

Guide to the Bachelor of Science in Computer Science (BSCS) in the Tufts School of Engineering April 9, 2019

Alva L. Couch -- Program Director, BSCS

This document is intended to aid students and advisors in the Bachelor of Science in Computer Science (BSCS) program in the School of Engineering. It is specifically geared toward the class of 2017 and how to graduate. This is not a set of rules, but rather, a brief description how to conform with the rules that are documented elsewhere. Thus, where appropriate, the source of the rules is referenced.

The bottom of the document contains many helpful hints as to how to make the most of this major, including extracurricular activities and other opportunities.

Table of contents

1. [Welcome to the BSCS!](#)
 - a. [The basics](#)
 - b. [The prerequisite structure](#)
 - c. [One-sentence course descriptions](#)
 - d. [An insider's guide to course numbering](#)
 - e. [Math course renumbering \(Fall 2019\)](#)
2. [Specific Advice by Class Year](#)
 - a. [BSCS Advice for Sophomores](#)
 - b. [BSCS Advice for Juniors](#)
 - c. [BSCS Advice for Seniors](#)
3. [Master checklist: graduating with a BSCS.](#)
 - a. [Choosing your degree sheet](#)
 - b. [Summary of degree sheet rules](#)
 - c. [Detailed degree sheet rules](#)
 - d. [Skipping courses](#)
 - e. [Double majors](#)
 - f. [Counting courses toward a graduate degree](#)
 - g. [Other resources for students and advisors](#)
4. [Detailed notes, exceptions, substitutions, and other variances – Class of 2018](#)
 - a. [Introductory Requirements](#)
 - b. [Humanities, Social Sciences, and Arts](#)
 - c. [Breadth](#)
 - d. [Foundation](#)
 - e. [Concentration](#)
5. [Special Instructions](#)
 - a. [Transfer students](#)
 - b. [Early graduation](#)
 - c. [Study abroad](#)
 - d. [Curricular Practical Training \(CPT\)](#)
6. [Options and opportunities](#)
 - a. [Undergraduate research](#)
 - b. [Teaching assistantships](#)

- c. [Combined BS/MS program](#)
- d. [Options for graduate school in Computer Science](#)
- e. [Jobs and Career Opportunities Board](#)
- f. [Student clubs and special interest groups](#)

Welcome to the BSCS!

The BSCS is a rigorous program designed to prepare you for both a profession and further graduate study in the exciting and evolving field of Computer Science. This guide attempts to show you not only how to navigate the major, but also, how to be an intelligent consumer and get the most out of the major.

Some initial caveats:

- Major requirements are the **minimum required components**, but do not include all of the opportunities available.
- The whole point of the University system is that you have access to **people who are developing knowledge**, and not just people who describe it. In this field, advances are rapid and the state of the art changes almost every year.

Some things you can do:

- **Be an intelligent and proactive consumer**; make sure to take advantage of the extra opportunities -- including undergraduate research -- that are not required but really interesting.
- **Be opportunistic**; when opportunities arise, don't be afraid to exploit them.
- Consciously **build your career portfolio and resume**; don't presume that courses will accomplish that without your help.
- **Engage in extra-curricular opportunities**, including teaching assistantships, student run clubs, meetings, hackathons, and other activities.
- **Take care of your physical and mental health**. This is a challenging major and you cannot expect to do perfectly in all courses due to simple constraints like the time you have available. Choose your objectives wisely and not solely upon what we advise you to do. You are the best judge of what you can handle.
- **Use Halligan Hall well**. This is one of the few study areas that is accessible 24 hours a day, seven days a week, via your ID, and has numerous areas available for group study and projects. If you are having trouble with a project or assignment, it is quite likely that others are having similar troubles. Studying in Halligan will more or less automatically bring you in contact with others with similar concerns. Network!

The basics

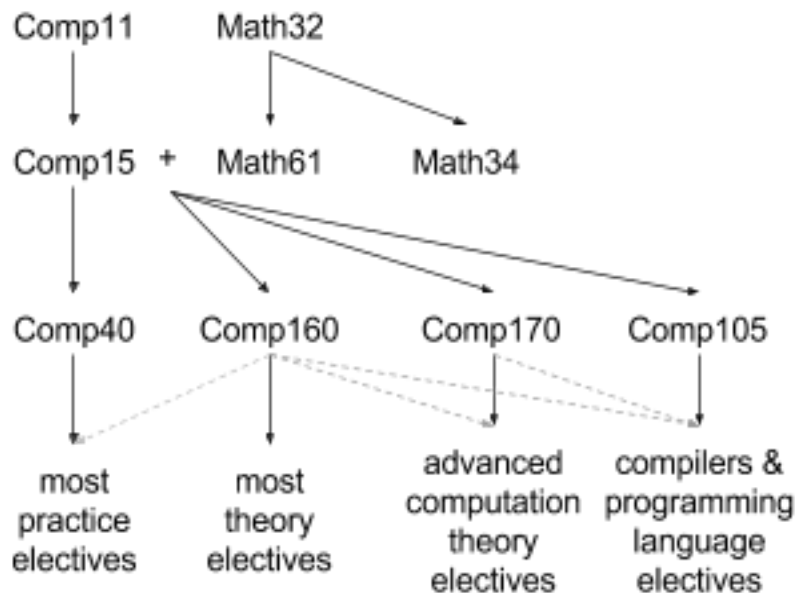
Several things to keep in mind when pursuing the BSCS.

- The degree sheet for the BSCS defines all requirements for the program. See [Choosing your degree sheet](#) below.
- The degree auditing system in SIS is **currently very broken and cannot be trusted** to audit BSCS degrees. Use the degree sheet and these notes instead.

- The recommended schedule for the BSCS in the catalog is just that: recommended and not required. The advice below outlines ways in which you might want to pursue a different schedule for your own reasons.

The prerequisite structure

Prerequisites can get confusing, but here is a simplified guide that can help you navigate them:



In this diagram, solid arrows are formal prerequisites, while dotted arrows indicate courses that “often help” one understand the next course. For example, if you are interested in Math, the gateway to advanced Computer Science courses with mathematics content is COMP160: Algorithms. If you are interested in software systems, then the gateway course is COMP40. This may determine the order in which you take courses. In general, the earlier you take a course, the more courses you can take that have that course as a prerequisite.

Note that Math 32 is a formal prerequisite for Comp 61, but not really necessary as far as material. Students who are confident in math can take these out of order.

In the above diagram, you might note that I have informally divided courses into “practice” and “theory”. This is not a hard and fast designation. As a bit of an over-simplification, a “practice” course is any course with a hands-on component in actually writing a program or designing one. The Engineering School refers to this informally as “engineering”. A “theory” course is any course with substantive mathematical content. Many special-topics courses contain both ‘practice’ and ‘theory’. This is because a master practitioner is also a master of theory. Theory helps practice in many ways, including:

- Avoiding trying to do the theoretically impossible or impractical.
- Predicting the behavior and suitability of program designs before writing them.
- Avoiding common and well-known pitfalls of design and programming.

One-sentence course descriptions

- COMP 15: How to manipulate data in a variety of forms.
- COMP 61: How to do proofs and be sure of mathematical claims.
- COMP 40: How to program to professional standards and optimize program performance.
- COMP 105: What does it all mean? What are programming languages and how do we describe them?
- COMP 160: How to determine how fast a program will run before writing it.
- COMP 170: How to avoid traps and pitfalls due to difficult problems and unreasonable expectations.

An insider's guide to course numbering

In Computer Science, there are several kinds of courses:

- Core courses, including COMP 11, 15, 40, 105, 160, and 170.
- Elective courses, including COMP 20, 23, 86, 111, 112,
- Special topics courses having the special designed numbers COMP 50, 150.

In general,

- Core courses are offered regularly, at least once and often twice a year.
- Elective courses are offered more irregularly, e.g., once every other year.
- Special topics courses are offered only a few times, perhaps even just once. Different sections of COMP 150 are actually different courses about separate topics.

More or less any course above 100 can serve as a prelude to research with faculty.

- Elective courses are more generic and give exposure to a general field.
- Special-topics courses are more focused and often outline the specific research of a faculty member. After being offered three times, the department decides whether to offer a special topics course permanently.

Thus, if you are interested in undergraduate research, pick your elective courses according to your interests. Many a research paper or a senior thesis has grown out of work in an elective or special-topics course. As to how to get involved, it's easy: ask your favorite faculty member what research opportunities are available!

Math course renumbering (Fall 2019)

Starting in Fall 2019, key math courses related to this major have been renumbered. The changes relevant to the BSCS are as follows:

- Math 126, Numerical Analysis (cross-listed with Computer Science, taught by Math), will become Math 125 (cross-listed as Computer Science 126)
- Math 128, Numerical Linear Algebra (cross-listed with Computer Science, taught by Math), will become Math 126 (cross-listed as Computer Science 128)

- Math 161, Probability, will become Math 165
- Math 162, Statistics, will become Math 166
- Math 163, Computational Geometry (taught by and cross-listed with Computer Science) will become Math 181 (cross-listed as Computer Science 163)
- Math 170, Computation Theory (taught by and cross-listed with Computer Science) will become Math 191 (cross-listed as Computer Science 170).

Specific Advice by Class Year

The guidelines below represent the minimum requirements for graduation. The recommended schedule represents the latest you can be and still graduate on time with no issues. It is fine to get ahead of this schedule and finish requirements earlier. If you want to know what's next you can advance to taking the next year's courses or simply refer to the prerequisite diagram for advice. The Stellar system is programmed with prerequisites and will tell you if you're taking something without prerequisites!

BSCS Advice for Sophomores

This is the year to complete all distribution requirements. By the end of this year, you should have completed:

- All introductory courses.
- COMP 11, COMP 15, and MATH/COMP 61
- ES3 and ES4

Some notes:

- COMP 15 and COMP 61 are complementary and can be taken simultaneously.
- The prerequisite for COMP 61 is MATH 36, not MATH 42. Thus in a pinch, you can take MATH 42 in a later semester. It is rather important to take COMP 61 by the end of this year, so that you can take COMP 160 in junior year.
- The regulations for ES 3-4 are quite strict. Please take the regulations seriously. Many a major has failed ES3 or ES4 by not doing this.
- Now is a good time to get Introductory and HASS requirements out of the way. It is a nuisance to do them later, after you have the prerequisites for more interesting Computer Science courses.

Now is also a good time to think about whether you wish to pursue:

- spending a semester abroad.
- graduating early with accelerated standing.
- getting an MS degree in five years in the BS/MS program.

It is difficult to do two or more of these for reasons documented below.

BSCS Advice for Juniors

By the end of your junior year, you should have at least completed:

- COMP 40: Architecture

- COMP 160: Algorithms.

These are the “gateway” courses into the advanced electives. COMP 40 is the prerequisite for most advanced systems courses, while COMP 160 is a prerequisite for many advanced theory courses. While not essential, it is also good to have completed:

- COMP 105: Programming Languages
- COMP 170: Theory of Computation

so that all that you have left for senior year are the concentration electives and capstone project. However, it is not a problem to defer one or both of these to senior year. COMP105 is a prerequisite for Compilers, so if you are interested in that course, you might want to take it in junior year.

Some notes:

- COMP 40 is a lot of work and many students opt for a reduced (4-course) load during the term in which they take it. This is the time to use your AP credits to reduce your load.
- Students who had difficulty with COMP61 and/or other math courses should plan to spend extra time on COMP160. In this situation, taking COMP160 with other challenging courses is not recommended.
- Which courses you take first of COMP 105, 160, 170 depends somewhat on how you feel about COMP 61 after taking it:
 - If you are comfortable with COMP 61 and did well, then you can go directly from COMP 61 into COMP 160. This is the normal path and opens up maximal opportunities to take other interesting courses later, for which COMP 160 is a prerequisite. COMP 160 is a pervasive part of the upper level curriculum and *you will find COMP 160 helpful in completing many courses in which it is not a formal prerequisite*, including even hands-on systems courses including COMP 111, 112, and 115!
 - If you are uncomfortable with math and had difficulty with COMP61, it might be good to take COMP 170 first. COMP 170 provides valuable practice in applying COMP 61’s proof techniques *before* taking on COMP 160 and COMP 105, which are -- for many students -- *somewhat more difficult* than COMP 170.
- If you are planning on graduating early, you should consider taking the COMP 97-98 sequence a year early. See [Early graduation](#).

At latest by spring of your junior year when registering for senior classes, you should have completed your degree sheet with a plan for completing the degree, including plans for both fall and spring courses. Please check that degree sheet with your advisor and against the guidelines and rules below. See [Choosing your degree sheet](#).

Now is a good time to plan an interesting summer internship and to think about getting involved in faculty research projects. Take an elective in an interesting field and then ask around for research opportunities! Also, now is also the time to get involved in projects that you can showcase to potential employers. Take some time to build your portfolio and start thinking about how you can become a more attractive employee and/or graduate student.

If seriously interested in graduate school, now is the time to talk to faculty about how to prepare for it and select one.

BSCS Advice for Seniors

Now is the time to fill out your degree sheet as documented below. If you have the option of accelerated standing and graduating early, please give some thought as to whether it would be better to graduate early or take extra courses to enrich your experience at Tufts and/or count toward eventual graduate school. Now is also the time to apply for jobs. Many seniors schedule a light spring semester in order to accommodate job interviews.

Master checklist: graduating with a BSCS.

	Complete the graduation information form.
	Complete the appropriate degree sheet.
	- Every box on the degree sheet corresponds to academic credit, earned by taking a course, advanced placement credit, transfer credit, courses in progress, and courses to be taken in the spring. This includes substitutions for courses out of which one has placed without credit, according to rules listed below.
	- Each course is used at most once on the degree sheet.
	- Any skipped course must be replaced by credit for an upper level course of similar purport. See notes below about skipping courses.
	- Every special case or variance from the degree sheet is accompanied by a petition for course substitution.
	- For concentration courses that do not appear on the degree sheet and are not required for the degree, count them toward a future graduate degree.
	Meet with advisor and obtain advisor signature on degree sheet and petitions.
	Submit all forms to the Computer Science department office for Prof. Alva Couch's signature. The office will contact you when the form is ready for you to pick up, and you will bring the form to Dowling.

Choosing your degree sheet

In SOE BSCS advising, all actions center upon the degree sheet. The current degree sheets can be found at the following location:

<http://students.tufts.edu/academic-advice-and-support/academic-advising/what-we-offer/guidance-academic-policies/requirements-graduation-engineering/engineering-degrees>

Students may utilize one of two degree sheets when graduating: the one corresponding to **year of matriculation** (when they came to Tufts) or the one corresponding to **year of graduation**. At

this point, changes in the degree sheets are very minor. The main difference is that – starting in the class of 2016 (matriculating in 2013) – one advanced mathematics course may be counted toward the BSCS concentration. After the class of 2016 there are no differences.

Note that although there is a degree auditing system (DARS) for the BSCS, at the present time, **DARS makes mistakes** and the degree sheet should be used as your final indication of degree progress.

Summary of degree sheet rules

- Every blank must correspond to academic credit earned, either through coursework, AP credit, or transfer credit.
- Each course can appear at most once on a particular degree sheet.
- Courses that are skipped for any reason must be replaced with appropriate substitutes.
- Any variance from degree sheet requirements must be accompanied by a petition for course substitution.

Detailed degree sheet rules

- Every requirement on the degree sheet must be satisfied with **some form of academic credit**, either a course at Tufts for a grade, a transfer course (TR), or advanced placement (AP) credit. The source of a credit should be indicated on the degree sheet as follows:

Course	Term	Grade
MATH32	F11	AP
COMP15	Sum12	TR
COMP40	F12	B+

This means that MATH 32 was satisfied with AP credit, COMP 15 credit was transferred in from outside in the summer of 2012, and COMP 40 was taken at Tufts with a grade of B+. Every AP credit and transfer credit must appear on the student's transcript, at the top, before all other courses.

- Students are responsible for applying for transfer credit in a timely and effective manner. To apply for transfer credit, students fill out an electronic form on SIS.
 - A single course may only occupy one blank on the degree sheet. There is no double-counting of courses on a single degree sheet.
 - If filling out two degree sheets for different majors in SOE, you may not list more than ½ of the smallest concentration on both forms. Double counting of Introductory, HASS, and Foundation courses is not limited. See [Double majors](#) for details.
 - In cases where the student has a choice of electives, write down the chosen course. In cases where the course is a special topics course, also indicate the section code and title. In cases where two ½-credit courses satisfy one requirement, write down both separated by a “/”. This normally happens only for HASS, Breadth, and free electives.
- Examples:

Course	Term	Grade
COMP Elective COMP112 – Networks	S11	A

COMP Elective COMP150FML – Found. of machine learning	Sum12	B+
HASS FAM05 – Calligraphy/FAM22 – Design: Architectural	F12/S13	P/P

- In the case where an equivalent or cross-listed substitution is made, mark out the original course and indicate the substitution. Example:

Course	Term	Grade
MATH 32 MATH 11	S11	A

See detailed notes below for allowable substitutions for each blank.

Skipping courses

- **Any skipped course must be replaced by credit for an upper-level course of similar purport.** Most commonly:
 - Students who pass out of ES2 via placement examination must still fill that blank with one credit from a course in Engineering (SIS attribute “Engineering Requirements”, value “SoE-Engineering”) . All hands-on computer science courses are suitable.
 - Students who skip COMP 11 without credit must replace that credit with some computer science course above 15. Currently, we do not award AP credit for COMP 11, though we did in past years including for students who matriculated in 2012. If you did receive AP credit, please write “AP” in the appropriate box. Your transcript will show whether you received AP credit or not. AP credit for COMP10 is not appropriate for this, but may be counted as a free elective.
 - Students who skip MATH 32 without credit must replace that credit with some MATH course above 42. Any course above this level is a valid replacement.
- Any substitution like the above must be accompanied with a [“petition for course substitution”](#), including the cases documented above. The reason for these cases may simply read “SOE Course Substitution Policy”.

Double majors

In general, double majoring in two Engineering disciplines is nearly impossible due to the large number of credits involved. Most students who double major opt for a second major in Arts and Sciences, with a 10 to 12 course concentration. These majors often fit well with BSCS requirements.

Overview

All second majors (whether Computer Science or otherwise) require a second concentration, but not background courses such as Introductory, HASS, or Foundation courses. A&S distribution requires are also not counted as part of a second major.

There is only one rule to keep in mind:

No more than half of any one concentration may be double counted toward another concentration.

Other courses than the concentration may in fact be double counted for two majors. For example,

- To double major in Computer Science and Electrical Engineering in the School of Engineering, one fills out both degree sheets and there is an enormous amount of double counting in Introductory, HASS, and Foundations. Double counting is limited *only when considering the Concentration sections of the degree sheets*.
- To double major in Computer Science in the School of Engineering and some other major in Arts and Sciences, *only consider the concentration in Arts and Sciences*, not the distribution requirements. You are not required to fulfill these at all.

This gives rise to some seemingly unusual circumstances.

1. Since COMP 11 and COMP 15 are in the foundations of the BSCS and not the concentration, there is no restriction against counting them toward another major concentration in EE, CPE, CE, EVE, ME, MATH, etc., even though *they appear in the concentration of the other major*.
2. Likewise, MATH 166 (formerly MATH 162) satisfies the statistics requirement and is not subject to the double-counting limit for MATH double majors, because *it is in the MATH concentration but not the Computer Science concentration*. Similar things are possible for the other courses fulfilling this requirement, including

For second majors in A&S to complement the BSCS:

- The primary major is considered to be Engineering, with a secondary major in A&S. There is no such thing as a second Computer Science major in Engineering for an A&S student.
- One can double count $\frac{1}{2}$ of the smallest concentration toward the other. For example, the BSCS Engineering concentration contains 11 courses, while the Mathematics concentration has 10, so one is allowed to double-count $10/2 = 5$ courses.
- Introductory, HASS, Foundation, and Free Elective courses (e.g. MATH 32, 34; PHY 11-12, CHEM 1-2, COMP 61, COMP 11, COMP 15, MATH 166, PHY 153, etc) do not count toward this limit and may always be counted as part of a second A&S major concentration.
- Courses that are cross-listed can be counted under either number. E.g., COMP 126/MATH 125, COMP 128/MATH 126, COMP 163/MATH 181. This does constitute double counting even if the numbers are different.
- Engineering students are not subject to the A&S distribution requirements.

Certain A&S second majors are easier to complete than others, for the following reasons:

- Double majors in mathematics may double count courses that are cross-listed in Computer Science and MATH toward both programs. At most half of the courses taken for the concentration may be double counted (5 courses). At present, these courses include COMP 126/MATH 125, COMP 128/MATH 126, COMP 163/MATH 181, and COMP 170/MATH 191.

- Double majors in Computer Science and Electrical or Computer Engineering may double count COMP111/EE128 toward both programs.
- Double majors in humanities, social sciences, and arts may be used to satisfy BSCS HASS and Breadth requirements. **It is possible to fit almost an entire second major into the BSCS HASS and Breadth requirements.**

For double majors in two Engineering programs:

- One may double count at most $\frac{1}{2}$ of the smallest concentration (as with A&S).
- There is no limit on double-counting other parts of the degree sheet, including the introductory, HASS, breadth, and foundation sections.

In Engineering, the primary major is listed on the degree itself. One can decide which major is primary and will be listed on the degree, and which is secondary and will appear only on one's transcript.

Counting courses toward a graduate degree

It is somewhat common for a student to have courses that do not fit on the degree sheet. If courses that do not fit have course numbers above 100, are appropriate as concentration electives, and have a grade of B- or better, these courses can count toward graduate credit instead of undergraduate credit.

- This course credit can be **transferred to other graduate schools** and is not only usable in Tufts graduate programs.
- Leaving the course credit on your undergraduate transcript **serves no purpose whatsoever**. You can even raise your undergraduate cumulative average by transferring the courses with the lowest grades above B-!
- If you currently believe that you will not go to graduate school, there is still no harm in counting these courses toward an eventual graduate degree. And the odds are against you: last I checked about 80% of our graduates eventually attend some form of graduate school. If you are employed as a software engineer, your company will likely pay for graduate school and give you a raise when you complete it!

Other resources for students and advisors

Other resources for advisors include the engineering advising FAQ:

<https://students.tufts.edu/academic-advice-and-support/academic-advising/engineering-advising>

Note that not all topics on the page apply to the BSCS; we are accredited by ABET CAC; the rest of the school programs are accredited by ABET EAC. This means that there are specifics of our program that do not exist in any other program, e.g., the breadth requirement.

Detailed notes, exceptions, substitutions, and other variances – Class of 2018

In this part of the document, I comment on the BSCS Class of 2018 degree sheet box-by-box, noting rule sources, the spirit of rules, and other information that might help in filling out the degree sheet and appropriate petitions.

Petitions for course substitution are required whenever a course is substituted for another on the degree sheet without a specific note on the degree sheet or in the bulletin that the substitution is appropriate.

- Petitions concerning all-school rules must be approved by Dean Rife. These include substitutions for Introductory and HASS courses.
- Petitions concerning program requirements for the BSCS degree must be approved by the BSCS program director, Prof. Alva Couch. These include substitutions for Foundation and Concentration courses.

In the following, each box on the degree sheet is analyzed in detail, with notes on (numbered) lines as appropriate. The line numbers do not appear on the real degree sheet.

Introductory Requirements

Introductory (10 Credits)*	Term	Grade
1. EN 1		
2. ES 2		
3. MATH 32		
4. MATH 36		
5. MATH 42		
6. MATH 61		
7. PHYS 11		
8. CHEM 1 or 16		
9. PHYS 12 or CHEM 2		
10. Nat Sci Elect (a)		

Source of rules: School of Engineering common core curriculum (except for MATH 61 as noted below). Petitions to substitute courses other than those substitutions explicitly mentioned in this document must be approved by an Associate Dean of Engineering Advising.

3-5: MATH 11, 12, 13 may replace MATH 32, 36, 42 respectively. Cross out the new number, and write in the old one. Also include a petition to this effect when submitting the degree sheet.

MATH 39 (also, formerly, MATH 17) may replace both MATH 32, 36. This is usually only applicable to MATH majors. However, the credit for MATH 32 (which is effectively skipped by taking math 39) must be replaced by some other math course (other than 32, 34, 39, 42, 44, and 61). This also requires a petition.

In general, a math course in blanks 3-5 that is skipped must be replaced by another math course. The best possible course to take is Linear Algebra (Math 70) because this plays into advanced computer science, especially in graphics.

- 6: May be replaced by COMP 61, MATH 22, or COMP 22. Strike out MATH 61 and write in the other option, as needed. Since these are cross-listed courses, a petition is not needed.
- 7: If you passed the PHY 11 placement exam and placed into PHY12, you must replace this with another PHY course higher than 12. You must petition for this substitution.
- 10: For an approved list of natural science courses, use SIS to search for courses with attribute "Engineering Requirements" and value "SoE-Natural Sciences." Science courses intended for non-majors and ExCollege courses are not allowed.

Humanities, Social Sciences, and Arts

Humanity/Art/Social Sci HASS (6 Credits) (b)	Term	Grade
1. ENG 1* or 3		
2. H		
3. SS		
4. HASS Elect		
5. HASS Elect		
6. HASS Elect		

Source of rules: general requirements for all students in the School of Engineering.

General notes: This set of courses is regulated by the School of Engineering. Thus all petitions to count courses outside the approved lists should be directed to Dean Rife for approval. ExCollege courses are specifically not allowed to fulfill these requirements.

- 1: In cases where students have placed out of English 1 **without credit**, they must take a Humanities course instead, which can be found by searching for attribute "Engineering Requirements", value "SoE-HASS-Humanities." Please write the course substitution in the space provided and fill out a petition for course substitution.
- 2: Also see the list generated by searching for attribute "SoE-HASS-Humanities". Please indicate the course number and name to be counted toward this requirement. Note that in Engineering, *language courses count as Humanities* and may be placed in every HASS box except box 3 below (In Arts and Sciences, Language courses are placed in a separate category).
- 3: See the above link for courses; select "SoE-HASS-Social Sciences" instead of "SoE-HASS-Humanities".

- 4-6: Chosen from “SoE-HASS-Humanities”, “SoE-HASS-Arts”, “SoE-HASS-Social Sciences”, lists. Two half-credit courses may fulfill one requirement; please indicate the numbers and names of both courses in the blank space provided.

School-wide requirements include that there must be two HASS courses in the same department.

Breadth

Breadth (4 Credits) (c)	Term	Grade
1. Ethics & Social Context: PHIL 24 or EM 54		
2. Breadth Elect		
3. Breadth Elect		
4. Breadth Elect		

Source of rules: program requirements for the BSCS specifically. Petitions to substitute courses must be approved by the BSCS program director (currently Prof. Alva Couch).

General notes: This set of courses is specific to the Department of Computer Science and was required by a previous ABET CAC visiting committee. Petitions to count courses outside the rules in item (c) on the back of the degree sheet must be approved by the BSCS program director, currently Prof. Alva Couch.

The spirit of the breadth requirement is to provide “broadening experiences” beyond the major. Thus, MATH and science courses (including COMP but also the physical sciences) are specifically disallowed, while some options not available for HASS are included, including courses in Entrepreneurship, as well as introductory Engineering courses in other Engineering disciplines. One is also allowed one ExCollege course and one Physical Education credit. To count as breadth, substitution courses other than those on the explicit list must obey the spirit of the breadth requirements and must be explicitly petitioned and approved by Prof. Alva Couch.

Foundation

Foundation* (5 Credits)	Term	Grade
1. COMP 11		
2. COMP 15		
3. ES 3		
4. ES 4		
5. Prob & Stats (d)		

Source of rules: program requirements for the BSCS. Petitions to substitute courses must be approved by the BSCS program director (currently Prof. Alva Couch).

- 3-4: It is extremely important that students complete ES3 and ES4 in one sequence in sophomore year; otherwise scheduling becomes difficult. Note that ES3 has a strict zero-tolerance grading policy, and that students who fail ES3 based upon grading policy are not allowed to sign up for ES4 until they complete ES3 with a passing grade. *Please take ES3 grading policies seriously.*
- 5: Most students will take ES 56. Other options accommodate double majors in MATH (MATH 166), Physics (PHY 153), Biology (BIO 132), Biomedical Engineering (BME 141), and Electrical Engineering (EE 24 or 104). *AP Stats credit is not acceptable for fulfilling this requirement.*

Concentration

Concentration* (11 Credits)	Term	Grade
<i>Required (4 Credits)</i>		
1. COMP 40		
2. COMP 105 or 80		
3. COMP 160		
4. COMP 170		
<i>Electives (5 Credits) (e)</i>		
5. COMP Elect (e)		
6. COMP Elect (e)		
7. COMP Elect (e)		
8. COMP Elect (f,g)		
9. COMP Elect (f,h)		
<i>Senior Design Project (2 Credit)</i>		
10. COMP 97		
11. COMP 98		

Source: departmental requirements. Petitions to substitute courses must be approved by the BSCS program director (currently Prof. Alva Couch).

2 Please circle which course was taken.

- 5-9 Please list the section number and title of any 50- and 150- level special topics courses taken, in the space provided. Dean Rife must be able to match descriptions against the student's transcript. 200-level courses are not allowed as electives.
- 5-7 Allowed to be any COMP course numbered 100-189.
- 8 Allowed to be a COMP course numbered between 16-189.
- 9 Allowed to be a COMP course numbered between 16-189, and additionally, allows selected MATH courses.

Free Electives (2 Credits)	Term	Grade

Source: departmental requirements. No limit on content; may count two ½ credit courses as one credit by listing both of them in the space provided.

Special Instructions

Transfer students

The following rules are normally invoked when a student transfers into the School of Engineering from another Tufts school or an outside school. These issues are normally resolved during transfer. However, if you have any confusion over the rules, here are the basics:

- Transfer students may substitute one credit of Engineering for EN1, to be located as above, by petition. The list of Engineering courses that are appropriate may be found in SIS by filtering on attribute Engineering Requirements, value SoE-Engineering. As EN1 is intended for freshmen only, this exemption is automatic for transfer students, but a petition must still be filed.
- Students who transfer into Tufts after freshman year or from Tufts A&S after freshman year may take a placement exam (offered in fall) to be exempt from ES2 and -- upon earning an exemption -- substitute one credit of Engineering for ES2 by petition. The list of Engineering courses that are appropriate substitutes may be found in SIS by filtering on attribute Engineering Requirements, value SoE-Engineering. **This exemption is only granted by placement exam.**

It is typical to choose an extra concentration elective for each of these, e.g., COMP 20 or 23. Note that MATH courses with no hands on component do not count as engineering courses. Any substitution outside the list of approved engineering courses must be approved by Dean Rife.

Early graduation

There are two exceptions to the residency requirement of 8 full-time semesters.

- Students who have 5 or more AP or summer school courses may apply for one term of "accelerated standing" and graduate one term early.

- Students who have 9 or more AP/summer school courses may apply for one year of “accelerated standing” and graduate a whole year early.

These options, however, require some careful pre-planning. All BSCS seniors normally take a one-year project course COMP 97-98. For those students planning to graduate early,

- **This course sequence should be completed in junior year.**

Alternatively, one can:

- **Become part-time in spring of senior year** to take only COMP 98 (paying by the course rather than the semester to reduce costs), or
- **Take an equivalent to COMP 98** (involving a group software project) **at some other institution.** See the BSCS Program Director (currently Prof. Alva Couch) for guidance on selecting this course substitution.

To apply for advanced standing/early graduation, during your junior year, please fill out and submit [this form](#).

This reduces overall tuition, and if you fulfill residency requirements and need one more course to graduate (e.g., COMP 98), you can opt to take that course part-time with a substantive tuition reduction. See the form for details.

Study abroad

Like early graduation, study abroad requires pre-planning. There are two successful strategies:

- Choose a study abroad experience in which you can transfer courses back to your concentration. These are less plentiful than programs that allow the second option, which is to:
- Choose to finish up your HASS and breadth requirements abroad.

Whichever you choose, you should apply in advance for permission to transfer the courses back to Tufts. Also, please apply to transfer more courses than you actually plan to take, because:

- Courses you plan to take are sometimes unexpectedly cancelled.
- You should ensure that you will get appropriate credit for what you take, before you take it.
- **An approved transfer credit request does not commit you to actually taking the course.** It is a conditional statement that “if you take the course and receive an acceptable grade, the credit will transfer.”
- When you graduate, all unused transfer credit approvals are erased forever. So there is no harm whatever in leaving some transfer credit approvals unused.

Counting courses toward a graduate degree

It is somewhat common for a student to have courses that do not fit on the degree sheet. If courses that do not fit have course numbers above 100, are appropriate as concentration electives, and have a grade of B- or better, these courses can count toward graduate credit instead of undergraduate credit.

- This course credit can be transferred to other graduate schools and is not only usable in Tufts graduate programs.
- Leaving the course credit on your undergraduate transcript serves no purpose whatsoever. You can even raise your undergraduate cumulative average by transferring the courses with the lowest grades above B-!
- If you currently believe that you will not go to graduate school, there is still no harm in counting these courses toward an eventual graduate degree. And the odds are against you: last I checked about 80% of our graduates eventually attend some form of graduate school. If you are employed as a software engineer, your company will likely pay for graduate school and give you a raise when you complete it!

To count courses toward a graduate degree, please fill out and submit [this form](#).

Curricular Practical Training (CPT)

CPT is an option for students holding student visas to the United States to receive on-the-job experience as internships inside the United States. CPT only applies to students who are not US citizens and who are not normally allowed to work in the US. The rules (enforced by the Tufts International Center in accordance with federal law) include that:

- You must receive academic credit toward your degree during the internship.
- This means you must have a faculty advisor and receive a grade.
- You must fill out an application for CPT with the International Center in order to receive a work permit. This must include your choice of academic advisor.
- You must complete the paperwork and register for the course **before starting work**.

The way Computer Science handles CPT is as follows:

- Prof. Ming Chow handles CPT for Computer Science.
- The typical credit awarded for a single internship is 1 credit hour, under the course number **COMP 99**.
- A typical CPT experience includes two summers of CPT internships at 1 credit apiece.
- These summers are typically the ones before junior and senior years.
- A total of three CPTs are allowed.
- The department prefers that CPT credit applied to the undergraduate Computer Science major concentration does not exceed a total of one credit. Any additional credits count toward the 120 credit requirement for your Engineering degree.
- Download and complete the CPT form: http://students.tufts.edu/sites/default/files/CPT%20Application%20Form_0.pdf. Prof. Ming Chow will need to complete Part III of the form. Student will also need to register for COMP 99 as a summer school course (at a cost depending on the year).

- The deliverable of the COMP 99 CPT is a final report, due by August 15th. The final report must address the following: (1) what did you learn technically, (2) what did you learn professionally, (3) what you wish your supervisor(s) did differently, and (4) what would you have done differently.

Options and opportunities

Combined BS/MS program

Another option is the combined BS/MS program in Engineering. This is a really good deal, because:

- You can double count two courses toward your BS and your MS.
- You can receive an MS in one year.
- You don't have to take the GRE, although a GRE score of 164 or higher entitles you to a \$5000 scholarship to the program!

However, there are some caveats:

- You must have a GPA of 3.5 or higher to enroll.
- You must enroll before the end of junior year.
- You receive your BS and MS together, after 5 years.
- The BS/MS program has a required residency of one year. This means that you are expected to pay MS tuition for one year after completing your undergraduate residency requirements, even if you have the requirements for MS graduation. This does not affect most students. See [Early graduation](#) for information on the undergraduate residency requirement.

BS/MS frequently asked questions:

- What if I change my mind?
A: you can just graduate with the BS as usual, and without the MS.
- What is the difference between this and a regular MS:
A: In both cases, you can transfer up to 4 courses not used for your undergraduate degree toward your graduate degree.
 - For the BS/MS, You take only 8 courses for the MS, and can double count two courses between undergrad and graduate school. You are responsible for one year of graduate school whether or not you need the year.
 - In the regular MS, you may not double-count courses, and you have no minimum residency requirement. In practice, however, it works out to one year. You also have the option of receiving the regular MS part-time while working.

For a more detailed discussion of graduate school options, see [Options for graduate school in Computer Science](#).

Undergraduate research

There are many undergraduate research opportunities with faculty, though the bold tend to be rewarded. Getting involved is easy:

- Take a special topics elective in or near the topic of interest.
- Ask around as to what opportunities are available for people who have taken that course.

Many of our 150 electives are designed to introduce one to a specific research field. **Please do not be shy about this**; we really enjoy working with undergraduates but **you must tell us you are interested**.

Undergraduate research can be engaged in for "free", for course credit, or for pay. Often faculty members have time to work on research with you but no money to pay you: or they might be able to pay you during the summer if you first start doing some research with them (unpaid) during the semester. Make sure a faculty member knows up front if you are asking for interesting problems, or if you in addition need to be paid for your research. Even if a faculty member does not have an individual research project that can support undergraduate research students, there are several opportunities for you to apply to be paid to engage in research with a faculty member: [Tufts Summer Scholars](#) is a Tufts program open to all Tufts students; [DREU](#) and [CREU](#) are nationwide programs open to women and under-represented groups in Computer Science. All of these programs require applications in February or March for the following summer, so it is important to talk to faculty members and find a mutual project of interest early!

Teaching assistantships

One way to become involved to the mutual benefit of yourself and other students is to become a teaching assistant. This is a paid position where salary depends upon experience. Teaching assistant duties include grading, leading recitations and labs, and helping students during office hours. You do not have to be the very best student in order to be an effective teaching assistant; it is often useful to have struggled yourself, so that you have some empathy for what students are going through. Your role is not to do the problems for them, but instead, to help them remove obstacles they might encounter. Having removed your own obstacles is often the best preparation!

To apply, sign up in the department office (Halligan 245) and indicate the courses for which you are interested in assisting. You will be contacted by the instructors. Please note that it is perfectly fine to become a teaching assistant for a course immediately after taking it. This is the best way to really learn the material yourself!

Jobs and Career Opportunities Board

URL: <https://piazza.com/tufts/fall2014/comp199>

The department hosts a job and opportunities board for undergraduates, graduate students, and alumni. We post all types of opportunities and events to this board including jobs, graduate school, research opportunities, and professorships. We want to send a message to students that life after CS at Tufts is not limited to going to Facebook | Google | Microsoft | Apple. We also post Assistant Professorship openings especially for our graduate students, and we hope that undergraduates take note that teaching is a career option. We welcome both graduate and

undergraduate students to utilize this board. We do not purge students from the board after they graduate: we encourage them to give back and post opportunities for our students.

Tutorial

The screenshot displays the Piazza Q&A interface. The top navigation bar includes 'COMP 199', 'Q & A', 'Resources', 'Statistics', and 'Manage Class'. The user 'Ming Chow' is logged in. The left sidebar shows a list of posts with a 'Pinned' section containing several posts, including 'Video: Career Panel', 'Applying to Grad School?', 'Feedback from an empl...', 'How do you write a cover...', 'Technical Interview Tips', 'New here? PLEASE READ FI...', 'Volpe Center Summer 2016 L...', '2016 Secretary's Honors Pro...', 'GreatHorn, Infosec Startup L...', and 'Privacy Tools project'. The main content area shows a post titled 'Applying to Grad School? NSF Fellowship Opportunities' by Professor Hassoun, dated 9/18/15. The post text discusses NSF fellowship opportunities and provides a link to the NSF website. The post has 189 views and is tagged with 'education' and 'scholarship/funding'. The bottom of the interface shows a 'Followup discussions' section and a status bar with 'Online Now: 5' and 'This Week: 233'.

Associated numbers (corresponding with red numbers in screenshot above):

1. Pinned posts: for important or frequently viewed posts
2. Tags (more below)
3. Number of views for post
4. Tags associated for post
5. Name of person who posted

Why is This on Piazza?

Most students are already using Piazza for other classes. I'm sure most people do not want another username/password for yet another system. Manager of board (me) can also control the flow of information, posts and people registered, easily with Piazza. Finally, this is a good centralized forum to eliminate mass emails.

What Kind of Information or Opportunities Will I Find Here?

Some faculty members frequently receive opportunity announcements from colleagues and friends in industry that are not available elsewhere. One will find materials with the following tags:

- **Internships:** Internship opportunities (tag: internship)
- **Full time jobs:** Full-time opportunities (tag: fulltime)
- **Temp/gig jobs:** Temporary or gig opportunities (tag: (temp|gig))
- **Research:** research opportunities (tag: research)

- **Graduate school information:** (tag: education)
- **Scholarship/funding:** Research and funding opportunities (tag: (scholarship|funding))
- **Readings:** Professional Development and Career-Related Readings (tag: readings)
- **Events:** hackathons, career fairs, meetups, Robin Kahan's office hours, and special sessions (tag: events)
- **Entrepreneurship:** (tag: entrepreneurship)
- **Volunteer:** help out at conferences (tag: volunteer)
- **Advice** from alumni and professionals (tag: tips)
- **Experience:** success stories, advice from alumni and professionals (tag: readings)
- **General announcements:** (tag: announcement)

Announcements can use multiple tags.

Frequently asked questions about the Jobs Board

1. Who can post Opportunities or Events?
A: All members can post. Manager of the board can also ban anyone for posting inappropriate material.
2. Can someone post anonymously?
A: Yes but you will not be anonymous to the manager of the board.
3. Can one send private messages?
A: No.
4. Can one invite friends to use this board?
A: Yes especially if he/she is a major or student of the Department of Computer Science.

Student clubs and special interest groups

There are many student-run groups that explore aspects of Computing outside the classroom. You are invited to explore these opportunities.

CSX (Computer Science Exchange) is a student group dedicated to promoting passion for Computer Science at Tufts. Through tech-talks, outreach, and community events, CSX provides a valuable resource for students of all skill levels and interests within computer science.

<https://www.facebook.com/TuftsCSX>

JumboCode is committed to developing software at no charge for nonprofit and federal organizations. JumboCoders work on teams for a particular project alongside other students with varying experience. Each team dedicates themselves to helping the organization while gaining first-hand development experience. Projects range from web development and mobile applications to data management systems and small scale software. <http://www.jumbocode.org>.

WiCS is the computer science group for women at Tufts. The group focuses on connecting women across class years in a student-mentor style with the goal to support each other at Tufts and beyond. Connect via their Facebook group

(<https://www.facebook.com/groups/221500931381460/>).

The Tufts GNU/Linux Users Group is a student group promoting Linux and open software. Linux has proven to be an exceedingly powerful platform that has the ability to adapt to the

needs of any kind of user. GLUG hopes to help students learn about these ever-expanding set of features, and ultimately help users adapt their Linux environments to cater to their specific needs. Please see <http://tuftsglug.github.io> for more details.

Founded in 2015 by Soubhik Barari (A'16), Calvin Liang (A'16), and McCall Bliss (A'15), **Tufts Enigma** is an independent publication based out of Tufts University at the crossroads of data and social science. We use data-driven methods to visualize and analyze real world issues in topics ranging from economics, history, sociology, policy, and most things in between. For more information see <http://tuftsenuigma.org> .

The Computer Science League of Learning (CSLOL) is a Tufts Graduate Student Organization founded in the Fall of 2014 by Michael Shah and Raoul Veroy. Our mission is to unify current graduate students within the department through social events, professional development events, and collaborate on student life topics. Our flagship workshop series "Programming for Non-Programmers" allows graduate students opportunities to teach workshops to other students in the university on the topics of: Python, R, Java, and LaTeX. More information can be found at: <http://sites.tufts.edu/cslo/>

oSTEM (out in Science, Technology, Engineering, and Mathematics) is a group for LGBTQ+ students in the STEM fields. They meet twice a month to collaborate, console, and just chat. The group is open to all identities (allies are welcome) and all majors! To stay up to date, check out their Facebook page (<https://www.facebook.com/tufts.ostem/>). To be added to the elist or for more information, please email either Eliza (eliza.schreibman@tufts.edu) or Ronna (ronna.ten_brink@tufts.edu).