost all courses for the CS MS degree are also approved for the Emory CSI PhD program, and vice-versa. For students who enter the CS MS program through the CS 4+1 program, this handbook is relevant only upon graduation from Emory College.

As such, the CS MS program is closely associated with the CSI PhD, which is jointly offered and administered by the Departments of CS, Biomedical Informatics (BMI), and Biostatistics and Bioinformatics (BIOS). CSI PhD students may receive an MS in CS by candidacy, or as an exit ramp. Terminal MS students overwhelmingly pursue the CS track. Given these factors, all three departments cooperate to offer the CS MS, although administratively, the program is situated in the Department of CS. The set of program administrators include:
- Director of Graduate Studies (DGS);
- Graduate Program Coordinator (GPC) or Program Administrator (PA);
- MS CS Committee comprising the MS CS DGS, and two additional faculty members.

3 Computer Science MS Program

The CS MS program is designed around departmental strengths in data and information management, data mining, healthcare analytics, machine learning, natural language processing, security and privacy, and information access and retrieval. The program prepares students for professional jobs in computer industry or further graduate study. Students can choose one of the following options:

- *Course-Only Option*: 30 graduate course credits
- *Project Option*: 24+6 graduate course plus research credits
  Students conduct a major implementation or analytic project, conducted independently, accompanied by a substantial project report and code and data as appropriate. Satisfactory completion of the project requires approval by the faculty advisor.
- *Thesis Option*: 21+9 graduate course plus research credits
  A thesis involving substantial, novel, independent research and contributions of quality

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[1] CSI and Math PhD students may obtain an MS CS via candidacy as outlined in the CSI PhD handbook.

publishable in a refereed workshop, conference, or journal,[2] to be submitted to LGS.

Additionally, each student must complete an internship as a part of CS596R. The internship may be done at Emory or externally (including internationally) and may be paid or unpaid. Students are expected to find their own internships, but the program may help as necessary.

3.1 Course Requirements

Students must take three required courses and *at least* four elective courses. The specific sets of required and elective courses depend upon a student's chosen CS MS track, CS or BMI. The track only needs to be declared during the term when the student intends to graduate, which is typically the spring semester of the 2nd year.

3.1.1 CS Track: Three (3) Required courses:

1. CS 526 Algorithms OR CS 523 Data Structures and Algorithms;
2. CS 534 Machine Learning;
3. CS 551 Systems Programming.

3.1.2 BMI Track: Three (3) Required courses:

1. BMI 500 Introduction to Ethical Data Science and Informatics.
2. BMI 510 Biostatistics for Machine Learning;
3. BMI 534 or CS 534 Machine Learning;

3.1.3 CS or BMI Track: Four or more (4+) Elective courses:

Totaling twelve or more (12+) credit hours in CS, BMI, BIOS, BMED or MATH. Common Electives for the CS and BMI tracks are listed in Appendix 1: CSI Course Listing. With prior CS MS DGS approval, other courses may be used to satisfy this requirement. *The course list will be updated as courseofferings evolve.*

3.2 MS CS Options

In addition to the 7 courses (3 Core and 4 Elective) described above, MS CS students must choose one of the following three options:

3.2.1 MS CS By Coursework: Three (3) Additional courses:

1. Any three approved additional courses from the list in the Appendix, or other appropriate courses approved by the DGS.

3.2.2 MS CS By Project: A Master's Level Project and One (1) Additional course:

1. CS 594 MS CS Project (6+ credit hours): Currently offered under the CS599R rubric, this course involves a substantial software development effort under the supervision of a faculty advisor resulting in a tangible artifact appropriate to Master's level contributions. May be conducted over two semesters as two 3-credit hour segments but must comprise one major comprehensive project.

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[2] While the student's thesis must be publication quality, it does not need to be a published or submitted work.

2. One approved additional course from the list in the Appendix, or other appropriate courses approved by the DGS.

3.2.3 MS CS By Thesis: A Master's Level Thesis

1. CS 599R Thesis (9 credit hours): A substantial research project at least equivalent to PhD proposal-level work, comprising original research of publishable quality, manifested in a substantial thesis. May be conducted over two semesters but must comprise one major research effort.

3.3 CS596R: Computer Science Master's Practicum

This course aims to expose Master's students to real life problems that Computer Science and Informatics professionals face in their working environment, and to help students to acquire crucial skills and experience in applying their CS and Informatics skills in solving practical problems.

Students perform a project under the direction of an Emory faculty member or supervised by a CS/Informatics expert in the industry. In both cases, the project to be undertaken should be described by the student and submitted for approval by the DGS.

The course is nominally taken for 1 (one) credit hour and is repeatable for up to two (2) times. CS596R is graded on a Satisfactory/Unsatisfactory (S/U) basis only. The amount of work for the course varies from full time (i.e., in case of an external internship) to part time of at least 10 hours per week (i.e., in case of internal internship). 596R cannot be the last solitary course in a student's program of study. In other words, 596R must be taken *before* you reach the 30 credit graduation requirement.

3.4 Graduation Requirements

All MS coursework must be completed with a grade of C or higher and an overall GPA of 3.0 or higher, based on the required, elective, and additional coursework only. The additional coursework refers to the additional 3 courses in the MS CS by coursework or the additional 1 course in the MS CS by Project. CS 594, CS 599R, and CS 596R are not included in the cumulative GPA computation. If the same course is re-taken, the highest grade will be used in the GPA calculation.

For MS students matriculating through the CS 4+1 program, only 2 of the graduate courses can be double-counted toward the BA/BS degree. In other words, the remaining coursework (5-8 courses depending on the MS option) cannot be used to fulfil the BA/BS degree requirements.

4 Annual Evaluation

The LGS and each program have standards for academic performance that students must meet, including making satisfactory progress through the program. CS MS students will be reviewed by the DGS and GPC/PA at the end of each semester to ensure they are making satisfactory progress. The evaluation is primarily based on an assessment of the student's overall performance including coursework, exams, and project/thesis performance. In the case of unsatisfactory progress, students will be notified shortly after the completion of the semester.

4.1 Unsatisfactory Progress

Per the LGS policy, any student who meets one or more of the following criteria is considered to be making

unsatisfactory progress:
- The student receives less than a 2.7 GPA in a term.
- The student has less than a 2.7 cumulative GPA.
- The student receives an F (Failing), a U (Unsatisfactory), an IF (Incomplete Failing), or an IU (Incomplete Unsatisfactory) grade in any course.
- The student receives I (Incomplete) grades in two or more courses.
- Student receives an I (Incomplete) grade in a single course worth 9 or more credit hours.
- The student has a total of two unresolved I (Incomplete) grades on their record.

4.2 Probation and Dismissal Policies

CS MS students who are making unsatisfactory progress risk being placed on academic probation. Two continuous terms of unsatisfactory progress will trigger a recommendation of dismissal from the program.

We understand that life circumstances can make it difficult for someone to achieve their goals and potential. We want all our students to be successful. We encourage any struggling student to reach out to the DGS, the Assistant Dean of Student Affairs in LGS, and/or Student Health Services for support. Please ask the DGS or GPC/PA for help, and please see the Support section of the handbook (CS MS and LGS) for more information about the resources that Emory provides. Placing a student on academic probation and recommendation for dismissal are not actions that we take lightly.

4.2.1 Probation

A student will continue to be placed on probation if they are making unsatisfactory progress until they have satisfied the exit criteria or are dismissed from the graduate program. If a student enters probation, they will be notified in writing first by the DGS and then by LGS of the reason(s) that they were placed on probation. To exit the probationary semester, the student must meet all the following criteria:
- No F, U, IF, or IU in any course.
- No I grade in any course without permission from LGS.
- The number of incompletes on the academic record is no more than 1.
- Term GPA must be greater than or equal to a 2.7.

4.2.2 Recommendation of Dismissal

Any CS MS student who remains on probation for *two consecutive terms* will be recommended for dismissal unless the program provides written justification for the students' continuation and LGS grants approval. Note the CS MS program has more stringent requirements than outlined in the LGS handbook for dismissal recommendation.

4.2.3 Dismissal Appeals

The student may petition the program for a stay upon receiving a recommendation for dismissal. The student can submit a letter to the DGS that details any extenuating circumstances that contributed to their probationary status and presents a concrete, actionable plan for leaving probation and resuming satisfactory progress. Additionally, the student may ask a faculty member to submit a letter of support to the DGS.

These letters must be received within two weeks after the student is notified of their probationary status. The MS Graduate Committee will review the appeal(s) and recommend that the appeal is either accepted or denied. Any faculty who issued grades that led to probation will be excluded from the committee. If the appeal is accepted, then the program will notify LGS the student is no longer recommended for dismissal. Note that LGS may still proceed with the dismissal even though the program does not recommend it. If the appeal is denied, then the student is subject to dismissal. Students may petition for a maximum of two one-term extensions.

5 Other Policies and Services

5.1 Grievance Policy

Students who have a grievance related to the CS MS graduate program should report it to the DGS. The student should describe the grievance and relevant details in a letter addressed to the DGS. The grievance shall be no longer than five (5) single-spaced pages and should include a concise statement of the grievance, a description of the previous efforts to resolve the problem, a clear statement of the remedy sought, and supporting evidence for claims made in the complaint. The DGS will try to resolve the grievance in conversations with the student and relevant parties. If this is unsuccessful, the DGS will appoint a committee of three program faculty members or use an existing standing committee, who will review the grievance and propose an appropriate response. If it is not possible to resolve the grievance within this committee or the framework of the program's administrative structure, the student should initiate or file a grievance to the Office of the Senior Associate Dean of LGS if they wish to take it to another level. At that time, the grievance will be handled according to the Grievance Procedure described in the LGS Handbook. If the grievance is with the DGS, the student submits the grievance directly to the Senior Associate Dean of LGS.

5.2 Parental Arrangement Policy

LGS Parental Arrangement Policy is for students with substantial parenting responsibility as a result of childbirth, care of newborn, or a newly adopted child. This policy guarantees PhD students a minimal level of accommodation during the transition of parenthood. For more information on the policy, eligibility requirements, and application procedure, go to this link:
https://www.gs.emory.edu/academics/policies-progress/parental-arrangement.html

5.3 Department of Accessibility Services (DAS)

Emory provides all persons an equal opportunity to participate in and benefit from programs and services afforded to others. The Department of Accessibility Services (DAS), part of the Office of Institutional Equity and Compliance, assists qualified students, faculty, and staff with obtaining a variety of services and ensures that all matters of equal access, reasonable accommodation, and compliance are properly addressed. DAS is committed to providing access to campus resources and opportunities to allow students with disabilities to obtain a quality educational experience.

Qualified students need to register with DAS and make a request for services. Confidentiality is honored and maintained. (Emory DAS website): http://accessibility.emory.edu/students/index.html

5.4 Student Support Services

Graduate school can be a stressful time for your body and mind. Be sure you are taking care of yourself. Go to LGS student support page and the LGS support page for links to all student support services available to you:

http://www.gs.emory.edu/guides/students/support.html

5.5 English Language Support

For students whose native language is not English, LGS provides English language enhancement workshops. All incoming MS CS students are "referred" to the Laney ESLP program, which will invite all students to

undertake a language ability assessment. Results of the assessment are used to recommend non-obligatory participation in a 2-credit hour, semester-long, English language workshop. Students whose undergraduate language of instruction was not English will likely benefit most from this workshop, but all students are eligible to participate.

5.6 University Policies

A selection of university policies can be found at this link:
https://policies.emory.edu/

Every effort has been made to make this document as accurate and complete as possible. Policies are subject to change without notice. Refer to the LGS Handbook (https://gs.emory.edu/handbook/index.html) for other policies such as:
• University Policies
• Honor Code
• Minimum Degree Requirements
• Professional Development Funds
• Withdrawals and Leaves of Absences
• Parental Arrangements and Leaves
• Degree Completion & Graduation

6 Appendix A: MS CS Course Listing

R = Required
R* = MS students Required to take CS 523 or CS 526
E = Elective
E* = Elective if and only if the course is formally taught and evaluated; i.e. seminar style or directed study courses may not be used to fulfill elective requirements
O=Other (Does not count as either a Required nor as an Elective Course.)

Course Number	Course Name	Credits	PhD CS Track	PhD BMI Track	MS CS CS Track	MS CS BMI Track
BIOS 506	Foundations of Biostatistical Methods	4	E	E	E	E
BIOS 507	Applied Regression Analysis	4	E	E	E	E
BIOS 510	Intro. to Probability Theory	4	E	E	E	E
BIOS 511	Introduction to Statistical Inference	4	E	E	E	E
BIOS 516	Intro to Large-Scale Biomed Data Analysis	1	O	E	O	E
BIOS 534	Machine Learning	3	O	O	O	O
BIOS 540	Introduction to Bioinformatics	2	O	E	O	E
BIOS 555	High-throughput Data Analysis using R	2	O	E	O	E
BIOS 707	Advanced Linear Models	4	E	E	E	E
BIOS 709	Generalized Linear Models	4	E	E	E	E
BIOS 711	Statistical Inference II	4	E	E	E	E
BIOS 731	Advanced Statistical Computing	2	E	E	E	E
BIOS 738	Bayesian and Empirical Bayes Methods	2	E	E	E	E
BIOS 770	Advanced Statistical Genetics	2	E	E	E	E
BMED 6041	Analytical Methods for BME	3	O	E	O	E
BMED 6517	Machine Learning in Biosciences	3	E	E	E	E
BMED 6700	Biostatistics	3	E	O	E	O
BMED 8813	Special Topics in BME (Various)	3	O	E*	O	E*
BMI 500	Introduction to Ethical Data Science and Informatics	3	E	R	E	R
BMI 510	Biostatistics for Machine Learning	4	E	R	E	R
BMI 520	Practical Computing for Informatics	3	O	E	O	E
BMI 532	Model-Based Machine Learning	3	E	E	E	E
BMI 534	Introduction to Machine Learning	3	E	R	E	R
BMI 536	Introduction to Deep Learning	3	E	E	E	E
BMI 539	Topics in Machine Learning	3	E	E	E	E
BMI 540	Time Series Analytics and Modeling	3	E	E	E	E
BMI 550	Applied Biomedical Natural Language Processing	3	E	E	E	E
BMI 555	Computational Methods for Biomedical Image Analysis	3	E	E	E	E
BMI 562	Cancer Single Cell Analytics	3	O	E	O	E
BMI 585	Topics in Biomedical Informatics (Various)	3	E*	E*	E*	E*

CS 523	Data Structure & Algorithms I	3	O	E	R*	E
CS 524	Theory of Computing	3	E	E	E	E
CS 526	Algorithms	3	R	E	R*	E
CS 534	Machine Learning	3	R	R	R	R
CS 540	Software Engineering	3	E	E	E	E
CS 541	Information Visualization	3	E	E	E	E
CS 551	Systems Programming	3	R	E	R	E
CS 553	Info. and Computer Security	3	E	E	E	E
CS 554	Database Systems	3	E	E	E	E
CS 555	Parallel Processing	3	E	E	E	E
CS 556	Programming Languages and Compilers	3	E	E	E	E
CS 557	Artificial Intelligence	3	E	E	E	E
CS 558	Networking	3	E	E	E	E
CS 559	Distributed Processing	3	E	E	E	E
CS 563	Digital Image Processing	3	E	E	E	E
CS 570	Data Mining	3	E	E	E	E
CS 571	Natural Language Processing	3	E	E	E	E
CS 572	Information Retrieval	3	E	E	E	E
CS 573	Data Privacy and Security	3	E	E	E	E
CS 580	Operating Systems	3	E	E	E	E
CS 581	High Performance Computing: Tools and Applications	3	E	E	E	E
CSI 584	Topics in Computer Science (Various)	3	E*	E*	E*	E*
MATH 511	Analysis I	3	E	E	E	E
MATH 512	Analysis II	3	E	E	E	E
MATH 515	Numerical Analysis I	3	E	E	E	E
MATH 516	Numerical Analysis II	3	E	E	E	E
MATH 517	Iterative Methods	3	E	E	E	E
MATH 531	Graph Theory	3	E	E	E	E
MATH 557	Partial Differential Equations I	3	E	E	E	E
MATH 558	Partial Differential Equations II	3	E	E	E	E
MATH 571	Numerical Optimization	3	E	E	E	E
MATH 572	Numerical Partial Differential Equations	3	E	E	E	E