

MSCS & PhD Core Competencies

Students are required to demonstrate competency in four core areas.

This can be done through taking one course in each area while at Tufts.

Or, if you have previously taken courses in these areas, you might be excused from repeating the requirement at Tufts.

Program Languages (PL)

- CS 21: Concurrent Programming (No Graduate Credit)
- CS 86: Object-Oriented Programming for GUIs (No Graduate Credit)
- CS 105: Programming Languages
- CS 121: Software Engineering
- CS 107: Compilers

Computer Architecture & Assembly Language (CA&AL)

- CS 40: Machine Structure (No Graduate Credit)
- CS 111: Operating Systems
- CS 112: Networks
- CS 114: Network Security
- CS 116: Introduction to Security
- CS 118: Cloud Computing
- CS 146 / EE 126: Computer Engineering
- CS 107: Compilers
- CS 140: Advanced Topics in Computer Architecture

Theory of Computation (ToC)

- COMP/CS 61: Discrete Math
- CS 170: Computation Theory

Data Structure & Analysis of Algorithms (DS&AA)

- CS 160: Intro to Algorithms

Registration

Continuous Enrollment Policy

Graduate students must be enrolled (registered), or on an approved leave of absence, for every academic-year semester between matriculation and graduation. Graduate students may only register for courses that count toward their degree program. Students should register during the early registration periods in November and April. The university reserves the right to withhold registration for any student having unmet Academic Integrity Training (AIT), financial, or health services obligations. Students who fail to register by the end of the first week of classes, or the add deadline for the term, whichever is first, will be administratively withdrawn and subject to a \$350 reinstatement fee. International students must maintain proper enrollment status per their visa requirements.

Degree-only Status

If a student has registered for all required courses, including thesis research (295, 296) or dissertation research (297, 298), the student must register for a course designation that indicates that only thesis, project, master's exhibition, or dissertation-related work, whether part-time or full-time, is being pursued.

Master's candidates must register for course 401-PT (part-time) or 402-FT (full-time) in their department and doctoral candidates must register for course 501-PT (part-time) or 502-FT (full-time) in their department. Graduate students may declare full-time status of thirty-five hours per week (402 or 502) with their advisor's concurrence.

Enrollment Status

Graduate students are responsible for maintaining enrollment status at Tufts.* Federal regulations require students to be enrolled (registered) full-time or half-time in order to receive and/or defer student loans. Tufts provides information regarding student enrollment status to lenders via the National Student Loan Clearinghouse and is required by law to return funds for students who do not maintain a minimum of half-time enrollment status. Enrollment status is either full-time, half-time, or part-time as defined below:

Full-time: Nine (9) or more course credits, six (6) course credits and a teaching or research assistantship (must also register for 405-TA or 406-RA), or registration as a full-time continuing student (402/502) working on a thesis, dissertation, project, or internship. Students admitted full-time who register for credits totaling less than full-time will not achieve a full-time status.

Half-time: Five (5) course credits; Two (2) course credits plus a teaching or research assistantship.

Part-time: One (1) to Four (4) course credits, or registration as a part-time continuing student (401/501).

**In most situations, international students must maintain full-time status. In certain circumstances, international students may be authorized for a [reduced course load](#), allowing them to drop below full-time: [Contact the International Center](#) with questions or concerns about Enrollment Status.*

Cross-Registration and Graduate School Consortium

During the academic year, full-time graduate students may take one course per semester through cross-registration agreements with Boston College, Boston University, and Brandeis University. A full-time graduate student at Tufts University may also enroll for two graduate courses during any semester at the Fletcher School of Law and Diplomacy, the Friedman School of Nutrition Science and Policy, and the Graduate School of Biomedical Sciences. Cross-registration is possible on a space available basis. Students who wish to cross-register should consult with the instructor of the course, and should expect to satisfy any prerequisites typically required for enrollment. Cross-registration is not permitted in any summer school. Courses satisfactorily completed (B– or better) at one of the three consortium schools (Boston College, Boston University, and Brandeis University) automatically appear on the student's Tufts transcript and may be counted toward degree requirements.

Tufts students who wish to cross register at a consortium school should first consult with their academic advisor and/or the department's graduate studies committee representative before completing the online [Cross-Registration Petition Form](#) through SIS. The host institution reserves the right to terminate the student's participation at that institution at any time.

Cross-registration is also offered through the Consortium for Graduate Studies in Gender, Culture, Women, and Sexuality at MIT. This consortium relationship is limited to the specific area of Women, Gender, and Sexuality Studies. For information about course offerings and application materials, visit the [GCWS website](#).

Audits

Graduate students may arrange with an instructor to sit in on a course, but this course will not appear on the academic record.

Dropping a Course

A course for which a student has registered remains on the record unless it has been dropped within the first five weeks of the term. Courses that are dropped after the fifth week but prior to the last day of classes will carry the grade of W and remain on the transcript. Students who are billed per credit should review the refund policy on the bursar's website for details: <https://students.tufts.edu/financial-services/billing/tuition-refund-policy/>.

Grades

Grades of scholarship are expressed by one of the following letters:

- A Superior work
- B Meritorious work
- C Not acceptable for graduate credit
- D Not acceptable for graduate credit
- F Failure
- P Not acceptable for graduate credit
- S, U Grades of S (Satisfactory) and U (Unsatisfactory) may be given by the instructor in special topics courses, courses in supervised teaching, research courses, certain graduate colloquia, certain professional development courses such as Graduate Institute for Teaching (GIFT), Graduate Research Excellence at Tufts (GREAT), thesis courses, and dissertation courses.

The following symbols are also used:

- I Incomplete: an indication that more time will be allowed to complete the work, specifically within six weeks of the first day of classes in the subsequent semester (fall or spring only; summer terms excluded).
- PI Permanent Incomplete: Students who received an Incomplete and do not complete the work within the stated time will receive a Permanent Incomplete (PI).
- W Withdrawn: an indication that a student has been permitted to withdraw from a course after the fifth week of a semester, but no later than the last day of classes.
- Y Work not scheduled for evaluation during the current term.

Changes in Course Grades: Statute of Limitations

Effective education requires timely and objective evaluation of students' academic work, using clear, standard, fair, and public criteria. Such standards should be listed

in the course syllabus. While criteria differ across disciplines and faculty, and while the ultimate responsibility for setting standards and evaluating performance rests with departments and individual faculty, submitted grades are final and not subject to negotiation. Exceptions are limited to correcting clerical and calculation errors, and correcting deviations from stated criteria. Students have the right to know the basis of a grade, and faculty should be open to that post-semester conversation. Following such conversation, students who believe that an error or deviation remains may appeal to the department chair and, if necessary, subsequently to the graduate dean.

Health Service Requirements

Prior to initial registration, all graduate students must complete an online medical history and provide proof of required immunizations before July 1. Those with missing or incomplete health reports will have an immunization hold placed on their account and will not be allowed to register for classes until the requirements are completed. For more information about the requirements, you can visit our [Resources for New Students](#) website. Please send your questions to Immunization Reviewer via the [Patient Portal](#).

Graduate Co-op Program

Tufts University's School of Engineering (SOE) offers a Cooperative (Co-op) Education Program for full time MS students. The objective of this program is to offer Tufts SOE MS students opportunities to pursue real-world work experience, form professional relationships, and to enhance their resumes. The program's main goal is to introduce students to professional experiences that will assist them in their career path. This program helps students get a feel for a company's culture and work environment, and learn to interact with other colleagues in their field.

Benefits of a Co-Op Program

- Provide students with the skills and frameworks to clarify short- and long-term personal, educational, and career goals and to consistently make prudent, informed decisions throughout one's career.
- Help students explore and experience professional employment in areas related to the student's academic program as well as professional interests and personal aspirations.
- Guide students through the development of a modern personal brand including brand statements, marketing documents curation, and effective network cultivation and strategic management.
- Understanding, practicing, and employing best practices around key career competencies in the modern world of work including, but not limited to: interviews, negotiations, workplace professionalism and etiquette, communication with leaders, managers, and colleagues.
- Receive direct and dedicated support from the Assistant Director, Graduate Co-op Advisor and the Tufts Career Center for the entirety of your co-op preparation and employment experience.

How Co-Op Works

Tufts Graduate School of Engineering's co-op program offers students a unique opportunity to integrate their academic knowledge with industry and subject matter expertise to help employers address and solve practical, real-world problems. Participating students may gain up to eight months of full-time paid work experience that is valuable for building and showcasing distinct, technical, professional, and social competencies employers covet and very often offer co-op alumni with a competitive edge for post-graduation employment opportunities.

Eligible MS students may complete one co-op over the course of their degree program. **Students must apply to join the co-op program at the end of their first semester as an enrolled master's student.** After starting their MS program and completing 18 credits, exclusive of seminar credits, that count toward their degree, students may then look for co-op opportunities.

The Graduate Co-op Program follows a cohort model, where admitted students are grouped based on the semester they intend to begin their co-op positions. During the preceding semester, students will engage in intentional, independent, and cohort-shared experiences across all aspects of the Tufts Career Center Career Planning and Management Process, including self-assessment and discovery, strategic opportunity identification and targeting, custom marketing document creation and co-op search, relationship building practice and management, and modern interview and negotiation practice and preparation. Consistent participation in curated professional development offerings, collaborative and supportive cohort working groups, and regularly scheduled meetings with the Graduate Co-op Advisor is expected, and often mandatory. The Career Center and the SOE Graduate School are sincerely invested in our admitted co-op program students' development and execution plan and have built a system of impactful tools, resources, coaching expertise, and insights that are fundamental to not only securing a co-op but also managing all aspects of a career.

In preparation for a co-op search, students must participate in the required career development sessions offered by Tufts Career Center, which provide valuable skills needed to be successful in securing a co-op position that simultaneously aligns with individual needs and preference while also adhering to Tufts standards and ethical guidelines and employer expectation.

As part of the co-op program, eligible MS students are only allowed to accept one position during their time in the program. *There is no guarantee that students who enter the co-op program will secure employment.*

Cost Of Co-Op Program

There is no additional charge for a student to be enrolled in the co-op program.

Graduate Co-op Program Eligibility

Prerequisites that the student must meet to be considered for the program:

1. Must be enrolled in a program that offers the Graduate Co-op Program (see the list of departments below). This program is not available to part time programs, online programs, certificate programs, Ph.D. programs, or Post Baccalaureate programs. Students enrolled in a combined Post-Bacc/MS program or Fifth-Year MS programs are eligible to participate as long as they meet program requirements.
2. Must complete at least 2 full-time semesters as a fully-matriculated and enrolled Master's student. Students must complete a minimum of 9 credits in their first semester to be considered for the program and must complete at least 18 credits towards their MS programs before beginning their co-op. Newly matriculated stu-

dents can only apply for the program and attend the required info session before the end of their first semester as a full-time student.

- a. Post-Bacc/MS students: No bachelor-level classes for at least 2 full-time semesters before beginning their co-op.
- a. Fifth-Year MS students: Must be fully matriculated with a completed BS degree.
3. Must be in good academic standing (See requirements below), enrolled full-time, have had no previous extensions of time or reduced course load accommodations, and have not enrolled in any undergraduate course as an MS student.
4. Must have at least one semester remaining in their MS programs after co-op opportunity .

Academics and the Co-op Program

Students must meet all requirements of the SOE Graduate Handbook and any departmental specific requirements to be eligible and to participate in the program. All students must meet the following criteria:

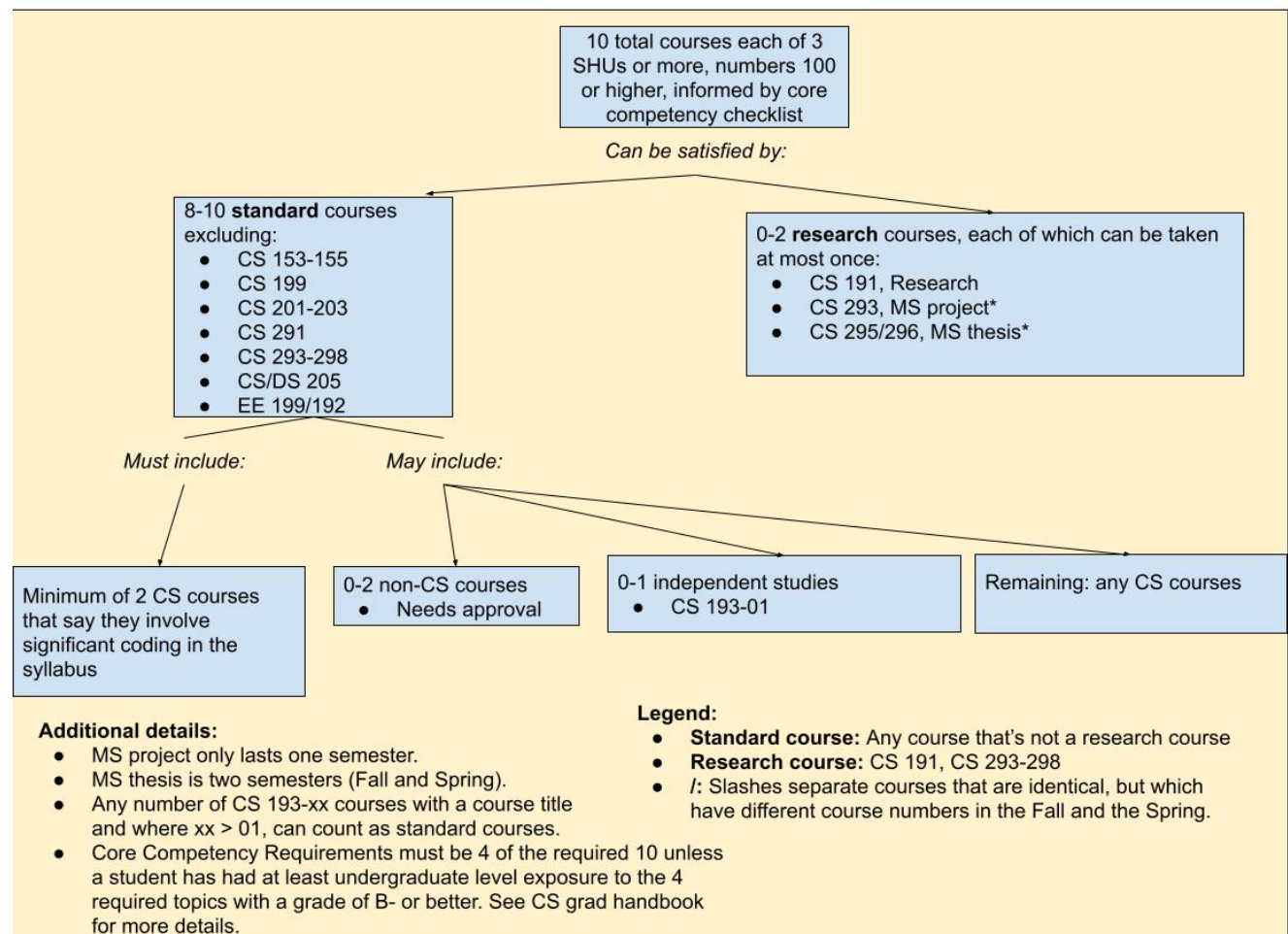
1. Good Academic Standing requirement: Students need to be in good academic standing, enrolled full-time, have had no previous extensions of time or reduced course load accommodations, and have not enrolled in any undergraduate courses as an MS student. Students must be in good academic standing at all times. Failure to remain in good academic standing at all times will result in a student being removed from the co-op program and the MS time to degree will be reduced to the non-co-op time to degree limits for MS programs.
2. Course completion requirement: Fully matriculated students must complete two full-time semesters before working at a co-op, with at least 9 credits total completed in their first semester and at least 18 total credits in the second semester. Courses must be taken at Tufts while matriculated and enrolled as an SOE graduate student. The SOE will be checking to see if an applicant is on track for meeting these requirements in the application process.
3. The student's academic record must demonstrate a high level of success, including:
 - a. No missing grades.
 - b. No incomplete grades (grade of I).
 - c. No grade of W in the most recent spring/fall semester completed or in progress.
 - d. No more than one repeated/substituted course.
 - e. No academic probation or disciplinary issues.
 - f. No semesters on a reduced course load or degree extensions of time.

Tufts course requirements for a Master's and Ph.D. in Computer Science

This document lists important information about course requirements for Master's and Ph.D. Students. The term “courses” refers to lecture-based classes, independent studies, and research. The first two are denoted by “standard courses” and the latter by “research courses. Both Master's and Ph.D. course requirements can be satisfied via a varying combination of standard and research courses depending on your interests.

We recommend that Master's students interested in completing a thesis and Ph.D. students bias their course selection toward research courses.

M.S. in Computer Science (10 total courses, each of 3 SHUs or more)



The flow chart above illustrates the course requirements to get a master's degree. A box that indicates a range in required courses (e.g., 8-10 standard courses) indicates that some of the required courses can be obtained from a box in a sibling branch (e.g., 0-2 research courses).

Core Competencies: By your last semester at Tufts, you must have completed at least one class in each of the four areas listed in Appendix E of the handbook and reproduced below. Designated faculty will hold core competency certification sessions during the first seven days of each semester and can approve and/or advise you on the completion of this requirement.

The competencies can be filled by equivalent classes you may have taken at other universities, and that appear on that university's transcript. Alternatively, you can fill them at Tufts by the courses listed in the sub-bullets below. You must have earned at least a B- in a course, whether at Tufts or elsewhere, to satisfy the relevant course-competency requirement. You will not receive graduate course credit for any course numbered less than 100.

Core Competency areas include:

- Computer Architecture and Assembly Language (CA&AL)
 - CS 40, Machine Structure. *No graduate credit.*
 - CS 111, Operating Systems
 - CS 112, Networks
 - CS 114, Network Security
 - CS 116, Introduction to Security
 - CS 118, Cloud Computing
 - CS 146, (also EE 126) Computer Engineering
 - CS 107 (Formerly COMP/CS 181), Compilers; offered infrequently
 - CS 140, Advanced Topics in Computer Architecture
- Programming Languages (PL)
 - CS 105, Programming Languages
 - CS 21, Concurrent Programming. *No graduate credit.*
 - CS 86, Object-Oriented Programming for GUIs. *No graduate credit.*
 - CS 121 (Formerly COMP/CS 180), Software Engineering
 - CS 107 (Formerly COMP/CS 181), Compilers; offered infrequently
- Data structures and Analysis of Algorithms (DS&AA)
 - CS 160: Intro to Algorithms (we highly recommend taking this class!)
- Theory of Computation (ToC)
 - CS 170, Computation theory
 - If you have little math background, try to take Discrete Math (COMP/CS 61) first.

CS 191: This course is a vehicle for doing research. It has similar requirements to the M.S. project (see below). This course can be taken at most once.

CS 199 (Internship in Computer Science): This course is a vehicle for international students to complete an internship. It does not count towards the 10 course requirement. Reach out to Professor Ming Chow for more information on this course.

M.S. Thesis: The thesis requires a commitment of two semesters total, recorded by enrolling in CS 295 and CS 296 in either order; the M.S. thesis is completely optional. Acceptance to the thesis track occurs after matriculation into the program and only with the support of a faculty advisor who is interested in supervising thesis work. After finding a faculty member who is willing to work with you on a MS Thesis, the faculty member can write to the CS Graduate coordinator to request your change to the thesis track. Some reasons for deciding to do a M.S. thesis may include: 1) you are a M.S. student who wants significant research experience; 2) You want to leave the Ph.D. program with a master's and retain some official record of your research activity; 3) You want to complete a substantial and polished preliminary research project on the way to a Ph.D. You need to submit a thesis prospectus at the end of the first semester and the thesis document just after the end of classes during the semester in which you defend. The deadline can be confirmed [here](#). The defense should be scheduled two weeks earlier than the deadline.

The student and advisor will jointly select a thesis committee subject to approval by the CS Graduate Committee. This committee must include at least three faculty members, including one member from outside the department. You will defend the research via a 45-minute presentation, which the committee will attend.

The defense is also open to the public. You will receive a grade for CS 295 and CS 296 only after you finish both semesters.

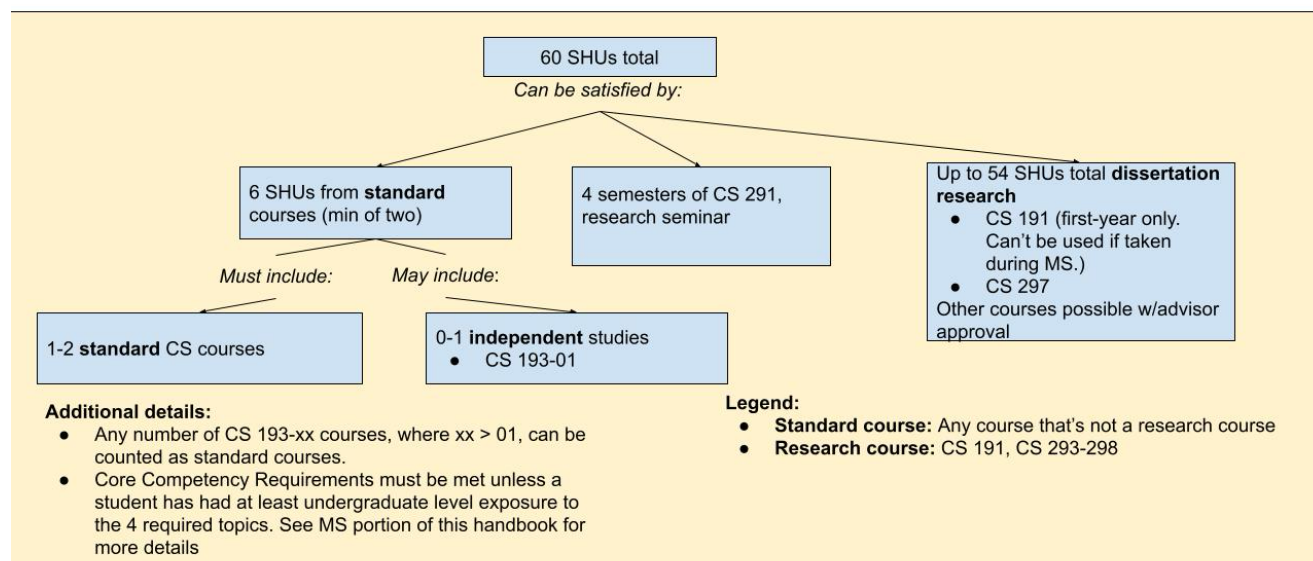
M.S. Project: An M.S. Project consists of research conducted with a faculty advisor and is a commitment of one semester recorded by registering for CS 293, usually for 3 SHUs. You may choose to take this option because: 1) you are a M.S. student who wants to complete a research project without the overhead of writing a thesis, or 2) you are a Ph.D. student who doesn't want to write a separate master's thesis. If you do not have an advisor for the project, you need to find one. If your advisor for the project is not your academic advisor, they need to agree to become your advisor. You and your advisor need to agree on the project and any write-up requirements. (Advisors approve the write-up and keep a copy). This course can be taken at most once.

CS 193-xx (where $xx > 01$): These are directed study courses with official names and with two or more students. Your advisor might create one as a vehicle for reading a set of research papers from a conference or understanding a new research area. Another faculty member might create one that involves a joint implementation project, or as a dry run of a course that will become a CS 150. You can count any number of these as *standard* CS courses.

Maintaining Good Standing: You must maintain a grade average of at least a B, earning no more than one grade below B-, and make continuous progress toward graduation. Courses that do not count toward your degree requirements must still meet the B- grade requirement.

Applying for Graduation: Graduation information for graduate students can be found at this website. The chart at the bottom of the page outlines what needs to be done by when for each possible graduation date.
<https://students.tufts.edu/registrar/make-request/apply-graduation/graduation-information-graduate-students>.

Ph.D. Requirements



The flow chart above shows the course requirements for obtaining a Ph.D. If you don't already have an M.S. degree in computer science or an approved alternative, you must complete these requirements in addition to those for the master's.

Teaching Assistantship: You must TA at least one course during your time as a student at Tufts.

Core Competencies: By the time you take quals (see below), you must certify that you do have background in the areas listed in Appendix E of the handbook. (See comments on core competencies in the M.S. section above.)

- Students without their M.S. must have core competencies finished by the end of their third or fourth semester, and before taking the qualifying exam.
- Students with their M.S. must have core competencies finished by the end of their first or second semester, and before taking the qualifying exam.

Qualifying Exam: This is a sanity check to ensure you are making research progress and have adequate background about your research area. The exam involves giving a presentation about some research you've conducted + an oral exam on 4-7 research papers. The presentation is 30-40 minutes followed by questions. The oral exam is one hour long. You may read more about the process [here](#).

- Timing:**
 - Students without M.S.: Take it during your third or fourth semester from entry into the program, after satisfying your core competencies. You must pass it by the end of your fifth semester at Tufts.
 - Students with M.S.: Take it by the end of your second semester, after satisfying your core competencies. You must pass it by the end of your third semester at Tufts.
- Process:**
 - Students, in conjunction with their advisor, select a committee of at least three members. At least two must be insiders of the student's research area, and at least one of these must be a regular faculty member in the computer science department. In addition, there must be at least one member from outside of the student's research area who is a tenured regular member of the computer science faculty. The Grad Committee approves quals committees; they make the final determination of what committees are acceptable.

- Insider committee members choose 4-7 papers related to the student's research and informs the student of them. These are the papers the student will be evaluated on during the oral exam.
- Students work with CS Grad Coordinator to schedule both the presentation and the oral exam with the committee. These may be done back-to-back on the same day or on separate days, so long as the research talk occurs first.

Prospectus: You must write a document describing the research you plan to conduct for your dissertation and submit it to the CS graduate committee. The prospectus you submit should be about 2-3 pages long and it must: (1) have a title, (2) describe your intended research direction or open problems to be addressed in the thesis research, (3) cite and briefly describe appropriate related work, (4) identify the dissertation advisor, and (5) identify two additional dissertation committee members within the CS department. Two more members will be added later, (6) include references on any cited work.

- *Process:*

- Write the prospectus with input from your Ph.D. advisor.
- Ask two additional Tufts faculty members apart from your advisor who will serve on your committee. List them in the prospectus.
- Submit the prospectus to the graduate committee six months after your quals. The document should be **signed by your advisor prior to submission**.
- Your prospectus is a living document and should be updated at least once per year at the time of the grad reviews.

Dissertation Committee: One year after the submission of the prospectus, the student will convene a meeting of the 3 Tufts CS members and the 1 Tufts member outside of CS to review the progress and plans. Six months before the defense, the full committee, including the member external to Tufts, shall meet to map out the expectations for the dissertation.

Dissertation Defense: This is when you are done. During a dissertation defense, you give a public presentation on your research, and then answer private questions from your committee members about both the presentation and the dissertation document that describes your research. The final deadline for submission of the approved dissertation document is just after the end of classes in each of the Spring, Summer, and Fall semesters, and can be confirmed [here](#). The defense occurs two weeks earlier than the university deadline to allow for edits requested by the committee at the defense.

- *Process:*

- Together with your advisor, propose a committee to the Grad Coordinator. This goes for review to the CS Grad Committee.
- Convene the committee one year after submitting prospectus and again 6-12 months before defense.
- Write the dissertation document.
- Schedule a defense date with your committee.
- Submit the abstract and title for the dissertation to the CS office at least three weeks before the defense date so that the public portion of the defense can be publicized.
- Submit the full draft of your dissertation to your committee at least three weeks before the defense date so that they have adequate time to review and to provide you with comments.
 - At the same time, submit a copy to the Graduate Program Coordinator for your student file. It will be made available to faculty or students upon request.
- Give your defense!
- Submit final approved document to the university.

- *Committee:*

- Your committee should have five members.

- CS Faculty Advisor (with or without tenure)
- CS Faculty Member (with tenure)
- CS Faculty Member (with or without tenure)
- Tufts Faculty Member Outside of CS (does not need to be tenured, can have a joint appointment in CS so long as primary appointment is elsewhere)
- Member Outside of Tufts (doctoral-level researcher whether in university or industry)
 - This member does not need to be tenured

Applying for Graduation: Graduation information for graduate students can be found at this website. The chart at the bottom of the page outlines what needs to be done by when for each possible graduation date.

<https://students.tufts.edu/registrar/make-request/apply-graduation/graduation-information-graduate-students>.

FAQs for Ph.D. Registrations

Registration for students on RAships and TAs:hips:

- You should register for at least 9 units of load to be considered full-time. You should not register for more than 13 units of load.
- You should register for CS 405-TA or CS 406-RA to indicate status as a Ph.D. TA or RA. These are special courses that count as 3 units of load, but do not count as credit.
- You need to register for at least 6 more SHUs of courses (standard or research) to be considered full time. You should not register for more than 10 additional SHUs of courses.
- An example full-time course load for a Ph.D. student on RA or TAs:hip could be:
 - CS 405-TA/406-RA (3 units of load)
 - CS 135 Machine Learning (3 SHUs)
 - CS 297 Dissertation Research (3 SHUs)
 - Total: 9 units of load, 6 SHUs towards degree requirements

What research courses do I register for once I have completed the 60 SHUs required for the Ph.D.?

- Once you have accrued 60 SHUs, you switch to “CS 502: Matriculation Continued” rather than registering for more research SHUs.
- An example full-time course load for a Ph.D. student who has met the 60 SHU requirement could be:
 - CS 405-TA (3 units of load)
 - CS 502 Matriculation Continued
 - Total: full-time status met

What is the minimum number of “actual” classes I need to take to get an M.S. + Ph.D.?

- You will need to take 8 “actual” classes. Your M.S. would consist of 7 actual courses, 2 research courses (i.e., CS 191 and 293 or CS 295 and 296), and 1 independent study (CS 193-01).
- Your Ph.D. would consist of 1 actual course, 1 CS 193-01, and the rest would be research credits (191, 297). It is possible this number could be further reduced by taking named CS 193-0x classes (x>1), as these count as “actual” classes.

What should I register for if I’m here over the summer?

- Current students who stay for the summer should register for CS 406-RA/405-TA as well as CS 502 – Doctoral Degree Continued.
- A Ph.D. student who has not yet completed the M.S. degree should register for CS 406-RA/405-TA and CS 401/402 – Master’s Degree Continued.
- For incoming Ph.D. students who will be here on a temporary visa, they must have a full-time enrollment of 6 SHUs over the summer. This could include one “standard” course, one “research/independent study” course, plus CS 406-RA/405-TA.

32 Results

Arts, Sciences, and Engineering, Summer 2025, CS

☐ Show Descriptions

☐ Show Sections

Enrollment Status: ● open ⛔ closed ⚠ waitlist

CS-0011 Introduction To Computer Science

The study of computer science centers on two complementary aspects of the discipline. First, computer science is fundamentally concerned with the problem-solving methodologies it derives from its foundational fields: the design principles of engineering, mathematical theory, and scientific empirical study. Second, these methodologies are applied in the complex context of a modern day computing system. In this course we will address both of these important aspects. As a means for developing your design skills, we will discuss the fundamental features of a high level, general purpose programming language — namely C++ — and learn how to use it as a tool for problem solving. We will also consider the performance of solutions, and how to apply both analytical and empirical assessment techniques. Finally, we will explore the Unix operating system as a context for problem solving.

LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50421	S12	Time Not Specified Online	STAFF	4	●	
C2-LEC Details	50456	S12	Time Not Specified Online	STAFF	4	●	
M1-LEC Details	50490	S12	Time Not Specified Online	STAFF	4	●	
M2-LEC Details	50476	S12	Time Not Specified Online	STAFF	4	●	

CS-0015 Data Structures

A second course in computer science. Data structures and algorithms are studied through major programming projects. Topics include linked lists, trees, graphs, dynamic storage allocation, and recursion. Enrollment priority given to freshmen or sophomores; computer science majors or minors; or majors or minors that list CS15 as a requirement or elective.

LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50422	S12	Time Not Specified Online	STAFF	4	●	
C2-LEC Details	50423	S12	Time Not Specified Online	STAFF	4	●	
M1-LEC Details	50477	S12	Time Not Specified Online	STAFF	4	●	
M2-LEC Details	50491	S12	Time Not Specified Online	STAFF	4	●	



CS-0061 Discrete Mathematics

(Cross-listed as MATH 61). Sets, relations and functions, logic and methods of proof, combinatorics, graphs and digraphs. Recommendations: MATH 32 or COMP 11 or permission of instructor.

LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50424	S12	Time Not Specified Online	STAFF	3	●	
C2-LEC Details	50457	S12	Time Not Specified Online	STAFF	3	●	
C3-LEC Details	50460	S12	Time Not Specified TBA Medford/Somerville	STAFF	3	●	
M1-LEC Details	50478	S12	Time Not Specified Online	STAFF	3	●	



Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
M2-LEC Details	50479	S12	Time Not Specified Online	STAFF	3	<div></div>	
CS-0099 Internship Computer Science							
Study of approved topics in Computer Science in concert with an internship in computing or a related field. Prerequisites: Permission of instructor.							
INTERNSHIP							
Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
CPT-INT Details	50405	S12	Time Not Specified Online	Ming Yan Chow	1	<div></div>	
CS-0111 Operating Systems							
(Cross-listed as EE 128). Fundamental issues in operating system design. Concurrent processes: synchronization, sharing, deadlock, scheduling. Relevant hardware properties of uniprocessor and multiprocessor computer systems.							
LECTURE							
Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50428	S12	Time Not Specified Online	STAFF	3	<div></div>	
M1-LEC Details	50480	S12	Time Not Specified Online	STAFF	3	<div></div>	
CS-0115 Database Systems							
Fundamental concepts of database systems, including conceptual design, relational and object-oriented data models, query languages (SQL, QBE), and implementation issues (indexing, transaction processing, concurrent control). The concepts and algorithms covered encompass many of those used in commercial and experimental database systems. Other topics include distributed databases and distributed query processing. Recommendations: CS 40							
LECTURE							
Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50427	S12	Time Not Specified Online	STAFF	3	<div></div>	
M1-LEC Details	50481	S12	Time Not Specified Online	STAFF	3	<div></div>	
CS-0120 Web Programming and Engineering							
Web applications as complex systems that deliver functionality to a large number of users, and exhibit unique behaviors and demands in terms of performance, scalability, usability, and security. How the web works, limitations of client-side and server-side technologies including frameworks and APIs, content optimization, and data persistence and storage. Projects will involve search, using the cloud infrastructure, location-based services, mobile web development, and using tools to assess the security and privacy of web applications.							
LECTURE							
Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50429	S12	Time Not Specified Online	STAFF	3	<div></div>	
M1-LEC Details	50482	S12	Time Not Specified Online	STAFF	3	<div></div>	
CS-0121 Software Engineering							
Core principles and ideas that enable development of large-scale software systems, with a focus on programming. Abstraction, modularity, design patterns, specification, testing, verification, and debugging.							
LECTURE							
Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50430	S12	Time Not Specified Online	STAFF	3		
M1-LEC Details	50483	S12	Time Not Specified Online	STAFF	3		

CS-0131 **Artificial Intelligence**

History, theory, and computational methods of artificial intelligence. Basic concepts include representation of knowledge and computational methods for reasoning. One or two application areas will be studied, to be selected from expert systems, robotics, computer vision, natural language understanding, and planning.



LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50431	S12	Time Not Specified Online	STAFF	3		
M1-LEC Details	50484	S12	Time Not Specified Online	STAFF	3		

CS-0135 **Introduction To Machine Learning And Data Mining**

An overview of methods whereby computers can learn from data or experience and make decisions accordingly. Topics include supervised learning, unsupervised learning, reinforcement learning, and knowledge extraction from large databases with applications to science, engineering, and medicine. Recommendations: CS 160 is highly recommended.


LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50432	S12	Time Not Specified Online	STAFF	3		
M1-LEC Details	50485	S12	Time Not Specified Online	STAFF	3		

CS-0151 **Special Topics in Data Infrastructure and Systems - Cybersecurity Clinic**

A special topics course in data infrastructures and systems, suitable for fulfilling requirements of the Bachelor of Science in Data Science.





LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C-LEC Details	50461	S12	Time Not Specified TBA Medford/Somerville	STAFF	3		

CS-0160 **Algorithms**

Introduction to the study of algorithms. Strategies such as divide-and-conquer, greedy methods, and dynamic programming. Graph algorithms, sorting, searching, integer arithmetic, hashing, and NP-complete problems. High demand (see "course notes" for signup procedure).

LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC Details	50425	S12	Time Not Specified Online	STAFF	4		
C2-LEC Details	50418	S12	Time Not Specified Online	STAFF	4		
M1-LEC Details	50486	S12	Time Not Specified Online	STAFF	4		
M2-LEC Details	50487	S12	Time Not Specified Online	STAFF	4		

CS-0170 **Computation Theory**

(Cross-listed as MATH 191). Models of computation: Turing machines, pushdown automata, and finite automata. Grammars and formal languages, including context-free languages and regular sets. Important problems, including the halting problem and language equivalence theorems.

LECTURE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-LEC	50426	S12	Time Not Specified Online	STAFF	3	<div></div>	
Details							
M1-LEC	50488	S12	Time Not Specified Online	STAFF	3	<div></div>	
Details							

CS-0191 Research

Research on a topic in Computer Science or a related discipline, culminating in a final paper describing accomplishments, with the goal of advancing the state of the art. Topic is proposed by a faculty sponsor in Computer Science. Faculty consent required. Students sign up for a section that corresponds to a faculty member.

RESEARCH

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C-RSC	50412	S12	Time Not Specified TBA Medford/Somerville	Abani Patra, Alva Couch, Bert Huang, Daniel Jared Votipka, Dave Lillethun, Deborah Sunter, Diane L Souvaine, Donna Slonim, Elaine Schaertl Short, Ethan E. Danahy, Fahad Rafique Dogar, Jeffrey Foster, Jivko Sinapov, Johannes Peter Albert De Ruiter, Karen A Panetta, Karen Edwards, Lenore J Cowen, Liping Liu, Mark A Sheldon, Marty Allen, Matthias Scheutz, Megan Monroe, Michael C. Hughes, Ming Yan Chow, Noah Mendelsohn, Norman Ramsey, Peter John Love, Raja Raman Sambasivan, Remco K Chang, Richard Townsend, Robert Jacob, Samuel Guyer, Soha Hassoun, Susan Landau	3	<div></div>	
Details							

CS-0193 Directed Study

Guided study of an approved topic. Please see departmental website for specific details.


INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
A-IND	50440	SA	Time Not Specified TBA Medford/Somerville	Diane L Souvaine, Elaine Schaertl Short, Jivko Sinapov	0-4	<div></div>	
Details							

CS-0193 Directed Study

Guided study of an approved topic. Please see departmental website for specific details.

INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
B-IND Details	50473	SB	Time Not Specified TBA Medford/Somerville	Diane L. Souvaine, Elaine Schaertl Short, Jivko Sinapov	0-4		

CS-0193 Directed Study

Guided study of an approved topic. Please see departmental website for specific details.


INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C-IND Details	50401	S12	Time Not Specified TBA Medford/Somerville	Abani Patra, Alva Couch, Bert Huang, Daniel Jared Votipka, Dave Lillethun, Diane L. Souvaine, Donna Slonim, Elaine Schaertl Short, Ethan E. Danahy, Fahad Rafique Dogar, Jeffrey Foster, Jivko Sinapov, Johannes Peter Albert De Ruiter, Karen Edwards, Lenore J Cowen, Liping Liu, Mark A Sheldon, Marty Allen, Matthias Scheutz, Megan Monroe, Megumi Ando, Michael Allan Jahn, Michael C. Hughes, Milod Kazerounian, Ming Yan Chow, Noah Mendelsohn, Norman Ramsey, Raja Raman Sambasivan, Remco K Chang, Richard Townsend, Robert Jacob, Samuel Guyer, Soha Hassoun, Susan Landau	0-4		

CS-0193 Directed Study - Algorithms Practicum

Guided study of an approved topic. Please see departmental website for specific details.


INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C1-IND Details	50470	S12	Time Not Specified TBA Medford/Somerville	Michael Allan Jahn	0-4		

CS-0193 Directed Study - Discrete Mathematics

Guided study of an approved topic. Please see departmental website for specific details.

INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C2-IND Details	50469	S12	Tu, Th 1:30PM - 3:00PM No Room Assigned Medford/Somerville	Michael Allan Jahn	0-4		

CS-0288 Master of Science Capstone Project I

Part one of a two-course, hands-on, and project-based culmination to the Master of Science in Computer Science Online program. Application of principles, strategies, methods, and tools for requirements analysis and design of a programming project, including project planning, project management, and proof of concept prototyping. Formulation

of a project plan, including estimation of project completion requirements and timeline. To be taken in the second-to-last term of the Master of Science in Computer Science Online degree. Not available to students outside that program. Prerequisites: CS 180 or 121, and enrollment in the Master of Science in Computer Science Online program.

INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
M1-IND	50475	S12	Time Not Specified Online	Marty Allen	3	<div></div>	
Details							

CS-0289 Master of Science Capstone Project II

Part two of a two-course, hands-on, project-based culmination experience for the Master of Science in Computer Science Online program. Implementation of the project defined in part one, including use of principles, tools, and strategies for implementation, debugging, testing, documentation, maintenance, and release management. Presentation of final project results and documentation. To be taken in the last term of the Master of Science in Computer Science Online degree. Not available to students outside that program. Prerequisites: CS 288, and enrollment in the Master of Science in Computer Science Online program.

INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
M1-IND	50416	S12	Time Not Specified Online	Marty Allen	3	<div></div>	
Details							

CS-0293 Master's Project

Guided individual study of an approved topic suitable for a master's design project. Please see departmental website for specific details. Faculty consent required. Students sign up for a section that corresponds to a faculty member.

PROJECT

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C-PRO	50402	S12	Time Not Specified Online	Abani Patra, Alva Couch, Bert Huang, Daniel Jared Votipka, Dave Lillethun, Diane L Souvaine, Elaine Schaertl Short, Fahad Rafique Dogar, Jeffrey Foster, Jivko Sinapov, Johannes Peter Albert De Ruiter, Lenore J Cowen, Liping Liu, Mark A Sheldon, Marty Allen, Matthias Scheutz, Megan Monroe, Michael C. Hughes, Ming Yan Chow, Noah Mendelsohn, Norman Ramsey, Raja Raman Sambasivan, Remco K Chang, Richard Townsend, Robert Jacob, Samuel Guyer, Soha Hassoun, Susan Landau	0-4	<div></div>	
Details							

CS-0295 Masters Thesis

Guided individual study of an approved topic suitable for a master's design project. Please see departmental website for specific details. Faculty consent required. Students sign up for a section that corresponds to a faculty member.

THESIS


Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C-THS	50409	S12	Time Not Specified Online	Abani Patra, Alva Couch, Bert Huang, Daniel Jared	0-6	<div></div>	
Details							

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
				Votipka, Dave Lillethun, Deborah Sunter, Diane L Souvaine, Donna Slonim, Elaine Schaertl Short, Fahad Rafique Dogar, Jeffrey Foster, Jivko Sinapov, Johannes Peter Albert De Ruiter, Lenore J Cowen, Liping Liu, Mark A Sheldon, Marty Allen, Matthias Scheutz, Megan Monroe, Michael C. Hughes, Milod Kazerounian, Ming Yan Chow, Noah Mendelsohn, Norman Ramsey, Peter John Love, Raja Raman Sambasivan, Remco K Chang, Richard Townsend, Robert Jacob, Samuel Guyer, Soha Hassoun, Susan Landau			

CS-0297 Dissertation Research

Guided research on a topic suitable for a doctoral dissertation. Please see departmental website for specific details.
Prerequisites: Ph.D. student standing in Computer Science


INDEPENDENT STUDY

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
C-IND Details	50411	S12	Time Not Specified TBA Medford/Somerville	Abani Patra, Alva Couch, Bert Huang, Daniel Jared Votipka, Dave Lillethun, Diane L Souvaine, Donna Slonim, Elaine Schaertl Short, Fahad Rafique Dogar, Jeffrey Foster, Jivko Sinapov, Johannes Peter Albert De Ruiter, Johes Bater, Karen A Panetta, Kathleen Fisher, Lenore J Cowen, Liping Liu, Mark A Sheldon, Marty Allen, Matthias Scheutz, Megan Monroe, Michael C. Hughes, Ming Yan Chow, Noah Mendelsohn, Peter John Love, Raja Raman Sambasivan, Remco K Chang, Richard Townsend, Samuel Guyer, Shuchin Aeron, Soha Hassoun, Susan Landau	1-9		

CS-0299 Internship In Computer Science

Study of approved topics in Computer Science in concert with an internship in computing or a related field outside the University. Prerequisites: Permission of instructor


INTERNSHIP

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
CPT-INT	50406	S12	Time Not Specified Online	Ming Yan Chow	1		
Details							

CS-0401 Masters Degree Continuation

Part-time.Please see departmental website for specific details.


CONTINUANCE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
PT-CON	50465	SA	Time Not Specified TBA Medford/Somerville	STAFF	0		
Details							

CS-0401 Masters Degree Continuation

Part-time.Please see departmental website for specific details.


CONTINUANCE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
PT-CON	50462	S12	Time Not Specified TBA Medford/Somerville	STAFF	0		
Details							

CS-0402 Masters Degree Continuation

Full-time.Please see departmental website for specific details.


CONTINUANCE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
FTA-CON	50463	SA	Time Not Specified TBA Medford/Somerville	Diane L Souvaine	0		
Details							

CS-0402 Masters Degree Continuation


Full-time.Please see departmental website for specific details.

CONTINUANCE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
FT-CON	50407	S12	Time Not Specified Online	Diane L Souvaine	0		
Details							

CS-0405 Grad Teaching Assistant

TEACHING ASSISTANT

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
TA-TAS	50403	S12	Time Not Specified Online	Abdullah Bin Faisal, Andrew Scott Winslow, Diane L Souvaine, Elaine Schaertl Short, Fabrizio Santini, Jivko Sinapov, Marty Allen, Michael Allan Jahn, Milod Kazerounian, Owen A. Morrissey, Patrick Feeney, Sandra Schulenburg, Shivam Goel	0		
Details							

RESEARCH

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
RA-RSC Details	50404	S12	Time Not Specified Online	Daniel Jared Votipka, Elaine Schaertl Short, Fahad Rafique Dogar, Jeffrey Foster, Jivko Sinapov, Lenore J Cowen, Matthias Scheutz, Megumi Ando, Michael C. Hughes, Peter John Love, Raja Raman Sambasivan, Remco K Chang, Robert Jacob, Saeed Mehraban, Sandra Schulenburg, Soha Hassoun, Vasanth Sarathy	0	<div></div>	

Full-time.Please see departmental website for specific details.

CONTINUANCE

Section	Class No.	Session	Day, Times and Locations	Faculty	Credit	Status	Select
CON-CON Details	50408	S12	Time Not Specified Online	Diane L Souvaine	0	<div></div>	

- g. Satisfied language assessment and completion of the English for Technical Professionals online course (for international students who were required to submit TOEFL/language scores in their application).
4. Students searching for a co-op position during a fall or spring semester must meet the semester-hour requirements.
5. All students must have their academic advisors sign off on the Co-op Agreement form to ensure a return plan that outlines a feasible pathway for completing the remaining requirements within the degree time limits. The sequence of courses in the program should be considered in addition to possible alternatives to required courses, should a required course not be offered during the semester when the student returns from co-op. A student's degree program cannot be extended because a required course is not offered during the semester that they return.
6. After the co-op, students must return to complete one full semester at Tufts before graduating. There must be degree requirements remaining in their program after the co-op is completed. Students cannot go on a co-op if all degree requirements are already satisfied.

Departments Participating in Co-Op Program

Students enrolled in MS degree programs offered by the following departments are eligible to participate in the co-op program for graduate students. Part-time, online certificate, post-bacc, and Ph.D. students do not qualify for the co-op.

- Biomedical Engineering
- Chemical and Biological Engineering
- Civil and Environmental Engineering
- Computer Science
- Electrical and Computer Engineering
- Mechanical Engineering
- Tufts Gordon Institute

Questions and Contact Information

[Graduate Admissions](#) for new applicants.

[Career Center](#) for enrolled MS students.

Co-op Application Process

To be considered for enrollment in the Graduate Co-op Program, students must:

1. **Attend a REQUIRED Graduate Co-op Information Session.** Info sessions are typically held at the end of the semester and are hosted by the Career Center and partnership with SOE. Eligible students will receive an announcement to their