How to survive and thrive in Bioengineering at UCLA

Tips and tricks to make the most out of your time in BE at UCLA academically, professionally, and personally, and have a little fun along the way.

Year 1

Overview

In this year, you should initially focus on transitioning from high school to college. Courses will be more difficult, larger, and with less personal attention from your instructors than you may be used to in high school. You may have been able to excel in your high school classes with low effort. It is likely that this will no longer be the case. When you get attuned to the rhythms of college life, you can begin to add more: research, clubs, volunteering, and an expanded social life can all enhance your college experience significantly.

Academics

Planning your courses

The BE major requires 6 quarters of math, 3 quarters of Physics and 1 quarter of physics lab, 4 quarters of chemistry and 1 quarter of chem lab, 2 quarters of Life Sciences, 1 quarter of programming, 1 quarter of English, 3 quarters of Engineering Technical Breadth, 10 BE required courses and 3 BE electives.

There are chained prerequisites for some classes (for example, BE 120 has EE 100 as a prereq, which has Math 33B and Physics 1C as prereqs, which have… etc.). This can get complicated, but you have help. Meet with your academic advisor (Erkki Corpuz) in the Office of Academic and Student Affairs (OASA) in 6426 Boelter to help you plan when to take your courses. It's a good idea to meet with your advisor at least once per year and to email with any questions as they arise. Set up a meeting with your advisor at the beginning of or before your first fall quarter to get your bearings and plan your upcoming year(s). The student chapter of the Biomedical Engineering Society (BMES) also offers course planning workshops (http://bmes.seas.ucla.edu/academic.html).

Your 3 courses in Engineering Technical Breadth, 4 GE courses, and 3 BE electives are largely up to you. The timing of when to take the electives as well as the required courses and prerequisites can be variable (within some constraints). It's a good idea to have estimates of these constraints by making a rough draft of your 4 year academic plan that you will fill in the blanks later (for example, similar to the one on this page: https://www.bioeng.ucla.edu/undergraduate-requirements/). This is useful because some courses have prerequisites and have offering limited to certain quarters. For example, BE 120 is only offered in the Winter Quarter, and has chained prerequisites. Naturally, you won't know the electives you want to take for all four years right away. But it's good to have a rough plan for when you'll take them or what flexibility you have in your schedule in case you have a tough quarter, study abroad, internship, or other things arise that can disrupt a generic course plan.

Summer classes are an excellent opportunity to lighten your course load during the academic year. GE's are often offered in the summer terms. But they do come at a cost, both literally and figuratively. Summer courses are paid for on a per-unit basis and may not be covered by your financial aid package. They also mean that you will be enrolled in classes for more than a year straight. It's easy to become burned out, so consider taking one or two classes if you are interested.

In your first year, you shouldn't take too many classes as you get acclimated. It's a good rule of thumb to take only three 4-5 unit classes per quarter your first year. This means you won't have that much space to take electives, maybe just one or two. As a side note, Engineering 96 (ENG 96) is a group of very fun 2-unit classes open to first and second year undergraduates in order to give you more hands-on engineering experience while working through lower division courses. Give one a shot if you have time in your schedule!

Taking your courses

Put yourself in a position to succeed—develop good habits:

Don't skip class. You will hear urban legends of students who never attended class and only showed up for exams and got an A. B's and C's (or worse) are more likely and way less legendary.

Learn actively. Most of your classes will be lectures. It's really easy to sit back and be passive. Take notes. Ask questions. (DO NOT BE AFRAID/EMBARRASSED TO ASK QUESTIONS.) Stay off your phone and the internet!

Manage your time. The 10-week quarter system at UCLA can be brutal, with midterms in some classes taking place as early as Week 3. Stay on top of your classes. Don't put off projects, essays, homework, or studying until the day or night before a deadline. This will catch up to you eventually. Learning how to manage your time is a crucial skill; maybe the most important skill you learn in college.

Make friends in class; form a study group. Studying with others will shore up your discipline to hit the books and also accelerate your learning.

Take advantage of all resources available to you.

Attend discussion sections Often TAs leading discussions will present material in a different way than the professor, which may work better for you. Also, if you are inhibited from asking questions in lecture, this is a great place to lose those inhibitions.

Professor Office Hours A very underutilized resource. In sparsely attended office hours, this is almost like getting a faculty tutor.

TA office hours Similar to Professor office hours, this can almost be individual tutoring sometimes.

Tutoring

English: Undergraduate Writing Center (https://uwc.ucla.edu/) make an appointment or drop in to get advice and feedback on your writing

Tau Beta Pi offers tutoring for lower div math and science courses as well as upper division engineering classes (https://tbp.seas.ucla.edu/schedule/)

The Student Math Center (SMC) is located on the third floor of the Mathematical Sciences building as well as online and open Mon-Fri , offering open office hour help by TA volunteers in all undergraduate math courses. Highly recommended for homework help!

Take care of yourself—get lots of sleep, eat regularly, and don't be afraid to ask for help when you need it.

Support

CAE. Center for Accessible Education (https://cae.ucla.edu/) If you have a condition or circumstances (including mental health issues) that affect your ability to learn in the classroom, take exams, or submit work, schedule an appointment with CAE to see if an accommodation can be made. Accommodations, once deemed necessary by CAE, must be supported by your instructors. Your instructors will be contacted by CAE for every quarter that you receive accommodations. The most common accommodation is extra time on exams, but can include other things. Sometimes the instructor can accommodate you directly by extending your exam period or by offering your exam at a different time. The instructor will indicate this to CAE. When this is not possible, the instructor will request that CAE provide space, time, proctoring, and exam pickup so that your accommodation can be met.

Mental Health. There is a lot going on in your life and a number of new stressors in your life. Don't neglect your mental health! As part of your time management plan, schedule some mental health time, where you can go for a walk, hang with friends, or relax and do nothing for a while.

Needing help in this area is natural and totally normal, especially as an engineering student. Outside therapy or Counseling and Psychological Services (CAPS, https://counseling.ucla.edu/) can help. Drop in to CAPS (it's on the west side of Wooden Center facing the IM fields) or schedule a confidential appointment. It could seem daunting at first to reach out for professional help, but additional resources such as CAPS can benefit you in multiple aspects of your life, from managing stress and learning how to relax to maintaining relationships with those around you. Resilience in Your Student Experience (RISE), a program extension of UCLA CAPS, provides many mental health events and resources throughout the year, as does BMES if you would prefer support from your peers.

Surviving Imposter Syndrome

It's common to be overwhelmed and intimidated by your new surroundings and classmates, which makes it easy to get caught up in what everyone else seems to be doing during Fall and Winter quarters. Students with different backgrounds, high schools, and prior achievements from yours may make you feel like you don't belong here or are outclassed academically. A sense of belonging fosters confidence, and when you are the only one in a classroom or social setting who looks like you or has experiences like your own, it's natural to feel like you might not fit in to the group. And if you're the first woman, person of color, or disabled person to achieve something others haven't, you might feel

additional pressure to represent your entire group. This is “Imposter Syndrome”, and it’s natural to feel this way. (Many of your classmates feel this way as well!)

Remember, you are not alone in this. Forgive yourself for inevitable mistakes that happen and develop a healthy response to failure—it doesn’t define you, but teaches you. Remember, you have a right to be wrong sometimes or ask for assistance. Reward yourself when you succeed and visualize your success. And remember, shame keeps people from sharing their feelings and working through them. Talk about this with your peers, a junior/senior mentor, and/or your faculty advisor. They’ve all felt this at one point.

What to cover with your faculty advisor

In UCLA Engineering, you are assigned a faculty advisor from BE and required to meet with them at least once per year. You must do this in order to avoid a hold on your records. The purpose of these meetings is for you to complement the advising from OASA: when/how to search for research opportunities, what tech breadth courses to take given your interests, etc. Additionally, if there are any problems you have, your advisor is a great first resource to try and solve them. You do not have to limit yourself to one meeting per year. You can also change your faculty advisor if you have meeting conflicts or a preference to meet with someone else. You even can change your faculty advisor to an engineering faculty outside of BE.

In your first meeting, you should introduce yourself and describe your interests inside and outside of BE, what your plans for post-graduation are (don’t worry if you don’t know yet, it’s just good to have a couple of possibilities in mind to make the planning easier), and how your first year is going so far. Do you have any problems academically or at UCLA in general? Talk to your advisor.

Time outside of classes and studying

Clubs

Clubs are a great way for you to add new skills, develop leadership abilities, network professionally, and have fun socially. There are over a **thousand** clubs/student orgs at UCLA! (https://community.ucla.edu/studentorgs) Many students will participate in one professional/academic/serious club and one fun/social club for balance. The quantity of your club participation is not nearly as important as the quality of it. Use your club experiences to enrich your resume as well as your life: acquire leadership roles, technical skills, make new friends, and most importantly, have a great time.

BMES is the largest Bioengineering club, and they offer a wide range of activities of interest to BE majors. There is Build Team, in which experienced students lead an electronics build over the course of a year. They take ~40 students per year for this activity. There is also Cell Team, which is an analogous effort focused on cell culturing and wet lab-related techniques. Advanced students can participate in Design Team, which has the goal of participating in local and national design competitions. BMES also hosts panels/info sessions covering medical school, graduate school, and internships. It also has a family

system in which experienced students are matched with less experienced students for support. There are also multiple social activities throughout the year.

Intersectional engineering clubs are wonderful opportunities for many underrepresented students in engineering. Society of Women Engineers (SWE) offers its members leadership opportunities, networking, social events, and more. Additionally, the National Society of Black Engineers (NSBE) supports all math and engineering majors, and American Indian, Arab American, Korean American, pan-Asian, Latino, and queer engineering societies are open to all and host many enriching events throughout the year. Links to engineering-related clubs can be found here (https://samueli.ucla.edu/student-clubs-organizations/).

You do not need to limit yourself to only one club, to BE clubs, or to technical clubs. Many BE students have participated in Bruin Racing, dance clubs, language clubs, and many more. You can learn about UCLA's over 1000 clubs at the club open house, which happens in the Fall every year.

There are many other professional clubs: https://community.ucla.edu/studentorgs/pre-professional

Research

Many students find working in a laboratory to be especially rewarding. Performing research is very different from your academic coursework, even from laboratory classes. In research, you typically work in a faculty laboratory on a team, where you will be supervised by a graduate student, postdoc, and/or the faculty PI (principal investigator). Your team will often be trying to make a measurement, engineer a process or material, or similar activity without fully knowing what to do or how to make it work. It can be challenging, frustrating, and very rewarding.

Knowing when to start engaging in research is a personal choice. A good rule of thumb when working in a lab is to spend about 10 hrs/week on your project. Too little time and you won't get much done, and too much time will negatively affect your coursework and life outside of the lab. As a first year student, you may feel the need to jump into research as soon as you can. However, you might not have your time management skills perfected and taking 10 hours out of your weekly schedule may be problematic. Use your Fall quarter to explore your interests and make connections at UCLA, and if you're still dead set on joining a research group, consider reaching out to them during Winter quarter so that you can begin in the Spring/Summer.

In the beginning, you will probably be doing a lot of "assisting" in the research, but as you acquire more experience and ability, you should be assigned more responsibility and more agency in carrying out the research. A successful culmination of your research can be a publication on which you are a co-author. This publication is presented at a professional conference or in a professional journal and represents your contribution to the scientific literature. Authoring a publication is a significant accomplishment and will boost your resume when applying to grad school and med school later, if that is your path.

Research can be time consuming; to recognize the value of research to your education, you may take BE 199 (Bioengineering Research) as a course with your research advisor. You can apply 8 units of

BE 199 to count as BE electives toward your graduation. To take BE 199, you meet with your research advisor (to be a BE 199 instructor, they must be a BE faculty) and develop a plan for the quarter's research, which you will describe in a contract (for more information see https://www.seasoasa.ucla.edu/enrollment-in-courses/).

Because of limited funding, often research positions in faculty labs are unpaid (volunteer). (There are some paid research positions available as well as some research fellowships and other sources of support. There is a lot of information at the Undergraduate Research Portal (URP) (https://urp.my.ucla.edu/)). Many faculty have research positions available that are unlisted in the URP. For these you will have to send the faculty an email expressing your interest and inquiring about available openings. (When you do this, it's best for your email to specifically cite aspects of that faculty's research that you find interesting and to show that you've done some digging into their website/research/published papers. This shows initiative and also that you are not just spamming all faculty looking for a research spot.)

BMES hosts a Research Mixer in Winter or Spring Quarter, inviting BE grad students looking for undergrad research assistance. Before you take a research position, it may be a good idea to talk with other student (undergrads and grads) already working in the lab to learn about what kinds of tasks you would be doing, the culture and intensity of the group, past successes/experiences of other students, and any other aspects that may inform your decision to join.

But you do not have to limit yourself to doing research in BE faculty labs. Many students have found rewarding research experiences in labs in Mechanical Engineering, Psychology, Chemistry, Biology, and many others, including the Medical School and even off campus at other institutions. The most important thing is to get a quality laboratory experience. If you wish to do a BE 199 in a lab where the PI a BE faculty, then contact the BE UG Vice Chair and they will be able to co-sponsor your BE 199 class after reviewing your research plan.

Professional Development

It's a good idea while you're in college to get some experience with jobs/tasks/activities that you may be doing after you graduate. If you're aiming for employment post-graduation, this could be an internship. If you're aiming for graduate school, this could be research (discussed above). If you're aiming for medical/dental school, this could be shadowing a health care worker or volunteering to work in a clinic. Information and advising for a variety of health care professions can be found here (https://prehealth.ucla.edu/).

Internships. Internships typically take place in the summers, although some can occur during the school year. In the latter case, participating in an internship requires coordination with the department/OASA and could add some time onto graduation. A summer internship is more common. They are also quite competitive, and it may be quite difficult to get one after your first year. To find internship opportunities, information can be found with BMES (http://bmes.seas.ucla.edu/academic.html), on the School website (https://samueli.ucla.edu/internships/), and at the annual engineering career fair (http://www.ascebruins.org/career-fair.html).

Volunteering. Volunteering is a great way to get experience and recommendation letters. UCLA has a central resource for volunteering opportunities on and off campus (https://volunteer.ucla.edu/).

Scholarships and Financial Aid

UCLA Samueli undergraduate scholarship applications open in the summer before the school year and usually close around Week 1 of fall quarter. Over one hundred scholarships are available from just one application (https://www.seasoasa.ucla.edu/scholarships-for-undergraduates/). If you have specific questions about applying to these, visit the OASA office or email Alina Haas, (ahaas@seas.ucla.edu). Make sure you apply every year – first years are eligible as well!

Other resources are available at https://financialaid.ucla.edu/.

Other Campus Resources

The UCLA Community Programs Office (CPO) offers important living assistance for students with financial difficulties, such as grocery subsidies and dining hall meal vouchers as well as a food closet located in the Student Activities Center (SAC). Visit the office on the main floor of the building and they can direct you to further resources. **During the COVID-19 Pandemic, the CPO curated an enormous basic needs resource document for UCLA students that is quite helpful for finding additional resources (https://docs.google.com/document/d/1AUbLyaeYTLGPY1tnDJTG3ROzXKVY0QvF5oOy9_ZLmKo/edit?usp=sharing). While some info is COVID-specific, much of it references resources at UCLA available year-round.**

Exercise

This is very important. Stay active! There are many opportunities for athletics and exercise on campus. The Wooden center offers facilities for individual and team sports, there are many intramural sports teams and activities, and there are also a number of UCLA-hosted activities off campus (sailing, kayaking, surfing, skiing, etc.) Check out UCLA Outdoor Adventures for all sorts of workshops, equipment rental, and guided activities in the Southern California area.

Living

Dorms are required for UCLA first year students, so that's where you'll be. The UCLA Office of Residential Life has many guides and lots of helpful information for living on the Hill, and this popular Reddit post outlines very clearly each building/dorm type and their perks (https://www.reddit.com/r/ucla/comments/bmleg8/housing_information/)

However, for your subsequent years, you might choose to live off campus in an apartment. Most students live on-campus their first two years and off-campus for the last two. Regardless of where you live, it's quite expensive, so you'll likely have a number of roommates. Begin your housing search the end of winter quarter the year before you'd like to move in to have the largest number of options. The

cheapest off-campus housing is the UCLA Co-Op (https://www.uchaonline.com/) which houses about four hundred students and works in a tier system: begin in a dorm-style triple and in later years, upgrade to larger and larger rooms based on availability. It's by far the cheapest way to live off-campus with some meals supplied to you, and helps you integrate into a large community.

Off-campus housing is most easily located through UCLA's annual Housing Fair, major UCLA housing Facebook groups, and by word of mouth. Useful places to gather information on what it is like to live in off-campus apartments are r/UCLA on Reddit, and asking from those that already live there. Take walks in the spring and cold call "For Rent" numbers listed on the side of buildings in order to begin the process. Be careful about sending money to people before you tour the property and sign a lease; there are many stories online about students who have been tricked.

Year 2

You made it through your first year. Whew.

Things heat up a bit in your second year, with a typical load of four classes per quarter. Did you develop good study habits and time management last year? You'll need them this year. If not, there's no better time to start.

You will finish up all of your lower division classes you need for prerequisites (Physics, Math, Chemistry, Biology) this year. The Bioengineering classes you'll take this year are BE 100 (Bioengineering Fundamentals) and BE 167L (Bioengineering Laboratory) and potentially BE 110 (Biotransport and Bioreaction Processes). BE 100 is offered in the Fall, BE 167L is offered in the Fall and Spring, and BE 110 is in the Spring.

This year is a good year to start doing research and join a club if you have not already. If you don't have a solid idea of what you want to do post-graduation, this is a great year to start exploring the options a little more in depth.

By the end of your second year, you should start to narrow down your preferences to what you're going to be doing post-graduation. Grad school? (PhD? MS?) Med school? Job? Something else- dental school, law school, etc.? Many of the choices you make hereafter should be made with the goal of enhancing these post-graduation preferences.

<u>Summer</u>

This summer, you should aim to be productive (internship, research, classes, job) with the aim of furthering yourself toward your above goal. Do you need to study for the MCAT/DAT/LSAT?

Year 3

This year fully exposes you to the BE major. Required BE classes include BE 110, BE 120, BE 175, and BE 176. To take BE 120 (offered winter quarter), you'll need to take EE 100, either in the Fall, or in the previous summer or year. For BE 175, you'll need to have taken your CS requirement already. All other courses should be covered by the prereqs you took in Years 1 and 2.

This year you will also take some BE and GE electives, in addition to some of your tech breadth electives.

Transfer Students

Are you a transfer student? If so, you've completed the equivalent of the first two years of the BE equivalent at your previous institution and you will hit the ground running. There might be an adjustment as you get acclimated to UCLA. The Engineering school has a number of resources available to transfer students: tutoring, networking, and other events and activities to help you make the most of your time at UCLA. These are all listed here: https://etransfercenter.seas.ucla.edu/.

For the BE major, incoming transfer students are only missing BE 100 and BE 167L, which you can take in your first Fall. If you did not have an introductory circuits equivalent at your previous institution, you should also take EE 100 in the Fall so that you can take BE 120 in the Winter Quarter.

Applying to Medical and Dental School (Make sure to read this guide by a UCLA BE alum: Guide)

If you are applying to medical and dental school, you've already been "working on your application" in one form or another for a while (hopefully), by volunteering, shadowing, working in a lab, etc. If you plan to go to Medical/Dental School straight out of college, your applications will be due in June at the end of your 3rd year. However, the sooner you submit the application when it opens, the better. You will need to take the MCAT/DAT during your 3rd year as well (before May). Make sure that you have taken all of your medical/dental school required courses before taking the MCAT/DAT (that material will be covered on the test). If you have a research project you've been working on that hasn't borne fruit yet, you may consider applying at the end of your senior year. In that case, you'll have a year off after college and before medical/dental school. Many students in that case will choose to do a coursework Masters (see below).

Do not feel pressured to apply immediately – the average age of a medical school student is approximately 24! Everyone takes a different route through college, and your path to medical or dental school is no exception.

Summer

This may be your last summer as an undergraduate. Try to get something done with it. You are at peak competiveness for an internship since you have taken many BE upper division courses. This is also a great time to get a lot of research done if you are working in a lab, and hopefully culminating in an authorship on a paper.

Year 4

Your last year. Your big BE courses are BE 177A and 177B, Capstone design. Although the format of the course can change from year to year, Capstone consists of you choosing from a menu of projects, each advised by a faculty/doctor/industry expert, and working with a team to plan and begin your attack on the project in the Fall (BE 177A) and complete it in the Winter (BE 177B) with a culminating presentation and competition at the end of the Winter Quarter. Some groups continue their projects after the course is over for national competitions or to publish results.

Graduate School

You may consider graduate school for different reasons. If you are interested in an MS, maybe you're looking for a 5th year of college because you're not ready to enter the job market, want a more senior starting position in industry that an MS will get you, want to dig deeper into subject matter or broaden your education, or many other reasons.

In general, if you are pursuing a terminal MS degree, you'll be covering the cost. If you are pursuing a PhD, you should not be paying at all. (In engineering or science—humanities are another matter entirely…)

A Master's degree is typically one year and coursework based, which can be a lot like a 5th year of undergraduate, unless you have a specialized program. A research-based Master's (where you write a thesis) is also possible, but it is typically two years. Since you're paying for it, it's twice as much. It's the same degree as a coursework Master's, but you'll get value from the research aspect (and in much less time than you'd spend on a PhD). Whether that is worth an extra year of cost is up to you.

A PhD program can take between 4 and 6 (or more) years. The number is variable because this is a research degree and the time is a function of the project, your advisor, you, luck, and a bunch of other variables. Doing PhD research can be very challenging and shouldn't be entered into lightly.

It's possible to do your graduate studies in a non-BE major, but it should be close to BE. Graduate schools will be concerned about your preparation for graduate studies in that major. Some BE majors have gotten Masters in EE or ME. They may have had their Tech Breadth requirements in EE or ME and also taken some extra courses. If this is something you are interested in, contact the departments that you'd be applying to and tell them about your situation and they will provide guidance.

Graduate applications will be due December of your senior year. For your graduate school applications, you'll need 3 letters of recommendation and a couple of short written statements. If you are pursuing an MS degree, a decent GPA (> 3.4) and non-disastrous rec letters are all you'll need. If you are pursuing a PhD, at least one year of research experience and a good letter from your research advisor are a must, and if you have authored a paper, even better. It is possible to get into a PhD program without undergraduate research experience, just more difficult. Remember that the quality of your PhD experience is going to be very heavily dependent on your project and your advisor (and less on the institution) and so research your potential advisors thoroughly. A great project and advisor at a non-elite school can be better than a bad project and advisor at the "best" school.

Make sure to read this great guide by Professor Kamei on getting into Graduate school.

Getting a job

There are many paths to getting a job post-graduation. Job postings on company websites, networking with a company through contacts, networking with a company through an internship you had with them last summer, making a contact at the Biotech Career Fair (hosted by BMES) and/or Engineering Career Fair (link), or using the UCLA Career Center (https://career.ucla.edu/). If you have a technical hobby, or have worked on a technical project on your own, for a club, in a research lab, or somewhere else, it's a great way to showcase your skills, determination, and abilities. It's nice to have something tangible to show, whether it is a demo, an academic paper, a GitHub page, or something related so that your interviewers have something to look at after your interview. BMES also hosts a number of industry info sessions, site visits, and networking events throughout the year.

Appendices

Graduate School Information
by Professor Daniel T. Kamei
Presented at Grad School Info Sessions Hosted by UCLA BMES

1. Components of the application
    a. GPA
        i. Sometimes the GPA is used to filter students.
        ii. Average GPA's will vary per program.
        iii. Some schools put more weight on your junior and senior years.
        iv. Some schools treat your major GPA different from your overall GPA.
    b. GRE
        i. Take it early enough to have your scores ready for applying for competitive graduate research fellowships (see Funding below). It can take as long as 6 weeks for the ETS to send GRE scores. (Note also that you want to send in your transcripts early.) Those deadlines appear faster than those for graduate admissions.
        ii. Make sure you do well on it.
    c. Research
        i. You should start as soon as possible. It will teach you lab techniques, approaches for tackling open-ended problems, etc. The letter from your research advisor is extremely important. He/she will have more to say about your research performance the longer you are in his/her lab.
        ii. The sooner you begin the more possible it is for you to generate data that can lead to:
            1. Poster presentations at UCLA
            2. Co-authorship on presentations at national meetings
            3. Co-authorship on publications
                a. It takes time to get good results. Also, for publications, there is a review period that should be kept in mind.
        iii. It is a good idea to stay with a lab for an extended period of time. That is definitely more meaningful than doing research in several labs. However, you shouldn't feel as though you need to stay in a lab if you are no longer interested

in that research field, etc. Your undergraduate education is also a good time to figure out what field is interesting to you.

d. Letters of recommendation (typically 3)
    i. An example of 3 letter writers:
        1. Research advisor
        2. Instructor
        3. Instructor/Employee/Extracurricular activity
    ii. I highly recommend not asking if someone will write a "strong" letter of recommendation since I think it can be offensive to someone who was already excited about writing a letter of recommendation for you. Also, the bottom line is that you should already know what type of letter you expect to receive from the individual by your efforts in his/her lab, class, etc. If you think it's not going to be strong, don't ask.
e. Statement of purpose
    i. You should describe your previous research experience(s).
    ii. You should try to demonstrate maturity in doing research by drawing from specific examples from your previous research experience(s) (e.g., learned that perseverance is one of the most important qualities of a researcher, etc.).
    iii. Although the majority of the statement will be the same for each school, take the time to change a paragraph near the end of the statement that describes your interest in the research performed by a few of the professors in the department you are applying to.
        1. Comment on their area of work and why it's interesting to you.
        2. Read some of their papers, and try to concisely demonstrate more depth than just reading a statement from their website.
    iv. If you do have presentations or publications, cite and footnote them in your personal statement. This ensures that the faculty will see your research accomplishments even if they go through your personal statement quickly.
    v. In addition, some schools or fellowships require a personal statement on diversity or extracurricular activities. If you want to mention non-research extracurricular activities but they do not have a separate personal statement on such activities, you can try to mention the activities in your statement of purpose if it naturally fits, e.g., they may be consistent with a medical goal, or they may show that you really enjoy teaching. However, if this pushes you over the page limit, you should not put them in.
    vi. Be aware that schools will also differ on the maximum page or word limit of your statements.
f. Deciding which schools to apply to
    i. Students typically apply to 8-10 schools.
        1. These are usually divided in some way between top, middle-ground, and back up schools. Typically, you have 2 to 3 back-up schools that you would go to if you weren't accepted anywhere else.
    ii. You should carefully look into the research performed at the schools to help you decide on the 8-10 schools.
        1. Visit websites and read papers.
        2. It is generally a good idea to look for schools that have 2-4 professors that you are interested in.
    iii. Also consider other factors that are important to you (e.g., location).

g. Being proactive and directly contacting professors via email to let them know you are interested in their work and why you are interested in their work is helpful, particularly if you are very interested in a professor.
    i. You should only contact one professor per program until he/she says there are no openings or if he/she never responds.
    ii. In addition, my advice is to only contact a professor if you are pretty sure you will work with him/her if you go to that graduate program.
h. What if you don't get into any of the schools you applied for?
    i. If you think you were close and still have a good shot next year, you could use the year off to significantly increase the research portion of your application. That would be most important.
    ii. If you think you weren't so close and still want to get a PhD, you might try volunteering to work in a lab at a university you want to attend. This probably won't fly at the top-ranked schools, but you may still be able to get into a reasonable program. However, be upfront, and mention to the professor from the beginning that you eventually want to be a PhD student in his/her program, and ask if your chances would increase if you volunteered and did good research.
i. What happens after you submit an application?
    i. Schools will contact you about an interview/recruiting weekend, and the extent of the filtering depends on the school. These trips are generally paid for by the programs.
    ii. Interviews are just as much about deciding if the school is fit for you as deciding if you are fit for the school. Be prepared to impress faculty with your research and interests as well as ask questions about their research and academic program in general.

2. Funding
    a. Unlike professional schools, you usually get paid to go to graduate school. Your tuition can be covered and you get a stipend to cover living expenses.
        i. Note that the probability of being funded is higher for PhD students than MS students.
    b. Funding can be in the form of fellowships (from the Department or from nationwide competitions), teaching assistantships, and research funding from your advisor.
    c. The following correspond to competitive nationwide fellowships to fund your research activities.
        i. Although you generally won't have to worry about funding, receiving one of these fellowships will put you in a good position for getting the research project of your choice. Keep in mind that you will probably have competition in graduate school for getting a project that you like.
        ii. If you're awarded a fellowship, there are some schools that offer a bonus to the stipend (e.g. 10%). However, if you do not get offered a bonus, you shouldn't ask for it. You should just be happy about the recognition and that your chances of getting a project of your choice have significantly increased.
        iii. DOD/NDSEG - https://www.asee.org/ndseg/
        iv. NSF - https://www.nsfgradfellows.org
        v. Hertz
        vi. DHS
        vii. DOE Computational Science

viii. Whitaker International - http://www.whitaker.org
ix. DOE Office of Science
x. Fulbright - http://us.fulbrightonline.org/

3. Length of time
    a. MS
        i. For an MS thesis, an approximate average number is 2-3 years.
        ii. There are some one-year MS programs where it's based on coursework and exams.
        iii. An MS thesis is definitely more meaningful than a one-year MS program.
            1. You will actually go through the thought process of proposing and accomplishing a short thesis, and your job prospects are better. Once you do a thesis, GPA plays less of a role, and connections that your advisor has are important.
            2. The downside is the funding probability for an MS student is lower than that for a PhD student, and so one-year would be financially more attractive.
    b. PhD: An approximate average time is 5-6 years.
    c. Postdoctoral researcher
        i. If you want to become a professor, you generally will have to do postdoctoral research after obtaining your PhD. For engineering, the time period for postdoctoral research is about 2-3 years.
4. Job opportunities in the biotechnology and pharmaceutical industries
    a. Someone with a BS has a ceiling, while someone with an MS has a higher ceiling. A PhD has no limits.
    b. However, some people can be happy in a non-leadership role (that associated with a BS or MS) and in just being in the lab and contributing.
    c. Other bioengineering industries differ in how much importance is placed on advanced degrees but please keep in mind that many more students get advanced degrees now than when those currently in leadership positions were your age. In other words, it's not clear in 20 years if those in leadership positions are predominantly those with advanced degrees.
5. Accepting students into our graduate program.
    a. We generally encourage our undergraduate students to go to other programs for their Ph.D. degrees because you will get a different perspective on bioengineering, which will be educational. However, we have taken students into our program.
    b. Many of our undergraduate continue on to get an M.S. in our program.