

Graduate Student Handbook Supplement
Department of Computer Science
Tufts University Spring 2019

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If you need further clarification, please contact Director of Graduate Studies

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Graduate Programs in Computer Science

The Department of Computer Science offers a number of graduate degrees and non-degree programs. The official degree requirements and procedures are already listed in other Tufts publications:

Degree programs and requirements are listed in the Tufts Bulletin, which is (at the time of writing) available at

<http://students.tufts.edu/registrar/bulletin>

Policies, procedures and other practical information is given in the graduate student handbook which is (at the time of writing) available through

https://asegrad.tufts.edu/sites/default/files/Tufts_Grad_Student_Handbook_18-19.pdf.

This booklet provides a brief overview of some of the requirements and procedures for graduate degrees and other programs offered by the department of Computer Science, but it does not replace these resources. The main goal of this booklet is to provide additional procedural information beyond these resources focusing mainly on the Master and Ph.D. programs. This information should be useful for both students and their advisors.

This document begins with an overview of degree programs, including M.S. and Ph.D. programs, and continues with an overview of non-degree programs, including Certificates and Post-Baccalaureate Certificates.

Overview of Degree Programs

The Department of Computer Science participates with a number of other departments for various degree programs. Students should make sure to visit the web sites of each program for requirement details.

M.S. and Ph.D. in Computer Science

The M.S. and Ph.D. in Computer Science are the core graduate programs in the department. They are open to students who have majored or minored in computer science, to students who have gained the requisite background knowledge through employment in the field, and to students who make a strong showing in Tufts' Post Baccalaureate Minor program or one of our other certificates. Details about the program can be found in their own sections of this Handbook.

M.S. and Ph.D. in Human-Robot Interaction

This interdisciplinary program is open to individuals with a bachelor's degree and some prior software experience. The program allows students to do something or another. Information about this program is provided separately, at

<http://hri.tufts.edu/>.

M.S. in Data Science – Starting in the fall of 2019

The department of Computer Science jointly offers a Master of Science in Data Science with the department of Electrical and Computer Engineering. This degree program will admit applicants starting in Fall 2019. In the 2018-2019 academic year, prospective students may enroll in the Certificate in Data Science and then transfer their certificate coursework to the M.S. program in entirety in Fall of 2019.

M.S. in Bioengineering

The Department of Computer Science participates in the interdisciplinary Tufts Engineering-School Bioengineering Master Program through a track that allows a specialization in Bioinformatics. Information about this program is provided separately, at

<http://engineering.tufts.edu/docs/Bioengineering-Masters-Program.pdf>.

M.S. in Computer Engineering

The M.S. program in Computer Engineering is jointly administered between the Department of Computer Science and the Department of Electrical and Computer Engineering.

<https://asegrad.tufts.edu/academics/explore-graduate-programs/computer-engineering>.

Ph.D. in Cognitive Science

The Department of Computer Science participates in the interdisciplinary Tufts Cognitive Science Ph.D. Program. Information about this program is provided separately, at

<http://cogsci.tufts.edu/academics/requirements.htm>.

BS/M.S. Combined Programs in Computer Science and Data Science

These programs, open only to Tufts undergraduates, allows students to complete both a bachelor's and master's degree at Tufts. Students must complete all the requirements for each degree. However, since they may transfer up to two qualifying courses taken during their undergraduate period into their M.S. program, and they may double-count up to two qualifying courses to be used towards both degrees, many students will need no more than two additional semesters to complete their M.S..

Evaluating Students' Progress: Annual Review

The Computer Science faculty collectively conducts an annual review of the progress of all graduate students in the department. Students will be asked to provide a summary of their progress, achievements, and difficulties in the preceding year to be used in the review. The advisor and/or department chair will report to the student, in writing, the suggestions resulting from the annual review.

The Master of Science (M.S.) Program

The Master of Science degree requires 10 courses comprising at least 30 credit hours of study at the 100 level or above. Students may choose to do a master's project or thesis, however these must be approved by a member of the faculty. Beginning in Fall 2018, the M.S. project is optional and may be replaced by a course in Computer Science.

Course Requirements: 10 courses, comprising at least 30 credit hours are required, of which at least 8 courses must be from an approved list. All COMP courses numbered 100 or higher, **excluding the courses listed in Appendix D**, are approved. The remaining two courses may be earned from the approved list, or from conducting approved research or independent study (COMP 294-296), or from a combination of the two. At least six courses must be in computer science, and at least two courses must include a serious programming component. Courses with a serious programming component include COMP 105 (Programming Languages), 111 (Operating Systems), 112 (Networks and Protocols), 115 (Database Systems), 116 (Introduction to Computer Security), and 120 (Web Engineering). The grade in each course must be B- or better in order to earn graduate credit.

During the Spring 2019 semester *only*, students who are close to completion of their degree, and having completed *all* requirements *except* the 10 course requirement, may petition the Graduate Committee to be allowed to graduate in May 2019. Petitions must be signed by the student's advisor and received by the Graduate Committee no later than January 30, 2019.

A student who received a grade below B- in COMP 105 (Programming Languages), COMP 160 (Algorithms) or COMP 170 (Computation Theory) (or their equivalents at other institutions) as an undergraduate may retake the course for graduate credit.

To use courses offered outside the Department of Computer Science, the student must obtain the approval of the department. In particular, students focusing on an interdisciplinary area of COMP may take fewer than six COMP courses, but this is subject to the approval of the department. Students who want to pursue this option should consult Appendix F for the appropriate procedure.

Residency Requirement: Students in the MSCS or MSDS programs have a one year (two semester) residency requirement. However, students who enroll in a certificate program may count time spent in the certificate courses as part of that residency requirement.

Core Competencies Requirement: Students must also demonstrate core competence as expected from a high quality undergraduate program in computer science in particular in the areas of:

- Computer Architecture and Assembly Language (Comp 40),
- Programming Languages (specifically, functional programming and object-oriented programming with inheritance (Comp 105),
- Data Structures and Analysis of Algorithms (Comp 160), and
- Theory of Computation (Comp 170).

The department additionally recommends that students with a weak math background take an equivalent of Discrete Math (Comp 61), either before enrolling in the program or online outside Tufts after enrolling.

Competence may be demonstrated by taking the respective graduate courses, and may also be demonstrated by taking more advanced courses on the corresponding topics. Students should make a plan to complete this requirement, complete the form in Appendix E together with their advisor, and submit it to the Director of Graduate Studies for approval, no later than one week into the student's final semester.

Students who do not have the required background in Computer Architecture and Assembly Language can complete the requirement in various ways: they can take COMP 40 for credit (but will not obtain graduate credit for this course), or they could take EE 126 that covers similar material, or study the material on their own and then take a more advanced course requiring 40 as a prerequisite (e.g. COMP 111 (Operating Systems) or 112 (Networks and Protocols). For these and other options, students should consult their advisors.

M.S. Projects: The project (which is optional as of Fall 2018) includes a written report which must be approved by a member of the faculty. This work can be done with any member of the COMP faculty. The project advisor need not be the same person serving as the academic advisor, although it often makes sense for the student to change academic advisors (so that their project advisor becomes their academic advisor) or to add the project advisor as a secondary academic advisor, but this is not a requirement.

Projects, whether initially arising through a course or initiated as an independent effort, generally count as 3-credit hour courses. The specific project and write-up requirements must be agreed between the student and project advisor, and the student registers for 1-3 credit hours for COMP 293 or 294 with the corresponding project advisor.

Writing a Thesis: Students who wish to write a thesis should contact COMP faculty members for appropriate topics and to define a scope and depth of work. Thesis preparation often includes taking a course with the thesis advisor covering preliminaries needed for the thesis. Students writing a thesis are required to submit a M.S. thesis prospectus by the end of the first term counted for thesis credit. The prospectus, which should provide a detailed description of research achievements and future plans, should be pre-approved by the thesis advisor. The prospectus will be vetted by the graduate committee, which will respond in writing to the student with the outcome.

The student's advisor will propose a committee to the faculty for approval. The thesis committee, chaired by the advisor, will include at least three faculty members, currently including one member from outside the department. Upon completion of the research, the student must prepare a dissertation and publicly defend it. The defense includes a 45-minute presentation open to the public where the student presents their research. The public presentation must be advertised to the entire department at least one week prior to the presentation.

Students should be aware that the scope of a thesis is much more involved than a project and it is not always possible to complete the work within a tight schedule, or predict in advance how long it should take. We therefore advise that those wishing to write a thesis take an optimistic but cautious strategy. This means starting work on your thesis early enough in your studies to complete it in your chosen time frame. One possibility (for those starting in the Fall and planning to spend two years at Tufts) is to take no more than 5-7 courses in the first two semesters, start to seek thesis ideas during the second semester, do some background reading and start actual work on the thesis in the summer. In this way, a substantial amount of work can already be done during the summer and fall. For students who intend to continue studying towards a Ph.D., this strategy provides an excellent opportunity to identify topics of interest and potential supervisors within the time frame of the M.S. degree.

Maintaining Good Standing

Students maintain good standing in the program by earning at most one grade below B-, maintaining a grade average of at least a B, and making continuous progress towards graduation. Students who fail to maintain good standing may be dismissed from the program at the discretion of the Graduate Committee and Graduate Dean.

Registration: The graduate school at Tufts uses registration to track multiple aspects pertaining to courses, service as RA or TA, and part- or full-time status. Please consult Appendix C for the expected procedures.

Continuing from an M.S. to a Ph.D. Program

Students in an M.S. program may apply to a Ph.D. program, using the same deadline and process as students applying from outside Tufts (for example submitting an essay and three references). Students applying will be notified of acceptance along with outside applicants.

The application must specifically demonstrate the potential for obtaining a Ph.D. at Tufts. In particular the essay should identify the research area, one of the references should be the proposed Ph.D. advisor, and a second reference should be another Tufts Computer Science faculty member who would be willing to serve on the dissertation committee.

Once admitted, the student will join the regular process of the Ph.D. program and the proposed advisor and topic can change as it does for other students. The actual topic and advisor are determined through the qualifying process and prospectus requirement of the Ph.D. program.

Proposed Checklist for M.S. Students and Advisors

- **Core competence:** The student and advisor should discuss the state of the student's core competencies, any need to obtain such competence during the degree, and steps to obtain these. This discussion should take place at the start of the student's first semester, and should be revisited as necessary. *Please make sure to complete the form in Appendix E as soon as a coherent plan is made and submit it for approval.*
- **The serious programming component:** By the end of first semester the advisor and student should verify that at least two courses, either completed or intended for the coming semester, have a serious programming component.
- **Master's project:** During the student's second semester, those who intend to complete a project should identify a project and advisor.
- **Master's thesis:** Students who intend to write a thesis should make sure to submit their prospectus in good time.
- **Ph.D. consideration:** Students in the M.S. program who are interested in a Ph.D. should:
 - Think strategically toward identifying a research topic and research advisor and toward fulfilling the qualifying requirement.
 - Take research-oriented courses that expose them to research in fields of interest and enable them to interact with potential advisors.

- Take courses not directly in their research focus to allow for the third-area in the qualifying exam. Ideally, a student who enters the Ph.D. program with the M.S. completed will be ready to take the qualifying exam in their first Ph.D. semester.
- Students intending to continue to the Ph.D. should make sure to submit the application on time, as specified on the Graduate Admissions web site, so as to avoid a break between the M.S. and the Ph.D. programs.

Ph.D. Program

Overview

The department differentiates between admission to the Ph.D. program and Ph.D. candidacy. Students are not considered to be formal Ph.D. candidates until they have exhibited merit in a qualifying examination and have identified a faculty member who has agreed to be their dissertation supervisor. Doctoral candidates are expected to plan a program of research under the direction of their dissertation supervisor and with the guidance of a faculty committee. Upon completion of this research, the candidate must prepare and publicly defend their dissertation.

Ph.D. Requirements and Process

Students wishing to obtain a Ph.D. degree in Computer Science at Tufts must successfully complete several requirements, as follows:

Courses and Credits: Students should take 20 courses, comprising 60 credits, for the Ph.D. degree. At least two courses must be regular 100-200 level courses. The rest can be earned by multiple registrations for Comp 297 and Comp 298 (guided graduate research, fall and spring respectively) or by taking other courses approved by the student's advisor. Students in the HRI or CogSci program must fulfill all the regular Ph.D. requirements, and additionally any requirements specific to their concentrations.

Registration: The graduate school at Tufts uses registration to track multiple aspects pertaining to courses, service as RA or TA, and part- or full-time status. Please consult Appendix C for the expected procedures. These requirements include:

- **The Community/Residence Requirement:** This requirement is fulfilled by attending at least 50% of the weekly departmental seminars in each of four semesters. This is the minimal requirement – it is hoped that most students will attend a larger percentage of seminars for a longer period of time. This requirement may be satisfied at any semester and concurrently with the other requirements.
- **The Teaching Requirement:** Every doctoral student is expected to assist in the teaching of a course for at least one semester. This requirement may be satisfied at any semester and concurrently with the other requirements.

The Qualifying Requirement: A student qualifies to begin research on their selected topic by completing the following steps (usually in the given order):

- Obtaining core competence
- Completing a preliminary research project
- Giving an oral presentation on this project
- Passing a written qualifying exam
- Passing an oral qualifying exam

A typical student should be able to satisfy the first two requirements while obtaining the M.S. degree. In any case, the student should meet with the members of the examination committee well before the examinations to make sure that preparation for these requirements has been adequate.

Core competence: Each Ph.D. candidate is expected to have competence at the level of an excellent undergraduate in the following core areas:

- Computer Architecture and Assembly Language

- Programming Languages (specifically, functional programming and object-oriented programming with inheritance)
- Data Structures and Algorithms
- Theory of Computation

In most cases, the candidate will have satisfied these requirements through course work in their Bachelor or M.S. degree, before beginning the Ph.D. program. Students should discuss this requirement with their advisor, complete the form in Appendix E, and submit it for approval no later than the date on which they turn in the qualifying exam contract. Although these requirements are not otherwise tested explicitly, the examiners at the oral part of the qualifying exam may ask questions addressing core competence.

In addition, each Ph.D. candidate is expected to have competence and experience in software implementation. The candidate must have completed an implementation project with documentation. In most cases, this will be a project completed as part of their previous degree work, for example the M.S. project or a final project in an implementation-oriented course.

Preliminary project: Each Ph.D. candidate is expected to have competence in execution and presentation of research, demonstrated by completing a research project. The project should include a written report giving a review of the relevant literature, and listing some open problems that could lead to a Ph.D. dissertation, and in most cases will also present results of original research. The written report is submitted to the intended advisor and is vetted directly by the advisor.

There is no requirement for this to be a new project with respect to the student's previous work, and in many cases this can be an outcome of the student's M.S. project, an independent study or a project done elsewhere. However, the intended advisor must confirm the suitability of the project for the purpose of the qualifying exam.

Oral presentation: The student will make a public oral presentation of at least 45 minutes on this research project. The public presentation must be advertised to the entire department at least one week prior to the presentation. The presentation should demonstrate the student's ability to engage in research and should outline promising research directions.

Written qualifying exam: Each Ph.D. candidate is expected to have advanced competence in three sub-areas of computer science. Two of these sub-areas should be closely related areas—generally, these span the areas of the student's proposed research. The third sub-area must be further removed. Generally, if a student will conduct research in applied computer science, two of the sub-areas will be applied computer science and one will be theoretical, or vice versa. Occasionally, there are exceptions. Some areas (algorithms, graph theory, computational geometry, programming languages) will usually be theoretical and others (compilers, human-computer interaction, virtual reality, visualization) will usually be applied, but many areas (artificial intelligence, distributed computing, databases, graphics) could be either theoretical or applied depending on the focus.

Each Ph.D. student will be examined by a committee of three faculty members: the proposed dissertation advisor, who will serve as chair; a faculty member in a closely-related field; a faculty member in a somewhat removed field. The Ph.D. student will meet each of these faculty members to discuss and agree on the expected depth and breadth of the sub-area to be examined. In the event that this group of three faculty does not include two tenured professors, a tenured faculty member will be added as a fourth member whose responsibility is primarily to observe or possibly ask questions related to core competency.

The choice of the examination committee is done by the student and advisor in consultation with the graduate committee. This choice is officially submitted and vetted through the "contract" described further below.

Ph.D. students will have four hours to complete a written exam with an in-depth question or questions written by each of the examiners. At the end of the four hours the student submits his or her responses but keeps a copy of the exam questions in what becomes the equivalent of a "take home exam." The student may consult published on-line or print materials but may not consult other human beings as he/she/they prepares to answer the follow-up questions pertaining to the written examination at the beginning of the oral qualifying exam described below.

Oral qualifying exam: Within two weeks of the written exam, the student will take an oral exam covering the core areas, the research talk, and the advanced areas. Some discussion of the research can be expected, and core competence is often discussed if the committee has some concerns. But typically the emphasis is on the advanced areas. In particular, the oral exam will begin with questions pertaining to the student's responses on the written examination. It is expected that the student will have independently both reviewed his or her responses and developed revisions and/or enhancements during the intervening time. The student may have consulted, and may bring to the oral exam, published print materials but must not have consulted other human beings.

Outcome of qualifying exam: The decision to pass or fail the student will be made by the Graduate Committee after receiving the report from the examination committee based on (1) the performance in the written (advanced area) exam (2) performance on the oral (both core and advanced) exam and (3) evidence of ability to do thesis-level research.

If a student fails this examination, then the student may try again with a schedule as determined by the faculty and typically within the next one or two semesters. A student who fails the exam for the second time is usually asked to leave the program. The qualifying requirement is passed or failed as one unit, and, if the exam is repeated, all steps and portions of the process must be repeated.

Confidentiality of the Contents of Written and Oral qualifying Exam: as a general rule the department considers the contents of the exams confidential *even after the outcome of exams has been published*. Unless explicitly allowed by the examining professor (or required for some legal reasons we cannot anticipate) students should not discuss the specific questions on their exams with other people, and should not share exam materials, neither questions nor answers, with anyone or at any time in future.

Schedule and Timing of Qualifying Exams: The exams are offered once per semester with the precise schedule is announced near the start of each semester. Typically, the contract specifying the three areas and examiners is due in the second week of classes. The form for the contract is provided in Appendix A. The contract is vetted by the graduate committee, which notifies the advisor and student of the outcome. Typically, research talks are given around mid-semester, the written exam is given 2-3 weeks before the end of the semester, and the oral exams around the last week of classes.

A student entering the Ph.D. program without an M.S. is expected to take the qualifying examination between the third and fifth semesters of the Ph.D. program. A student entering with an M.S. may be ready to take the qualifying examination earlier. The exam can be deferred at the discretion of the proposed dissertation advisor and the Graduate Committee.

The Prospectus Requirement:

Within six months of successfully completing the qualifying examination, the student submits a thesis prospectus. The prospectus should be about a page in length. It must (1) describe the student's intended research direction or open problems to be addressed in the thesis research, (2) cite and briefly describe appropriate related work, (3) identify the dissertation advisor, and (4) identify two additional dissertation committee members.

The faculty member listed in (3) must approve of the contents in (1) and (2) and he or she must have agreed to serve as the advisor. The faculty members listed in (4) must have agreed to serve on the dissertation committee. The prospectus will be vetted by the graduate committee that will respond in writing to the student welcoming them to the status of Ph.D. candidacy when the prospectus is approved.

Who may serve as the dissertation advisor? Tenure-stream members of the computer science department or tenure-stream faculty with a secondary appointment in computer science may serve as dissertation advisors. Other faculty with special appointments in the computer science department may be allowed to serve. If uncertain, please check with the Director of the Graduate Studies. In some cases, the primary advisor for the student's intended research might not be qualified to serve as the dissertation advisor. In such cases, the student must identify a full member of the Computer Science faculty as the formal advisor, and must keep the formal advisor well-informed about his/her research progress. When such a case arises please contact the Director of Graduate Studies well in advance to identify if such a solution is feasible, and coordinate per appropriate procedures.

Who may serve as members of the dissertation committee? Tenure-stream members of the computer science department or tenure-stream faculty with a secondary appointment in computer science may serve as dissertation advisors. Other faculty with special appointments in the computer science department may be allowed to serve. If uncertain, you should check with the Director of the Graduate Studies.

While the names of only the **three** computer science faculty members of the committee – the thesis advisor and two additional faculty members -- are required at the time the prospectus is submitted for approval, the final defense committee shall additionally include a tenure-stream Tufts faculty member from a different department as well as a scholar from outside of Tufts.

Further practical information for the submission of the prospectus is provided in Appendix B.

The Dissertation Requirement

The student will perform research under the direction of the advisor, write a dissertation about that work, have the dissertation read by a committee, and defend the work in an oral presentation to the committee and all who are interested. Note that students should pass the qualifying exams before beginning significant work on the dissertation.

The student's advisor will propose a committee to the graduate committee for approval. The thesis committee, chaired by the advisor, will include at least three Computer Science faculty members (typically as identified in the prospectus document), one member from another department at Tufts, and one additional person referred to as the "outside member". This outside member cannot be a member of the Tufts Computer Science faculty, should be from outside the university whenever possible, and is expected to be a recognized authority on the subject of the dissertation. The outside member is included in the committee in order to provide an objective and disinterested evaluation of the student's work. Once the committee has been formed, the outside member is expected to participate in giving the student the assistance and feedback necessary to assure that the dissertation meets the appropriate standard.

As a general rule, each Ph.D. dissertation should be an extended study that go well beyond the scope of individual scholarly articles. Dissertations are expected to present a broad review of relevant literature and theory, to study extensively the problem posed, and to place the results in a larger intellectual/research context. On occasion, the dissertation may substitute two to four narrower, original studies on closely related problems in place of a single, more extended study. Such a dissertation must still be presented as a single document, must have a common general introduction and literature review, must have appropriate connecting matter, and must have a general conclusion relating the results of the separate studies.

The Defense: The defense includes a 45-minute talk open to the public where the student presents their research. The public presentation must be advertised to the entire department in advance; the title and abstract must be provided to department staff at least five business days before the defense.

The most common procedure for the defense is as follows. First, the student presents a 45-minute talk open to the public on their research. The presentation is followed by a question and answer session open to the public where anyone can ask questions. Following that, all people other than the student and the committee are asked to leave and the committee may continue with further questions, clarifications or discussion. Finally, the committee confers without the student to make a decision on the outcome. The committee shall consist of five scholars in total as specified in the section "Who may serve as members of the dissertation committee?".

A title and abstract for the thesis must be submitted to the CS Administrative Office at least two weeks prior to the defense date so that the defense may be properly advertised.

Proposed Checklist for Ph.D. Students and Advisors

- **Core competence** (this includes core areas and implementation project): Any need to obtain such competence during the degree, and steps to obtain these. Student and advisor should discuss this early in the first semester and make sure that a plan is in place to demonstrate that the student has achieved competence in all the core areas. *Please make sure to complete the form in Appendix E as soon as a coherent plan is made and submit it for approval. The form must be on file no later than the date on which the student submits a Qualls contract.*

- **Research topic:** Think strategically toward identifying a research topic and toward fulfilling the qualifying requirement. This should comprise a series of conversations beginning in the first semester and concluding only once the qualifying exam has been passed.
 - Identify and take research-oriented courses that expose the student to research in fields of interest.
 - Identify and take courses not directly in the student's research focus to allow for the third-area in the qualifying exam.
- **Qualifying exam:** During the first semester, select the semester in which the advisor and student agree that the student is likeliest to be ready to take the qualifying exam. Work towards that goal. Revisit the timeline at least once a semester to ensure that it remains realistic.
- **Thesis prospectus:** In the semester prior to the qualifying exam, start to consider the thesis prospectus. The prospectus requirement may be completed up to six months after passing the qualifying exam, but completing it sooner is usually in the student's best interest. In most cases, the thesis advisor has already agreed to work with the student, and they have already identified the research direction. In such cases, the prospectus can be submitted immediately after passing the qualifying exam. This is the preferred scenario.
- **The thesis process:** Having established the internal portion of the dissertation committee with the prospectus, *the student should follow up and update the committee on progress* (e.g., by forwarding published papers or other drafts), and their planned schedule for writing the dissertation and graduation. Some readers prefer to see early drafts; others prefer to see the complete product. *Please consult the committee well in advance to accommodate different styles on both student's and reader's part.* Close communication with the thesis committee reduces the risk during the thesis defense of surprises requiring major rewrites.
- **The thesis committee:** The advisor should identify and recruit the two outside members of the committee before or during the last year in the program, and the candidate should similarly communicate with them per research papers, thesis drafts, and the defense.
- **The written thesis:** Students should submit their thesis for feedback before the defense (please see graduate student handbook for official schedule). Feedback is sometimes given before and sometimes during and after the defense.
- **Revisions:** There are almost always revisions to be done following the thesis defense. These may take days or weeks to complete, depending on how extensive the revisions must be and how quickly the student is able to work.
- **Submission of paperwork.** The thesis advisor will make sure the Certificate of Fitness and the Approval of Thesis forms are submitted to Dowling Hall. The student is responsible for all other paperwork, including the submission of the thesis online and in the correct format, along with a request for graduation. Details are in the Tufts Graduate Student Handbook.

Non-Degree Programs

Non-degree programs are designed to allow interested individuals to take a handful of courses at Tufts. Some non-degree students may double-count or transfer course credits into a Tufts degree-granting program part-way through their certificate. Those who do so may transfer or double-count courses suitable for graduate credit from the certificate program to the graduate degree program. Courses to be transferred must be at the 100-level or 200-level and must be completed with a grade of B- or better. The number of courses eligible varies by certificate.

Graduate Career Advancement Program (GCAP)

The Department of Computer Science participates in this program offered by the graduate school. It allows non-degree students to enroll in graduate classes on a space-available basis. Further details can be found at

<https://asegrad.tufts.edu/academics/gcap>.

Post-Baccalaureate Program

This program offers students with a bachelor's degree, but having taken few prior computer science courses, the opportunity to earn the equivalent of an undergraduate minor in computer science by completing the requirements for the minor.

The program requires five Tufts courses, including: COMP 15, COMP 61 or MATH 61, at least two courses from COMP 40, 105, 160, 170, and one computer science elective numbered higher than 15.

Certificate in Computer Engineering

In the certificate program in computer engineering, students gain foundational knowledge in connected systems, networking applications, and computer architecture. Through this program, students can hone their skills in the analysis, design, and operation of computing devices and software, which is offered over fifteen credit hours.

<https://asegrad.tufts.edu/academics/explore-graduate-programs/computer-engineering>

Certificate in Computer Science

This program is intended for students with a bachelor's degree in computer science or a closely related field. The certificate requires four graduate-level courses in Computer Science. This flexible program allows students to cluster course electives around a particular interest or specialty area.

Certificate in Data Science

This interdisciplinary program is open to individuals with a Bachelor of Science degree in fields including Science, Technology, Engineering, or Mathematics (STEM) and prepares students for practice in the emerging field of Data Science. This certificate can be undertaken as a goal in itself, or as a stepping stone toward enrollment in the Master of Science in Data Science program.

Certificate in Human-Computer Interaction

This interdisciplinary program is open to individuals with a bachelor's degree and some prior software experience. The program allows students to enhance their user-interface design and implementation skills. Further information about this program can be found at

<https://engineering.tufts.edu/cs/hci-certificate>.

Transferring and/or Double Counting Credits from a Certificate to an M.S. or Ph.D. Program

If and when the student is accepted to an M.S. or Ph.D. program, courses numbered above 100 with a grade of B- or above are eligible for graduate credit and qualify for double counting or transfer into the M.S. or Ph.D. program. Students in the GCAP, Post-Bac, Data Science, HCI, or COMP Certificate programs can double-count courses from *one* of these programs in an M.S. program. At most two courses can be double-counted from the GCAP program. In the case where double-counting is not allowed, courses may be transferred from certificates into an M.S. program, but only one certificate's courses may be double counted. Transferred courses are removed from the certificate transcript and become part of the graduate transcript without double-counting. There is no limit to courses transferred from the Post-Bac, Data Science, HCI, or COMP certificates into our M.S. and Ph.D. programs.

Appendix A: Qualifying Exam Contract

Qualifying Exam Contract Department of Computer Science Tufts University

Please complete the following form and return to the COMP office by the advertised due date. Please make sure that all items requiring a signature are complete as requested. **Please also indicate whether the topic will be theoretical or applied.**

Semester and year when exam is to be taken (e.g. Fall 2012): _____

Student Name (print legibly)

Student Email (print legibly)

Topic #1, (the advisor's): _____

Advisor Name (print legibly)

Signature

Topic #2: _____

Faculty Member Name (print legibly)

Signature

Topic #3: _____

Faculty Member Name (print legibly)

Signature

Title of Research Seminar:

Topic of implementation project, associated faculty member, and their signature: (If this is the same as research seminar please write "same as research" and no signature is required.)]

Student signature and date:

Advisor signature (w.r.t. their topic and having vetted other items) and date:

Appendix B: Prospectus Guidelines

This 1-2 page abstract document must include:

- A brief description of the student's intended research direction or open problems to be addressed in the thesis research.

Please write a paragraph or two--- no more than that -- describing what questions you might want to investigate, or what outcomes you might hope to achieve and please don't just say "I intend to perform research in area X"; on the other hand the intention is for the text to be relatively short, not putting a huge burden on the student and advisor, but simply serving to confirm that the student is working with the advisor and specifying research directions briefly.

- Citations to and a description of appropriate related work, intended to demonstrate that the student is familiar with foundational and current work in the field,
- The name of the dissertation advisor, who must be a member of the Computer Science Department (adjunct appointments included) who is a tenure-track faculty member at Tufts University.
- The names of two additional members of the computer science faculty who have agreed to serve on the dissertation committee.

Please have the advisor sign the prospectus to attest that he or she approves the prospectus. Unlike the qualifying exam contracts we do not require a signature from other members of the committee; however, you should have secured their agreement before submitting your prospectus.

Appendix C: Registration

The graduate school at Tufts uses registration to track multiple aspects pertaining to courses, service as RA or TA, and part or full time status. This has confused some students in the past; here we attempt to clarify all the requirements in one place.

M.S. Students: Fall and Spring

M.S. students must earn 30 credits by a combination of at least 10 regular courses.

Students who have already completed 10 courses and 30 credits but are still working on an M.S. project or thesis should register for one of the Master's Continuation courses (Comp 401 or Comp 402), whichever is appropriate. This indicates that they are still pursuing their studies but have otherwise completed the credit requirements.

Ph.D. Students: Fall and Spring

Ph.D. students must earn 60 credits by a combination of at least twenty courses for their degree. At least six credits must be composed of at least three regular 100-200 level courses. The rest can be earned by multiple registrations one of the Graduate Research courses (Comp 297 and Comp 298) or by taking other courses approved by the student's advisor.

Full time students should register for regular courses as guided by their advisor, and in addition register for the appropriate Graduate Research course each semester when doing dissertation work, for a total of 9 credits per semester. Registration for Graduate Research should be repeated until the student has accumulated 60 credits. This means that, normally, a student will register for 9 credits per semester (including Graduate Research) until they have accumulated 60 credits. Full-time students who have already accumulated 60 credits and are working on their dissertation should register for the appropriate Doctoral Continuation course (Comp 501 or Comp 502).

Summer Session

Both M.S. and Ph.D. students who are not registered for a full load of summer classes but who are otherwise engaged in either a full- or part-time capacity in their studies – for example, working on their research – should register for one of the Continuation courses.

The chart on the following page outlines various student study situations and the appropriate course registrations that go with them.

Appendix D: Chart of Departmental Non-Classroom & Tracking Courses

| Who | Situation | Course | Credits |
|--|--|--|---------|
| Ph.D. Students | Ph.D. students in the fall semester who are engaged in dissertation-level research. May register every semester | Comp 297: Graduate Research | 1-9 |
| | Ph.D. students in the spring semester who are engaged in dissertation-level research. May register every semester | Comp 298: Graduate Research | 1-9 |
| | Ph.D. student doing part-time doctoral work, not being paid AND not registered for a full load of regular classes (This covers most students during the summer.) | Comp 501-PT: Doctoral Continuation Part Time | 0 |
| | Ph.D. student doing full-time doctoral work, not being paid AND not registered for a full load of regular classes (This covers most students over the summer.) <i>Register for this in addition to Comp 405/Comp 406 if you are a summer TA or RA.</i> | Comp 502-FT: Doctoral Continuation Full Time | 0 |
| | Ph.D. student who is serving as a TA . Although this is a 0-credit course it may be used towards the full-time requirement. | Comp 405-TA: Graduate Teaching Assistant | 0 |
| | Ph.D. student who is serving as an RA . Although this is a 0-credit course it may be used towards the full-time requirement. | Comp 406-RA: Graduate Research Assistant | 0 |
| M.S. Students | M.S. student doing part-time master's work, not being paid for that work and not registered for a full load of regular classes. (This typically applies to students doing research during the summer <i>or</i> who have already completed 10 courses and 30 credits but are still working on an M.S. project or thesis.) | Comp 401-PT: Master's Continuation Part Time | 0 |
| | M.S. student doing full-time master's work, not being paid for that work and not registered for a full load of regular classes. (M.S. students who have already completed 10 courses and 30 credits but are still working on an M.S. project or thesis.) <i>Register for this in addition to your TA tracking course if you are a summer TA or RA.</i> | Comp 402-FT: Master's Continuation Full Time | 0 |
| | M.S. students in the fall semester who are engaged in thesis research . | Comp 297: Graduate Research | 1-6 |
| | M.S. students in the spring semester who are engaged in thesis research. | Comp 298: Graduate Research | 1-6 |
| | M.S. students in the fall semester who are engaged in writing a thesis. | Comp 295: Master's Thesis | 1-6 |
| | M.S. students in the spring semester who are engaged in writing a thesis. | Comp 296: Master's Thesis | 1-6 |
| | M.S. students in the fall semester who are doing a master's project | COMP 293: Graduate Special Topics / Master's Project | 1-3 |
| | M.S. students in the spring semester who are doing a master's project | COMP 294: Graduate Special Topics / Master's Project | 1-3 |
| International M.S. and Ph.D. Students | This course is only available to international students who are doing an internship. These credits apply to the full-time visa requirement but may not be applied to either the M.S. or Ph.D. degree requirements. | Comp 199: Internship Computer Science | 2 |

Appendix E: Verification of Core Competence: M.S. and Ph.D.

Department of Computer Science, Tufts University

This form serves to document how students in the M.S. and Ph.D. programs have covered (or are planning to cover) the core competence requirement. It should be completed by the student and advisor together, and signed by the advisor. It should then be submitted, preferably in paper form, to the COMP main office, to be reviewed (and approved) by the department by the end of the first week of classes of the semester in which the student will file for graduation. The approved form will be kept in the student's file. If the coverage plan is changed please submit a new copy for the changed portions.

Student Name: _____

Topic: Computer Architecture and Assembly Language. This is covered by:

Advisor signature and date: _____

Topic: Programming Languages (specifically, functional programming and object-oriented programming with inheritance). This is covered by:

Advisor signature and date: _____

Topic: Data Structures and Algorithms. This is covered by:

Advisor signature and date: _____

Topic: Theory of Computation. This is covered by:

Advisor signature and date: _____

Approved by: _____ *Date:* _____

Appendix F: Procedure for Approving Choice of Courses in M.S. for Interdisciplinary Students

Department of Computer Science, Tufts University

A student in the M.S. program who has an interdisciplinary focus but who satisfies all the requirements as specified above does not need special approval, and their choice of courses can be vetted directly by their advisor. In some cases, students focusing on an interdisciplinary area of COMP are allowed to take fewer than six COMP courses. This requires prior planning and approval. The student should prepare a document with the following components:

1. A detailed plan for the 10 courses to be counted for the M.S..
2. The reasoning which explains why this plan make sense for their specific M.S. education.
3. An explanation as to how they satisfy all the depth and breadth requirements for M.S. in COMP as specified in the handbook.

The completed document should be approved and signed by the advisor. The signed document should be submitted to the COMP main office for approval. Students who want pursue this option are advised to follow this procedure in advance and as early as possible to make sure their plans for the M.S. form an approved program.