

NC STATE UNIVERSITY

ADVISING HANDBOOK



CHEMICAL &
BIOMOLECULAR
ENGINEERING

NC STATE UNIVERSITY

August 2024

Dear Student:

Welcome to the Department of Chemical and Biomolecular Engineering! The Advising Handbook is intended to be your comprehensive reference for information about the Department and its undergraduate academic programs. The Handbook contains information about courses and curricula, academic policies and procedures, scholarships, the Co-operative Education Program, and student activities in the department. In addition, there is helpful information about professional development topics such as resumes, cover letters, and interviewing. To make the best use of this information, you should consult the Handbook at least once each semester prior to meeting with your academic advisor during the registration advising period. On the last page there is space for you to list your professional and personal goals while at NC State. We encourage you to take the time to reflect on your own goals and to document them – this is the first step toward reaching them!

One copy of the Handbook is provided to each student after you've been accepted as a degree candidate (CODA'd) into the department. Since you'll receive only one copy of the Handbook, we recommend that you keep it with your other reference books and that you treat as the valuable resource it is. Please send any comments or suggestions for improvements to the Handbook to Dr. Lisa Bullard.

Dr. Sinee Simon
Department Head

Dr. Lisa Bullard
Director of Undergraduate Studies

TABLE OF CONTENTS

My Professional and Personal Goals While at NC State	5
52 Things To Do Before You Graduate	6
A Survival Guide to Chemical Engineering	7
Choices of Successful Students	15
Who to See For...	16
CHE Faculty and Staff	18
CHE Courses	22
Prerequisites for CHE Courses	26
CHE Curricula	28
BS in Chemical Engineering	29
Biomolecular Concentration	31
Biomufacturing Sciences Concentration	33
Honors Program in Chemical Engineering	35
Nanoscience Concentration	37
Sustainable Engineering, Energy, and the Environment Concentration	39
Accelerated BS/MS in Chemical Engineering	41
Accelerated BS CHE/MR Biomufacturing	3
Dual BS in Chemical Engineering and BS in Paper Science & Engineering	45
Dual BS in Chemical Engineering and BS in Textile Engineering	47
Dual BS in Chemical Engineering and BS in Chemistry	49
Dual BS in Chemical Engineering and BA in Chemistry	50
Engineering Humanities and Social Sciences Requirement	51
Academic Policies and Procedures	57
Academic Misconduct	57
Advisor Assignment	57
Adding and Dropping Courses	58
Course Load	59
Course Prerequisite Enforcement	59
Course Repeats	59
Credit-Only Grading	60
Double Majors	60
Eligibility to Continue Enrollment	60
Foreign Language Requirement	61
GPA Calculations	62
Grade Exclusion Policy	63
Graduation Requirements	63
Grievances in Grading	64
Honors Courses in Chemical Engineering	64
Plan of Work	64
Plus/Minus Grading System	64

Satisfactory Academic Progress	65
Scholarships for Chemical Engineering Students	65
Transfer Credit	66
Tutoring	67
Undergraduate Research Projects	67
Professional and Personal Development	68
Learning Styles	68
Student Chapter of the American Institute of Chemical Engineers	72
Omega Chi Epsilon, the Chemical Engineering Honor Society	73
International Society for Pharmaceutical Engineers	74
Pre-Med	74
Pre-Law	74
Study Abroad	74
Cooperative Education Program	75
Professional Development Topics	78
Email and Voicemail Etiquette	78
AIChE Code of Ethics	85
Resumes and Cover Letters	86
Interview Tips	89
Interview Prep Sheet	91
Interview Checklist	93
Examples of Interview Questions	95
Career Fair Tips	96
Useful Web Sites	97

MY PROFESSIONAL AND PERSONAL GOALS WHILE AT NC STATE

In order to be successful, it's important to set goals early in your academic career and then developing a plan to achieve them. List some of your goals below and talk with your advisor about how to prepare yourself for the career you envision.

- I would like to have a GPA at graduation of _____
- I would like to get work experience via summer internships or co-ops at companies like:

- I would like to get involved in campus activities such as:

- I would like to get involved in community activities like:

- I would like to develop my leadership skills by:

- After graduation, I can see myself...

- Besides my schoolwork, personal goals include:

- 3 things I want to accomplish at NC State:

52 Things To Do Before You Graduate

With a little help from our Facebook fans and other devoted alumni, the staff of the alumni magazine compiled this list of can't-miss NC State experiences. **How many can you check off the list?**

- 1. Live on campus.
- 2. Get to know D.H. Hill Library.
- 3. Attend a basketball game at the RBC Center and sit in the student section.



- 4. Camp out for men's basketball tickets.
- 5. Travel with the Pack when they make postseason play.
- 6. Paint your face red and white.
- 7. Support non-revenue sports.
- 8. Memorize the "Red & White Song," fight song and alma mater.
- 9. Participate in Homecoming.
- 10. Guard the Free Expression Tunnel from our rivals.
- 11. Purchase a class ring.
- 12. Tell others why you love NC State.
- 13. Take a class that sounds fun.
- 14. Take a class not listed in the Course Catalog.
- 15. Be a guinea pig for a research experiment.
- 16. Sign up for a student competition.
- 17. Get a part-time job or an internship.



- 18. Milk a cow on the Brickyard.
- 19. Head to the Arts to Wear fashion show.
- 20. Tailgate before a home football game.
- 21. Attend a concert by a student a cappella group.
- 22. Check out a University Theatre performance.
- 23. Attend a showcase of student work.
- 24. Eat a feast served by University Dining.
- 25. Rub the Strolling Professor's head for good luck.
- 26. Whisper to a friend using the parabolic reflectors behind D.H. Hill Library.
- 27. Try a scoop of Howling Cow ice cream.
- 28. Take your picture with a wolf sculpture on campus.
- 29. Enjoy a picnic on the Court of North Carolina.
- 30. Watch a movie outdoors on Harris Field.
- 31. Visit the Gregg Museum of Art & Design.
- 32. Check out NCSU Libraries' latest exhibit.

- 33. Catch a glimpse of the Bell Tower when it's lit up red.
- 34. Watch a game in the Old Barn.
- 35. Take a campus tour using NCSU Libraries' WolfWalk.
- 36. Skate around Harrelson Hall's circular ramp.
- 37. Visit the Burlington Nuclear Reactor.
- 38. Support Student Media.
- 39. Join an intramural team or make use of Carmichael Complex.
- 40. Help build a shack during Shack-a-thon.
- 41. Donate your blood and package meals for Service NC State.
- 42. Jump into Lake Raleigh for Polar Plunge.



- 43. Attend a Hoops 4 Hope women's basketball game.
- 44. Run the Krispy Kreme Challenge.
- 45. Donate your gently-used items to Wolf Pac 'N' Go.
- 46. Join a club, student organization or fraternity/sorority.
- 47. Strike up a conversation with a stranger in the dining hall or on the bus.
- 48. Meet a professor for coffee.
- 49. Listen to your academic adviser.
- 50. Go somewhere off campus and see the world.
- 51. Paint the Free Expression Tunnel.
- 52. Attend your commencement.

NC STATE ALUMNI ASSOCIATION



RED & WHITE OF LIFE

A Survival Guide to Chemical and Biomolecular Engineering

Dr. Lisa G. Bullard
Department of Chemical and Biomolecular Engineering
North Carolina State University

As you prepare to take your first chemical engineering course, you may be feeling a bit smug, or perhaps a bit nervous, or both. You managed to navigate your one-person kayak through the relatively smooth waters of the freshman year, easily maneuvering around the rocks of calculus, chemistry, and physics by spending about 30-45 minutes (usually 30) on any given homework assignment and studying the night before a test, usually for an hour and a half at the most. The terrain was familiar based on your strong high school preparation. Group work was not necessary (hence your one-person kayak); you may have noticed your fellow kayakers paddling along, some falling by the wayside, but most keeping pace with the group.

Now you and some others have made your way to what looks to be a large, remote island. As you climb out and gaze at the island, you see in the distance that there are spectacular, steep cliffs. Some have beautiful waterfalls cascading down. You can see beautiful flowers and exotic plants before you. All of a sudden some natives emerge from the forest to greet you and your fellow travelers. They look a little strange and they are speaking a language that you don't understand. They hold out some sort of tools in an effort to be friendly (you hope), but you have no idea what they are or how to use them. You realize that you've developed strong paddling skills in order to get here, but you have no idea what lies ahead of you and how to reach those spectacular cliffs.

Welcome to Chemical and Biomolecular Engineering.

Taking the first course in your major – any major – is an exciting but scary step into the unknown. There's the excitement of feeling like you're FINALLY getting into your chosen field, accompanied by the nagging feeling that you're not sure what it really is or what you'll end up doing with it. After teaching the first course in Chemical Engineering – CHE 205 – several times, I've observed that the course is a big shock for many students. They spend several weeks or perhaps the whole semester discovering ways in which CHE 205 is different from courses they've taken before, and trying to figure out how to be successful. Some students quickly get “the lay of the land” and adapt their study habits to achieve success. Other students fight it kicking and screaming all semester, and either give up or barely limp through, feeling battered and betrayed at the end of the semester.

In an effort to equip and inform you from Day 1, I asked some current and former undergraduate and graduate students to share advice and observations that might help you avoid the mistakes they made when they took the course. I hope that you'll take their advice to heart, since they have successfully scaled the high cliffs and stand looking back on the journey with valuable perspective on the potential pitfalls along the way. Comments in italics come directly from students – they say it best.

- **Develop a strong work ethic.** This theme was echoed in almost every student response.

There is no such thing as a lazy (successful) chemical engineer.

You do not have to be brilliant to be a CHE, but you do have to have the dedication, persistence, and downright stubbornness to keep working at it until you get it. Along the way you will doubt yourself. Those who really want it will succeed.

Most importantly, CHE 205 requires time, lots of time. Time spent reading the text, reviewing notes, speaking to the professor, working on the problem sets solely, working on the problem sets collectively, speaking to the TA, and going to problem session. One is also required to quickly develop a work ethic that has never been required before, because in high school they never studied and did well and freshmen year was hard but they still managed to do well with simply doing the homework and studying right before the test. This approach will not prove successful in chemical engineering.

- **Get used to working in groups.**

I recommend that everybody taking these classes should have a group of people that they can study with. Everyone approaches complex problems differently, so working with a team may allow someone to see an aspect of the problem that they would otherwise not consider.

At the beginning of CHE 205, you may think you have it all under control. Don't learn the hard way that a study group is a great source for understanding CHE material. In addition, you may be the resource someone else needs to understand a topic. Working in groups has mutual benefits. Remember, the group members need and value your input as much as you need and value theirs.

I did everything short of going to the bathroom with my group.

Learning how to band together as a class, going beyond our groups to tackle the difficult homework sets became the essence of what we learned in CHE205: hard work, cooperation, and the satisfaction of a team victory.

Once you start working in CHE205 groups, never work on problem sets alone again. Set aside the required time during your week, every week, to do group work. Make it a high priority.

- **...But don't rely on group work (or other resources) to carry you through.**

My instructors always emphasized working in groups, but being able to do the problems independently. Unfortunately, I didn't fully appreciate that advice until later on. The problems never look that difficult when you see the solutions your group members or instructors develop. The solutions are usually straightforward and relatively short. However, the amount of trial and error and flipping through notes and books that it takes to develop those answers seems endless if you actually complete all the problems on your own. So when you sit down and take your first exam, you need to be able come up with these "short" answers on your own from all the information you have been taught up until that point. This can be difficult or impossible if you have relied on your group to carry you along.

There are many resources out there where you can get the answer to most homework problems in CHE 205. By copying those answers, you are cheating yourself of the experience to figure out how to solve that problem. Getting the correct answer to a problem is not worth risking your academic integrity or your opportunity to continue being a Chemical Engineering student.

If you ever feel tempted to copy or cheat, take a minute and pause. More often than not, it's because you're stressed out or pressed for time. Walk away from the books, take a breather, and really think about how much it's worth to you. I bet you will reconsider. Your professors will be much more proud of you turning an assignment in late and completed well, rather than on-time and dishonestly.

- **Get organized.**

Get organized and stay organized. I began each semester with everything in order and color-coded. As the semester progressed and the workload increased, before I realized what was happening, my organized notebooks and folders were in disarray. I soon learned the importance of setting aside just a few minutes one day a week to re-organize. It's much easier to maintain organization!

You should be able to pick up notes from classes a year ago and be able to read and understand them. You should also be able to look at a problem you worked and know what you were doing. Beginning to use calendar software during my junior year was the single most powerful self-investment I made during CHE. It made assignment deadlines easy to make, extracurricular activities easy to manage, and allowed me to do more than I ever thought possible with my time.

- **Embrace CHE as a new community.**

Learn to love the AICHE Lounge and to join AICHE as early as possible. There is always someone there to help you if you need help, or if you just want someone to talk with. I think that is one reason that I like being a CHE so much — we all stick together and work with each other and generally care about each other. I would recommend that students visit the lounge if they have a problem they can't solve, generally there will be someone from their class or a helpful upperclassman that has been through it and knows their pain.

The best friendships of my life were found in the ChE lounge.

CHE is more than a major, it is a lifestyle.

If you look around the room in your CHE 205 class, you'll see people that will become a significant part of life in the coming three years. You may not realize it now, but you will be spending a large amount of time with them. They will inevitably become your friends as you share pains and triumphs in the coming years. Take some time to get to know them. Go out to dinner together and talk about something other than CHE.

Making friends with my assigned group teammates in CHE205 helped me to meet people in other teams, and thus make more friends. As the problems became increasingly difficult, we all had to reach out to other teams and the TA's for help with them. By the end of CHE205, the difficulty of the homework sets began to bring the whole class together. Little did we know, but this same cycle would repeat for every CHE class we took from there forward—with less individual struggling and more teamwork at each turn. By the end of this road, we all graduated with a feeling of camaraderie and friendship that we will all cherish for a very long time.

Putting together a major event for the department and College of Engineering helped solidify my place in this community. It opened doors for me, and I made friends that I will keep for life. My words of advice are only two: be proactive. If you knock on doors and ask good questions, you will find good neighbors and better answers. Don't wait for someone else to make the change you want to see.

Those who journeyed with me through CHE will be the people that I can call on in the future—they are my friends for life.

- **Recognize that you have to train your brain to think differently.**

Many students think the way to do well is to understand a little bit or memorize. In CHE, memorizing stuff is not important, but the way you THINK is. This retraining the brain to think like an engineer is trivial for some people, not hard for others, and nearly impossible for others that just don't understand how to apply concepts.

If something isn't clicking for you, let another show you how to make it click. Sit down with someone who is "getting it," and have them explain to you how they tackle a problem. Don't try to understand the details or the calculations. Just focus on the way they visualize the big picture, break it down, and then build it up again. Soon, analysis and synthesis will become your natural ways of solving problems, too—and you will be headed in the right direction.

- **Get used to the idea that you will never see multiple choice tests again.**

Studying tips [From a former TA]:

- *Make a 'per exam' cheat sheet (cheat sheet for Exam 1, then 2, then 3) and figure out what you think will be most fruitful to put onto your "torpedo." Do not make the torpedo so confusing you cannot use it.*
- *Practice. In ALL of your further CHE courses, practice in doing various types of problems is the key to doing well. You will encounter problems in tests that make you go to the next level and expand on what you already know.*
- *Make your review problems that you do logical, neat and organized so you can always follow through what you did as a "summary" of the problem. You may get lucky and do a practice problem that the professor uses as an exam problem – it's been known to happen!*
- *Do not get into the habit of plugging and chugging. It will not serve you well. Understand what is going on, make a reasonable analysis of the problem, and try to figure out what you should be getting. Doing this through the review problems will make them sink in and you will then remember what to do on the final.*
- *Memorizing and solving calculations is work for a computer. Understanding the significance of the calculations, and then organizing a way to solve them, is work for an engineer.*

You have to invest the time before the test to know exactly how to find what you need in the book, and where it is. Putting tabs in your book might look geeky, but it will save you time in looking up commonly used tables and equations. And actually reading the book just might help, too.

- **Chemical engineering is not chemistry.**

Engineering is different from purely scientific fields. Where chemists and physicists seek new scientific principles without bound, engineers realize and accept limitations and concentrate on what is practical. Upcoming students should be ready to be trained in this way of solving problems. An engineering education seems to be more of a way of looking at the world and putting it to use than looking at the world and trying to explain it.

Chemistry is a cornerstone of a chemical engineer's toolbox, and will be important knowledge for your future career. By the time that you graduate, however, you will realize that it is just one tool among many; physics, mathematics, economics, creativity, problem solving...

The Chemist creates or discovers new chemistries, and the Chemical Engineer finds a way to use them for mankind's gain.

- **You can't get away with procrastination.**

I think that time management is the biggest thing that a student must learn when coming into the CHE curriculum. In other classes, it is often easy to wait until the last day to do an assignment, and still end up with a good grade. In CHE, it is a necessity to start the work early. There are too many concepts that will escape your grasp if you don't start early because the problems take a large amount of time, and you will never finish them in one sitting. Scheduling time to ask questions (with a teacher or TA) is also a must. It is inevitable that there will be a time when you get stuck on a problem, and none of your classmates are able to figure it out either. Basically, I believe it is impossible to procrastinate and be successful in the CHE curriculum.

Get together with two or three other people far in advance of the homework due date, and work single problems as a team. Never divide up the work. No, it is not the most efficient way to complete the assignment. But, working together on a problem is more fun. You also get "stuck" less often, and almost undoubtedly will understand all of the material upon finishing the homework. In the end, paying it forward will be worth the time you save in reworking wrong problems and cramming for tests. You will soon see: the best students are the ones who figure out that CHE is all about "down payments." They are also the cheeriest in your morning classes, and happiest at the end of tests.

Teach each other, together, and I promise you it will pay dividends.

- **Follow instructions.**

The syllabus will probably say something like: "Use green engineering paper (available in the Student Supply Store), one side of each page; begin each problem on a new page, and box the final answers. Each completed assignment should be in one person's handwriting. Staple the pages and fold them vertically when you hand them in, putting the names and roles of the participating group members and the problem set number and date on the outside." Follow these instructions – to the letter. You can believe that the TA's will take off points for not stapling, writing on the back, etc. You may think these things are silly but if that's what the prof asks for, do it. One day your client will ask for something just so – and that's what they expect, too.

If the homework is due at the beginning of class, then it had better be there. Set two alarms, get your roommate to wake you up, whatever, but don't be late or the rest of your group will hate you forever (deservedly). If in doubt, put it under the instructor's door the night before (or at 3AM when you finish it).

Writing legibly is a must. You can't get partial credit if no one can decipher your scribbles.

- **Ask for help.**

Get help when you need it. If you are unsure or completely lost, get help from other students in the class, the TA or the professor. Engineering classes are built upon information from your previous classes and previous lectures. If you get lost at one point, it is likely that you will be lost for the rest of the class and possibly longer. Don't make it harder on yourself; there is no shame in getting help. Don't be embarrassed to go to the Engineering Tutorial Center and get a personal or group tutor – that's why they are there!

Get to know your professors by going to see them during office hours. Having the professors get to know you early on at the start of the ChE curriculum can support you and encourage you to try

things like research or internships that perhaps you wouldn't be aware of. It's also helpful when it comes time to ask for a recommendation letter.

- **Choose a major for the right reasons.**

[From a former CHE 205 TA]: There was one commonality with the students who REALLY struggled in the class. During an informal talk with some of these students, I asked them why they chose chemical engineering. And all of them (these are the ones who get D's and F's in CHE 205) told me that they chose chemical engineering because of the money or job opportunities. In contrast to that, the ones who did well tended to respond that they chose chemical engineering because they liked math and science. The students who were really struggling hated every moment of the science, math and engineering courses.

- **Become comfortable making assumptions.**

Now I have learned to list all the assumptions I am making when solving a problem. It is difficult to learn when you can make certain assumptions and when you can't. Making an assumption when describing a system might make my life easier while solving the problem, but it might not provide an accurate enough picture for the process, depending on the accuracy required. The more problems I work through, the more I know when it is okay to simplify a component/idea to get a solution.

In all the other classes I'd had, there were definite right and wrong answers to a given question; however, in CHE, there may be a number of different ways to arrive at an answer that might be considered correct. This took some getting used to.

- **Don't be devastated if you aren't at the top of the class.**

The majority of people in CHE were at the top of the class at some point during their academic career. Whether it was high school or freshmen courses, chances are you were too. You are now among the best, the competition is a little tougher, and the course material is going to be more difficult. You may not be at the top of the class, but always put forth your best effort. You may not always be satisfied with the result, but you'll know you did everything you could do.

School and grades had been one of the most important things to me in my life up to this point, perhaps, sadly, the most important thing to me. (I say sadly because many parts of life are more important than grades, which are, after all, subjective and superficial. I now believe my spiritual state, my relationships with other people, actually learning, which is different from making good grades, and my health are more important).

I finished my freshman year with a 4.0 GPA. I had thoughts creeping in telling me that I may be the smartest person in the world. Then I took CHE 205. I spent a LOT of time on the homework, and I made a ~70 on the first test. Since I thought I may be the smartest person in the world, I had figured my grades in my major should be even better than what I had been making. This idea was supported by the fact that I did not think I had tried really hard to do well before, even in the classes that I did do well. Actually, I was somewhat of a slacker and a procrastinator. I began to realize that I had this attitude: I had to achieve perfection in order to have joy. I thought such a frame of mind was necessary to keep me motivated and doing well. Instead, not being content with anything less than perfection almost destroyed me. Having successfully completed the curriculum and obtained my degree, I now encourage you to study CHE for the sake of learning, not for the sake of being the best.

- **Keep your eye on the goal.**

Listening to people talk about "real" chemical engineering and learning more about different industries and the application of chemical engineering principles can be quite helpful. Because chemical engineers go into such a broad array of fields, I think that it is all the more important that students begin considering where they might like to go early on by learning about what's out there (through attending lectures, conversations with professors/advisors, etc). When I was a junior in college, I felt a certain sense of shame because I could not name 10 chemical engineering-related companies, when in fact there are hundreds of companies which hire ChemE's.

[From an alumnus]: Encourage the students to view the course as representative of things that real chemical engineers do. Because of this, the hard work is very worthwhile, far beyond the value of getting a good grade. Some graduates (like those who go to medical school) will not use the material very much, but for many others it will be the very core of the value they present to their future employers. Particularly for people in process engineering, in research and development, or for others in the process industries, they will return to the content of this course over and over again. My group essentially applies all the classical chemical engineering approach using the latest advances, but all our work has CHE 205 as a foundation. We use these ideas continuously to the point of them being second nature to us

[From an alumnus]: Embrace ChE with all its good and bad. We all love the title and the smugness we get from telling people "I'm an engineer, a CHEMICAL engineer." Kind of like "Bond, James Bond..." I feel good about it because I survived it, because I sacrificed to get it, and because I wanted it more than anything else - other than my family.

This is my philosophy of, reflection on, and motivation for problem solving, which I believe to be the most valuable thing I learned as a CHE:

- *First, embrace the idea that there are always multiple ways to solve any problem.*
- *Then, recognize the difference between easy problems and hard ones. Easy problems have one solution, and it's straightforward. Hard problems have more than one solution, and no one has found any of them yet.*
- *Now, reflect on how many hard problems you have solved in your life.*
- *Get excited about the hard problems out there—they're waiting for you.*

At this point, you may be thinking one of two things: (1) "This isn't so bad, I think I can probably handle it if I just discipline myself to follow some of these common sense tips;" or (2) "Why would anyone want to survive such a hellish major...and where do I submit my drop form?" If you're inclined to (2), let me offer some words of advice before you run screaming to Registration and Records. First, chemical engineering is an exciting career field and is worth investing your time and effort. You will be able to work in a number of different industries including pharmaceuticals, petrochemicals, electronic materials, paper, textiles, consumer products, and more. You will have the skills to perform many different job functions, including research and development, process engineering, project management, sales, marketing, environmental assessment, quality assurance, technical support, information technology, and management.

Many companies specifically target chemical engineers as new hires because they have found them to have a broad skill set and a strong work ethic. Chemical engineers traditionally have the highest starting salaries of all engineering disciplines, and the job market is always more stable for them than for most other branches of engineering. This is no coincidence—employers assign high value to a chemical engineering degree. It's also no coincidence, therefore, that the curriculum is

extremely challenging, and your strong work ethic and broad skill set will take much investment on your part.

Second, others no smarter than you—and many not as smart—have trod this path before and lived to tell about it. Chemical Engineering alumni frequently cite the importance of problem-solving and teamwork skills that were developed during the chemical engineering curriculum and in CHE 205 in particular.[1] And all those horror stories about 50% of the class getting F's are not true – just look at recent grade distributions. In my Fall 2002 section of CHE 205, 70% of the class – those who stuck it out – got A's or B's.

Lastly, if you think you're the only one with doubts, think again. The quotation that follows is from an article about the "Impostor Phenomenon," which is like a tape that people play inside their heads.

If you're an engineering student looking around at your classmates, the tape goes something like this: "These people are good—they understand all this stuff. They really belong here...but I don't. Over the years I've somehow managed to fool them all—my family, my friends, my teachers. They all think I'm smart enough to be here, but I know better...and the very next hard test or hard question I get in class will finally reveal me as the impostor I am." And what would happen next is too horrible to contemplate, so at that point you just rewind and replay the tape. What you don't know is that almost everyone else in the class is playing the same tape, and the student in the front row with the straight A average is playing it louder than anyone else. Furthermore, the tape is usually wrong. If you survived your first year of engineering school, you almost certainly have what it takes to be an engineer. Just remember all your predecessors who had the same self-doubts you have now and did just fine. You do belong here, and you'll get through it just like they did. Try to relax and enjoy the trip.

So anchor your kayak, strap on your backpack, and let's begin. Contrary to rumors you might hear, the natives are not hostile, and some of your fellow travelers actually look somewhat friendly. There may be some spine-tingling adventures ahead, some precarious positions to get through, and a few death-defying moments, but I assure you that the view from the heights is worth the climb.

Acknowledgments

I appreciate the input and feedback from current and former NCSU undergraduate and graduate students and faculty.

[1] R.M. Felder, "The Alumni Speak," *Chem. Engr. Education*, 34(3), 238–239 (2000).
<http://www.ncsu.edu/felder-public/Columns/alumni.html>

CHOICES OF SUCCESSFUL STUDENTS

SUCCESSFUL STUDENTS...	STRUGGLING STUDENTS...
<p>...ACCEPT SELF-RESPONSIBILITY, seeing themselves as the primary cause of their outcomes and experiences.</p>	<p>...see themselves as victims, believing that what happens to them is determined primarily by external forces such as fate, luck, and powerful others.</p>
<p>.....DISCOVER SELF-MOTIVATION, finding purpose in their lives by discovering personally meaningful goals and dreams.</p>	<p>...have difficulty sustaining motivation, often feeling depressed, frustrated, and/or resentful about a lack of direction in their lives.</p>
<p>...MASTER SELF-MANAGEMENT, consistently planning and taking purposeful actions in pursuit of their goals and dreams.</p>	<p>...seldom identify specific actions needed to accomplish a desired outcome. And when they do, they tend to procrastinate.</p>
<p>...EMPLOY INTERDEPENDENCE, building mutually supportive relationships that help them achieve their goals and dreams (while helping others to do the same).</p>	<p>...are solitary, seldom requesting, even rejecting offers of assistance from those who could help.</p>
<p>...GAIN SELF-AWARENESS, consciously employing behaviors, beliefs, and attitudes that keep them on course.</p>	<p>...make important choices unconsciously, being directed by self-sabotaging habits and outdated life scripts.</p>
<p>...ADOPT LIFE-LONG LEARNING, finding valuable lessons and wisdom in nearly every experience they have.</p>	<p>...resist learning new ideas and skills, viewing learning as fearful or boring rather than as mental play.</p>
<p>...DEVELOP EMOTIONAL INTELLIGENCE, effectively managing their emotions in support of their goals and dreams.</p>	<p>...live at the mercy of strong emotions such as anger, depression, anxiety, or a need for instant gratification.</p>
<p>...BELIEVE IN THEMSELVES, seeing themselves capable, lovable, and unconditionally worthy as human beings.</p>	<p>...doubt their competence and personal value, feeling inadequate to create their desired outcomes and experiences.</p>

<http://www.oncourseworkshop.com/On%20Course%20Principles.htm>

WHO TO SEE FOR:

Advisor:

CHU's, Honors Program, BS/MS CHE
CHE Double Majors, CHE Minor

Dr. Lisa Bullard

Biomolecular concentration

Dr. Robert Kelly, Dr. Nathan Crook,
Dr. Albert Keung, Dr. Jason Haugh

Biomufacturing Sciences concentration

Dr. Stefano Menegatti, Dr. Bala Rao,
Dr. Kirill Efimenko

Nanoscience concentration

Dr. Greg Parsons

Sustainable Engineering, Energy, and the Environment
Concentration

Dr. Fanxing Li, Dr. Westmoreland,
Dr. Peter Fedkiw, Dr. Orlin Velev

Undergraduate Secretary

Ms. Danielle Riegel

Graduate Secretary

Ms. Sandra Bailey

Change from credit to audit, to credit only (pass/fail), or drop a course:

a. before 2-week deadline

use MyPack portal

b. after first six weeks

Dr. Bullard

Cooperative Education (Co-op)

Cooperative Education Office
2100 Pullen Hall, 515-2300

Counseling Center

Counseling Center
2nd Floor, Student Health Center
515-2423

Fundamentals of Engineering (FE) Exam (Seniors):

a. date, place, requirements

NC State Board of
Registration for PE and
Land Surveyors
781-9499 or 781-9547
<http://www.ncbels.org/>

Independent Study (correspondence courses), non-degree programs, evening programs

Lifelong Education
McKimmon Center,
515-2261

WHO TO SEE FOR:

Inter-institutional forms for the Cooperative Raleigh College (CRC) signature: Dr. Mary Clare Robbins
414 Lampe, 515-9954

Jobs: Summer and/or part-time:

- a. work/study on campus Financial Aid
2005 Harris, 515-2421
- b. off campus Career Development Center
2100 Pullen Hall, 515-2396
-

Masters in CHE/Accelerated MS: Dr. Saad Khan

Senior Re-examination: Dr. Bullard

Scholarship information

College of Engineering and Department of Chemical and Biomolecular Engineering
Applications received in PackASSIST by February 15 will receive priority consideration
<https://ncsu.academicworks.com/>

Transfer out of College of Engineering: Dean's Office in the
college you want to
transfer to

Transfer credit for courses completed at other Institutions <https://webappprd.acs.ncsu.edu/php/transfer/>

Withdrawal from NCSU (drop all courses):

Initiate your term withdrawal request through the **MyPack Portal: Student Homepage > Planning & Enrollment tile > Term Withdraw menu item.**

What if I have a concern/problem/issue about something in the department? Here are options for you to share your concern:

- Dr. Lisa Bullard (Director of Undergraduate Programs)
- Dr. Sinee Simon (Department Head)
- University Ombuds Office (<https://ombuds.dasa.ncsu.edu/>) An independent, neutral, confidential, and informal office at NC State, Student Ombuds Services is here to be a personal guide for conflict management, prevention and resolution while advocating for fair processes and empowering students to successfully navigate NC State.
- If you are not able to resolve your concern through these sources, you can file a written student complaint to the university (<https://provost.ncsu.edu/institutional-quality/accreditation/written-student-complaints/>). This is not intended to replace regular channels of professional communication, and students must first approach appropriate NC State administrators, faculty and staff regarding their concern before submitting a formal written complaint.

CHEMICAL AND BIOMOLECULAR ENGINEERING FACULTY

Dr. Milad Abolhasani, University Faculty Scholar and Professor and Director of Graduate Programs (515-8935); Ph.D., Mechanical Engineering, University of Toronto (2014). Flow Chemistry, Microfluidics, Microscale Technologies for Energy and Environment, Continuous Nano-Manufacturing, Microscale Transport Phenomena. [mabolha@ncsu.edu]. 2014 EB1.

Dr. Lisa G. Bullard, Teaching Professor and Director of Undergraduate Programs (515-7455); Ph.D., Chemical Engineering, Carnegie Mellon University (1991); engineering education [lisa_bullard@ncsu.edu] EB1 2012.

Dr. Ruben G. Carbonell, Frank Hawkins Kenan Distinguished Professor; Chemical Engineering Director, William R. Kenan, Jr., Institute for Engineering, Technology & Science; Director, Golden LEAF Biomanufacturing Training and Education Center (BTEC); (515-5118 or 513-0050); Ph.D., Chemical Engineering, Princeton University (1973); Biochemical engineering; molecular recognition; bioseparations; immunodiagnostics; colloid and interface science; transport phenomena, compressed fluid processes. [ruben@ncsu.edu] BTEC 190.

Dr. Matthew E. Cooper, Teaching Professor (513-1623); Ph.D, Chemical Engineering, Ohio University (2008); engineering education [mecoop3@ncsu.edu]. EB1 2016.

Dr. Nathan C. Crook, Assistant Professor (513-2429); Ph.D., Chemical Engineering, University of Texas at Austin (2014); Metabolic engineering, synthetic biology, and microbial ecology [nccrook@ncsu.edu]. PhD, EB1 2026.

Dr. Michael Dickey, Camille and Henry Dreyfus Professor and University Faculty Scholar (513-2917); Ph.D., Chemical Engineering, University of Texas at Austin (2006). Alternative micro- and nano-fabrication, microfluidics, electronic materials, and photo-curable materials for nanotechnology [mdickey@ncsu.edu]. EB1 2088G.

Dr. Kirill Efimenko, Research Associate Professor (513-05480); Ph.D., Material Science and Technology, Institute of Chemical Technology in Prague (1999); [efimenko@ncsu.edu]. 3500 Partners I.

Dr. Peter S. Fedkiw, Alumni Distinguished Graduate Professor (515-3572); Ph.D., Chemical Engineering, University of California, Berkeley (1978); Electrochemical reaction engineering; electrocatalysis; environmental applications of electrochemistry. [fedkiw@eos.ncsu.edu] EB1 2088A.

Dr. Jan Genzer, S. Frank and Doris Culberson Distinguished Professor (515-2069); Ph.D., Materials Science and Engineering, University of Pennsylvania (1996); polymer characteristics at surfaces and interfaces. [jgenzer@ncsu.edu] EB1 2088H.

Dr. Harvinder Gill, Ronald B. and Cynthia J. McNeill Term Professor in Nanomedicine (515-8855); Ph.D., Bioengineering, Georgia Tech (2007). Micro- & nano-systems for drug and vaccine delivery, bio-nanomaterials, mucosal vaccination, immunomodulation. [hsgill2@ncsu.edu] EB1 1056.

Dr. Hassan Golpour, Teaching Assistant Professor, Ph.D., Missouri University of Science & Technology (2016); engineering education. [hgolpou@ncsu.edu] EB1 2086A.

Dr. Christine S. Grant, Professor (515-2317); Ph.D., Chemical Engineering, Georgia Institute of Technology (1989); Surface and interfacial science, mass transfer, environmental engineering. [grant@ncsu.edu] EB1 2088B.

Dr. Keith E. Gubbins, Worley H. Clark Jr. Professor Emeritus (513-2262); Ph.D., Chemical Engineering, London University (1962); Molecular simulation and statistical mechanics applied to chemical engineering problems, phase equilibria and surface property prediction. [keg@ncsu.edu] EB1 1058.

Dr. Carol K. Hall, Worley H. Clark, Jr. Distinguished University Professor (515-3571); Ph.D., Physics, SUNY Stony Brook (1972); Molecular thermodynamics and computer simulation, equations of state, polymer modeling, bioseparations, protein folding. [hall@ncsu.edu] EB1 2024.

Dr. Jason M. Haugh, Professor (513-3851); Ph.D., Chemical Engineering, MIT (1999); Biomedical and biochemical engineering; signal transduction networks; mammalian cell engineering. [jmhaugh@ncsu.edu] Partners II 3100.

Dr. Lilian Hsiao, Associate Professor (515-8057); PhD Soft matter and colloids, Complex fluids, Biomimetic and responsive materials. [lilian_hsiao@ncsu.edu] EB1 2088D.

Dr. Robert M. Kelly, Alcoa Professor and Director of NCSU Biotechnology Program (515-6396); Ph.D., Chemical Engineering, North Carolina State University (1981); Biochemical engineering, biocatalysis at extremely high temperatures, microbial physiology, enzyme engineering. [rmkelly@eos.ncsu.edu] Partners 2, Centennial Campus, Suite 3313/EB1 2014.

Dr. Albert Keung, Goodnight Distinguished Scholar in Innovation in Biotechnology and Biomolecular Engineering, University Faculty Scholar, Associate Professor (515-3352); Ph.D., Chemical Engineering University of California Berkeley (2012); Synthetic biology, chromatin engineering, molecular and cellular engineering, stem cell engineering. [ajkeung@ncsu.edu] 2088F EB1.

Dr. Saad A. Khan, INVISTA Professor (515-4519); Ph.D., Chemical Engineering, MIT (1985); Polymer science; rheology of complex fluids; sol-gel rheology. [khan@eos.ncsu.edu] EB1 2034.

Dr. Fanxing Li, Alcoa Professor and University Faculty Scholar (515-7328); Ph.D., Chemical Engineering, Ohio State University (2009). Energy and environmental engineering, nano reagent and catalyst particles for biomass and fossil energy conversions, CO₂ capture and pollutant control [fli5@ncsu.edu]. EB1 2038

Dr. Gregory McKenna, Research Professor (513-6016); Ph.D. Materials Science and Engineering (1976); Small molecule interactions with glassy polymers, torsion & normal force measurements, nanorheology & nanomechanics, melt & solution rheometry, residual stresses in composite materials. [gbmckenn@ncsu.edu] EB1 2000C.

Dr. Stefano Menegatti, University Faculty Scholar and Associate Professor (515-6398); Ph.D. Chemical Engineering, NC State (2013); Bioseparations [smenega@ncsu.edu] EB1 1054.

Dr. Luke Neal, Research Assistant Professor (515-8757) [lmneal2@ncsu.edu] EB1 2093.

Dr. Gregory N. Parsons, Celanese Acetate Professor (515-7553); Ph.D., Physics, North Carolina State University (1990); Surface reactions and chemical processes in electronic materials synthesis; bonding structure and electronic properties of inorganic semiconductors and insulators; [gnp@eos.ncsu.edu] EB1 2044.

Dr. Balaji Rao, Professor; (513-0129); Ph.D., Chemical Engineering, MIT (2004); Molecular and cell bioengineering; molecular control of cellular processes; stem cell bioengineering. [bmrao@ncsu.edu] EB1 2088C.

Dr. Artem Rumyantsev, Assistant Professor; Ph.D., Polymer Physics, Lomonosov Moscow State University (2017); [arumyan@ncsu.edu] EB1 2042.

Dr. Adriana San Miguel, Associate Professor (515-2934); PhD, Chemical Engineering, Georgia Tech (2011); Systems biology, microfluidics, quantitative biology, high-throughput experimental platforms [asanmig@ncsu.edu] EB1 2010.

Dr. Erik E. Santiso, University Faculty Scholar and Associate Professor; Ph.D., Chemical Engineering, North Carolina State University (2007). Computer-based discovery of new materials and chemicals, molecular modeling of solids and structured fluids, crystallization. [eesantis@ncsu.edu] EB1 2100D

Dr. Sindee Simon, Distinguished Professor and Department Head (515-1297); Ph.D., Chemical Engineering, Princeton University (1992); Physics of the glass transition, cure and properties of thermosets, polymerization and polymer properties under nanoconfinement. [slsimon@ncsu.edu] EB1 2006.

Dr. Richard J. Spontak, Distinguished Professor (515-4200); Ph.D., Chemical Engineering, University of California, Berkeley (1988); Morphological design and characterization of microstructured polymer systems; polymer physics; polymer thermodynamics. [Rich_Spontak@ncsu.edu] EB1 2088E.

Dr. Wentao Tang, Assistant Professor; Ph.D., Chemical Engineering, University of Minnesota (2020); Process control, machine learning in nonlinear dynamics, dissipative systems; mathematical programming, distributed optimization; large-scale systems, networked control [wtang23@ncsu.edu] EB1 2040.

Dr. Orlin D. Velev, S. Frank and Doris Culberson Distinguished Professor (513-4318); Ph.D., Physical Chemistry, Sofia University, Bulgaria (1996); Colloidal science and engineering, colloidal interactions, self-assembly and crystallization; assembly of nano- and microstructures with photonic, optical and electrical functionality; protein interactions and phase equilibria, biosensors. [odvelev@unity.ncsu.edu] EB1 2030.

Dr. Qingshan Wei, Associate Professor. (515-3154); Ph.D., Chemistry, Purdue (2012); Imaging and sensing devices, lab on a chip, point-of-care diagnostics, DNA sequencing and genotyping, nanoscience and nanoengineering, global health [qwei3@ncsu.edu] 2220 Toxicology Building.

Dr. Phillip R. Westmoreland, Professor and Executive Director, NCSU Institute for Computational Science and Engineering (515-7121); Ph.D., Chemical Engineering, Massachusetts Institute of Technology (1986); Energy and the environment, biofuels, chemical kinetics, computational chemistry, molecular-beam mass spectrometry. [phil.westmoreland@ncsu.edu] EB1 2036.

CHEMICAL AND BIOMOLECULAR ENGINEERING STAFF

- Ms. Sandra Bailey**, Graduate Secretary (515-6367), [sbailey@ncsu.edu], EB1 2007
- Ms. Christiana Boyle**, Business Officer (515-6391) [christiana_boyle@ncsu.edu], EB1 2008
- Ms. Donna Cooper**, Admin. Support Associate (515-2324) [dcooper5@ncsu.edu], EB1 2001.
- Dr. Kim Dickey**, Unit Ops. Lab Asst. (515-7733), [kcdickey@ncsu.edu], EB1 1016.
- Mr. Richard Maida**, Contracts and Grants Manager (513-7763), [rdmaida@ncsu.edu], EB1 2003.
- Mr. Michael Mantini**, Specialty Trades Technician (515-7005), [mjmanti2@ncsu.edu], EB1 B003
- Ms. Lauren Marlier**, Public Communication Specialist [lhmarlie@ncsu.edu], EB1 2011.
- Mr. Otto Nelson**, Pre- and Post-Award Specialist [anelson5@ncsu.edu], EB1 2003.
- Dr. Russ O'Dell**, Dir. Alumni Relations (513-2071), [russ_odell@ncsu.edu], EB1 2100B
- Ms. Kenya Pridgen**, University Program Associate, [kharvey2@ncsu.edu], EB1 2005.
- Ms. Danielle Riegel**, Administrative Support Associate (515-2177), [dlkelly2@ncsu.edu], EB1 2005
- Ms. Alison Stieglitz**, NANO Initiative Coordinator (515-6390), [astiegl@ncsu.edu], EB1 2100A
- Ms. Summer VanRiper**, Bookkeeper (515-3999) [sdvanrip@ncsu.edu], EB1 2001A.

CHEMICAL AND BIOMOLECULAR ENGINEERING COURSES - A brief description of selected CHE courses follows, along with the course prerequisites and scheduling information. Students should note that all prerequisites in Chemical Engineering are strictly enforced. It is the student's responsibility to check prerequisites and see the instructor or Dr. Bullard if there is a question about prerequisites. In exceptional circumstances, prerequisites may be waived on a case-by-case basis by Dr. Bullard. **Failure to complete prerequisites prior to enrolling in a CHE course may result in the student's administrative disenrollment from the CHE course after the deadline to enroll in other courses has passed.**

CHE 205 Chemical Process Principles. Preqs: Grade of C or better in MA 241 and PY 205; C- or better in (CH 201/203 or CH 221/225). 4 hr. Offered in Fall, Spring, and Summer (if demand is sufficient). Engineering methods of treating material balances, stoichiometry, phase equilibrium calculations, thermophysics, thermochemistry and the first law of thermodynamics.

CHE 225 Chemical Process Systems. Preqs: C- or better in both CHE 205 and MA 242. Coreq: MA 341. 3hr. Offered in Fall, Spring, and Summer (if demand is sufficient). Introduction to mathematical and computational tools for analyzing chemical engineering problems. Sequential modular and equation-based simulation of steady-state chemical processes using advanced spreadsheet methods and multivariate root-finding algorithms. Material and energy balances on transient processes and their solution using analytical and numerical methods.

CHE 311 Transport Processes I. Preqs: C- or better in both CHE 225 and MA 341; must be CODA'd into CHE or pursuing CHE minor. 3hr. Offered in Fall and Spring. Fundamental aspects of momentum and heat transfer, and the use of these fundamentals in solving problems in transport operations. Introduction to microscopic material and energy balances using the "shell balance" approach to develop the governing differential equations. Solutions to steady-state boundary value problems in heat conduction and Fickian diffusion.

CHE 312 Transport Processes II. Preq: C- or better in CHE 311. 3hr. Offered in Fall and Spring. Fundamental aspects of mass transfer and the use of these basic principles in solving problems in transport operations.

CHE 315 Chemical Process Thermodynamics. Preq: C- or better in CHE 225; must be CODA'd into CHE or pursuing CHE minor. 3hr. Offered in Fall and Spring. Laws of thermodynamics and their application to chemical engineering problems, both in theory and in practice. Criteria of equilibrium in physical and chemical changes. Behavior of real fluids, including mixtures.

CHE 316 Thermodynamics of Chemical and Phase Equilibria. Preq: C- or better in CHE 315. 3hr. Offered in Fall and Spring. Systematic study of chemical reaction equilibria and phase equilibrium. Use of fugacity, activity and chemical potential concepts for predicting the effect of such variables as temperature, pressure on equilibrium compositions. Methods for measuring and estimating thermodynamic properties important to equilibrium calculation in real systems.

CHE 330 Chemical Engineering Lab I. Preq: CHE 311, 3 hr. Offered in Fall and Spring. Laboratory experiments in unit operations of heat transfer and fluid flow. Laboratory safety, technical report writing, statistics, experimental design, error analysis, and instrumentation.

CHE 331 Chemical Engineering Lab II. Preqs: CHE 312, CHE 330. 2 hr. Offered in Fall and Spring. Laboratory experiments in mass transfer and reaction kinetics. Experimental planning, technical report writing and oral presentations are emphasized.

CHE 395 Professional Development Seminar. 1 hr. Offered in Fall and Spring. Professional development and topics of current interest in chemical engineering.

CHE 435 Process System Analysis and Control. Preq: CHE 312. 3hr. Offered in Spring. Dynamic analysis and continuous control of chemical engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques.

CHE 446 Design and Analysis of Chemical Reactors. Preq: CHE 316. 3hr. Offered in Fall only. Characterization and measurement of the rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors.

CHE/BEC 448/548 Bioreactor Engineering. Preq: CHE 446, Co-Req: BCH 451. 2 hr. Offered in Spring only. Critical aspects of bioreactor design, including design of reactors for enzyme-catalyzed reactions, fermentation of microorganisms, and scale-up considerations for bioreactors. Hands-on experiments involving fermentation of microorganisms and scale-up of bioreactors will be included.

CHE 450 Chemical Engineering Design I. Preq: CHE 312; Co-Req: CHE 446. 3hr. Offered in Fall only. Applications of cost accounting, cost estimation for new equipment, manufacturing cost and measures of profitability. Use of computer simulation design and cost programs. Procedures for sizing unit operations commonly encountered in the chemical process industry. Heuristics for selection of separation processes and heat exchanger network synthesis.

CHE 451 Chemical Engineering Design II. Preqs: CHE 450, CHE 446. 3hr. Offered in Spring only. Chemical process design and optimization. The interplay of economic and technical factors in process development, site selection, project design, and production management. Comprehensive design problems.

CHE 452/552: Biomolecular Engineering. Preqs: CHE 448, BCH 451. 2 hr. Offered in Spring only. This course will cover modern methods in biomolecule design, including gene expression regulators, RNA structure, protein structure, and metabolic networks. Current methods in genetic engineering and 'omics-based analysis will be discussed, followed by a critical review of current literature on the applications of these methods to engineering microbes, cells, and multi-species communities. Hands-on assignments involving computational design will be included.

CHE 455 Polymer Technology and Engineering. Prereq: MSE 425. 3hr. Offered in Fall only, alternate years. Covers classes of commercially important polymers, advanced topics in the phase behavior, viscoelasticity, fracture, and ultimate properties of polymers; polymer rheology, processing, and permeability; and the design of polymeric materials.

CHE 460 Chemical Processing of Electronic Materials. Preqs: CHE 446. **Credit for both CHE 460 and CHE 560 is not allowed.** 3hr. Offered in Spring only, alternate years. This course is an introduction to electronic materials, chemical processes used in their fabrication, and basic physical principles of electronic device operation and function. The course will address how principles of chemical engineering are applied to design and fabricate current and emerging electronic systems. We will also discuss emerging areas of electronic technologies, including organic semiconductors, advanced energy conversion, and quantum computing and related systems. Credit for both CHE 460 and CHE 560 is not allowed.

CHE 461 Polymer Science and Technology. Preqs: CH 223, CHE 316. **Credit for both CHE 461 and CHE 543 is not allowed.** 3hr. Offered in Fall only, alternate years. Concepts and

techniques for polymerization of macromolecules. Structure, properties, and applications of commercially important polymers.

CHE (BEC) 462 Fundamentals of Bio-Nanotechnology. Prerequisite: MA 241, PY 208, CH 223. Concepts of nanotechnology are applied in the synthesis, characterization, recognition and application of biomaterials on the nanoscale. Emphasis will be given to hands-on experience with nanostructured biomaterials; students will also be familiarized with the potential impact of these materials on different aspects of society and potential hazards associated with their preparation and application.

CHE (BEC) 463/563 Fermentation of Recombinant Microorganisms Preq: CH 223 or BIT 410 or BIT 810 or MB 409 or BCH 454. 2hr. Offered in Fall and Spring. Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.

CHE (BIT) 464 Protein Purification. Preq: BIT 410 or MB 409 or BCH 454, 2hr. Offered in Spring only, alternate years. Comparison of several different chromatography techniques for protein purification. Construction of purification tables and SDS-and native-PAGE analysis. Cost-benefit analysis of industrial-scale procedures. Half semester course, second part.

CHE 467 Polymer Rheology. Preq: CHE 311 or equivalent. **Credit for both CHE 467 and CHE 567 is not allowed.** 3hr. Offered in Spring only, alternate years. Theoretical principles and experimental techniques associated with flow and deformation of polymer systems. Systems include: melts and solutions, suspension, gels, emulsions, and thixotropic mixtures.

CHE (ECE) 468/568 Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems. 3 hr. Offered in fall only. Conventional and emerging nanomanufacturing techniques and their applications in the fabrication of various structures and devices. Review of techniques for patterning, deposition, and etching of thin films including emerging techniques such as an imprint and soft lithography and other unconventional techniques. Electronic and mechanical properties of 0 to 3-D nanostructures and their applications in nano-electronics, MEMS/NEMS devices, sensing, energy harvesting, storage, flexible electronics and nano-medicine. Credit for both ECE/CHE 468 and ECE/CHE 568 is not allowed.

CHE (BEC) 488 Animal Cell Culture Engineering. Preqs: BEC 463 or BEC 420 or BIT 466. 2 hr. Offered in spring only. Design and operation of animal cell culture bioreactors for therapeutic protein production. Topics include: batch, fed-batch and perfusion bioreactors, agitation and aeration for mixing and oxygen mass transfer, bioreactor monitoring and control, optimizing bioreactor performance, and single-use (disposable) bioreactors. This is a half-semester course.

CHE 495 Honors Thesis Preparation. Preq: CHE 497, senior level standing, Honors Program only. 1hr. Offered in Spring only. Development and presentation of Honors Thesis in Chemical Engineering and discussion of graduate school selection and preparation.

CHE 497 Chemical Engineering Projects I. Preq: Junior standing. 3hr. Offered in Fall and Spring. Introduction to chemical engineering research through experimental, theoretical and literature studies. Oral and written presentation of reports. Requires 150 hours of work and a final written report. Students should contact faculty directly regarding project availability.

CHE 498 Chemical Engineering Projects II. Preq: Junior standing. 1-3hr. Variable Credit. Offered in Fall and Spring. Projects in research, design or development in various areas of chemical engineering. Requires 50 hours of work per credit hour and a final written report. Students should contact faculty directly regarding project availability.

CHE 525 Process System Analysis and Control. Preq: CHE 312. **Credit for both CHE 435 and CHE 525 is not allowed.** 3hr. Offered in Spring only. Dynamic analysis and continuous control of chemical engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques.

CHE 543 Polymer Science and Technology. Preqs: CH 223, CHE 316. **Credit for both CHE 461 and CHE 543 is not allowed.** 3hr. Offered alternate years. Concepts and techniques for polymerization of macromolecules. Structure, properties, and applications of commercially important polymers.

CHE 546 Design and Analysis of Chemical Reactors. Preq: CHE 316. **Credit for both CHE 446 and CHE 546 is not allowed.** 3hr. Offered in Fall only. Characterization and measurement of rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors.

CHE 560 Chemical Processing of Electronic Materials. Preqs: CHE 312, CHE 446. **Credit for both CHE 460 and CHE 560 is not allowed.** 3hr. Offered in Spring only. Plasma and thermal inorganic chemical processes in semiconductor device fabrication. Thin films and electronic devices. Kinetics and chemical transport in electronic materials synthesis, modification and etching. Plasma physics and chemistry, reactors and process diagnostics.

CHE (BEC) 577 Advanced Biomanufacturing and Biocatalysis. Graduate standing in engineering. 3hr. Overview of biomanufacturing using microorganisms (bacteria, yeast, fungi), eukaryotic cells (hybridomas, insect, plant, CHO) and recombinant enzymes focusing on methods used in industry. Course will emphasize process design for optimization of heterologous protein expression, metabolic/cell line engineering, metabolomics, protein engineering to alter enzymes and antibodies. Pathway engineering strategies include developing microbes to produce new therapeutic compounds or overproduce primary metabolites, antibiotics, biotherapeutics, therapeutic enzymes, diagnostics, recombinant vaccines, and biopharmaceuticals. Utilization of immobilized biocatalysts, and microbial kinetics are covered.

CHE 711 Chemical Engineering Process Modeling (CHE Honors Program Students Only) Preqs: CHE 312, MA 341. 3hr. Offered in Fall only. Applications of methods of mathematical analysis to formulation and solution of problems in transport phenomena, process dynamics and chemical reaction engineering.

CHE 713 Thermodynamics I (CHE Honors Program Students Only) Preq: CHE 316. 3hr. Offered in Fall only. In-depth coverage of chemical engineering thermodynamics principles. Application of non-ideal fluid-phase chemical potentials to problems in phase and chemical reaction equilibria. Relations of molecular structure and intermolecular forces to macroscopic thermodynamic properties.

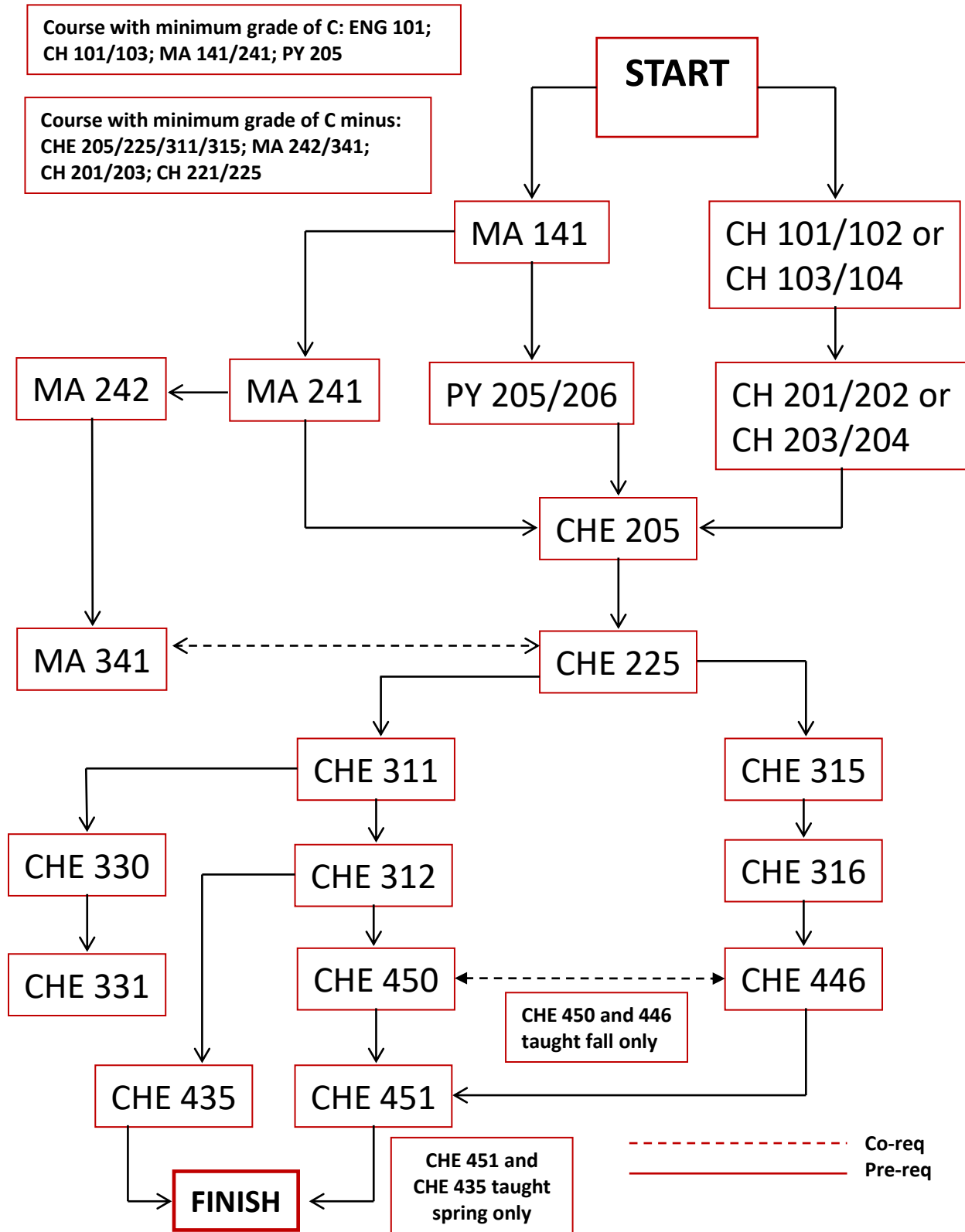
CHE 715 Transport Phenomena (CHE Honors Program Students Only) Preq: CHE 311. 3hr. Offered in Fall only. A theoretical, unified study of transport of momentum, energy and matter. Introduction to diffusional operations including coupled heat and mass transfer in light of the theory.

CHE 717 Chemical Reaction Engineering (CHE Honors Program Students Only) Preq: CHE 446 or 447. 3hr. Offered in Spring only. Rates and mechanisms of homogeneous and heterogeneous reactions. Design, analysis and scale-up of batch and continuous chemical reactors.

Prerequisite and Co-requisite Requirements for CHE courses

Course	Prerequisite	Co-requisite
CHE 205	C or better in MA 241, PY 205 and C- or better in (CH 201/203 or CH 221/225)	
CHE 225	C- or better in CHE 205 and MA 242	MA 341
CHE 311	C- or better in CHE 225 and MA 341; <i>must be CODA'd in CHE or pursuing CHE minor</i>	
CHE 312	C- or better in CHE 311	
CHE 315	C- or better in CHE 225; <i>must be CODA'd in CHE or pursuing CHE minor</i>	
CHE 316	C- or better in CHE 315	
CHE 330	CHE 311	
CHE 331	CHE 312, CHE 330	
CHE 435	CHE 312	
CHE 446 <i>Note: only taught in fall</i>	CHE 316	BCH 451
CHE 448 <i>Note: only taught in spring</i>	CHE 446	BCH 451
CHE 450 <i>Note: only taught in fall</i>	CHE 312	CHE 446
CHE 451 <i>Note: only taught in spring</i>	CHE 450, CHE 446 <i>Note: CHE 450/451 must be taken back-to-back in fall-spring)</i>	
CHE 452 <i>Note: only taught in spring</i>	BCH 451	CHE 448
CHE 455	MSE 425	
CHE 460	CHE 312, CHE 446	
CHE 461	CH 223, CHE 316	
CHE/BEC 463	BIT 410 or CH 223	
CHE/BIT 464	BIT 410	
CHE 467	CHE 311	
CHE/BEC 465	MA 241, PY 208, CH 223	
CHE 469	CH 223, CHE 316	
CHE/BEC 488	BEC 463 or BEC 420 or BIT 466	
CHE 495	CHE 497, senior standing, honors program.	
CHE 497	Junior standing	
CHE 498	Junior standing	
CHE 711	CHE Honors Program Students Only, CHE 311H, CHE 312H, MA 341	
CHE 713	CHE Honors Program Students only, CHE 315, CHE 316	
CHE 715	CHE Honors Program Students only, CHE 311H	
CHE 717	CHE Honors Program Students only, CHE 446 or CHE 447	

Prerequisite Flowsheet for CHE Core Classes



CHEMICAL ENGINEERING CURRICULA - Students may choose one of several parallel curricula in the department: the standard chemical engineering curriculum, the Biomolecular concentration, the Biomanufacturing Sciences concentration, the Nanoscience concentration, the Sustainable Engineering, Energy, and the Environment concentration, or the CHE Honors Program. The Biomolecular concentration is designed for students who wish to develop expertise in biochemical engineering and in the biological sciences; the Biomanufacturing Sciences concentration is designed for students who are interested in industrial applications in the pharmaceutical and biomanufacturing sector; the Nanoscience concentration is designed for students interested in technology associated with microelectronics and/or polymers manufacturing; and the Sustainable Engineering, Energy, and the Environment concentration is designed to prepare students to solve technical challenges in a way that produces sustainable outcomes.

The CHE Honors Program is open to students by invitation, based upon their CHE and overall grade point averages at the completion of CHE 225, and is designed to serve as a preparation for graduate study in chemical engineering. Candidates for admission to the CHE Honors Program must have earned a minimum over-all grade point average of 3.50, and a minimum major grade point average of 3.5 based on taking CHE 205 and CHE 225. Students must graduate with a total GPA of at least 3.25.

Upon their CODA into chemical engineering, students are normally enrolled in the standard CHE curriculum unless they request otherwise at the time of CODA. Students must contact Dr. Bullard to request the change to a concentration so that their curriculum display can be modified.

Bachelor of Science in Chemical Engineering

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chemistry I Lab ^{1a}	1	CH 202 (or 204) General Chemistry II Lab	4
E 101 Introduction to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	3
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	1
ENG 101 Academic Writing and Research ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	2
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	<u>1</u>
HESx 1** Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>15</u>
	15		

Fall Semester	Credit	Spring Semester	Credit
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I Lab	1	CH 224 (or 228) Organic Chemistry II Lab	3
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
EC 205 Econ (or EC 201 or ARE 201)*	<u>3</u>	PY 208 Physics Engr & Sci II	1
	15	PY 209 Physics Engr & Sci II Lab	<u>3</u>
		GEP Requirement*	<u>17</u>

Fall Semester	Credit	Spring Semester	Credit
CH *** Chemistry Elective ²	4	CH 315 Quantitative Analysis	3
CHE 311 Transport Processes I ^{1b}	3	CH 316 Quantitative Analysis Lab	1
CHE 315 Chem Process Thermo ^{1b}	3	CHE 312 Transport Processes II	3
ECE 331 Prin Electrical Engr OR	3	CHE 316 Thermo of Chem & Phase Eq	3
MSE 201 Struct & Prop Engr Mat		CHE 330 Chem Engr Lab I	4
GEP Requirement*	3	Free Elective	<u>3</u>
CHE 395 Professional Dev Seminar	<u>1</u>		17
	17		

Fall Semester	Credit	Spring Semester	Credit
CHE 331 Chem Engr Lab II	2	CHE 435 Proc System Analy & Control	3
CHE 446 Des & Analy Chem Reactors	3	CHE 451 CHE Design II	3
CHE 450 CHE Design I	3	Technical Elective ³	3
Technical Elective ³	3	GEP Requirement*	3
GEP Requirement*	<u>3</u>	GEP Requirement*	<u>3</u>
	14		15

Minimum Credit Hours Required for Graduation: **125**

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² Chemistry electives include: PCC 461/464: Chemistry of Polymeric Materials (fall only); BCH 451: Principles of Biochemistry; CH 437: Physical Chemistry (spring only); FS 402: Chemistry of Food and Bioprocessed Materials (fall only); PSE 335: Green Chemistry (fall only); BIO 183: Introductory Biology; TOX 415: Environmental Toxicology and Chemistry (fall only).

³ Technical Electives: Any CHE elective course 460 or higher (except ChE Core Concepts I and II); BEC 462, CE 214, CE 373, CSC 111/113/116, E 304, ECE 331 (if not previously taken), ISE 311, MAE 206, MSE 201 (if not previously taken), NE 419, E304, BIT 295, BBS 325, BBS 326, BBS 327, EED 401, EED 411, EED 414.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences(6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing(4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge(GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

Bachelor of Science in Chemical Engineering
Biomolecular Engineering Concentration

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chemistry I Lab ^{1a}	1	CH 202 (or 204) General Chemistry II Lab	1
E 101 Introduction to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writing & Research ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	2
HESx 1** Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	15		15

Fall Semester	Credit	Spring Semester	Credit
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I Lab	1	CH 224 (or 228) Organic Chemistry II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
PY 208 Physics Engr & Scientists II	3	BIO 183 Intro Biol: Cellular & Molecular	4
PY 209 Physics Engr & Scientists II Lab	<u>1</u>	EC 205 Econ (or EC 201 or ARE 201)*	<u>3</u>
	16		17

Fall Semester	Credit	Spring Semester	Credit
BCH 451 Intro Biochemistry	4	BIT *** BIT Lab Module ²	2
CHE 311 Transport Processes I ^{1b}	3	BIT *** BIT Lab Module ²	2
CHE 315 Chem Process Thermo ^{1b}	3	CHE 312 Transport Processes II	3
BIT 410 Manipulation Recomb DNA	4	CHE 316 Thermo of Chem & Phase Eq	3
CHE 497 Chemical Engr Projects	3	CHE 330 Chem Engr Lab I	4
CHE 395 Professional Dev Seminar	<u>1</u>	GEP Requirement*	<u>3</u>
	18		17

Fall Semester	Credit	Spring Semester	Credit
CHE 446 Des & Analy Chem Reactors	3	CHE 435 Proc System Analy & Control	3
CHE 450 CHE Design I	3	CHE 451 CHE Design II	3
GEP Requirement*	3	CHE 448 Bioreactor Design	2
GEP Requirement*	3	CHE 452 Biomolecular Engineering	2
Biotech Minor Grp E (GEP IP req*) ³	<u>3</u>	Technical Elective ⁴	2-3
	15	GEP Requirement*	<u>3</u>
			15

Minimum Credit Hours Required for Graduation*: **128**

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² Students must take two 2-hour BIT lab modules. Eligible labs include any BIT lab numbered 463 and above.

³ Biotech Minor Group E must be selected from: IDS 201, 303; STS 302, 304; STS(PHI) 325. If another IP GEP course has already been taken, BIT 501 (1 hr) can satisfy the Biotech Minor Group E requirement.

⁴ Technical Elective must be selected from: any BIT course not already taken to fulfill another requirement, BEC 425, BEC 426, BEC 330, BEC 462, BEC 463, BEC 480, BEC 485, BEC 488; any CHE course numbered CHE 460 or above, including CHE 596 special topics; CE 373, ECE 331, MSE 201, NE 419, NE 491, BIT 295, BBS 325, BBS 326, BBS 327, EED 401, EED 411, EED 414.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences(6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing(4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge(GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

B. S. in Chemical Engineering
Biomufacturing Sciences Concentration

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chem I Lab ^{1a}	1	CH 202 (or 204) General Chemistry II Lab	1
E 101 Introduction to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writing & Research ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	2
HESx 1** Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	15		15

Fall Semester	Credit	Spring Semester	Credit
BEC 220 Intro Biomanufacturing	1	BIO 183 Intro Bio: Cellular & Molecular	4
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I Lab	1	CH 224 (or 228) Organic Chemistry II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
PY 208 Physics Engr & Scientists II	3	EC 205 Econ (or EC 201 or ARE 201)*	<u>3</u>
PY 209 Physics Engr & Scientists II Lab	<u>1</u>		17
	17		

Fall Semester	Credit	Spring Semester	Credit
BCH 451 Intro Biochemistry	4	BEC 426 Industrial Micro & Bioman Lab	2
BEC 425 Molecular Bio Biomanufact	2	BEC 330 Prin & Applications of Biosep	2
BEC 463 Ferm of Recomb Microorg	2	CHE 312 Transport Processes II	3
CHE 311 Transport Processes I ¹	3	CHE 316 Thermo of Chem & Phase Eq	3
CHE 315 Chem Process Thermo ¹	3	Free Elective	3
GEP Requirement*	<u>3</u>	GEP Requirement*	<u>3</u>
	17		16

Fall Semester	Credit	Spring Semester	Credit
BEC 436 Downstream Proc of Biomat	2	Biomanufacturing Elective ²	2
BEC 480 Large Scale Fermentation OR	2	CHE 448 Bioreactor Design	2
BEC 485 Large Scale Recov & Purif		CHE 435 Proc System Analy & Control	3
CHE 395 Professional Dev Seminar	1	CHE 451 CHE Design II	3
CHE 446 Des & Analy Chem Reactors	3	Bioethics Course (GEP IP Req*) ³	3
CHE 450 CHE Design I	3	GEP Requirement*	<u>3</u>
GEP Requirement*	<u>3</u>		16
	14		

Minimum Credit Hours Required for Graduation*: **127**

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² The Biomanufacturing elective course must be selected from the following list: Any 400- or 500-level BEC course not previously taken.

³ The bioethics course must be selected from: IDS 201, 303; STS 302, 304; STS(PHI) 325. Note that you can double count the ethics requirement for either the IP-GEP (IDS 201/303; STS 302/304, STS 325) or the Humanity-GEP (PHI 325).

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences(6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing(4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge(GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

Bachelor of Science in Chemical Engineering
Honors Program

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chem I Lab ^{1a}	1	CH 202 (or 204) General Chem II Lab	1
E 101 Intro to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writing and Res ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	2
HESx 1** Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	15		15

Fall Semester	Credit	Spring Semester	Credit
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chem I Lab	1	CH 224 (or 228) Organic Chem II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
EC 205 Econ (or EC 201 or ARE 201)*	<u>3</u>	PY 208 Physics Engr & Scientists II	3
	15	PY 209 Physics Engr & Scientists II Lab	1
		GEP Requirement*	<u>3</u>
			17

Fall Semester	Credit	Spring Semester	Credit
CH *** Chemistry Elective ³	4	CH 315 Quantitative Analysis	3
CHE 311H Transport Processes I ^{1b}	3	CH 316 Quantitative Analysis Lab	1
CHE 315 Chem Process Thermo ^{1b}	3	CHE 312H Transport Processes II	3
Mathematics Elective ²	3	CHE 316 Thermo of Chem & Phase Eq	3
GEP Requirement*	3	CHE 330 Chem Engr Lab I	4
CHE 395 Professional Dev Seminar	<u>1</u>	ENG 333 Comm for Science and Res	<u>3</u>
	17		17

Fall Semester	Credit	Spring Semester	Credit
CHE 446 Des & Analy Chem Reactors	3	CHE 435 Proc System Analy & Control	3
CHE 450 CHE Design I	3	CHE 451 CHE Design II	3
CHE 497 Chemical Engr Projects	3	CHE *** Honors Electives ⁵	3
CHE 7** CHE Elective ⁴	3	GEP Requirement*	3
GEP Requirement*	<u>3</u>	GEP Requirement*	3
	15	CHE 495 Honors Thesis Prep ⁶	<u>1</u>
			16

Minimum Credit Hours Required for Graduation: **127**

Requirements:

Students must have a total GPA of 3.5 and a major GPA (CHE 205 + CHE 225) of 3.5 to enroll in the departmental Honors Program. The Honors Program requirements can also be combined with another concentration (see Dr. Bullard for course planning).

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² Math electives include: MA 401, 402, 405, 427, 501.

³ Chemistry electives include: PCC 461/464: Chemistry of Polymeric Materials (fall only); BCH 451: Principles of Biochemistry; CH 437: Physical Chemistry (spring only); FS 402: Chemistry of Food and Bioprocessed Materials (fall only); PSE 335: Green Chemistry (fall only); BIO 183: Introductory Biology; TOX 415: Environmental Toxicology and Chemistry (fall only).

⁴ CHE 7xx includes CHE 711, 713, 715, 717. (CHE 711 is generally recommended.)

⁵ Honors electives include CHE 448 and 452 (must be 3 hours total), CHE 455 and above (including cross-listed CHE courses in BIT, BEC, ECE, and MSE), CHE 7xx.

⁶ An honors thesis is required for completion of the Honors Program.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing (4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge (GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

Bachelor of Science in Chemical Engineering
Nanoscience concentration

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chem I Lab ^{1a}	1	CH 202 (or 204) General Chem II Lab	1
E 101 Intro to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writing and Res ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	2
HESx 10* Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	15		15

Fall Semester	Credit	Spring Semester	Credit
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chem I Lab	1	CH 224 (or 228) Organic Chem II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
PY 208 Physics Engr & Scientists II	3	MSE 201 Struct & Prop Engr Mat	3
PY 209 Physics Engr & Scientists II Lab	<u>1</u>	EC 205 Econ (or EC 201 or ARE 201)*	<u>3</u>
	16		16

Fall Semester	Credit	Spring Semester	Credit
CH *** Chemistry Elective ²	4	CH 437 Phys Chem for Engrs	4
CHE 311 Transport Processes I ^{1b}	3	CHE 312 Transport Processes II	3
CHE 315 Chem Process Thermo ^{1b}	3	CHE 316 Thermo of Chem & Phase Eq	3
GEP Requirement*	3	CHE 330 Chem Engr Lab I	4
GEP Requirement*	3	Free Elective	<u>3</u>
CHE 395 Professional Dev Seminar	<u>1</u>		17
	17		

Fall Semester	Credit	Spring Semester	Credit
CHE 331 Chem Engr Lab II	2	CHE 435 Proc System Analy & Control	3
CHE 446 Des & Analy Chem Reactors	3	CHE 451 CHE Design II	3
CHE 450 CHE Design I	3	Nanoscience Elective ³	3
Nanoscience Elective ³	3	GEP Requirement*	3
GEP Requirement*	<u>3</u>	GEP Requirement*	<u>3</u>
	14		15

Minimum Credit Hours Required for Graduation: **125**

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² Chemistry electives include: PCC 461/464: Chemistry of Polymeric Materials (fall only); BCH 451: Principles of Biochemistry; FS 402: Chemistry of Food and Bioprocessed Materials (fall only); PSE 335: Green Chemistry (fall only); CH 315/316: Quantitative Chemistry; BIO 183: Introductory Biology; TOX 415: Environmental Toxicology and Chemistry (fall only).

³ Nanosciences Electives include: E304: Introduction to Nano Science and Technology; CHE(ECE) 468: Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems; MSE 455: Polymer Technology and Engineering, CH 460: Chemical Processing of Electronic Materials; CHE 461: Polymer Sciences and Technology, CHE 462: Fundamentals of Bio-Nanotechnology, CHE 467: Rheology, CHE 470: Colloidal and Nanoscale Engineering, CHE 597D: Colloidal and Macromolecular Physics, CHE 597J: Polymers at Interfaces and in Confined Geometries, ECE 331: Principles of Electrical Engineering I, MSE 425: Polymer Science & Technology, MSE 331: Elec Properties of Materials, MSE 460: Microelectronic Materials, PY 407: Introduction to Modern Physics. Additional nanoscience electives may be approved on a case-by-case basis as new courses are introduced.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing (4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge(GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

B.S. in Chemical Engineering
Sustainable Engineering, Energy and the Environment

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chem I Lab ^{1a}	1	CH 202 (or 204) General Chem II Lab	1
E 101 Introduction to Engr & Prob Solv ¹	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writing and Res ¹	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	2
HESx 1** Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	15		15
Fall Semester	Credit	Spring Semester	Credit
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I Lab	4	CH 224 (or 228) Organic Chem II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	3	MA 341 Applied Differential Eq ^{1b}	3
EC 205 Econ (or EC 201 or ARE 201)*	<u>1</u>	PY 208 Physics Engr & Scientists II	3
CHE 395 Professional Dev Seminar	16	PY 209 Physics Engr & Scientists II	1
		GEP Requirement*	<u>3</u>
			17
Fall Semester	Credit	Spring Semester	Credit
PSE 335 Principles of Green Chemistry	4	CH *** Chemistry Elective ²	4
CHE 311 Transport Processes I ^{1b}	3	CHE 312 Transport Processes II	3
CHE 315 Chem Process Thermo ^{1b}	3	CHE 316 Thermo of Chem & Phase Eq	3
CHE 497 Chem Engr. Proj.	3	CHE 330 Chem Engr Lab I	4
Free Elective	<u>3</u>	GEP Requirement*	<u>3</u>
	16		17
Fall Semester	Credit	Spring Semester	Credit
CHE 331 Chem Engr Lab II	2	CHE 435 Proc System Analy & Control	3
CHE 446 Des & Analy Chem Reactors	3	CHE 451 CHE Design II	3
CHE 450 CHE Design I	3	Concentration Elective ³	3
Concentration Elective ³	3	GEP Requirement* ⁴	3
GEP Requirement*	<u>3</u>	GEP Requirement*	<u>3</u>
	14		15
Minimum Credit Hours Required for Graduation*:			125

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² Chemistry electives include: PCC 461/464: Chemistry of Polymeric Materials (fall only); BCH 451: Principles of Biochemistry; CH 437: Physical Chemistry (spring only); FS 402: Chemistry of Food and Bioprocessed Materials (fall only); CH 315/316: Quantitative Chemistry; BIO 183: Introductory Biology; TOX 415: Environmental Toxicology and Chemistry (fall only).

³ Concentration electives include: CE 373; Principles of Environmental Engineering; CE 476: Air Pollution Control; CE 484: Water and Waste Systems; CE 456: Air Quality; CE 477: Solid Waste Management; CE 478: Energy and Climate; PSE(WPS) 476: Environmental Life Cycle Analysis; BAE 528: Biomass to Renewable Energy Processes; CHE 596 special topics courses (Emerging Energy Frontiers; Biofuels; Green Chemical Engineering; as offered); NE 419 (Introduction to Nuclear Engineering); CE 497: Water and Wastewater in the Developing World.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences(6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing(4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge(GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

Accelerated Master's Degree (BS/MS in CHE)

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chemistry I Lab ^{1a}	1	CH 202 (or 204) General Chemistry II Lab	1
E 101 Introduction to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writing and Research ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E 102 Engr in the 21 st Century	2
HESx 1** Fitness & Wellness Course*	<u>1</u>	HESx (100 or 200 level) Elective*	<u>1</u>
	15		15

Fall Semester	Credit	Spring Semester	Credit
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I Lab	1	CH 224 (or 228) Organic Chemistry II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
GEP Requirement*	<u>3</u>	PY 208 Physics Engr & Scientists II	3
	15	PY 209 Physics Engr & Scientists II Lab	1
		GEP Requirement*	<u>3</u>
			17

Fall Semester	Credit	Spring Semester	Credit
CH *** Chemistry Elective ²	4	CH 315 Quantitative Analysis	3
CHE 311 Transport Processes I ^{1b}	1	CH 316 Quantitative Analysis Lab	1
CHE 315 Chem Process Thermo ^{1b}	3	CHE 312 Transport Processes II	3
ECE 331 Prin Electrical Engr OR	3	CHE 316 Thermo of Chem & Phase Eq	3
MSE 201 Struct & Prop Engr Mat	3	CHE 330 Chem Engr Lab I	4
GEP Requirement*	3	Free Elective	<u>3</u>
CHE 395 Professional Dev Seminar	<u>1</u>		17
	17		

Fall Semester	Credit	Spring Semester	Credit
CHE 331 Chem Engr Lab II	2	CHE 525 Proc System Analy & Control	3
CHE 546 Des & Analy Chem Reactors	3	CHE 451 CHE Design II	3
CHE 450 CHE Design I	3	500-Level CHE Technical Elective	3
500-Level CHE Technical Elective	3	GEP Requirement*	3
GEP Requirement*	<u>3</u>	EC 205 Econ (or EC 201 or ARE 201)*	<u>3</u>
	14		15

Fall Semester	Credit	Spring Semester	Credit
CHE 711 ChE Process Modeling	3	CHE 5** Graduate Elective	3
CHE 713 Thermodynamics I	3	CHE 715 Transport Phenomena	3
CHE 717 Chem Reaction Engineering	<u>3</u>	CHE 5** Graduate Elective	<u>3</u>
	9		9

Minimum Credit Hours Required for Graduation: ³ **144**

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² Chemistry electives include: PCC 461/464: Chemistry of Polymeric Materials (fall only); BCH 451: Principles of Biochemistry; CH 437: Physical Chemistry (spring only); FS 402: Chemistry of Food and Bioprocessed Materials (fall only); PSE 335: Green Chemistry (fall only); BIO 183: Introductory Biology; TOX 415: Environmental Toxicology and Chemistry (fall only).

³ Students must have an overall GPA of 3.5 through the end of the junior year and must maintain this GPA through the senior year to be admitted into the program. Students who wish to complete the Accelerated BS/MS ChE degree program typically apply for candidacy to the MS degree before the fall semester of the senior year. The admissions process includes submitting the following information to the Chemical and Biomolecular Engineering Graduate Administrator, Dr. Saad Khan:

- (1) Completed copy of the signed graduate application form
- (2) NC Residency Form if you wish to claim NC residency for tuition purposes
- (3) Non-Refundable application fee in form of a check or money order
- (4) Three letters of recommendation
- (5) Official transcript sent directly from every college and graduate school attended
- (8) Graduate Record Examination (**GRE**) scores

Students must receive a grade of B (3.0/4.0) or better in the double-counted graduate-level courses. Courses with a grade of B- or below cannot be double-counted between the two degrees. No more than twelve (12) hours of graduate work may be counted towards the requirements of both degrees. Students must complete the Master's degree within 12 months from the completion of the baccalaureate degree for a non-thesis Master's degree and within 18 months for Master's programs requiring a thesis. If the Master's program is not completed within these time limits, none of the courses can be double counted. Note that the B.S. Degree must be completed in order to get the dual BS/MS (students cannot double major in something else and then skip to the MS CHE). Recipients of the MS degree must earn a minimum semester GPA of 3.0 during the final two semesters, including no more than one C grade in 500 and 700-level CHE courses.

Accelerated Master's Degree in Biomanufacturing
(BS CHE Biomanufacturing Concentration/MR BIOM)^{4,5}

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chem I ^{1a}	3	CH 201 (or 203) General Chem II ^{1b}	3
CH 102 (or 104) Gen Chem I Lab ^{1a}	1	CH 202 (or 204) General Chem II Lab	1
E 101 Intro to Engr & Prob Solv ^{1a}	1	MA 241 Calculus II ^{1a}	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ^{1a}	3
ENG 101 Academic Writ & Res ^{1a}	4	PY 206 Physics for Engr & Sc I Lab ^{1a}	1
MA 141 Calculus I ^{1a}	4	E102 Engr in the 21 st Century (GEP IP)	<u>1</u>
HESx 1** Fitness & Wellness*	<u>1</u>	HESx (100 or 200 level) Elective*	15
	15		

Fall Semester	Credit	Spring Semester	Credit
BEC 220 Intro Biomanufacturing	1	BIO 183 Intro Bio: Cell & Molecular	4
CH 221 (or 225) Organic Chem I ^{1b}	3	CH 223 (or 227) Organic Chem II	3
CH 222 (or 226) Org Chem I Lab	1	CH 224 (or 228) Organic Chem II Lab	1
CHE 205 Chemical Proc Prin ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
PY 208 Physics Engr & Sc II	3	EC 205 Econ (or EC 201/ARE 201)*	<u>3</u>
PY 209 Physics Engr & Sc II Lab	<u>1</u>		17
	17		

Fall Semester	Credit	Spring Semester	Credit
BCH 451 Intro Biochemistry	4	BEC 426 Ind Micro & Bioman Lab	2
BEC 425 Molecular Bio Biomanf	2	BEC 330 Prin & Applications of Biosep	2 3
BEC 463 Ferm of Recomb Micro	2	CHE 312 Transport Processes II	3
CHE 311 Transport Processes I ¹	3	CHE 316 Thermo of Chem & Phase Eq	3
CHE 315 Chem Process Thermo ¹	3	Free Elective	<u>3</u>
GEP Requirement*	<u>3</u>	GEP Requirement*	16
	17		

Fall Semester	Credit	Spring Semester	Credit
BEC 536 Intro. to Downstream Process Development ²	2	CHE/BEC 548 Bioreactors ²	2
BEC 580 Large Scale Fermentation ² OR		CHE 552 Biomolecular Engineering ²	2
BEC 585 Large Scale Recov & Purif	2	CHE 435 Proc System Analy & Control	3
CHE 395 Professional Dev Seminar	1	CHE 451 CHE Design II	3
CHE 446 Des & Analy Chem React	3	GEP Requirement*	3
CHE 450 CHE Design I	3	BEC 620 Prep. For Industry Internship ⁵	<u>2</u>
Bioethics Course (GEP IP Req*) ³	3		15
GEP Requirement*	<u>3</u>		
	17		

Fall Semester	Credit	Spring Semester	Credit
BEC 590 Industry Practicum	3	BEC 575 Global Regulatory Affairs	3
BEC 580 Large Scale Fermentation OR BEC 585 Large Scale Recov & Purif	2	BEC/CHE 577 Adv. Biomanufacturing & Biocatalysis	3
BEC 545 Mammalian Cell Line Development	2	BEC/CHE 588 Cell Culture Engineering	<u>3</u>
BEC 515 Biopharmaceutical Product Characterization	2	ST 516 Statistics for Engineers II	11
ST 515 Statistics for Engineers I	<u>3</u>		
	12		

Minimum Credit Hours Required for Graduation: **152**

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

²BEC courses that must be taken for graduate credit: BEC 536, BEC 548, BEC 552, BEC 580 **OR** BEC 585, BEC 575

³The bioethics course must be selected from: IDS 201, 303; STS 302, 304; STS(PHI) 325

⁴ Students must have a minimum overall GPA of 3.5 through the end of the junior year and must maintain this GPA through the senior year to be admitted into the program. Students who wish to complete the Accelerated BS/MS CHE BIOM degree program must apply for candidacy to the MS degree before the fall semester of the senior year. The admissions process includes submitting the following information to the Biomanufacturing Graduate Administrator, Dr. Danny Monroe:

- (1) Completed copy of the signed graduate application form
- (2) NC Residency Form if you wish to claim NC residency for tuition purposes
- (3) Non-Refundable application fee in form of a check or money order
- (4) Three letters of recommendation and a personal statement outlining your career goals
- (5) Official transcript sent directly from every college and graduate school attended
- (6) Graduate Record Examination (**GRE**) scores

Students must receive a grade of B (3.0/4.0) or better in the double counted graduate level BEC or CHE courses. Courses with a grade of B- or below cannot be double counted between the two degrees. No more than twelve (12) hours of graduate work may be counted towards the requirements of both degrees. Students must complete the Master's degree within 12 months from the completion of the baccalaureate degree. If the Master's program is not completed within these time limits, none of the courses can be double counted. Note that the BS Degree must be completed in order to get the dual BS/MS (students cannot double major in something else and then skip to the MS CHE). Recipients of the MS BIOM degree must earn a minimum semester GPA of 3.0 during the final two semesters, including no more than one C grade in a 5xx level CHE or BEC course.

Bachelor of Science in Paper Science & Engineering -- Chemical Engineering Concentration
(Degrees: B.S. in Paper Science & Engineering, B. S. in Chemical Engineering)

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1a}	3	CH 201 (or 203) General Chemistry II ^{1b}	3
CH 102 (or 104) General Chemistry I Lab ^{1a}	1	CH 202 (or 204) General Chemistry II Lab	1
E 101 Introduction to Engr & Prob Solv ^{1a}	1	EC 205 Econ (or EC 201 or ARE 201)*	3
E 115 Intro to Computing Environ	1	MA 241 Calculus II ^{1a}	4
ENG 101 Academic Writ and Research ^{1a}	4	PY 205 Physics Engr & Scientists I ^{1a}	3
MA 141 Calculus I ^{1a}	4	PY 206 Physics Engr & Scientists I Lab ^{1a}	1
HESx 1** Fitness & Wellness Course *	<u>1</u>	PSE 201 Pulping & Paper Tech ^{1b}	<u>3</u>
	15		18
CH 221 (or 225) Organic Chemistry I ^{1b}	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I Lab	1	CH 224 (or 228) Organic Chemistry II Lab	1
CHE 205 Chemical Proc Princ ^{1b}	4	CHE 225 Chemical Proc Systems ^{1b}	3
MA 242 Calculus III ^{1b}	4	MA 341 Applied Differential Eq ^{1b}	3
PSE 212 Paper Properties ^{1b}	4	PY 208 Physics for Engr & Sci II	3
HESx (100 or 200 level) Elective*	<u>1</u>	PY 209 Physics for Engr & Sci II Lab	1
	17	PSE 371 Pulping Process Analysis ^{1b}	<u>3</u>
			17
Summer industry internship (required)			
Chemistry Elective ³	4	CHE 312 Transport Processes II	3
CHE 311 Transport Processes I ^{1b}	3	CHE 316 Thermo of Chem & Phase Eq	3
CHE 315 Chem Process Thermo ^{1b}	3	PSE 332 Wood & Pulping Chemistry	3
PSE 211 Pulp & Paper Internship Report ²	1	PSE 360 Pulp & Paper Unit Proc. II	3
PSE 322 Wet End/Polymer Chemistry	4	PSE 370 Pulp & Paper Prod. Mkts.	<u>3</u>
GEP Requirement*	<u>3</u>		15
	18		
PSE 415 Paper Ind Strat Proj Analysis	3	PSE 416 Project Design and Analysis	3
PSE 417 Process Design & Analy. Lab	3	PSE 465 Process Engineering	3
PSE 425 Bioenergy & Biomaterials Eng.	3	PSE 472 Paper Process Analysis	3
PSE 475 Process Control	3	GEP Requirement*	3
GEP Requirement*	3	GEP IP Requirement*	<u>2-3</u>
GEP Requirement*	<u>3</u>		14-15
	18		
CHE 330 CHE Lab I	4		
CHE 446 Des & Analy Chem Reac	3		
GEP Requirement*	3		
ECE 331 Intro Elect Circuits or			
MSE 201 Intro Material Sci Engr.	<u>3</u>		
	13		
Minimum Credit Hours Required for Graduation*:			145

Major/Program requirements and footnotes:

^{1a} Must be completed with grade of (C) or higher.

^{1b} Must be completed with grade of (C-) or higher.

² There is one required internship in industry. PSE 211 should be taken the first semester upon returning from that internship.

³ Chemistry Elective: choose from the following: BIO 183, CH 315/316, CH 331, CH/PSE 335, CH 437, FS 402, PCC 461/464; TOX 415.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements. MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences(6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing(4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge(GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

CURRICULUM IN CHEMICAL ENGINEERING & TEXTILE ENGINEERING
(Degrees Earned: B.S. Chemical Engineering and B.S. Textile Engineering)

Fall Semester	Credit	Spring Semester	Credit
CH 101 (or 103) General Chemistry I ^{1,6}	3	CH 201 (or 203) General Chemistry II ^{2,6}	3
CH 102 (or 104) General Chem I Lab ^{1,6}	1	CH 202 (or 204) General Chemistry II Lab ⁶	1
E 101 Introduction to Engr & Prob Solv ¹	1	MA 241 Calculus II ¹	4
E 115 Intro to Computing Environ	1	PY 205 Physics for Engr & Sc I ¹	3
ENG 101 Academic Writing and Research ²	4	PY 206 Physics for Engr & Sc I Lab ¹	1
MA 141 Calculus I ¹	4	TE 110 Comp Based Model Engineers ²	3
HESx 1** Fitness & Wellness Course*	<u>1</u>	E 102 Engr in the 21 st Century	<u>2</u>
	15		17
CH 221 (or 225) Organic Chemistry I ^{2,3,7}	3	TE 201 Textile Engr. Sci.	4
CH 222 (or 226) Organic Chemistry I Lab ⁷	1	MAE 206 Engr Statics OR	
CHE 205 Chemical Proc Prin ²	4	CE 214 Engr Statics	3
MA 242 Calculus III ²	4	MA 341 Applied Differential Eq ²	3
PY 208 Physics Engr & Scientists II	3	CH 223 (or 227) Organic Chemistry II ⁷	3
PY 209 Physics Engr & Scientists II Lab	<u>1</u>	CH 224 (or 228) Organic Chem II Lab ⁷	1
	16	CHE 225 Chemical Proc Systems ²	<u>3</u>
			17
CH 315 Quantitative Analysis	3	TE 302 Textile Mfg Proc II	4
CH 316 Quantitative Analysis Lab	1	ST 370 Prob & Stat for Engineers	3
TE 301 Engr Textile Structures I	3	CHE 312 Transport Processes II	3
GC 120 Found of Graphics	3	CHE 316 Thermo of Chem & Phase Eq	3
CHE 311 Transport Processes I ²	3	TE 205 Analog & Digital Circuits	<u>4</u>
CHE 315 Chem Process Thermo ^{2,4}	<u>3</u>		17
	16		
CHE 446 Des & Analy Chem Reactors	3	TE 402 Textile Engr Des II ⁵	4
TE 401 Textile Engr Des I ⁵	4	TE 404 Six Sigma Quality	3
GEP IP Requirement*	3	TE 424 Tex Engr Qual Impr Lab	1
EC 205 Econ (or EC 201 or ARE 201)	3	GEP Requirement*	3
GEP Requirement*	<u>3</u>	GEP Requirement*	3
	16	CHE 395 Professional Dev Seminar	<u>1</u>
			15
CHE 330 Chem Engr Lab I	4		
CHE 435 Proc System Analy & Control	3		
PCC 301 Tech of Dyeing & Finish	3		
PCC 304 Tech of Dyeing & Finish Lab	1		
GEP Requirement*	3		
HESx (100 or 200 level) Elective*	<u>1</u>		
	15		
Minimum Credit Hours Required for Graduation*:			144

Major/Program Footnotes:

¹ Grade of C (2.0) or higher required.

² Minimum grade of C- required.

³ CH 221 will replace TE 200 (in the Textile Engineering curriculum)

⁴ CHE 315/316 will replace TE 303 (in the Textile Engineering curriculum)

⁵ TE 401/402 will replace CHE 450/451 (in the Chemical Engineering curriculum).

⁶ CH 103/104 may substitute for CH 101/102, and CH 203/204 may substitute for CH 201/202.

⁷ CH 225/226 may substitute for CH 221/222, and CH 227/228 may substitute for CH 223/224.

*** General Education Program (GEP) requirements and GEP Footnotes**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied. University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>

A. Mathematical Sciences (6 credit hours; one course with MA or ST prefix)

Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: Fulfilled as part of the Major requirements.

MA 141, 241

B. Natural Sciences (7 credit hours; include one laboratory course or course with a lab)

Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: CH 101, 201; PY 205, 206, 208, 209.

C. Humanities (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None.

D. Social Sciences (6 credit hours selected from two different disciplines/course prefixes)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: EC 205 or EC 201 or ARE 201

E. Health & Exercise Studies (2 credit hours; at least one 100-level Fitness and Wellness Course)

Choose from the University approved GEP Health & Exercise Studies course list.

F. Additional Breadth (3 credit hours to be selected from the following checked University approved GEP course lists)

X Humanities/Social Sciences/Visual and Performing Arts

G. Interdisciplinary Perspectives (5-6 credit hours)

Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: E102

H. Introduction to Writing (4 credit hours satisfied by completing ENG 101 with a C- or better)

The following **Co-Requisites** must be satisfied to complete the General Education Program requirements

I. U.S. Diversity (USD)

Choose from the University approved GEP US Diversity course list or choose a course identified on the approved GEP course lists as meeting the US Diversity (USD) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

J. Global Knowledge (GK)

Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: None

K. Foreign Language proficiency Proficiency at the FL_102 level is required for graduation.

CURRICULUM IN CHEMICAL ENGINEERING & CHEMISTRY (BS)
(Degrees earned: B.S. in Chemical Engineering/ B.S. in Chemistry)

Fall Semester			Credits	Spring Semester			Credits
CH	101 (or 103)	General Chemistry I	3	CH	201 (or 203)	General Chemistry II	3
CH	102 (or 104)	General Chemistry I Lab	1	CH	202 (or 204)	General Chemistry II Lab	1
E	101	Intro to Engr. & Prob Solv	1	E	102	Eng in the 21 st Century	2
E	115	Intro to Computing Envir ¹	1	MA	241	Calculus II	4
ENG	101	Academic Writing and Resch	4	PY	205	Physics Engr & Scien I	3
MA	141	Calculus I	4	PY	206	Physics Engr & Scien I Lab	1
HESx	10x	Physical Education	<u>1</u>	HESx (100 or 200 level) elective			<u>1</u>
			15				15
CH 221 (or 225)		Organic Chemistry I	3	CH 223 (or 227)		Organic Chemistry II	3
CH 222 (or 226)		Organic Chemistry I lab	1	CH 224 (or 228)		Organic Chemistry II Lab	1
CHE 205		Chemical Process Prin	4	PY 208		Physics Engr & Scien II	3
MA 242		Analyt Geom & Calculus III	4	PY 209		Physics Engr & Scien II Lab	1
GEP Requirement			<u>3</u>	CHE 225		Chemical Proc Systems	3
			15	MA 341		Applied Differential Eqns	3
				GEP Requirement			<u>3</u>
							17
BCH	451	Biochemistry	4	CH	437	Physical Chemistry ³	4
CHE	311	Transport Processes I	3	CHE	312	Transport Processes II	3
CHE	315	Chem Process Thermo ²	3	CHE	316	Thermo Chem & Phase Eq	3
GEP Requirement			3	CHE	330	CHE Lab I	4
GEP Requirement			<u>3</u>	CHE	395	Professional Dev Seminar	<u>1</u>
			16				15
CH	315 ⁴	Quantitative Chemistry	3	CH	401	Inorganic Chem	3
CH	316 ⁴	Quantitative Chemistry Lab	1	CH	452	Adv. Meas. Tech I	3
CHE	450	CHE Design I	3	CHE	435	Proc Sys Analy & Control	3
CHE	331	CHE Lab II	2	CHE	451	CHE Design II	3
CHE	446	Des & Analy Chem Reac	<u>3</u>	Technical Elective			<u>3</u>
			12				15
CH	442	Adv. Synthetic Techniques	4	CH	444	Adv Synthetic Tech II OR	
CH	415	Analytical Chemistry II	3	CH	454	Adv Measure Tech II	4
ECE	331	Prin Electrical Engr or		EC	205	Fund Econ (or EC 201/ARE 201)	3
MSE	201	Struct & Prop Engr Matl	3	Chemistry elective ⁵			3
Chemistry elective ⁵			3	ENG	331	Communication Eng Tech ⁶	3
Technical Elective			<u>3</u>	GEP Requirement			<u>3</u>
			16				16
Total Hours Required for Graduation			152				

¹ Students completing both degrees can substitute E 115 for CH 106/108.

² CHE 315 fulfills the CH 433 requirement

³ CH 437 fulfills the CH 431 requirement

⁴ CH 315/316 fulfills the CH 211 requirement

⁵ Chemistry electives include: CH/PSE 335, CH 403, CH 435, CH 441, CH 572, or CH 7xx.

⁶ ENG 333 could also fulfill this requirement

CURRICULUM IN CHEMICAL ENGINEERING & CHEMISTRY (BA)
(Degrees earned: B.S. in Chemical Engineering/ B.A. in Chemistry)

Fall Semester	Credits	Spring Semester	Credits
CH 101 (or 103) General Chemistry I	3	CH 201 (or 203) General Chemistry II	3
CH 102 (or 104) General Chemistry I Lab	1	CH 202 (or 204) General Chemistry II Lab	1
E 101 Intro to Engr. & Prob Solv	1	E 102 Eng. In the 21 st Century	2
E 115 Intro to Computing Envir	1	MA 241 Calculus II	4
ENG 101 Acad Writing and Resch	4	PY 205 Physics Engr & Scien I	3
MA 141 Calculus I	4	PY 206 Physics Engr & Scien I Lab	1
HESx (100 or 200 level) elective	<u>1</u>	HESx 10x Physical Education	<u>1</u>
	15		15
CH 221 (or 225) Organic Chemistry I	3	CH 223 (or 227) Organic Chemistry II	3
CH 222 (or 226) Organic Chemistry I lab	1	CH 224 (or 228) Organic Chemistry II Lab	1
CHE 205 Chemical Process Prin	4	PY 208 Physics Engr & Scien II	3
MA 242 Analyt Geom & Calculus III	4	PY 209 Physics Engr & Scien II Lab	1
GEP Requirement	<u>3</u>	CHE 225 Chemical Proc Systems	3
	15	MA 341 Applied Differential Eqns ¹	<u>3</u>
			14
CH 315 Quantitative Analysis	3	CH 437 Intro Physical Chem	4
CH 316 Quantitative Analysis Lab	1	CHE 330 CHE Lab I	4
CHE 311 Transport Processes I	3	CHE 312 Transport Processes II	3
CHE 315 Chem Process Thermo	3	CHE 316 Thermo Chem & Phase Eq	3
MSE 201 Struct & Prop Engr Mat	3	CHE 395 Professional Dev. Seminar	<u>1</u>
GEP Requirement	<u>3</u>		15
	16		
CHE 331 CHE Lab II	2	CH 401 Sys Inorganic Chem	3
CHE 446 Des & Analy Chem Reac	3	CHE 435 Proc Sys Analy & Control	3
CHE 450 CHE Design I	3	CHE 451 CHE Design II	3
EC 205 Fund Econ (or EC 201/ARE 201)	3	Chemistry elective ³	3
GEP Requirement	<u>3</u>	Technical Elective	<u>3</u>
	14		15
BCH 451 Prin of Biochemistry	4		
ENG 331 ² Comm for Engr and Tech	3		
GEP Requirement	3		
GEP Requirement	3		
Technical Elective	<u>3</u>		
	16		
Total Hours Required for Graduation	135		

¹MA 341 fulfills the chemistry requirement for an upper level math elective.

²ENG 333 could also fulfill this requirement

³ Chemistry electives include: CH/PSE 335, CH 403, CH 415, CH 435, CH 441, CH 572, or CH 7xx.

General Education Program (GEP) Requirements in the *Humanities, Social Sciences, Visual & Performing Arts, and Interdisciplinary Perspectives*

A total of **seven courses (20-21 credit hours)** from the appropriate GEP category list is required. The requirements may be completed in any order. All must be completed for a letter grade; none of the seven courses may be taken as pass / fail or credit only grading. In addition to the seven categories, two co-requisites must be met: U.S. Diversity (USD) and Global Knowledge (GK).

Students should consider the GEP web site the authoritative source for approved courses and requirements. This document is provided merely as a planning tool.
 See <https://oucc.dasa.ncsu.edu/general-education-program-gep/gep-category-requirements/>

<p>Humanities https://oucc.dasa.ncsu.edu/humanities/ Select two courses from different disciplines.</p> <p><u>Special Major Requirements:</u> ME & AE majors may select PHI 214, PHI(STS) 325 or PHI 375 to fulfill Ethics requirement OR see Interdisciplinary Perspectives requirements MSE majors may select PHI 214, PHI 221, PHI(STS) 325 or PHI 375 to fulfill Ethics requirement OR see Interdisciplinary Perspectives requirements</p>	<hr/> <hr/> <hr/>
<p>Social Sciences https://oucc.dasa.ncsu.edu/social-sciences/ Select an Introductory Economics course (EC 205/EC 201/ARE 201). Select one course from Social Sciences other than Economics.</p> <p><u>Special Major Requirements:</u> CON majors select SOC 205, SOC 301, SOC 305/AFS 305 (USD), PS 202, PS 310, PS 312, PS 314, or PS 320 ENE majors select PS 336 (GK) or PS 320.</p>	<p>EC 205/201/ARE 201</p> <hr/> <hr/>
<p>Interdisciplinary Perspectives https://oucc.dasa.ncsu.edu/1096-2/ Select one courses</p> <p><u>Special Major Requirements</u> BE majors select IDS 201 (GK), STS 302(GK), or STS 304 IE majors select IDS 201 (GK), IDS(NR) 303 or STS 214, STS 302(GK), STS 304, STS 322, STS(PHI) 325 AE & ME majors select IDS 201 (GK), STS 302(GK), STS 304, STS (PHI) 325 to fulfill Ethics requirement OR see Humanities Requirements MSE majors select IDS 201 (GK), STS 302 (GK), STS 304, STS (PHI) 325 to fulfill Ethics requirement OR see Humanities Requirements</p>	<p>E 102: Engineering in the 21st Century (2 credits)</p> <hr/> <hr/>
<p>Additional Breadth https://oucc.dasa.ncsu.edu/visual-and-performing-arts/ Select one course from Humanities, Social Sciences, or Visual & Performing Arts.</p>	<hr/> <hr/>
<p><i>The following requirements must also be met:</i></p>	
<p>US Diversity (USD) Course from selections above or select an additional course. https://oucc.dasa.ncsu.edu/u-s-diversity/</p>	<hr/> <hr/>
<p>Global Knowledge (GK) Course from selections above or select an additional course. https://oucc.dasa.ncsu.edu/global-knowledge/</p>	<hr/> <hr/>

Humanities

GK	AFS 240	Afr Civilization	GK	FLG 315	Germanic Civilization & Cult	HI 449	US Labor History to 1900	
USD	AFS 241	Intro to Afr-Am Studies II	GK	FLG 320	Intro to German Literature	HI 450	US Labor History since 1900	
USD	AFS/ENG 248	Surv of Afr-Am Lit	GK	FLG 323	20th Cent German Lit	USD	HI 462	Social Hist of the New South
GK	AFS/HI 275	Intro to Hist of South & East Africa	GK	FLG 325	German Lyric Poetry	GK	HI 473	Japan's Empire in Asia 1868-1945
GK	AFS/HI 276	Intro to Hist of West Africa	GK	FLI 315	Italian Civilization & Cult	GK	HI 486	Science and Empire
GK	AFS 342	Intro to the Afr Diaspora	GK	FLI 318	Italian Society Through the Cinema	HON	HON 202	Inquiry, Discovery, & Lit
GK	AFS 343	African Religions	GK	FLJ 342	Classic Japanese Lit in Trans	USD	HON 290	Special Topics - Hum/USD
USD	AFS/ARS 346	Black Popular Cult	GK	FLJ 344	Early Modern Japanese Lit in Trans	HON	HON 294	Special Topics - Philosophy or Rel
GK	AFS/ENG 349	Afr Lit in English	GK	FLJ 345	Modern Japanese Lit in Trans	HON	HON 341	Time Travel
USD	AFS/HI 372	Afr-Am Hist Thr the Civil War, 1619-1865	GK	FLJ/ANT 351	Contemporary Culture in Japan	HON	HON 344	Kantian Ethics
USD	AFS/HI 373	Afr-Am Hist Since 1865	GK	FLN 301	Advanced Hindi: Readings in Lit I	HON	HON 345	On the Human
GK	AFS 442	Issues in the Afr Diaspora	GK	FLN 302	Advanced Hindi: Readings in Lit II	USD	HON 346	Ethics & Gender
USD	AFS/ENG 448	Afr-Am Lit	GK	FLN 401	Hindi Lit & South Asian Cult Contexts	HON	HON 347	Freedom & the Self
USD	AFS/HI 455	Hist of the Civil Rights Movement	GK	FLR 303	Russian Lit in Trans: The 19th Cent	ID	ID 244	History of Industrial Design
GK	ANT/FLJ 351	Contemporary Culture in Japan	GK	FLR 304	Russian Lit in Trans: The 20th Cent	LAR	LAR 221	Intro to Environ & Behav for Designers
GK	CLA 210	Classical Mythology	GK	FLR 318	Russian Cinema and Society	NS	NS 420	Naval Leadership & Ethics
GK	CLA 215	Ancient World in Modern Media	GK	FLS 335	Spanish for Native and Heritage Speakers	PHI	PHI 205	Intro to Philosophy
GK	CLA 320	Masterpieces of Classical Literature	GK	FLS 340	Intro to Hisp Lit and Cult	PHI	PHI 210	Representation, Reason & Reality
GK	CLA 325	Gender, Ethnicity & Identity	GK	FLS 341	Lit and Cult of Spain I	PHI	PHI 214	Issues in Business Ethics
	COM 200	Comm Media in a Changing World	GK	FLS 342	Lit and Cult of Spain II	PHI	PHI 221	Contemporary Moral Issues
	COM 211	Argumentation & Advocacy	GK	FLS 343	Lit and Cult of Spain III	PHI	PHI 300	Ancient Philosophy
	COM/ENG 395	Studies in Rhetoric & Digital Media	GK	FLS 351	Lit and Cult of Latin America I	PHI	PHI 301	Early Modern Philosophy
	COM 289	Science Comm & Public Engagement	GK	FLS 352	Lit and Cult of Latin America II	PHI	PHI 302	19th Cent Philosophy
GK,USD	ECD 225	Foundations of Cultural Competence	GK	FLS 353	Lit and Cult of Latin America III	PHI	PHI 305	Philosophy of Rel
	ENG 206	Studies in Drama	GK	HA/HI 240	Introduction to Visual Culture	PHI	PHI 309	Contemporary Political Philosophy
	ENG 207	Studies in Poetry	GK	HI 207	Ancient Mediterranean World	PHI	PHI 310	Existentialism
	ENG 208	Studies in Fiction	GK	HI 208	The Middle Ages	PHI	PHI 312	Philosophy of Law
	ENG 209	Intro to Shakespeare	GK	HI 209	Europe, Renaiss to Waterloo, 1300-1815	PHI	PHI 313	Ethical Problems in Law
GK	ENG/FL 219	Studies in Great Works of Non-West Lit	GK	HI 210	Modern Europe 1815-Present	USD	PHI 319	Africana Political Philosophy
GK	ENG/FL 220	Studies in Great Works of West Lit	GK	HI 214	Hist & Archaeology of Anc Lat America	USD	PHI 320	Philosophy of Race
GK	ENG/FL 221	Lit of the West World I	GK	HI 215	Latin America to 1826	PHI/STS	PHI/STS 325	Bio-Medical Ethics
GK	ENG/FL 222	Lit of the West World II	GK	HI 216	Latin America Since 1826	PHI	PHI 330	Metaphysics
GK	ENG/FL 223	Contemporary World Lit I	GK	HI 217	Caribbean History	PHI	PHI 331	Philosophy of Language
GK	ENG/FL 224	Contemporary World Lit II	GK	HI 221	British Hist to 1688	PHI	PHI 332	Philosophy of Psychology
	ENG 232	Lit & Medicine	GK	HI 222	Hist of British Cults & Societies	PHI	PHI 333	Theory of Knowledge
GK	ENG/FL 246	Lit of the Holocaust	GK	HI 232	The World from 1200-1750	PHI	PHI 340	Philosophy of Science
USD	ENG 249	Native Am Lit	GK	HI 233	The World in the 20th Cent	PHI	PHI 347	Neuroscience & Philosophy
	ENG 251	Major British Writers		HI 251	Early Am Hist	PHI	PHI 375	Ethics
	ENG 252	Major Am Writers		HI 252	American History II	PHI	PHI 376	Hist of Ethics
GK	ENG 255	Beyond Britain: Lit Colonies of Brit Emp	USD	HI 253	Early Am Hist	PHI	PHI 401	Kant's Critique of Pure Reason
	ENG 261	English Lit I	USD	HI 254	Modern Am Hist	PHI	PHI 403	Continental Philosophy after 1900
	ENG 262	English Lit II	GK	HI 263	Asian Civilization to 1800	PHI	PHI 420	Global Justice
USD	ENG 265	Am Lit I	GK	HI 264	Modern Asia: 1800 to Present*	PHI/PSY	PHI/PSY 425	Intro to Cognitive Science
USD	ENG 266	Am Lit II	GK	HI 270	Modern Middle East	PHI	PHI 440	The Scientific Method
USD	ENG 267	LGBTQI - Literature in the U.S.		HI 305	Frauds and Mysteries of the Past (also IP)	PHI	PHI 447	Philosophy, Evolution and Human Nature
GK	ENG 275	Literature and War	GK	HI 307	Jewish History	PS	PS 361	Intro to Political Theory
USD	ENG/WGS 305	Women in Literature	GK	HI 317	Cuba Today	PS	PS 362	Am Political Thought
	ENG/WGS 308	Contemporary Iss in Ecofeminism	USD	HI/REL 320	Religion in American History	GK	REL 200	Intro to the Study of Rel
	ENG 340	Literature, Art, and Society	GK	HI 321	Scientific Rev and Eur Soc 1500-1800	GK	REL 210	Religious Traditions of the World
USD	ENG 342	Literature of Space and Place	GK	HI 324	History of Common Law & Constitution	GK	REL 220	Religion in the Contemporary World
	ENG 361	Studies in British Poetry	GK	HI 332	Germany and the World Wars	GK	REL 230	Asian Religions
	ENG 362	The British Novel of the 18th Cent		HI 335	The World at War	REL/SOC	REL/SOC 309	Rel & Society
	ENG 370	Early 20th-Cent Fiction		HI 337	Spy vs. Spy: Cold War Intelligence Hist	GK	REL 311	Intro to the Old Testament
	ENG 372	Early 20th-Cent Poetry	GK	HI 338	Empire, War, and Revolution in Russia	GK	REL 312	Intro to the New Testament
	ENG 377	Fantasy	GK	HI 340	History of Agriculture	GK	REL 314	Intro to Intertestamental Lit
GK	ENG 380	Modern Drama		HI 345	American Popular Culture	GK	REL 317	Christianity
	ENG 385	Biblical Backgrounds of English Lit	USD	HI 346	Intro to Civil War and Reconstruction	USD	REL 323	Rel Cults, Sects, & Min Faiths in America
	ENG 390	Classical Backgrounds of English Lit		HI 350	Am Military Hist	GK	REL 327	Issues in Contemporary Rel
GK	ENG/FL 392	Major World Author		HI 351	U.S. Naval Hist	GK	REL 331	The Hindu Tradition
GK	ENG/FL 393	Studies in Literary Genre		HI 354	The Rise of the American Empire	GK	REL 332	The Buddhist Traditions
GK	ENG/FL 394	Studies in World Literature	USD	HI 360	U.S. Agricultural History	GK	REL 333	Chinese Rels
GK	ENG 399	Contemporary Lit II (1940 to Present)		HI 364	Hist of North Carolina	GK	REL 334	Japanese Rels
GK	ENG/FL 406	Modernism		HI 365	The Am West	GK	REL 340	Intro to Islam
GK	ENG/FL 407	Postmodernism	USD	HI 366	Native Am Hist	GK	REL 350	Intro to Judaism
USD	ENG/WGS 410	Studies in Gender and Genre	USD	HI 369	Sexuality in US History	GK	REL 383	Rel, Globalism, & Justice
	ENG 420	Major Am Author	GK	HI 370	Modern Egypt	GK	REL 412	Adv Readings in the Christian Gospels
	ENG 439	17th-Cent English Lit	GK	HI 371	Modern Japan, 1850 to Present	GK	REL 413	The Life & Letters of the Apostle Paul
	ENG 451	Chaucer	GK	HI 374	Visual Culture of Modern South Asia	USD	REL 423	Religion & Politics in America
	ENG 460	Major British Author	GK	HI 375	Global History of Travel and Tourism	GK	REL 423	Religion & Politics in Global Perspective
GK	ENG 464	British Lit, 1900-1945		HI 380	Hist of Nonprofits, Philant, & Soc Change	REL/STS	REL/STS 471	Darwinism and Christianity
GK	ENG 465	British Lit, Since 1945	GK	HI 381	NGO Nonprofits in a Global Context	REL/WGS	REL/WGS 472	Women & Rel
USD	ENG 466	Transatlantic Literatures	USD	HI 382	History of Capitalism in America	GK	REL 482	Rel & Conflict
	ENG 467	Am Colonial Lit	USD	HI 385	Introduction to Public History	GK	REL 489	Interpretations of Rel
	ENG 468	Am Romantics	GK	HI/REL 402	Christianity to Time of Eusebius	USD	WGS 305	Women and Literature
	ENG 469	Am Realism & Naturalism	GK	HI/REL 407	Islamic Hist to 1798	WGS	WGS 308	Contemporary Iss in Ecofeminism
USD	ENG 470	Am Lit, 1914-1945	GK	HI/REL 408	Islam in the Modern World	WGS	WGS 390	Queer Theory
USD	ENG 476	Southern Lit	GK	HI 410	Italian Renaissance	USD	WGS 492	Theor Iss in Women's & Gender Studies
	ENG 485	Shakespeare: Revisions & Resources	USD	HI 445	Early Am Frontiers			
	ENG 486	Shakespeare, The Earlier Plays	USD	HI 446	Civil War & Reconstruction			
	ENG 487	Shakespeare, The Later Plays	USD	HI/WGS 447	Hist of Am Women to 1900			
GK	FLA 318	Egyptian Culture through Film	USD	HI/WGS 448	Am Women in the 20th Cent			
GK	FLC 351	Modern Chinese Pop Culture						
GK	FLC 402	Advanced Chinese: Readings in Lit & Sci						
GK	FLF 301	Surv of Fr Lit -Mid Ages Thr the Enlight						
GK	FLF 302	Surv of Fr Lit-Rom to the Contemp Period						
GK	FLF 315	French Civilization & Cult						
GK	FLF 425	Lit, Cinema & Cult of the Franco World						

The current University-approved list is available at:
Retrieved: September 20, 2020

<https://oucc.dasa.ncsu.edu/humanities/>

Social Sciences

USD	AFS/SOC 305	Racial & Ethnic Relations	GK	HON 353	Code Breakers: Unlocking Hum Lang	GK	PS 341	European Pol
	ANT 251	Physical Anthropology		MS 302	Applied Leadership	GK	PS 342	Pol of China & Japan
GK	ANT 252	Cultural Anthropology		NR 460	Renewable Resource Pol and Mgt	GK	PS 345	Govs & Pol in the Middle East
GK	ANT 253	Unearthing the Past		NS 210	Leadership & Management		PS 353	Iss in Latin American & Caribbean Pol
USD	ANT 254	Lang & Culture		PRT 152	Intro to Parks, Rec & Tourism		PSY 200	Intro to Psych
GK	ANT/SOC 261	Tech in Soc & Culture		PRT 200	Leisure Behavior, Health & Wellness		PSY 311	Social Psych
USD	ANT 310	Native Peoples & Cultures of N America		PS 201	Amer Pol & Gov		PSY 376	Developmental Psych
GK	ANT 315	Aztecs, Maya & Their Predecessors		PS 202	State & Local Gov	USD	PSY/WGS 406	Psych of Gender
GK	ANT 325	Andean South America		PS 203	Intro to Nonprofits	USD	SOC 202	Principles of Soc
GK	ANT 330	Peoples & Cultures of Africa		PS 204	Problems of Amer Democracy	USD	SOC 203	Current Social Problems
GK	ANT 345	Anthropology of the Middle East	GK	PS 231	Intro to Int'l Relations	USD	SOC/WGS 204	Sociology of Family
GK	ANT 346	Peoples & Cultures of Southeast Asia	GK	PS 236	Issues in Global Pol		SOC 205	Jobs & Work
	ANT 370	Intro to Forensic Anthropology	GK	PS 241	Intro to Comparative Pol		SOC 206	Social Deviance
	ANT 389	Fundamentals of Archaeological Res	GK	PS 301	The Presidency & Congress	USD	SOC 207	Language & Society
	ARE 309	Env Law & Economic Policy		PS 302	Campaigns & Elect in the US Pol Sys	GK	SOC/GEO 220	Cultural Geography
	ARE 311	Agricultural Markets	USD	PS 303	Race in U.S. Pol		SOC 241	Soc of Agriculture & Rural Soc
	ARE 433	U.S Agricultural Policy		PS 305	Justice Sys in the Amer Pol Proc		SOC 300	Social Research Methods
	AS 321	Air Force Leadership Studies I	USD	PS/WGS 306	Gender & Pol in the U. S.		SOC 301	Human Behavior
	COM 112	Interpersonal Comm	USD	PS 309	Equality & Justice in US Law	USD	SOC/WGS 304	Women and Men in Society
GK, USD	COM/HSS 392	Int'l & Crosscultural Comm		PS 310	Public Policy	USD	SOC/AFS 305	Racial and Ethnic Relations
	EDP 304	Educational Psych		PS 312	Intro to Public Administration		SOC 306	Criminology
	EDP 370	Applied Child Development		PS 314	Science, Tech & Public Policy		SOC/REL 309	Religion and Society
	ENG 210	Intro to Lang & Linguistics		PS 315	Public Leadership		SOC 310	Managers, Work, & Organizations
	GEO 200	Principles of Geography		PS 320	U.S. Env Law & Pol		SOC 311	Community Relationships
GK	GEO/SOC 220	Cultural Geography		PS 331	U.S. Foreign Policy	GK	SOC 342	Int'l Development
	HON 295	Special Topics - Social Sciences	GK	PS 335	Int'l Law		SOC 350	Food and Society
USD	HON 352	Self, Schooling, & the Social Order	GK	PS 336	Global Env Pol	GK	SOC 351	Population & Planning

Retrieved: September 20, 2020

The current University-approved list is available at:

<https://oucc.dasa.ncsu.edu/social-sciences/>

Visual and Performing Arts

	ADN 111	Two Dimensional Design		ENG 382	Film & Lit		HS 242	Intro to Small Scale Landscape Design
	ADN 112	Three Dimensional Design		ENG 384	Introduction to Film Theory		LAR 444	Hist of Landscape Architecture
	ADN 272	Intro to Printing & Surface Des	GK	FL 216	Art & Soc in France		MUS 103	Music Theory I
GK	ADN 275	Survey of Fibers in Arts & Design	GK	FLF 318	The Heritage of French Cinema		MUS 120	Rudiments of Music
	ADN 311	Basic Visual Laboratories	GK	FLG 318	New German Cinema		MUS 180	Intro to Musical Experiences
USD	AFS/MUS 230	Introduction to African-Amer Mus	GK	FLS 360	Hispanic Cinema		MUS 181	Exploring Music Theory
USD	AFS/MUS 260	Hist of Jazz		FTM 400	Major Fashion Designers	GK	MUS 200	Understanding Mus
	ARC 140	Experiencing Architecture		GC 120	Foundations of Graphics	GK	MUS 201	Intro to Mus Lit I
	ARC 241	Intro to World Architecture		GD 203	Hist of Graphic Des	GK	MUS 202	Intro to Mus Lit II
GK	ARS 251	The Arts of a World Capital: London		GD 303	Graphic Des Theory & Practice	GK	MUS 205	Intro to Mus in Western Soc
GK	ARS 252	Vienna in 1900		HA 201	Hist of Art Anc Greece Thr the Renaiss	USD	MUS 206	America's Mus
	ARS 259	The Arts & Politics		HA 202	Hist of Art Renaiss Thr the 20th Cent	USD	MUS 210	History of Rock I: 1950s - 1970s
	ARS/MUS 306	Mus Composition with Computers		HA 203	Hist of Amer Art	USD	MUS 211	History of Rock I: 1980s - present
GK	ARS 351	Arts, Ideas & Values		HA 401	19th Cent European Art		MUS 240	Intro to the Music Industry
GK	ARS 353	Arts & Cross Cultural Contacts		HA 404	Italian Renaissance Art & Matl Cult		MUS 270	Songwriting Digital Audio Workstations
GK	ARS 354	The Arts & the Sacred		HA 410	Hist of Art & Photography		MUS 305	Mus Composition
	COM 110	Public Speaking	GK	HESM 322	Dance and Society	GK	MUS 310	Mus of the 17th & 18th Centuries
GK	COM/ENG 364	Hist of Film to 1940	USD	HESM 324	Concert Dance History	GK	MUS 315	Mus of 19th Cent Europe
GK	COM/ENG 374	Hist of Film From 1940		HESM 326	Current Trends in Dance	GK	MUS 320	Mus of the Twentieth Cent
	D 231	Des Hist for Engineers & Scientists	USD	HESM 328	Dance Composition II	GK	MUS 330	Mus Drama
	DAN 272	Dance Composition		HESD 265	Ballet II	GK	MUS 350	World Mus I: Mus of Asia
	DS 101	Hist of Des I		HESD 280	Jazz Dance II	USD	MUS/WGS 360	Women in Mus
GK	ENG 282	Intro to Film		HON 299	Special Topics - Visual & Performing Arts		TDE 351	The Art & Craft of Clay
	ENG 292	Writing About Film	GK	HON 390	Music & the Celtic World		THE 103	Intro to the Theatre
GK	ENG/FLM 378	Women & Film		HON 391	Mus & Social Life		THE 203	Theory & Practice of Acting

Retrieved: September 20, 2020

The current University-approved list is available at:

<https://oucc.dasa.ncsu.edu/visual-and-performing-arts/>

Interdisciplinary Perspectives

GK	AEC 380	Global Water Resources	GK	FLG 440	Green Germany: Nat & Envin		PB 219	Plants in Folklore, Myth, and Religion
	AEE/ANS/PB 208	Ag Biotech: Issues & Implications	GK	FLS 212	Spanish, Lang, Tech, Culture		PCC 274	Introduction to Forensic Science
GK	ANT/SOC 261	Technology in Society & Culture		FOR 220	Urban & Community Forestry		PCC 401	Manuf & Impact on Safety, the Envir, & Soc
	ARE/EC 336	Intro to Resource & Env Econ	GK	FOR/FW 221	Conservation of Natural Resources		PHI 210	Representation, Reason & Reality
	ARS/STS 257	Tech in the Arts		FOR 248	Forest Hist, Tech & Soc		PHI 312	Philosophy of Law
	BIO 165	Intro to Environmental Res		GIS 205	Spatial Thinking with GIS		PHI 313	Ethical Problems in Law
	BIO 227	Biological Illustration	GK	HA/HL 240	Introduction to Visual Culture		PHI/STS 325	Bio-Medical Ethics: Inter Inquiry
	BIO 230	The Science of Studying Dinosaurs		HI 305	Frauds and Mysteries of the Past		PHI 331	Philosophy of Language
	BIO 233	Human-Animal Interactions		HESM 332	Dance Composition II		PHI 332	Philosophy of Psychology
	BIO 440	Human Animal: Evol Perspective		HESM 328	Dance and Technology		PHI 340	Philosophy of Science
	BIT 100	Current Topics in Biotechnology		HI 322	Ancient & Medieval Science	USD	PHI 422	Philosophical Issues in Env Ethics
USD	CNR 250	Diversity & Environmental Justice		HI 321	Rise of Modern Science		PHI/PSY 425	Intro to Cognitive Science
	COS 100	The Science of Change		HI 341	Tech in Hist		PHI 440	The Scientific Method
GK	CS 224	Seed, Biotechnology & Societies		HI 440	Amer Env Hist		PHI 447	Philosophy, Evolution and Human Nature
GK	CS 230	Introduction to Agroecology		HI 481	Hist of the Life Sciences		PO 212	Poultry & People: Why did the Chicken?
	CSC 281	Found of Interactive Game Design		HI 482	Darwinism in Science & Soc		PO 411	Agrosecurity
	D 100	Design Thinking I	GK	HI 483	Science & Religion in European Hist		PP 241	The Worm's Tale: Parasites in our Midst
	D 101	Design Thinking II	GK	HI 484	Science in European Culture		PRT 449	Human Dimensions of NR in AU/NZ
	E 102	Engineering in the 21st Century		HI 485	Hist of Amer Tech	GK	PRT 450	Sustaining Nat. Resources in AU/NZ
	EI 201	Expl Interdisc. Entrepren Thinking	USD	HON 310	The Creative Process in Science		PSE 220	Papyrus to Plasma Screens: Paper & Soc
	EI 331	Interdisc Entrep. Thinking I	GK	HON 311	Words Through Space & Time		REL/STS 471	Darwinism and Christianity
	EMA 110	Intro to Arts Entrepreneurship		HON 341	Time Travel		SLC 250	Critical & Creative Decision Making Models
	EMA 365	Foundations in Arts Entrepreneurship		HON 345	On the Human		SMT 201	Sustainable Materials for Green Housing
	EMA 370	Practical Arts Entrepreneurship	USD	HON 346	Ethics & Gender		SMT 232	Recycling to Create a Sustainable Environ
	ENG 232	Lit & Medicine		HON 347	Freedom & the Self		SMT 310	Intro to Industrial Ecology
	ENG 339	Lit & Technology		HSS 120	Intro Humanities & Social Sci		SOC 381	Soc of Medicine
	ENG 340	Lit, Art & Society		ID 444	History of Industrial Design		SSC 185	Land & Life
	ENG 341	Lit & Science	GK	IDS 201	Env Ethics	USD	STS/WGS 210	Women & Gender in Science & Tech
USD	ENG 342	Lit of Space and Place	USD	IDS 210	Intro to America Studies		STS 214	Tech & Values
	ENG 376	Science Fiction		IDS 211	Eating through Amer Hist		STS 301	Science & Civilization
	ENG 425	Analysis of Sci & Tech Writing	GK, USD	IDS 220	The Science & Art of Happiness		STS 302	Contemp Sci, Tech & Human Values
	ENT 201	Insects and People		IDS/NR 303	Humans & the Environment		STS 304	Ethical Dimensions of Progress
GK	ENT 207	Insects and Human Disease	GK	IDS 310	Animals in the Global Community		STS 322	Technological Catastrophes
GK	ES/ET 100	Intro to Environmental Science	GK	IS 200	Intro to International Studies		STS 323	World Population & Food Prospects
GK	ES 150	Water and the Environment		LSC 101	Crit & Creative Thinking in Life Sci	GK	STS 402	Peace & War in the Nuclear Age
GK	ES 200	Climate Change & Sustainability	GK	MEA 100	Earth Systems Science: Exp the Conn		STS 405	Tech & Amer Culture
GK	ES 300	Energy & the Environment		MIE 201	Intro to Business Processes	USD	SW 260	Intro to Gerontology
	ET 410	Toxic Substance & Soc		NR 406	Conservation of Biological Diversity	USD	SW 290	Social Welfare & Social Work in the US
GK	FLF 212	French: Lang, Culture & Tech		NS 420	Naval Leadership and Ethics		WGS 224	Issues in Ecofeminism
GK	FLG 212	German Lang, Culture, Science & Tech	USD	NTR 210	Intro to Community Food Security		WGS 330	Women and Health
	FOR 330	North Carolina Forests		PB 213	Plants in Civilization		WGS 370	Adv Studies of Gender in Science
GK	FOR 414	World Forestry						

Retrieved: September 20, 2020

The current University-approved list is available at:

<https://oucc.dasa.ncsu.edu/1096-2/>

Global Knowledge

Humanities

ENG 255	Beyond Britain: Lit Colonies of Brit Emp	FLF 302	Surv of Fr Lit-Rom to the Contemp Period	HI 216	Latin America Since 1826	REL 317	Christianity
ENG 275	Literature and War	FLF 315	French Civilization & Cult	HI 217	Caribbean History	REL 327	Issues in Contemporary Rel
AFS 240	Afr Civilization	FLF 425	Lit, Cinema & Cult of the Franco World	HI 221	British Hist to 1688	REL 331	The Hindu Tradition
AFS 342	Intro to the Afr Diaspora	FLG 315	Germanic Civilization & Cult	HI 222	Hist of British Cults & Societies	REL 332	The Buddhist Traditions
AFS 343	African Religions	FLG 320	Intro to German Literature	HI 232	The World from 1200-1750	REL 333	Chinese Rels
AFS 442	Issues in the Afr Diaspora	FLG 323	20th Cent German Lit	HI 233	The World in the 20th Cent	REL 334	Japanese Rels
AFS/ENG 349	Afr Lit in English	FLG 325	German Lyric Poetry	HI 263	Asian Civilization to 1800	REL 340	Intro to Islam
AFS/HI 275	Intro to Hist of South & East Africa	FLI 315	Italian Civilization & Cult	HI 264	Modern Asia: 1800 to Present*	REL 350	Intro to Judaism
AFS/HI 276	Intro to Hist of West Africa	FLI 318	Italian Society Through the Cinema	HI 270	Modern Middle East	REL 383	Rel, Globalism, & Justice
ANT/FLJ 351	Contemporary Culture in Japan	FLJ 342	Classic Japanese Lit in Trans	HI 307	Jewish History	REL 412	Adv Readings in the Christian Gospels
CLA 210	Classical Mythology	FLJ 344	Early Modern Japanese Lit in Trans	HI 317	Cuba Today	REL 413	The Life & Letters of the Apostle Paul
CLA 215	Ancient World in Modern Media	FLJ 345	Modern Japanese Lit in Trans	HI 321	Scientific Rev and Eur Soc 1500-1800	REL 423	Religion & Politics in Global Perspective
CLA 320	Masterpieces of Classical Literature	FLJ/ANT 351	Contemporary Culture in Japan	HI 324	History of Common Law & Constitution	REL 482	Rel & Conflict
CLA 325	Gender, Ethnicity & Identity	FLN 301	Advanced Hindi: Readings in Lit I	HI 332	Germany and the World Wars	REL 489	Interpretations of Rel
ECD 225	Foundations of Cultural Competence	FLN 302	Advanced Hindi: Readings in Lit II	HI 338	Empire, War, and Revolution in Russia	REL 200	Intro to the Study of Rel
ENG 380	Modern Drama	FLN 401	Hindi Lit & South Asian Cult Contexts	HI 340	History of Agriculture	REL 210	Religious Traditions of the World
ENG 399	Contemporary Lit II (1940 to Present)	FLR 303	Russian Lit in Trans: The 19th Cent	HI 370	Modern Egypt	REL 220	Religion in the Contemporary World
ENG 464	British Lit, 1900-1945	FLR 304	Russian Lit in Trans: The 20th Cent	HI 371	Modern Japan, 1850 to Present	REL 230	Asian Religions
ENG 465	British Lit, Since 1945	FLR 318	Russian Cinema and Society	HI 374	Visual Culture of Modern South Asia	REL 311	Intro to the Old Testament
ENG/FL 219	Studies in Great Works of Non-West Lit	FLS 335	Spanish for Native and Heritage Speakers	HI 375	Global History of Travel and Tourism	REL 312	Intro to the New Testament
ENG/FL 220	Studies in Great Works of West Lit	FLS 340	Intro to Hisp Lit and Cult	HI 381	NGO Nonprofits in a Global Context	REL 314	Intro to Intertestamental Lit
ENG/FL 221	Lit of the West World I	FLS 341	Lit and Cult of Spain I	HI 410	Italian Renaissance	REL 317	Christianity
ENG/FL 222	Lit of the West World II	FLS 342	Lit and Cult of Spain II	HI 473	Japan's Empire in Asia 1868-1945	REL 327	Issues in Contemporary Rel
ENG/FL 223	Contemporary World Lit I	FLS 343	Lit and Cult of Spain III	HI 486	Science and Empire	REL 331	The Hindu Tradition
ENG/FL 224	Contemporary World Lit II	FLS 351	Lit and Cult of Latin America I	HI/REL 402	Christianity to Time of Eusebius	REL 332	The Buddhist Traditions
ENG/FL 246	Lit of the Holocaust	FLS 352	Lit and Cult of Latin America II	HI/REL 407	Islamic Hist to 1798	REL 333	Chinese Rels
ENG/FL 392	Major World Author	FLS 353	Lit and Cult of Latin America III	HI/REL 408	Islam in the Modern World	REL 334	Japanese Rels
ENG/FL 393	Studies in Literary Genre	HA/HI 240	Introduction to Visual Culture	REL 200	Intro to the Study of Rel	REL 340	Intro to Islam
ENG/FL 394	Studies in World Literature	HI 207	Ancient Mediterranean World	REL 210	Religious Traditions of the World	REL 350	Intro to Judaism
ENG/FL 406	Modernism	HI 208	The Middle Ages	REL 220	Religion in the Contemporary World	REL 383	Rel, Globalism, & Justice
ENG/FL 407	Postmodernism	HI 209	Europe, Renaiss to Waterloo, 1300-1815	REL 230	Asian Religions	REL 412	Adv Readings in the Christian Gospels
FLA 318	Egyptian Culture through Film	HI 210	Modern Europe 1815-Present	REL 311	Intro to the Old Testament	REL 413	The Life & Letters of the Apostle Paul
FLC 351	Modern Chinese Pop Culture	HI 214	Hist & Archaeology of Anc Lat America	REL 312	Intro to the New Testament	REL 423	Religion & Politics in Global Perspective
FLC 402	Advanced Chinese: Readings in Lit & Sci	HI 215	Latin America to 1826	REL 314	Intro to Intertestamental Lit	REL 482	Rel & Conflict
FLF 301	Surv of Fr Lit -Mid Ages Thr the Enlight					REL 489	Interpretations of Rel

Social Sciences

ANT 315	Aztecs, Maya, & Their Predecessors	ANT 330	Peoples & Cultures of Africa	HON 353	Code Breakers: Unlocking Hum Lang	PS 341	European Pol
ANT 461	Wealth, Poverty and International Aid	ANT 345	Anthropology of the Middle East	PS 231	Intro to Int'l Relations	PS 342	Pol of China & Japan
ANT/IS 471	Understanding Latino Migration	ANT 346	Peoples & Cultures of Southeast Asia	PS 236	Issues in Global Pol	PS 345	Govs & Pol in the Middle East
ANT 252	Cultural Anthropology	ANT/SOC 261	Tech in Soc & Culture	PS 241	Intro to Comparative Pol	SOC 342	Int'l Development
ANT 253	Unearthing the Past	COM/HSS 392	Int'l & Crosscultural Comm	PS 335	Int'l Law	SOC 351	Population & Planning
ANT 325	Andean South America	GEO/SOC 220	Cultural Geography	PS 336	Global Env Pol	SOC/GEO 220	Cultural Geography

Visual & Performing Arts

ADN 275	Survey of Fibers in Arts & Design	ARS 354	The Arts & the Sacred	FLF 318	The Heritage of French Cinema	MUS 205	Intro to Mus in Western Soc
HESM 322	Dance and Society	COM/ENG 364	Hist of Film to 1940	FLG 318	New German Cinema	MUS 310	Mus of the 17th & 18th Centuries
HON 390	Music & the Celtic World	COM/ENG 374	Hist of Film From 1940	FLS 360	Hispanic Cinema	MUS 315	Mus of 19th Cent Europe
ARS 251	The Arts of a World Capital: London	ENG 282	Intro to Film	MUS 200	Understanding Mus	MUS 320	Mus of the Twentieth Cent
ARS 252	Vienna in 1900	ENG 378	Women & Film	MUS 201	Intro to Mus Lit I	MUS 330	Mus Drama
ARS 353	Arts & Cross Cultural Contacts	FL 216	Art & Soc in France	MUS 202	Intro to Mus Lit II	MUS 350	World Mus I: Mus of Asia

Interdisciplinary Perspectives

ANT/IS 471	Understanding Latino Migration	ANT/SOC 261	Technology in Society & Culture	FLG 440	Green Germany: Nat & Envin	IDS 201	Env Ethics
E 480	Namibia WildlifeSerial Observatory (6 cr)	CS 224	Seed, Biotechnology & Societies	FLS 212	Spanish, Lang, Tech, Culture	IDS 220	The Science & Art of Happiness
ENG 329	Language in Globalization	CS 230	Introduction to Agroecology	FOR 414	World Forestry	IDS 310	Animals in the Global Community
ES 150	Water and the Environment	ENT 207	Insects and Human Disease	FOR/FW 22	Conservation of Natural Resources	IS 200	Intro to International Studies
HON 293	Honors Special Topics (IP/GK)	ES 200	Climate Change & Sustainability	HA/HI 240	Introduction to Visual Culture	MEA 100	Earth Systems Science: Exp the Conn
HON 390	Music & the Celtic World	ES 300	Energy & the Environment	HI 483	Science & Religion in European Hist	PRT/ES 449	Human Dimensions of NR in AU/NZ
MUS 200	Understanding Music: Global Perspectives	ES/ET 100	Intro to Environmental Science	HI 484	Science in European Culture	PRT/ES 450	Sustaining Nat. Resources in AU/NZ
AEC 380	Global Water Resources	FLF 212	French: Lang, Culture & Tech	HON 311	Words Through Space & Time	STS 302	Contemp Sci, Tech & Human Values
		FLG 212	German Lang, Culture, Science & Tech	HON 360	Music & Oppression	STS 323	World Population & Food Prospects

Retrieved: September 20, 2020

The current University-approved list is available at:

<https://oucc.dasa.ncsu.edu/global-knowledge/>

US Diversity

Humanities

HON 290	Special Topics - Hum/USD	ECD 225	Foundations of Cultural Competence	ENG/WGS 4	Studies in Gender and Genre	HI 446	Civil War & Reconstruction
REL 423	Religion & Politics in America	ENG 249	Native Am Lit	HI 253	Early Am Hist	HI 462	Social Hist of the New South
WGS 305	Women and Literature	ENG 265	Am Lit I	HI 254	Modern Am Hist	HI/REL 320	Religion in American History
AFS 241	Intro to Afr-Am Studies II	ENG 266	Am Lit II	HI 346	Intro to Civil War and Reconstruction	HI/WGS 447	Hist of Am Women to 1900
AFS/ARS 346	Black Popular Cult	ENG 267	LGBTQI - Literature in the U.S.	HI 360	U.S. Agricultural History	HI/WGS 448	Am Women in the 20th Cent
AFS/ENG 248	Surv of Afr-Am Lit	ENG 342	Literature of Space and Place	HI 366	Native Am Hist	HON 346	Ethics & Gender
AFS/ENG 448	Afr-Am Lit	ENG 466	Transatlantic Literatures	HI 369	Sexuality in US History	PHI 319	Africana Political Philosophy
AFS/HI 372	Afr-Am Hist Thr the Civil War, 1619-1865	ENG 470	Am Lit, 1914-1945	HI 382	History of Capitalism in America	PHI 320	Philosophy of Race
AFS/HI 373	Afr-Am Hist Since 1865	ENG 476	Southern Lit	HI 385	Introduction to Public History	REL 323	Rel Cults, Sects, & Min Faiths in America
AFS/HI 455	Hist of the Civil Rights Movement	ENG/WGS 305	Women in Literature	HI 445	Early Am Frontiers	WGS 492	Theor Iss in Women's & Gender Studies

Social Sciences

COM/HSS 392	Int'l & Crosscultural Comm	ANT 310	Native Peoples & Cultures of N America	SOC 202	Principles of Soc	SOC/AFS 305	Racial and Ethnic Relations
COM 292	Language, Communication, and Culture	PS 303	Race in U.S. Pol	SOC 203	Current Social Problems	SOC/WGS 204	Sociology of Family
HON 352	Self, Schooling, & the Social Order	PS 309	Equality & Justice in US Law	SOC 207	Language & Society	SOC/WGS 304	Women and Men in Society
ANT 254	Lang & Culture	PS/WGS 306	Gender & Pol in the U. S.	SOC 211	Community & Health	AFS/SOC 305	Racial & Ethnic Relations
		PSY/WGS 406	Psych of Gender	SOC 212	Race in America		

Visual & Performing Arts

DAN 260	Hip Hop Dance	AFS/MUS 230	Intoduction to African-Amer Mus	MUS/AFS 2:	Intro to African-American Music	MUS/AFS 260	History of Jazz
HESM 324	Concert Dance History	AFS/MUS 260	Hist of Jazz	MUS 210	History of Rock I: 1950s - 1970s	MUS/WGS 360	Women in Mus
		MUS 206	America's Mus	MUS 211	History of Rock I: 1980s - present		

Interdisciplinary Perspectives

AFS 344	Leadership in African-American Comm	HI 346	The Civil War in Popular Culture	IS 250	Globalizing NC	SOC 207	Language & Society
AFS/REL 343	African-American Religions	HI 382	History of Capitalism in America	NTR 210	Intro to Community Food Security	STS/WGS 210	Women & Gender in Science & Tech
CNR 250	Diversity & Environmental Justice	HON 310	The Creative Process in Science	HON 346	Ethics & Gender	SW 260	Intro to Gerontology
ECI 305	Equity & Education	IDS 210	Intro to America Studies	PHI 422	Philosophical Issues in Env Ethics	SW 290	Social Welfare & Social Work in the US
ENG 342	Lit of Space and Place	IDS 220	The Science & Art of Happiness	SLC 350	Leadership & Negotiation		

Retrieved: September 20, 2020

The current University-approved list is available at:

<https://oucc.dasa.ncsu.edu/u-s-diversity/>

The Humanities category in the “new” GEP requirements includes courses formerly listed under Humanities and Visual and Performing Arts categories

USDEI

AFS 241 Introduction to African American Studies	HI 555 History of the Civil Rights Movement
AFS 248 Survey of African-American Literature	HI 562 Southern History since the Civil War
AFS 305 Racial and Ethnic Relations	HON 314 Society's Mirror: Literature in 20th-Century America
AFS 343 African American Religions	HSS 201 Transformative Texts in American Life: Engaging Across Difference
AFS 344 Leadership in African American Communities	IDS 210 Introduction to American Studies
AFS 345 Psychology and the African American Experience	IS 250 Globalizing North Carolina
AFS 346 Black Popular Culture	LPS 320 Research Methodology for the Public Sector
AFS 372 African-American History Through the Civil War, 1619-1865	MUS 206 America's Music
AFS 373 African-American History Since 1865	MUS 360 Women In Music
AFS 375 African American Cinema	PHI 319 Black Political Philosophy
AFS 380 Black Feminist Theory	PHI 320 Philosophy of Race
AFS 444 African American and African Women Leaders	PRT 238 Diversity and Inclusion in Recreation and Sport
AFS 448 African-American Literature	PS 303 Race in U.S. Politics
AFS 455 History of the Civil Rights Movement	PS 306 Gender and Politics in the United States
AFS 470 The Red Record and The Birth of a Nation	PS 309 Equality and Justice in United States Law
AFS 548 African-American Literature	PS 313 Criminal Justice Policy
AFS 555 History of the Civil Rights Movement	PS 418 Gender Law and Policies
ARS 346 Black Popular Culture	PSY 345 Psychology and the African American Experience
COM 292 Language, Communication, and Culture	PSY 406 Psychology of Gender
DAN 324 U.S. Concert Dance History	PSY 477 Psychology of Aging
ECI 305 Equity and Education	REL 320 Religion in American History
ECI 436 Perspectives on English as a New Language	REL 323 Religious Cults, Sects, and Minority Faiths in America
ECI 536 Perspectives on English as a New Language	REL 343 African American Religions
ENG 248 Survey of African-American Literature	REL 423 Religion and Politics in America
ENG 249 Native American Literature	SOC 202 Principles of Sociology
ENG 265 American Literature I	SOC 203 Current Social Problems
ENG 266 American Literature II	SOC 203A Current Social Problems
ENG 305 Women and Literature	SOC 204 Sociology of Family
ENG 342 Literature of Space and Place	SOC 207 Language and Society
ENG 375 African American Cinema	SOC 211 Community and Health
ENG 410 Studies in Gender and Genre	SOC 212 Race in America
ENG 448 African-American Literature	SOC 304 Gender and Society
ENG 470 American Literature, Twentieth Century and Beyond	SOC 305 Racial and Ethnic Relations
ENG 548 African-American Literature	STS 210 Women and Gender in Science and Technology
ENV 250 Diversity and Environmental Justice	SW 290 The Development of Social Welfare and Social Work in the U.S.
FL 218 The Harlem Renaissance in Paris: Paris Noir	THE 340 African American Theatre
FL 436 Perspectives on English as a New Language	USDEI 295 US Diversity, Equity and Inclusion Special Topic (1 - 3 Units)
FL 536 Perspectives on English as a New Language	WG 200 Introduction to Women's, Gender, and Sexuality Studies
HI 253 Early American History	WGS 204 Sociology of Family
HI 254 Modern American History	WGS 210 Women and Gender in Science and Technology
HI 320 Religion in American History	WGS 215 Abolitionist Futures
HI 346 The Civil War Era in Popular Culture	WGS 220 Men and Masculinity
HI 360 U.S. Agricultural History	WGS 304 Gender and Society
HI 366 Native American History	WGS 305 Women and Literature
HI 369 Sexuality in U.S. History	WGS 306 Gender and Politics in the United States
HI 372 African-American History Through the Civil War, 1619-1865	WGS 360 Women In Music
HI 373 African-American History Since 1865	WGS 380 Black Feminist Theory
HI 382 History of Capitalism in America	WGS 406 Psychology of Gender
HI 383 Law in the American Story	WGS 410 Studies in Gender and Genre
HI 446 Topics in Civil War and Reconstruction	WGS 418 Gender Law and Policies
HI 450 U.S. Labor Since 1900	
HI 455 History of the Civil Rights Movement	
HI 462 Southern History since the Civil War	
HI 546 Topics in Civil War and Reconstruction	

ACADEMIC POLICIES AND PROCEDURES

ACADEMIC MISCONDUCT - Any student charged with and found guilty of committing any act of academic misconduct is subject to disciplinary action. Academic misconduct includes all forms of academic dishonesty wherever committed, including, but not limited to cheating, plagiarism, fabrication, giving or receiving aid on an examination or quiz, copying another student's exam, term paper, report, problem or laboratory report, etc., theft or attempted theft of examinations and/or exam answers, etc., receipt of stolen examinations and/or exam answers, etc., facilitating academic dishonesty. The Department of Chemical and Biomolecular Engineering pursues enforcement of sanctions against academic misconduct to the maximum extent specified under the NCSU Code of Student Conduct.

ADVISOR ASSIGNMENT – When you CODA into Chemical and Biomolecular Engineering, you receive an advisor who will serve in that capacity until you graduate. Advisors are assigned using the following process:

Bullard	Engineering First Year-CHE Intent, Double Majors, CHE Minor
Parsons	Nanoscience Concentration
Li, Velev, Fedkiw, Westmoreland	Sustainable Engineering, Energy, and the Environment Concentration
Haugh, Kelly, Keung, Crook	Biomolecular Engineering Concentration
Menegatti, Rao, Efimenko	Biomanufacturing Science Concentration
All other faculty	Standard CHE Curriculum (assigned to an advisor such that the faculty advising load is well balanced)

If there is a problem with your assigned advisor, or if your advisor is unavailable, you may see Dr. Bullard for assistance.

Responsibilities of the Student

Students have the primary responsibility for planning their individual programs and meeting graduation requirements. This involves: (1) keeping up-to-date with University, College, and departmental curricular requirements through materials available from the faculty advisers or departmental coordinator of advising; (2) keeping informed of academic deadlines and changes in academic policies; and (3) consulting with the faculty adviser or departmental coordinator of advising during each registration period, following notification of academic status or probationary status, and at other times as needed and required by academic policy. It is ultimately the student's responsibility to make sure that the classes they're choosing each semester will let them graduate on time.

Responsibilities of the Adviser

Although students have the primary responsibility for planning their programs, faculty advisers are expected to: (1) be available for conferences at appropriate times and places about which their advisees have been informed; (2) provide accurate information about academic regulations and procedures, course prerequisites, and graduation requirements; (3) assist students in planning academic programs suited to their interests and abilities and their career objective; (4) discuss with their advisees appropriate course choices in fulfilling curriculum requirements as well as possible

consequences of various alternative course choices; (5) inform their advisees when their proposed course selections conflict with University academic or curricular regulations; (6) assist advisees with following proper procedures for such things as exceptions to the course drop deadlines, auditing a course before or after taking it for credit, taking a course under the credit by examination policy, registering for 19 or more credit hours, registering for CRC inter-institutional courses, or repeating a course previously passed; (7) refer their advisees for special testing or counseling as needed; (8) assist their advisees in considering the appropriateness of academic adjustments where these become necessary in cases of serious injury or illness.

Responsibilities of the Coordinator of Advising

Each college or department has a coordinator of advising who is responsible for: (1) assigning, training, and supervising faculty advisers; (2) providing up-to-date, printed course and curriculum information for advisers and students; (3) reassigning to another adviser any student who so requests; and (4) assisting any student who wants to major in the coordinator's area of study but is ineligible at the time to transfer into it. Students in this category keep their adviser in the department in which they are enrolled but consult additionally with the coordinator of advising for the department offering the curriculum in which they wish to enroll. Whenever appropriate, the coordinator will advise students that they should consider alternative curricula.

ADDING AND DROPPING COURSES

Students may add courses without permission during the first five (5) days of fall or spring terms and during the first two (2) days of summer terms. Students must have permission of the instructor to enroll in a course during days six (6) through ten (10) of fall or spring terms and during the third (3rd) day of summer terms. After the census date, students must have permission of the instructor of the course and their college dean to enroll in a course.

Except in cases of withdrawal, courses may be dropped until the census date without permission.

However, in order to receive financial aid, students must meet the minimum course load requirements of the appropriate funding agency. Dropping below full-time enrollment could impact financial aid, housing and insurance eligibility. Students are expected to complete all courses for which they are enrolled as of the census date. Except as noted below, students may self-drop from a course from census through the first eight (8) weeks (40 days) of regular fall and spring terms and during the first thirteen (13) days of summer terms. Undergraduate student course drops after census date are considered to be course withdrawals and will result in a W grade on the transcript. Course withdrawals that would result in full-time undergraduate students falling below the minimum full-time course load requirements will not be allowed except for documented medical reasons or other verified, unforeseen grounds of personal or family hardship. Undergraduate students will be limited to a maximum of sixteen (16) hours of course withdrawals over their academic career. All hours from course withdrawals will count as attempted hours for course repeats, determining eligibility to continue enrollment, determining eligibility to receive financial aid, and for calculating undergraduate tuition surcharge.

After the University deadlines have passed, the College of Engineering will consider exceptions to the University drop policy (drop, change to audit, or change to credit-only grading) **only for documented medical reasons or other verified, unforeseen grounds of personal or family hardship.** *Changing majors, job demands or planning to change majors are not sufficient justification.*

Students who feel that they have justification for a drop after the deadline should first contact the Coordinator of Advising and be prepared to provide documentation to verify the circumstances associated with their drop request. All requests for exceptions to the add/drop policies require a letter from the student, a recommendation from the Coordinator of Advising, input from the instructor, and approval by the Assistant Dean for Academic Affairs in the College of Engineering.

Any schedule revision, including a late drop, is not complete until the schedule revision form with all approvals has been submitted to Registration and Records in Harris Hall. Retain a copy of your revised schedule until the change has been posted to your permanent record.

Note that no schedule changes (including changing to audit or credit only) are accepted during the last two weeks of the semester – no exceptions.

The MyPack portal system closes at 5:00 p.m. on the last day to add a class. Students who wish to make modifications to their schedules after that time (within the published deadlines) may do so by presenting their student identification card at Room 1000 Harris Hall.

COURSE LOAD - Students who are employed on a regular basis or who have time-consuming extracurricular activities are advised to reduce their course loads to a manageable level. **Note that 12 credit hours is the minimum course load for full-time status.** Check for tax, insurance, dormitory, financial aid, and other benefits and privileges which may depend upon full-time status.

<u>Student's GPA</u>	<u>Recommended Credit Hours</u>	<u>Adjustments for part-time job or other regular obligation or commitment:</u>	
		<u>Job (or other) Hours/Week</u>	<u>Recommend Reduce Course Load by</u>
1.8	12		
2.0	14		
2.2	15		
2.5	16	5	2 credit hours
3.0	17	10	3 " "
3.5	18	15	4-5 " "
		20	6 " "
		25	6-8 " "
		30	7-9 " "
		35	8-10 " "
For 19, 20, or 21 credit hours, approval of your faculty advisor is required			

COURSE PREREQUISITE ENFORCEMENT - All prerequisites in chemical engineering courses are strictly enforced. **Failure to complete prerequisites prior to enrolling in a CHE course may result in the student's administrative disenrollment after the deadline to enroll in other courses has passed.**

COURSE REPEATS - Students are not permitted to take a course more than twice without receiving permission from the Dean of Engineering. The permission request to the Dean must be processed through the CBE Director of Undergraduate Studies and include documentation that describes circumstances leading to the request. In general, exceptions are approved only for documented medical reasons, documented emotional problems or crisis situations, or statements of documented hardship. A grade of S/U, W, or a letter grade less than C- are all counted as unsuccessful attempts.

CREDIT-ONLY GRADING - Students may select credit-only grading for physical education and foreign language (proficiency) courses. Excluding PE and other courses authorized to be graded on an S/U basis (e.g. E 490 and E 115), courses taken as credit-only will **not** satisfy graduation requirements. Students may not select credit-only grading for Military Science and Aerospace Studies courses. The deadline for changing course grading to credit only is six weeks from the beginning of a regular semester and eleven class days from the beginning of a summer session.

The grades in credit-only courses are "S" and "U." These grades have no effect on the grade point average; however, the course and its grade are counted in the cumulative hours attempted. Students are encouraged to select credit-only grading for PE courses.

DOUBLE MAJORS - Students who intend to earn degrees in chemical engineering and a second major must fulfill all graduation requirements for both degrees. Where overlap between degree requirements occurs, the same courses can normally be used to satisfy graduation requirements in both curricula. In order to minimize the number of courses that must be completed, double major students should prepare a plan of work and review the plan with an academic advisor in each department as early as possible. In subsequent semesters, the student should consult with both advisors during the registration advising period.

Double major students whose second degree is chemical engineering and who wish to receive transfer credits for courses completed at other institutions must receive permission to do so from the Chemical and Biomolecular Engineering Coordinator of Advising (Dr. Bullard) prior to enrolling at the outside institution. **Receipt of transfer credit through another college at NCSU does not guarantee approval of those credits by the College of Engineering.**

ELIGIBILITY TO CONTINUE ENROLLMENT

Academic status will be calculated at the end of every fall, spring and summer term according to the rules established below:

Good Standing

Students must maintain a cumulative grade point average (GPA) of at least 2.0 or be on Academic Warning or Academic Probation status in order to continue enrollment. Students are considered to be in Good Standing if they are eligible to continue enrollment.

Academic Warning

Students who meet either of the following criteria will be placed on Academic Warning and will be allowed to continue enrollment:

- Have a cumulative GPA less than 2.0 and a grade point deficit* of 15 or less
- Have a cumulative GPA above 2.0 and a term GPA below 1.0

Students on Academic Warning **must maintain a term GPA of at least 2.0** for every subsequent fall, spring and summer term of enrollment, until they achieve a cumulative GPA of at least 2.0.

Academic Probation:

Students will be placed on Academic Probation for one term after an appeal to return from Academic Suspension has been approved. Students on Academic Probation who:

- earn a term GPA of at least 2.0 during their Probation term will move to Academic Warning and will be subject to the continuation criteria described above.
- fail to earn a term GPA of at least 2.0 during their Probationary term will be suspended.

Timely Advising: Students on Academic Warning or Academic Probation are required to meet with their academic advisor during the first four (4) weeks of the fall or spring term to discuss their plan for academic success.

Academic Suspension:

Students who meet either of the following criteria will be placed on Academic Suspension:

- Have a cumulative GPA less than 2.0 and a grade point deficit* greater than 15 at the end of any term
- Students on Academic Warning or Probation who fail to maintain a term GPA of at least 2.0 for every subsequent fall, spring or summer term

Options for suspended students: All suspended students have the right to submit an appeal to continue enrollment for a subsequent term. Information on submitting appeals is available online.

NOTE: Students who remain on Academic Suspension will have all future term enrollments canceled and may not re-enroll.

***Grade Point Deficit:** Grade point deficit (GPD) is defined as the number of grade points below the required 2.0 minimum GPA. The deficit reflects the number of hours of B (3.0) grades necessary in the future to raise the GPA to the 2.0 minimum.

FOREIGN LANGUAGE REQUIREMENT – Requirements are listed at <http://sasw.chass.ncsu.edu/fl/place.htm>

Freshmen may satisfy this requirement **before** entering NC State in one of the following ways:

- Score of 510 or above on the College Board Foreign Language Achievement Test (SAT II)
- Advanced placement score of 3 or above (College Entrance Examination Board AP Test)
- Obtaining an average grade of C for two years of high school study of the same language

Proficiency at the FL 102 level **after** entering NC State may be demonstrated as follows:

- Completion of FL 102 course with a passing grade of S, D or better (note: in addition to PE, foreign language is the only class that can be taken for credit only)
- Transfer credit equivalent to FL 102 from an accredited institution or university-approved study abroad program
- Placement into FL 201 or higher on the placement tests in the languages offered by the Department of Foreign Languages and Literatures

If you have not met the requirement, please take the placement tests as soon as possible after enrolling. Taking the placement exam two or three years after entering will probably not produce the best results. If you don't pass, then you will have plenty of time to take the required course here or elsewhere.

The "Placement Tests" are offered in the Laundry Building M-F from 8-5. This is a computerized test. The student can take the test ***only once***. If you place into FL 201, then you have satisfied the foreign language proficiency requirement. If you fail to place into the 201 level, then you need to take FL 102 here at NCSU or the equivalent elsewhere.

You can tell whether you have satisfied the requirement by looking at your degree audit. A student who has not yet fulfilled the requirement looks like this:

GRP 211 FOREIGN LANG PROFICI COREQ 090700

A student who has fulfilled the requirement looks like this:

FLF 100 HIGH SCHOOL FRENCH COREQ 8/03 MET 050800

GPA CALCULATIONS - The semester and overall grade point averages are based on a weighted-average calculation. In computing the average, the credit hours associated with each course are multiplied by a weighting factor which depends on the course grade (See chart below). The results of this multiplication are **quality points**, which are summed and then divided by the hours attempted in order to calculate the GPA. **The credit hours associated with courses in which the grade earned is CR, TR, S, U, IN or LA, are not included in the GPA calculation.**

For instance, the grade point average earned during the semester which appears below is 2.12:

<u>COURSE</u>	CREDIT HRS	GRADE	MULTIPLIER	QUALITY POINTS
CH 101	3	B+	3.33	9.99
CH 102	1	A-	3.67	3.67
MA 141	4	C	2.0	8
E 115	1	S	0	0
PE 107	1	S	0	0
ENG 251	3	F	0	0
EC 205	<u>3</u>	B-	2.67	<u>8.01</u>
TOTAL	16			29.67

$$\text{Semester GPA} = 29.67/14 = 2.12 \text{ (2.119)}$$

Note that, since the grades in PE 107 and E 115 were S, the total credit hours **for purposes of the GPA calculation** equals 14 instead of 16.

Continuing the example, for the next semester the student plans to enroll in the following courses and is wondering what GPA must be earned in order to have an overall grade point average of 2.5 following the second semester:

CH 201	3	PE 241	1
CH 202	1	MA 241	4
ENG 251	3	PY 205/206	4
Total Hours = 16			

The student will take the PE course on a credit-only basis, and will use one of the allowed course repeats on the ENG 111 grade from the first semester. By using the course repeat, the **first** semester total hours for the GPA calculation will be reduced to 11. Furthermore, the **second** semester hours for the GPA calculation equal 15, and the total GPA hours after two semesters will equal 26.

Therefore, obtaining the 2.5 GPA after two semesters requires a total of 65 quality points (26 X 2.5), and 35.33 of those must be earned during the spring semester. This means the second semester GPA must be $35.33/15 = 2.35$.

SEMESTER DEAN'S LIST - A full-time undergraduate student, who earns a semester average of (a) 3.5 or better on 12 to 14 credit hours of course work for which grade points are earned; or (b) 3.25 or better on 15 or more credit hours of course work for which grade points are earned, is on the Dean's List for that semester. Students are not eligible for the Dean's List in any semester in which they receive an F or IN grade. When IN grades are resolved, however, students who are otherwise eligible will be added retroactively to the Dean's List for that semester. Dean's List recognition is noted on the student's semester grade report and permanent academic record.

GRADE EXCLUSION POLICY - Undergraduate students may select up to two NC State courses with posted letter grades of C- or below to be excluded from calculation of their cumulative grade point average. Unsuccessful audits or credit-only attempts are not eligible for exclusion. The form can be found at <http://www.ncsu.edu/registrar/forms/pdf/gradeexclusion.pdf>

- Grades excluded under previous university regulations (such as First Year Course Repeat or Course Repeat Without Penalty) count toward the maximum two courses allowed for exclusion.
- Once a grade exclusion is applied to a course, the grade points and the credit hours attempted and earned on the course will be removed from the calculation of the cumulative grade point average and from the calculation of the total hours attempted.
- The course title and grade for the course will be shown on the official record with a notation to indicate the grade was excluded from the computation of the cumulative grade point average.
- Excluded courses cannot be used to satisfy degree requirements.
- Grade exclusions must be posted prior to a student applying for graduation. Grade exclusions cannot be invoked after a baccalaureate degree has been conferred upon the student by NC State.
- *Grade exclusions cannot be applied to courses in which the student was found to have committed academic dishonesty.*

GRADUATION REQUIREMENTS - Students are eligible for graduation when they have satisfactorily completed all academic requirements of their degree program. The course requirements for graduation appear on the Automated Degree Audit (ADA) form for all engineering students who have CODA'd. Furthermore, competency in a foreign language at the 102 level is a graduation requirement for all students at NCSU. Students are not eligible to graduate if they have any late (LA) or incomplete (IN) grades.

NCSU requires that, in addition to other University, College and departmental requirements, all students must earn a grade point average of at least 2.0, based on all courses attempted at NCSU, in order to be eligible to receive a baccalaureate degree. Furthermore, all baccalaureate degree programs in engineering have the graduation requirement of at least a 2.0 GPA for all courses attempted in the student's major, or the alternative graduation requirement of a C- or better in all required courses in the student's major. For this purpose, the required major courses are defined as including only those courses offered by the major department, or courses which are substituted for the required major courses.

June or August graduates may participate in May graduation with a memo from the department to the bookstore to allow them to pick up a cap and gown. Students who are double majors should notify Registration and Records where they want both diplomas sent. If the student does not, each

respective college receives the appropriate diploma and the student must arrange to get the one they did not pick up. University information regarding graduation is on the web at http://www2.ncsu.edu/ncsu/reg_records/grad_inf.htm.

Requirements for graduation with academic honors:

- *Cum Laude* - for grade point averages of 3.25 through 3.499;
- *Magna Cum Laude* - for grade point averages of 3.5 through 3.749; and
- *Summa Cum Laude* - for grade point averages of 3.75 and above

At least 48 of the last 60 hours towards a degree must be taken at NCSU. Here is the link to the policy: <http://www.ncsu.edu/provost/hat/current/ch06/08.html>. To be eligible for degree honor designations, students must have completed at least two semesters and at least 30 credit hours at NC State.

GRIEVANCES IN GRADING - Grievances related to a grade in a course should first be discussed with the instructor, then with your advisor, and then with the head of the department offering the course. If you feel that the response of these individuals is unsatisfactory, you may pursue a more formal complaint through the college council, grievance committee, or Department Head or Dean for Academic Affairs in your college.

HONORS COURSES IN CHEMICAL ENGINEERING - Eligible students (minimum GPA = 3.5) may complete designated CHE courses for Honors credit, even if those students are not in the CHE Honors Program. Students in the Engineering Scholars program may request Scholars Option enrollment for CHE courses in semesters where no Honors sections are scheduled.

PLAN OF WORK – Each student must complete a plan of work, to be approved by his or her advisor. This is done through MyPack portal.

PLUS/MINUS GRADING SYSTEM-A plus/minus grading became effective in the fall of 1994 for students who entered in summer 1994 or later. Students who were taking courses through the Lifelong Education Program at NCSU prior to being admitted to the University for summer 1994 (or later) are considered NEW. Under the plus/minus system the quality points earned for each credit hour of a given course are:

A+ = 4.33	B+ = 3.33	C+ = 2.33	D+ = 1.33	F = 0
A = 4.0	B = 3.0	C = 2.0	D = 1.0	
A- = 3.67	B- = 2.67	C- = 1.67	D- = 0.67	

SATISFACTORY ACADEMIC PROGRESS

Progress Towards Degree

Students are expected to be in a degree granting major before entering their fifth term (fall or spring). Students are encouraged to maintain continuous enrollment in a minimum of 15 hours toward a degree every fall and spring term, the pace which leads to graduation from a 120 hour degree program in four years.

Satisfactory academic progress (SAP) will be evaluated for all students, including part-time students, at the end of each academic year (May). Students admitted mid-year (January) and those who attend only one term for the year will also be evaluated in May each year. Satisfactory academic progress is measured by meeting the following three standards:

- **Pace of Completion:** Students must pass at least 2/3 of all hours attempted each academic year (summer term – spring term). Attempted hours include all hours enrolled for credit as of census date plus hours added after census. Hours dropped after census, withdrawn or excluded through Grade Exclusion (REG 02.20.16) also count as attempted hours.
- **Maximum Timeframe:** Students must graduate before attempting more than 150% of the hours required for their degree program (e.g. 180 hours for a 120 hour degree program).
- **Degree Status:** Students must have an academic standing that allows for continued enrollment.

Progress Deficiency

Students failing to make satisfactory academic progress will have a Progress Deficiency hold placed on their record preventing enrollment and will have future term enrollments (summer, fall or spring) canceled. Students meeting SAP but failing to make reasonable progress toward degree may be placed on Progress Deficiency by their College. Reasonable progress may be defined as completing courses required for the student's major in a timely manner, maintaining the expected GPA for the major, or making timely progress toward degree completion. Students placed on Progress Deficiency may submit an appeal to retain their schedule and continue enrollment in the next term. (For information about appeals, see RUL 02.66.01 Undergraduate Readmission and Appeals). Students with successful appeals will be placed on Progress Probation for one term (summer, fall or spring) and required to meet the satisfactory academic progress standards described above.

SCHOLARSHIPS FOR CHEMICAL AND BIOMOLECULAR ENGINEERING STUDENTS

The scholarship program for students in chemical engineering is generally divided into four levels:

1) **University-level merit scholarships.** These scholarships are awarded in a campus-wide competition coordinated by the NCSU Caldwell Programs and the Park Scholars Office. Many of these scholarships (i.e. the Park and Caldwell Fellow Scholarships) are typically highly competitive. The Park Scholarship is awarded to incoming freshmen, while the Caldwell Fellow Scholarships are usually awarded to students who have completed one semester of studies at NCSU.

2) **College of Engineering scholarships.** To be considered for College of Engineering scholarships, apply to PackASSIST at <https://ncsu.academicworks.com/> (a new application must be submitted each year!) Through its Scholarship Committee, the College of Engineering (COE) awards a number of scholarships each year to students in all engineering programs in the college. The selection criteria for these scholarships are established by the donors who provide the financial support for the scholarships. Many of these scholarships are targeted to recognize strong academic

performance by minority or female engineering students. Other scholarships are provided for students with strong academic records and demonstrable financial need.

Financial need has typically been assessed by the scholarship committee based on information supplied by the NCSU Financial Aid Office. In addition to scholarly excellence at NC State, examples of other criteria which are required by some donors in the selection of scholarship recipients include evidence of leadership skills and geographic location of the scholar's home. To assist in the evaluation of a student's suitability as a recipient of a particular scholarship, the COE uses an online scholarship information form to be completed by the student at <https://ncsu.academicworks.com/>. The information in these forms, along with overall academic records and financial aid information, is used in selecting the candidate who most closely matches the profile specified by the donor of a particular scholarship. These forms are due on Feb. 15 of each year and should be submitted every year in order for the student to be eligible for these scholarships.

Most COE-level scholarship selections are made in the late Spring, typically in late April or early May, and recipients are notified by mail shortly thereafter. A few scholarships will usually be available for award in the Fall semester, and the recipients are notified by mail.

3) **Chemical and Biomolecular Engineering Department Scholarships.** To be considered for departmental scholarships, apply to PackASSIST at <https://ncsu.academicworks.com/> (a new application must be submitted each year!) The Department offers a small number of highly competitive scholarships which are reserved for chemical engineering students. The selection criteria for these scholarships are similar to those for the COE scholarships (i.e. academic merit, financial need, minority status, female students, etc.) Most ChE scholarship decisions are made in the spring for the next academic year.

Many of the ChE scholarships are provided by corporate sponsors who have typically hired chemical engineers from NC State. Most of the ChE scholarships are targeted by the donors for junior and senior level students. In this regard, the ChE department offers no scholarships for incoming freshmen. The information used to match students with scholarships includes academic records, financial aid information, and additional information on the COE scholarship information form. Dr. Bullard coordinates the scholarship program in the Department, and students are encouraged to contact her if they have questions regarding the scholarship program.

4) **Other Sources of Scholarships.** In addition to the three sources of scholarships mentioned above, some chemical engineering students will have scholarships from other sources. These sources include but are not limited to: grants and loans from the Financial Aid Office to qualified students, scholarships from other departments for students pursuing more than one degree (i.e. double majors in Polymer and Color Chemistry and Chemical Engineering), and scholarships from external sources (i.e. National Merit Scholarships, some companies offer scholarships to children of employees, etc.).

Because the Air Force needs a large number of engineers, the Air Force ROTC has a number of programs designed to help engineering students get through college, including the two types of scholarship programs. Over 70% of Air Force scholarships are awarded to engineering students. To learn more about the programs available at NCSU, stop by Room 135E in Reynolds Coliseum or call the Air Force ROTC Unit Admissions Officer 515-2417.

TRANSFER CREDIT - Students who wish to take courses at another institution should obtain prior approval from Dr. Bullard in order to insure that the transfer credits will apply toward fulfilling specific graduation requirements. Information about transfer course equivalencies at a large number of institutions appears at: <https://www.acs.ncsu.edu/php/transfer/> .

TUTORING - A number of tutoring programs are available on campus. Students are encouraged to seek tutoring help for subjects in which they are weak. It is very important that the student not wait until late in the semester to start with a tutor for two reasons:

- 1) There are a limited number of tutors available on campus.
- 2) The later it is, the more material will have to be covered to catch up.

NC State maintains a central Tutorial Services website at http://www.ncsu.edu/tutorial_center/. This is probably the best starting point if you are seeking tutorial assistance. There are many campus resources to help you if you would like academic assistance:

- **Academic Advising Services** -- <https://advising.dasa.ncsu.edu/>
- **Counseling Center** -- <https://counseling.dasa.ncsu.edu/> - 2nd floor, Student Health Center
- **Disability Services** -- <http://dso.dasa.ncsu.edu/> - University College Commons Suite 304
- **Writing and Speaking Tutorial Center** -- https://english.chass.ncsu.edu/undergraduate/first_year_writing/fy_student_resources.php
- **Physics Tutorial Center** -- <http://www.physics.ncsu.edu/classes/tutor.php>
319A Riddick
- **Supplemental Instruction (SI)** -- <https://asc.dasa.ncsu.edu/supplemental-instruction/>
- **Undergraduate Tutorial Center** -- <http://tutorial.dasa.ncsu.edu/> - 101 Park Shops

UNDERGRADUATE RESEARCH PROJECTS - Students who plan to attend graduate school should consider completing an undergraduate research project under the supervision of a faculty advisor. Projects normally require at least one semester to complete, and the student is normally required to prepare oral and written reports that document and present their work. To receive academic credit for the research project work, students must enroll in either CHE 497 (3 credits) or CHE 498 (1-3 credits). Before enrolling in either of these courses, you should consult with Dr. Bullard to understand the requirements. For CHE 497, typically 10/hrs week or 150 hours total over the course of the semester are required, along with a written technical report and an oral presentation to the research group.

PROFESSIONAL AND PERSONAL DEVELOPMENT

ON-LINE LEARNING STYLE QUESTIONNAIRE:

<http://www.engr.ncsu.edu/learningstyles/ilsweb.html>

LEARNING STYLES AND STRATEGIES

Richard M. Felder
Hoechst Celanese Professor of Chemical Engineering
North Carolina State University

Barbara A. Soloman
Coordinator of Advising, First Year College
North Carolina State University

ACTIVE AND REFLECTIVE LEARNERS

- Active learners tend to retain and understand information best by doing something active with it--discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.
- "Let's try it out and see how it works" is an active learner's phrase; "Let's think it through first" is the reflective learner's response.
- Active learners tend to like group work more than reflective learners, who prefer working alone.
- Sitting through lectures without getting to do anything physical but take notes is hard for both learning types, but particularly hard for active learners.

Everybody is active sometimes and reflective sometimes. Your preference for one category or the other may be strong, moderate, or mild. A balance of the two is desirable. If you always act before reflecting you can jump into things prematurely and get into trouble, while if you spend too much time reflecting you may never get anything done.

How can active learners help themselves?

If you are an active learner in a class that allows little or no class time for discussion or problem-solving activities, you should try to compensate for these lacks when you study. Study in a group in which the members take turns explaining different topics to each other. Work with others to guess what you will be asked on the next test and figure out how you will answer. You will always retain information better if you find ways to do something with it.

How can reflective learners help themselves?

If you are a reflective learner in a class that allows little or no class time for thinking about new information, you should try to compensate for this lack when you study. Don't simply read or memorize the material; stop periodically to review what you have read and to think of possible questions or applications. You might find it helpful to write short summaries of readings or class notes in your own words. Doing so may take extra time but will enable you to retain the material more effectively.

SENSING AND INTUITIVE LEARNERS

- Sensing learners tend to like learning facts, intuitive learners often prefer discovering possibilities and relationships.
- Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitors like innovation and dislike repetition. Sensors are more likely than intuitors to resent being tested on material that has not been explicitly covered in class.
- Sensors tend to be patient with details and good at memorizing facts and doing hands-on (laboratory) work; intuitors may be better at grasping new concepts and are often more comfortable than sensors with abstractions and mathematical formulations.
- Sensors tend to be more practical and careful than intuitors; intuitors tend to work faster and to be more innovative than sensors.
- Sensors don't like courses that have no apparent connection to the real world; intuitors don't like "plug-and-chug" courses that involve a lot of memorization and routine calculations.

Everybody is sensing sometimes and intuitive sometimes. Your preference for one or the other may be strong, moderate, or mild. To be effective as a learner and problem solver, you need to be able to function both ways. If you overemphasize intuition, you may miss important details or make careless mistakes in calculations or hands-on work; if you overemphasize sensing, you may rely too much on memorization and familiar methods and not concentrate enough on understanding and innovative thinking.

How can sensing learners help themselves?

Sensors remember and understand information best if they can see how it connects to the real world. If you are in a class where most of the material is abstract and theoretical, you may have difficulty. Ask your instructor for specific examples of concepts and procedures, and find out how the concepts apply in practice. If the teacher does not provide enough specifics, try to find some in your course text or other references or by brainstorming with friends or classmates.

How can intuitive learners help themselves?

Many college lecture classes are aimed at intuitors. However, if you are an intutor and you happen to be in a class that deals primarily with memorization and rote substitution in formulas, you may have trouble with boredom. Ask your instructor for interpretations or theories that link the facts, or try to find the connections yourself. You may also be prone to careless mistakes on test because you are impatient with details and don't like repetition (as in checking your completed solutions). Take time to read the entire question before you start answering and be sure to check your results.

VISUAL AND VERBAL LEARNERS

Visual learners remember best what they see--pictures, diagrams, flow charts, time lines, films, and demonstrations. Verbal learners get more out of words--written and spoken explanations. Everyone learns more when information is presented both visually and verbally.

In most college classes very little visual information is presented: students mainly listen to lectures and read material written on chalkboards and in textbooks and handouts. Unfortunately, most people are visual learners, which means that most students do not get nearly as much as they would if more visual presentation were used in class. Good learners are capable of processing information presented either visually or verbally.

How can visual learners help themselves?

If you are a visual learner, try to find diagrams, sketches, schematics, photographs, flow charts, or any other visual representation of course material that is predominantly verbal. Ask your instructor, consult reference books, and see if any videotapes or CD-ROM displays of the course material are available. Prepare a concept map by listing key points, enclosing them in boxes or circles, and drawing lines with arrows between concepts to show connections. Color-code your notes with a highlighter so that everything relating to one topic is the same color.

How can verbal learners help themselves?

Write summaries or outlines of course material in your own words. Working in groups can be particularly effective: you gain understanding of material by hearing classmates' explanations and you learn even more when you do the explaining.

SEQUENTIAL AND GLOBAL LEARNERS

- Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."
- Sequential learners tend to follow logical stepwise paths in finding solutions; global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

Many people who read this description may conclude incorrectly that they are global, since everyone has experienced bewilderment followed by a sudden flash of understanding. What makes you global or not is what happens before the light bulb goes on. Sequential learners may not fully understand the material but they can nevertheless do something with it (like solve the homework problems or pass the test) since the pieces they have absorbed are logically connected. Strongly global learners who lack good sequential thinking abilities, on the other hand, may have serious difficulties until they have the big picture. Even after they have it, they may be fuzzy about the details of the subject, while sequential learners may know a lot about specific aspects of a subject but may have trouble relating them to different aspects of the same subject or to different subjects.

How can sequential learners help themselves?

Most college courses are taught in a sequential manner. However, if you are a sequential learner and you have an instructor who jumps around from topic to topic or skips steps, you may have difficulty following and remembering. Ask the instructor to fill in the skipped steps, or fill them in yourself by

consulting references. When you are studying, take the time to outline the lecture material for yourself in logical order. In the long run doing so will save you time. You might also try to strengthen your global thinking skills by relating each new topic you study to things you already know. The more you can do so, the deeper your understanding of the topic is likely to be.

How can global learners help themselves?

If you are a global learner, it can be helpful for you to realize that you need the big picture of a subject before you can master details. If your instructor plunges directly into new topics without bothering to explain how they relate to what you already know, it can cause problems for you. Fortunately, there are steps you can take that may help you get the big picture more rapidly. Before you begin to study the first section of a chapter in a text, skim through the entire chapter to get an overview. Doing so may be time-consuming initially but it may save you from going over and over individual parts later. Instead of spending a short time on every subject every night, you might find it more productive to immerse yourself in individual subjects for large blocks. Try to relate the subject to things you already know, either by asking the instructor to help you see connections or by consulting references. Above all, don't lose faith in yourself; you will eventually understand the new material, and once you do your understanding of how it connects to other topics and disciplines may enable you to apply it in ways that most sequential thinkers would never dream of.

STUDENT CHAPTER OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS

The American Institute of Chemical Engineers (AIChE) is the national professional organization for chemical engineers. The primary objective of the student chapter of AIChE is to promote the professional development of the members by programs and relations with other student chapters. Secondly, the chapter contributes to the development of chemical engineering at NCSU through activities involving the faculty and student members. While membership is extended only to those students in chemical engineering, other interested engineering students are heartily invited to the chapter's programs. Chemical engineering freshmen are urged to join the chapter. The chapter helps to give each student an understanding of their future, in school as well as after graduation.

Student Lounge: EB1 2013

Mission: To promote the development and reputation of our members and the department in industry and academia.

Membership: Membership is open to all undergraduate and graduate students enrolled in chemical engineering or chemical engineering undesignated. Dues are \$20 per year or \$10 per semester if participating in the co-op program. There is also a discount for sophomores and freshman (\$10/year in past years) as an incentive to join.

Activities/Benefits: The student chapter schedules several luncheons, usually two per week, mostly during the fall semester. These luncheons are funded by companies that actively recruit chemical engineers from N.C. State, and are open to all AIChE members. The sponsoring company provides food and information about its operations, recruiting, career opportunities, benefits, etc. Regular sponsors of the luncheons include Alcoa, Procter & Gamble, ExxonMobil, Hoffman-LaRoche, Merck, Monsanto, International Paper, Shell, and several others.

The chapter prepares a resume book in the fall for those seeking full-time, co-op, or internship positions. Copies of the resume book are distributed to various companies through the department head and to all companies sponsoring luncheons. The resume book is a very successful recruiting tool.

For students interested in graduate school, AIChE sponsors an information session conducted by several chemical engineering faculty members. The information session covers topics including applications, requirements, graduate schools, graduate studies and more.

The chapter also attends the national and regional annual conferences. The national conference is usually held in November, and the regional conference is in March or April. Some previous conference sites have included San Francisco, St. Louis, Tallahassee, Miami, and New Orleans. The conferences provide the opportunity to learn more about the chemical engineering profession and current research efforts, and gives exposure to other schools and companies. It's also a great opportunity to meet other ChE's and have a lot of fun.

Social events are scheduled throughout the year. During homecoming weekend, members are encouraged to join N.C. State Chemical Engineering alumni for the football game and a pre-game picnic. Other social events may include Durham Bulls baseball, Raleigh Icecaps hockey, Charlie Goodnight's comedy club, etc. The chapter may also organize fundraisers to assist departmental projects or charitable causes. Depending on participation, the chapter sponsors intramural teams (basketball, volleyball, softball, etc.).

- **Leadership/Organization:** The chapter is lead and managed by a group of officers, with the help of several committee members and the guidance of a faculty advisor. Every spring, the chapter members nominate and elect officers to lead the chapter in the following school year. At the beginning of the fall semester, the new officers recruit members to serve on various committees that help manage the chapter's activities.

How to Join: If you're interested in joining the student chapter of AIChE, attend any of the luncheons or chapter meetings announced in class or via email. The web site for more information is <https://www.ncsuaiche.com/>

OMEGA CHI EPSILON: THE CHEMICAL ENGINEERING HONOR SOCIETY

Omega Chi Epsilon is an organization created to support the academic life of students in chemical engineering.

Mission: The mission of Omega Chi Epsilon is the following:

1. To recognize the achievements of outstanding chemical engineering students.
2. To promote academic pursuits within chemical engineering.
3. To create awareness of chemical engineering among other disciplines.

Membership: The membership of Omega Chi Epsilon is currently restricted to the top 20% of the junior class and the top 25% of the senior class in chemical engineering.

Activities: Members of Omega Chi Epsilon are expected to take an active role in the organization by assisting the Society in its mission within the department. Some of the activities that are planned include:

- **Graduate School Information Session:** A session is planned to bring faculty and students together for a lively discussion of going to graduate school. Faculty and graduate students will discuss questions such as, "How do I apply," "When should I start applying?" and "Why should I pursue graduate study?"
- **Open House:** The organization will assist the department in preparing for the College of Engineering Open House. Most of the recruiting of students into the CHE curriculum occurs at this very important event.
- **Undergraduate Research:** We are compiling a list of faculty members who need students to work in their research programs.

How to Join: If you are eligible based on the criteria for membership, you will be contacted by the secretary of the honor society in the spring. If you are interested and have not been contacted, please email Dr. Bullard or one of the officers for a membership application.

THE INTERNATIONAL SOCIETY FOR PHARMACEUTICAL ENGINEERING

The NC State student chapter of the International Society for Pharmaceutical Engineering (ISPE) was founded in the fall semester of the 1995-96 school year. ISPE is a national organization which supports engineers working in the pharmaceutical industry. Each month, the N.C. State student chapter hosts luncheons featuring speakers from the pharmaceutical industry. The speakers focus on their specific work experiences within the industry as well as featured technical topics. These technically-based luncheons complement many of the recruiting-oriented luncheons featured by AIChE. In addition to the luncheons, students are invited to attend two tours of pharmaceutical facilities each semester. These tours are sponsored by the professional Carolina Chapter of ISPE and offer great opportunities to see the actual work environment and to network with professional engineers. See <http://ispencsu.weebly.com/> for more information.

PRE-LAW – Students who are interested in attending law school should consult the Pre-Law Services web site at <https://prelaw.dasa.ncsu.edu/>

PRE-MED – Students who are interested in attending medical, dental, pharmacy, or other health-related professional program should utilize to the on-line “Health Professions Advising Center” at <https://prehealth.dasa.ncsu.edu/>

STUDY ABROAD - Students interested in Study Abroad opportunities should go to the Study Abroad office and fill out an application packet. In that packet will be a "Request for NC State Academic Approval" form, which the student should take to Brian Koehler (koehler@ncsu.edu) to complete and sign. The web site for more information is <https://studyabroad.ncsu.edu/>

COOPERATIVE ENGINEERING EDUCATION PROGRAM
(OFFICE – 2100 PULLEN HALL)

The cooperative education program enhances and broadens the student's academic experience by alternating periods of academic study with periods of employment. It is a five-year plan with the freshman year on campus. Students alternate semesters of school and work, with a minimum of 12 months of work experience. A typical schedule is illustrated below.

	<u>1st Year</u>			<u>2nd Year</u>			<u>3rd Year</u>			<u>4th Year</u>			<u>5th Year</u>	
	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp
Student A	S	S	W	S	W	S	W	S	W	S	W	S	S	S
Student B	S	S	S	W	S	W	S	W	S	W	S	W	S	S

S=School W=Work

A student may begin the first co-op work period as late as the second semester of the junior year. In this case, the student's graduation may be extended in order to complete twelve months work experience required for program completion.

BACKGROUND

A sound curriculum that combines theoretical and practical training in chemical engineering principles and design coupled with professional work experience is the basis of NC State's Cooperative Education Program. The Cooperative Education Program at NC State provides outstanding undergraduates with terms of full-time study interspersed with up to five semesters and summer sessions of full-time engineering-related employment.

During the past year, 26 individual chemical engineering majors participated in the Co-op program. The students are full-time employees of the sponsoring company during their terms of work. During 2023-2024, the average monthly salary for Co-op chemical engineers was \$4,077. The students worked for 15 different companies at 14 different locations, mostly in the south and southwest US. A high percentage of Co-op students receive offers of professional employment after graduation. Here are some examples of companies who hire co-ops:

AMGEN	FMC CORPORATION	NOVO NORDISK
AVID SOLUTIONS	FUJI FILM	NOVOZYMES
BEKAERT	GE	PATHEON
BIOGEN	GEORGIA PACIFIC	PCA
BOEHME FILATEX	GILEAD SCIENCE	PERFORMANCE FIBERS
BOWATER	GLAXOSMITH KLINE	PHILIP MORRIS
CHEMOURS	HERSHEY	PROGRESS ENERGY
CLOSURE MEDICAL	HONEYWELL	ROBERT E. MASON
COGNIS	INTERNATIONAL PAPER	ROVISYS
CURTIS PAPER	INVISTA	SEALED AIR CORPORATION
DOMTAR INDUSTRIES	KIMBERLY CLARK	SHAW INDUSTRIES
DOW CHEMICAL	MARRANCA ENGINEERING	UNC ENERGY SERVICES
DSM PHARMACEUTICAL	MEAD WESTVACO	WESTROCK
DUPONT	MILLIKEN	
EASTMAN CHEMICAL	NASA KENNEDY	
EXXONMOBIL	NATIONAL GYPSUM	

ADVANTAGES FOR CO-OP STUDENTS

1. Co-op provides for career exploration and confirmation of career choice.
2. The co-op job is a learning laboratory that often provides state-of-the-art equipment that universities cannot afford to purchase.
3. The co-op job provides students the opportunity to develop their human relations and communication skills while working in unique situations with professionals in their field.
4. The co-op experience enhances the marketability of students at graduation.
5. The co-op engineering students (75% of all co-ops) had substantial earnings that helped defray their educational expenses.
6. The NCSU Co-op Program is accredited by ABET. This allows students to use the work experience toward meeting requirements to obtain a license as a professional engineer.
7. NCSU co-op students have a higher rate of graduation than non co-ops.

ENTRY REQUIREMENTS

The applicant must be enrolled as a full-time student in the College of Engineering, must complete the department admission requirements prior to the first scheduled work period, must have a minimum overall grade point average of 2.25/4.00, and should have enough semesters remaining prior to graduation to arrange for a minimum of twelve months work experience. The student should apply at the co-op office early in the semester prior to the first work period. To remain in the program, students must maintain a minimum grade point average of 2.0/4.0 and perform satisfactorily for the employer. Some companies require a higher GPA.

EMPLOYERS--WHO AND WHERE

Employers may be private industry, federal or state agencies, or any firm requiring engineering talent. Geographically, the employers may be anywhere in the USA or even in a foreign country if it can be arranged. Students who are willing to accept co-op jobs outside of North Carolina will find that they have a larger choice of companies and opportunities and less competition for positions than in the Triangle.

EMPLOYER SELECTION

When students make application for the co-op plan, the Co-op Coordinator ascertains the student's interests and strives to match those interests with employer needs, also taking into consideration geographic preferences when possible. Resumes are sent to employers chosen by the student and the coordinator. Interested employers will arrange interviews when feasible. Offers are made and students with more than one offer have a choice. Students are free to suggest employers even though they may not be among those listed with the co-op office.

REGISTRATION

Students going on a co-op job the next semester must register for that semester (as a co-op) during the usual registration period and are considered full-time students while on the job. No academic credit is given for the work period, but a grade of "satisfactory" or "unsatisfactory" is recorded on the student's transcript.

HOUSING

Students are responsible for obtaining housing. Employers are helpful and a few have housing arrangements for their co-ops.

GENERAL

Each student is required to complete a brief work report, and the employer's evaluation of each work period is discussed with the student following the work semester. When co-op students graduate, they are under no obligation to work for their co-op employers, and the employers are under no obligation to offer jobs to the graduating students. A certificate is awarded to graduating students who have satisfactorily completed twelve or more months of co-op work experience and who have submitted a subsequently approved work report for each co-op session. Also, a notation is made on the permanent record for these students indicating the months of work experience obtained.

PROFESSIONAL DEVELOPMENT TOPICS

ELECTRONIC ETIQUETTE

Why do you need email etiquette? (1)

A company needs to implement etiquette rules for the following three reasons:

- Professionalism: by using proper email language your company will convey a professional image.
- Efficiency: emails that get to the point are much more effective than poorly worded emails.
- Protection from liability: employee awareness of email risks will protect your company from costly law suits.

What are the etiquette rules?

There are many etiquette guides and many different etiquette rules. Some rules will differ according to the nature of your business and the corporate culture. Below we list what we consider as the 32 most important email etiquette rules that apply to nearly all companies. (Note: Items 1-32 are all from source 1).

1. Be concise and to the point.

Do not make an e-mail longer than it needs to be. Remember that reading an e-mail is harder than reading printed communications and a long e-mail can be very discouraging to read.

2. Answer all questions, and pre-empt further questions.

An email reply must answer all questions, and pre-empt further questions – If you do not answer all the questions in the original email, you will receive further e-mails regarding the unanswered questions, which will not only waste your time and your customer's time but also cause considerable frustration. Moreover, if you are able to pre-empt relevant questions, your customer will be grateful and impressed with your efficient and thoughtful customer service. Imagine for instance that a customer sends you an email asking which credit cards you accept. Instead of just listing the credit card types, you can guess that their next question will be about how they can order, so you also include some order information and a URL to your order page. Customers will definitely appreciate this.

3. Use proper spelling, grammar & punctuation.

This is not only important because improper spelling, grammar and punctuation give a bad impression of your company, it is also important for conveying the message properly. E-mails with no full stops or commas are difficult to read and can sometimes even change the meaning of the text. And, if your program has a spell checking option, why not use it? [Note: avoid using common IM acronyms unless you are writing to a close friend – many in the older generation will be clueless as to what you are trying to say].

1 <http://www.emailreplies.com/#why>

4. Make it personal.

Not only should the e-mail be personally addressed, it should also include personal i.e. customized content. For this reason auto replies are usually not very effective. However, templates can be used effectively in this way, see next tip.

5. Use templates for frequently used responses.

Some questions you get over and over again, such as directions to your office or how to subscribe to your newsletter. Save these texts as response templates and paste these into your message when you need them. You can save your templates in a Word document, or use pre-formatted emails.

6. Answer swiftly.

Customers send an e-mail because they wish to receive a quick response. If they did not want a quick response they would send a letter or a fax. Therefore, each e-mail should be replied to within at least 24 hours, and preferably within the same working day. If the email is complicated, just send an email back saying that you have received it and that you will get back to them. This will put the customer's mind at rest and usually customers will then be very patient!

7. Do not attach unnecessary files.

By sending large attachments you can annoy customers and even bring down their e-mail system. Wherever possible try to compress attachments and only send attachments when they are productive. Moreover, you need to have a good virus scanner in place since your customers will not be very happy if you send them documents full of viruses!

8. Use proper structure & layout.

Since reading from a screen is more difficult than reading from paper, the structure and layout is very important for e-mail messages. Use short paragraphs and blank lines between each paragraph. When making points, number them or mark each point as separate to keep the overview.

9. Do not overuse the high priority option.

We all know the story of the boy who cried wolf. If you overuse the high priority option, it will lose its function when you really need it. Moreover, even if a mail has high priority, your message will come across as slightly aggressive if you flag it as 'high priority'.

10. Do not write in CAPITALS.

IF YOU WRITE IN CAPITALS IT SEEMS AS IF YOU ARE SHOUTING. This can be highly annoying and might trigger an unwanted response in the form of a flame mail. Therefore, try not to send any email text in capitals. [Likewise, do not eliminate all capital letters unless you're e.e. cummings].

11. Don't leave out the message thread.

When you reply to an email, you must include the original mail in your reply, in other words click 'Reply', instead of 'New Mail'. Some people say that you must remove the previous message since this has already been sent and is therefore unnecessary. However, I could not agree less. If you receive many emails you obviously cannot remember each individual email. This means that a 'threadless email' will not provide enough information and you will have to spend a frustratingly long time to find out the context of the email in order to deal with it. Leaving the thread might take a

fraction longer in download time, but it will save the recipient much more time and frustration in looking for the related emails in their inbox!

12. Add disclaimers to your emails.

It is important to add disclaimers to your internal and external mails, since this can help protect your company from liability. Consider the following scenario: an employee accidentally forwards a virus to a customer by email. The customer decides to sue your company for damages. If you add a disclaimer at the bottom of every external mail, saying that the recipient must check each email for viruses and that it cannot be held liable for any transmitted viruses, this will surely be of help to you in court. Another example: an employee sues the company for allowing a racist email to circulate the office. If your company has an email policy in place and adds an email disclaimer to every mail that states that employees are expressly required not to make defamatory statements, you have a good case of proving that the company did everything it could to prevent offensive emails.

13. Read the email before you send it.

A lot of people don't bother to read an email before they send it out, as can be seen from the many spelling and grammar mistakes contained in emails. Apart from this, reading your email through the eyes of the recipient will help you send a more effective message and avoid misunderstandings and inappropriate comments.

14. Do not overuse Reply to All.

Only use Reply to All if you really need your message to be seen by each person who received the original message.

15. Mailings > use the Bcc: field or do a mail merge.

When sending an email mailing, some people place all the email addresses in the To: field. There are two drawbacks to this practice: (1) the recipient knows that you have sent the same message to a large number of recipients, and (2) you are publicizing someone else's email address without their permission. One way to get round this is to place all addresses in the Bcc: field. However, the recipient will only see the address from the To: field in their email, so if this was empty, the To: field will be blank and this might look like spamming. You could include the mailing list email address in the To: field, or even better, if you have Microsoft Outlook and Word you can do a mail merge and create one message for each recipient. A mail merge also allows you to use fields in the message so that you can for instance address each recipient personally. For more information on how to do a Word mail merge, consult the Help in Word.

16. Take care with abbreviations and emoticons.

In business emails, try not to use abbreviations such as BTW (by the way) and LOL (laugh out loud). The recipient might not be aware of the meanings of the abbreviations and in business emails these are generally not appropriate. The same goes for emoticons, such as the smiley :-). If you are not sure whether your recipient knows what it means, it is better not to use it.

17. Be careful with formatting.

Remember that when you use formatting in your emails, the sender might not be able to view formatting, or might see different fonts than you had intended. When using colors, use a color that is easy to read on the background.

18. Take care with rich text and HTML messages.

Be aware that when you send an email in rich text or HTML format, the sender might only be able to receive plain text emails. If this is the case, the recipient will receive your message as a .txt attachment. Most email clients however, including Microsoft Outlook, are able to receive HTML and rich text messages.

19. Do not forward chain letters.

Do not forward chain letters. We can safely say that all of them are hoaxes. Just delete the letters as soon as you receive them.

20. Do not request delivery and read receipts.

This will almost always annoy your recipient before he or she has even read your message. Besides, it usually does not work anyway since the recipient could have blocked that function, or his/her software might not support it, so what is the use of using it? If you want to know whether an email was received it is better to ask the recipient to let you know if it was received.

21. Do not ask to recall a message.

Biggest chances are that your message has already been delivered and read. A recall request would look very silly in that case wouldn't it? It is better just to send an email to say that you have made a mistake. This will look much more honest than trying to recall a message.

22. Do not copy a message or attachment without permission.

Do not copy a message or attachment belonging to another user without permission of the originator. If you do not ask permission first, you might be infringing on copyright laws.

23. Do not use email to discuss confidential information.

Sending an email is like sending a postcard. If you don't want your email to be displayed on a bulletin board, don't send it. Moreover, never make any libelous, sexist or racially discriminating comments in emails, even if they are meant to be a joke.

24. Use a meaningful subject line, and include an address and closing.

Try to use a subject that is meaningful to the recipient as well as yourself. For instance, when you send an email to a company requesting information about a product, it is better to mention the actual name of the product, e.g. 'Product A information' than to just say 'product information' or the company's name in the subject.

An email should have an opening, typically "Dear Dr. Bullard" – don't just dive into the body of the message. "Hey Dr. Bullard" is not professional. Similarly, you should close the email with "Sincerely", "Thank you", "Regards", another appropriate closing, followed by your name.

25. Use active instead of passive voice.

Try to use the active voice of a verb wherever possible. For instance, 'We will process your order today', sounds better than 'Your order will be processed today'. The first sounds more personal, whereas the latter, especially when used frequently, sounds unnecessarily formal.

26. Avoid using URGENT and IMPORTANT.

Even more so than the high-priority option, you must at all times try to avoid these types of words in an email or subject line. Only use this if it is a really, really urgent or important message.

27. Avoid long sentences.

Try to keep your sentences to a maximum of 15-20 words. Email is meant to be a quick medium and requires a different kind of writing than letters. Also take care not to send emails that are too long. If a person receives an email that looks like a dissertation, chances are that they will not even attempt to read it!

28. Don't send or forward emails containing libelous, defamatory, offensive, racist, or obscene remarks.

By sending or even just forwarding one libelous, or offensive remark in an email, you and your company can face court cases resulting in multi-million dollar penalties.

29. Don't forward virus hoaxes and chain letters.

If you receive an email message warning you of a new unstoppable virus that will immediately delete everything from your computer, this is most probably a hoax. By forwarding hoaxes you use valuable bandwidth and sometimes virus hoaxes contain viruses themselves, by attaching a so-called file that will stop the dangerous virus. The same goes for chain letters that promise incredible riches or ask your help for a charitable cause. Even if the content seems to be bona fide, the senders are usually not. Since it is impossible to find out whether a chain letter is real or not, the best place for it is the recycle bin.

30. Keep your language gender neutral.

In this day and age, avoid using sexist language such as: 'The user should add a signature by configuring his email program'. Apart from using he/she, you can also use the neutral gender: 'The user should add a signature by configuring the email program'.

31. Don't reply to spam.

By replying to spam or by unsubscribing, you are confirming that your email address is 'live'. Confirming this will only generate even more spam. Therefore, just hit the delete button or use email software to remove spam automatically.

32. Use cc: field sparingly.

Try not to use the cc: field unless the recipient in the cc: field knows why they are receiving a copy of the message. Using the cc: field can be confusing since the recipients might not know who is supposed to act on the message. Also, when responding to a cc: message, should you include the other recipient in the cc: field as well? This will depend on the situation. In general, do not include the person in the cc: field unless you have a particular reason for wanting this person to see your response. Again, make sure that this person will know why they are receiving a copy.

33. Remember that email is not always the best form of communication. (2)

There are many subjects that are too sensitive to discuss over email mainly because misinterpretation could have serious consequences. Some topics that should generally be resolved outside of email are:

- Disciplinary action
- Conflicts about grades or personal information
- Concerns about fellow classmates/workmates
- Complaints

When it appears that a dialogue has turned into a conflict, it is best to suggest an end to the swapping of email and for you to talk or meet in person. If you receive a flaming email try to respond in a short and simple response. If that does not appease the flamer, then make contact with him or her outside the virtual realm.

33. For your personal accounts, use a user ID that comes across as professional.

A potential employer who is trying to contact you regarding a position will not be impressed if they are sending their email to thicnspicy@hotmail.com or amishburrito@aol.com. Choose a user name that would not be offensive or childish to a potential employer.

And finally, two very important items to remember:

34. Never send an email when you are angry.

Don't send an angry or sarcastic message without first giving yourself a few hours or overnight to make sure you really want to send it. Remember that an email can be forwarded to your boss or others or used as evidence in court!

This is closely followed by:

35. Remember that email is a public document. (3)

Stop right where you are and set aside a couple of brain cells for the following statement: there is no such thing as a private e-mail. The reason? Keep reading.

With some e-mail systems, the e-mail administrator has the ability to read any and all e-mail messages. If this is the case where you are located, you better hope that there is an honest and respectable person in that position.

Some companies monitor employee e-mail (as well as internet usage). The reasons for this obtrusive behavior range from company management wanting to make sure users are not wasting time on frivolous messages to making sure that company secrets are not being leaked to unauthorized sources.

E-mail software is like all software in that occasionally things go wrong. If this happens, you may end up receiving e-mail meant for another person or your e-mail may get sent to the wrong person. Either way, what you thought was private is not private anymore.

So where does this leave us. First: there is no such thing as a private e-mail. Got it? Second, don't send anything by e-mail that you would not want posted on the company bulletin board. If it's safe enough for the bulletin board, it's safe enough for e-mail. Finally, if you are debating whether or not to send something personal by e-mail, either deliver it by hand or send it by snail mail.

Voice Mail Etiquette (4)

Voice mail is this decade's answering machine. It is an efficient way to communicate valuable information. Statistics show that only 70% of phone calls are ever completed on the first try, therefore voice mail is an important communication tool. Here are eight tips to ensure that your voice mail messages are effective and do not create professional problems for you.

- Yes, it's basic, but...don't forget to give your name and phone number.
- Keep messages short and to the point.
- Never leave a harsh or negative message on voice mail. This can lead to major problems. Unlike a conversation the receiver can redirect it to other people.
- Don't record anything that can be misinterpreted or is confidential.
- If you find yourself reading a prepared memo or announcement over the phone stop. It is better to just send the memo out.
- Always be prepared to leave a message. Statistics show that 70% of the time the individual you wish to speak with will not be available.
- Avoid flippant messages, even in jest.
- Remember to check your voice mail at least twice a day, especially if you receive time sensitive messages.
- Don't leave messages from noisy restaurants, parties or bars, background noise can be heard clearly.

American Institute of Chemical Engineers (AIChE) Code of Ethics

Members of the American Institute of Chemical Engineers shall uphold and advance the integrity, honor, and dignity of the engineering profession by: being honest and impartial, and serving with fidelity their employers, their client, and the public; striving to increase the competence and prestige of the engineering profession; and using their knowledge and skill for the enhancement of human welfare.

To achieve these goals, members shall:

1. Hold paramount the safety, health and welfare of the public in performance of their professional duties.
2. Formally advise their employers or clients (and consider further disclosure, if warranted) if they perceive that a consequence of their duties will adversely affect the present or future health or safety of their colleagues or the public.
3. Accept responsibility for their actions and recognize the contributions of others; seek critical review of their work and offer objective criticism of the work of others.
4. Issue statements or present information only in an objective and truthful manner.
5. Act in professional matters for each employer or client as faithful agents or trustees, and avoid conflicts of interest.
6. Treat all colleagues and coworkers fairly, recognizing their unique contributions and capabilities.
7. Perform professional services only in areas of their services.
8. Build their professional reputations on the merits of their services.
9. Continue their professional development throughout their careers, and provide opportunities for the professional development of those under their supervision.

RESUMES AND COVER LETTERS

Characteristics of a resume that gets results

- Professional in appearance
- Clear, concise, and well-organized
- One page preferred, two pages only if extensive work experience
- White or off-white paper
- 10-12 pt. font size
- Tailored for the organization or position
- Career-related projects, skills, and interests
- Relevant paid and unpaid experiences
- Demonstrated accomplishments
- Involvement on campus or in the community

RESUME TIPS (5)

- **CONTACT INFORMATION:** Don't forget to list a reliable email address and phone number, and include you're your school address and permanent home address. Some employers may need to contact you after you leave campus for a summer position. Note: if you don't use your unity email address, make sure that your personal email address sounds professional (see electronic etiquette article, above) and have a professional message on your voicemail.
- **What's the FASTEST way to improve a resume?** Remove everything that starts with "responsibilities included ..." and replace it with on-the-job ACCOMPLISHMENTS.
- **What the COMMONEST MISTAKE made by resume writers?** Leaving out their Job Objective! (Equivalent to: Somebody knocks on your door. You open it and say, "Hello, what do you want?" They say, "Duh ...")
- **What's the FIRST STEP in writing a resume?** Decide on a job target (or "job objective") that can be stated in about 5 or 6 words. Anything beyond that is "fluff" and indicates lack of clarity and direction.
- **HOW FAR BACK should you go in your Work History?** Far enough; and not TOO far. College students should list high school work experience, but the high school items will probably drop off after college graduation.
- **Don't include "Hobbies" on a resume...UNLESS** the activity is somehow relevant to your job objective. OR it clearly reveals a characteristic that supports your job objective. (A hobby of Sky Diving (adventure, courage) might seem relevant to some job objectives (Security Guard?) but not to others.)
- **Employers HATE parchment paper and pretentious brochure-folded resume "presentations."** They think they're phony, and toss them out.
- **Don't fold a laser-printed resume right along a line of text.** The "ink" could flake off along the fold.
- **What if you don't have any EXPERIENCE in the kind of work you want to do? GET SOME!** Find a place that will let you do some VOLUNTEER work right away. You only need a brief, concentrated period of volunteer training (for example, 1 day/week for a month) to have at least SOME experience to put on your resume. Also, look at some of the volunteer work you've done in the past and see if any of THAT helps document some skills you'll need for your new

job.

- **What if you have GAPS in your work experience?** You could start by LOOKING at it differently. If you were doing ANYTHING valuable (though unpaid) during those so-called "gaps," you could just insert THAT into the work-history section of your resume to fill the hole-- for example: "1993-95 Full-time parent" or "1992-94 Maternity leave and family management" or "Travel and study," or "Full-time student," or, "Parenting plus community service."
- **What if you have a fragmented, scrambled-up work history, with lots of short-term jobs?** To minimize the job-hopper image, combine several similar jobs into one "chunk," for example: 1993-1995 Secretary/receptionist - Jones Bakery; Micro Corp.; Carter Jewelers.
OR
1993-95 Waiter/Busboy - McDougal's Restaurant; Burger-King; Traders Coffee Shop.
ALSO you can just DROP some of the less-important or briefest jobs. But DON'T drop a job, even when it lasted a short time, if that was where you acquired important skills or experience.
- **Students can make their resume look neater by listing seasonal jobs very simply.** Use something such as "Spring 2006" or "Summer 2006" rather than 6/06 to 9/06. (The word "Spring" can be in very tiny letters, say 8-point in size.)
- **What if your job title doesn't reflect your actual level of responsibility?** When you list it on the resume, either REPLACE it with a more appropriate job title (say "Office Manager" instead of "Administrative Assistant" if that's more realistic) OR use "their" job title AND your fairer one together "Administrative Assistant (Office Manager)".
- **Got your degree from a different country?** You can say: "Degree equivalent to U.S. Bachelor's Degree in Economics; Tehran, Iran."
- **What if you don't have your degree yet?** You can say "BS Degree in Chemical Engineering, expected date May, 2009."
- **What if you have several different job objectives you're working on at the same time?** Or you haven't narrowed it down yet to just one job target? Write a different resume for EACH different job target. A targeted resume is much, much stronger than a generic resume.
- **Want to impress an employer?** Fill your resume with "PAR" statements. PAR stands for Problem-Action-Results, in other words, first you state the problem that existed in your workplace, then you describe what YOU did about it, and finally you point out the beneficial results.
 - Here's an example:
 - "Transformed a disorganized, inefficient warehouse into a smooth-running operation by totally redesigning the layout; this saved the company \$250,000 in recovered stock."
 - Another Example:
 - "Improved an engineering company's obsolete filing system by developing a simple but sophisticated functional-coding system. This saved time and money by recovering valuable, previously lost, project records."
- **What if you never had any "real" paid mainstream jobs - just self-employment or odd jobs?** Give yourself credit, and create an accurate, fair job-title for yourself. For example, "A&S Hauling & Cleaning (self-employed)" or "Household Repairman--Self-employed," or "Child-Care--Self-employed." Be sure to add "Customer references available on request" and then be prepared to provide some very good references of people you worked for.

TIPS ON COVER LETTERS (6)

Who Needs a Cover Letter?

Everyone who sends out a resume does! Even if the cover letter never "came up" in conversation or wasn't mentioned in an advertisement, it's expected that you will write one. It is regarded as a sign of laziness (sorry about that) to send out a cover letter that is not tailored to the *specific* company. In the days before word processors, you could *maybe* get away with it. Not anymore.

Yes, it adds to the wear and tear of looking for a job! But the good news is: the cover letter gives you **another** chance to emphasize what you have to contribute to the company or organization. Don't give the person screening the resumes a second to entertain the thought: "**But how can this person help US?**" Your cover letter will answer that question in your own words. Your resume will also answer that question but in a somewhat more rigid format.

What makes a *Good* Cover Letter?

1. **No spelling or typing errors.** Not even one.
2. **Address it to the person who can hire you.** Resumes sent to the personnel department have a tougher time of it. If you can find out (through networking and researching) exactly who is making the hiring decision, address the letter to that person. Be sure the name is spelled correctly and the title is correct. A touch of formality is good too: address the person as "Mr.," "Ms.," "Mrs.," "Miss," "Dr.," or "Professor." (Yes, life is complicated.)
3. **Write it in your own words** so that it sounds like you--not like something out of a book. Employers are looking for knowledge, enthusiasm, focus.
4. **Being "natural" makes many people nervous.** And then even **more** nervous because they are trying to avoid spelling errors and grammatical mistakes. If you need a little help with grammar (do they still teach grammar?)--check out the classic work on simple writing, Strunk & White's **Elements of Style**, published in 1918 and now online. A good place to begin is "Chapter 5: Words and Expressions Commonly Misused."
5. **Show that you know something about the company and the industry.** This is where your research comes in. Don't go overboard--just make it clear that you didn't pick this company out of the phone book. You know who they are, what they do and *you* have chosen them!
6. **Use terms and phrases that are meaningful to the employer.** (This is where your industry research and networking come in.) If you are applying for an advertised position, use the requirements in the ad and put them in **BOLD** type. For example: the ad says--
"2 years' experience processing magnetic media (cartridge, tape, disc); interface with benefit plan design, contracts and claims; and business background with strong analytical & technical skills--dBase, Excel, R&R, SQL."

Make sure your cover letter contains each of these requirements and shows how you measure up.

INTERVIEW TIPS FOR STUDENTS (7)

What to Expect in a Typical On-Campus Interview

- Interviews are usually 30 minutes in length – arrive 10 minutes early so the interview can begin promptly.
- The interviewer will usually spend a few minutes at the beginning introducing himself/herself and giving some information about the company and job openings – it is fine for you to take notes.
- The interviewer will ask questions based on the student's resume – he/she will want to hear specific examples of behaviors from past experiences, not hypothetical or vague answers.
- Time will be left at the end for your questions – be sure to have specific questions about the job openings or location, etc.
- If you want to highlight or point out something you've accomplished that didn't come out in the interview, mention it to the interviewer at the end if there is time.
- Ask for the interviewer's business card if he/she hasn't already given you one.

Do's and Don'ts

- Answer questions honestly, thoroughly, and sincerely – if you don't know the answer, indicate that.
- Do not try to tell the interviewer what you think he/she wants to hear.
- Don't be afraid to discuss your successes and most positive traits.
- Be careful about saying negative things about past experiences (e.g. insult a company that you interned with).
- Don't display a negative or arrogant attitude.
- Be polite, tactful, and sincere – eye contact is also important.
- Be neatly and appropriately dressed in professional business attire (conservative, not trendy).
- Do not be late unless there is an emergency!

How to Prepare Ahead of Time

- Confirm the date, time, and location for your interview with Career Services or via their online information.
- Review the company's website and any literature you've obtained – know the latest "news" about the company.
- Talk to any students on campus that has interned/co-oped with the company (Career Services or the co-op office can tell you).
- Generate quality questions to ask about the company based on what you've read and heard – don't just ask questions for the sake of asking them – make them count.
- Review your resume again to make sure everything is accurate and that you're prepared to answer any questions pertaining to it.
- If for any reason you must cancel or withdraw from an interview, contact the company and/or Career Services promptly – don't be a "no-show".
- If the company needs an employment application or other forms filled out before the interview, do this as soon as you receive them and submit them by the deadline.
- Find out whether you need to bring your transcripts to the interview (Career Services should be able to tell you).
- Even though the interviewer already has your resume, bring an extra copy to the interview just in case he/she needs another one.

Follow-up

- Email or write a "thank-you" note to the interviewer – email is perfectly acceptable.
- Provide the interviewer with updated contact information if it's changed since you last communicated with him/her.
- If you are receiving other offers/have deadlines and need to hear back from the company, contact the interviewer to get an updated status and explain your timeframe.
- If you think of any questions that you forgot to ask during the interview, don't hesitate to email them to the interviewer!

Final Notes

Many companies have a team that will be responsible for 'researching' information on candidates via phone screens, Facebook, MySpace, etc. Depending on the subject matter, it is safe to say that the impact could play a role in whether or not someone is viewed as being the type of employee we would want on our team. Pictures of groups, outings, friends, etc. - all well and good. Those that would probably not be so helpful - well, we know what those look like.

Last Spring we had a group of candidates that were on a plant tour, and a couple of the candidates let their guard down and were trying to be either funny or the center of attention, not realizing that the tour guide provided input to the interview team. This behavior was viewed as immature and not someone that we would want to hire. Students should realize that their interactions with Company employees, be it the assistant that makes and confirms their travel plans, to the Staffing Reps, to the dinner hosts, all the way up to the Hiring Manager, are constantly trying to make a hiring decision given a short amount of time with the candidate. Their interactions with all of these people add up to an impression. Even the company's drivers who take you to and from the airport provide feedback.

INTERVIEW PREP SHEET (8)

This is a document you prepare before important interviews. It is a personal briefing to you, from you. It helps you remember key facts, such as your major accomplishments, and serious questions or concerns. You don't read from the sheet, but you do keep it handy, and if convenient, you may want to review it as your interview is ending to be certain you didn't forget anything critical.

Day and Date:

Meeting With:

Name
Title
Company
City, State Zip
Telephone
FAX
Mobile/Pager
E-mail

Major Accomplishments:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

My Work Style:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Things You Need to Know About Me:

- 1.
- 2.
- 3.
- 4.

Answers to Difficult Questions:

- 1.
- 2.
- 3.
- 4.

My Strengths/Weaknesses:

- 1.
- 2.
- 3.

Questions to Ask Interviewer:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Things I Can Do For You:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

INTERVIEW CHECKLIST (9http://niefs.net/intvw_b.htm)

Preparation - Two to three days before the interview

- I have collected information about the business.
- I know the first and last name of the person(s) who will be interviewing me.
- I know why I want to work for this company.
- I have prepared some answers to common interview questions. I know how I am going to answer these questions and/or I have created a cheat sheet.
- I have prepared a list of questions that I would like to ask the interviewer.
- I have an up-to-date resume with complete references ready to take to the interview.
- I know exactly where the interview will take place and how long it will take me to get there.
- I have decided what to wear to the interview.
- I have scheduled a full night's sleep before the interview.

The Day of the Interview

- I have a copy of my resume and names of my references.
- I have paper and pen for notes.
- I have my cheat sheet and/or my list of questions.
- I have paid special attention to personal hygiene and my choice of clothing.

The Interview - Travel time and Arrival

- I am leaving early in case of traffic jams or unforeseen problems. I do not arrive more than 10 minutes early.
- I am relaxed, friendly and business-like with everyone I meet.
- I introduce myself to the receptionist, and confirm my appointment.

The Interview - Setting the scene

- I greet the interviewer by name and shake their hand.
- I maintain positive body language. e.g. I don't cross my arms and I maintain eye contact

The Interview - Exchanging Information

- I stay on topic and ask for clarification where necessary and when appropriate.
- I use specific examples rather than general statements when giving information about my education, training, transferable skills, and work experience.

The Interview - Conclusion

- I ask any suitable questions that have not already been answered.
- I summarize, with enthusiasm, my interest in the position and the business.
- I state my appreciation for the interview.
- I confirm, if already noted, their response date. If this date is not definite, I make arrangements to contact them.
- I shake hands if appropriate and say goodbye.

Interview - Follow-up

- I keep my cell phone with me the day they said they would call.
- If I have arranged to call them back on a certain date, I make sure that I have reviewed my telephone protocol.
- I write and send the interviewer(s) a thank-you letter.
- If offered a position I give them a written answer (whether it be to accept or to decline) within the week, or by their stated deadline.

EXAMPLES OF INTERVIEW QUESTIONS (10)

Samples of Traditional Interview Questions

- Tell me about yourself.
- What are your strengths and weaknesses?
- What kind of work environment do you like best?
- Why did you apply for this job?
- What jobs have you enjoyed the most? The least? Why?
- What have you done that shows initiative and willingness to work?
- What are your short-range and long-range goals?
- Why did you choose your area of study?
- Do you prefer working with others or by yourself?
- What do you know about our company?
- What qualifications do you have that make you think that you will be successful?
- What have you learned from participation in extracurricular activities?
- What academic subjects do you like the best? Least?

Samples of Behavior Description Interview Questions

- Give me an example of a time when you did more than was required in your job. What was the result?
- Describe the most stressful situation you have encountered. How did you handle it? What was the outcome?
- How do you set priorities?
- Describe a situation where you wished that you had behaved differently. What was the outcome?
- We've all had to work with someone who was difficult. Tell me about the most difficult situation that you have experienced and how you handled it. What was the result?
- How do you define doing a good job?
- Tell me about a time when you did not meet your own standards of performance. What did you do to change that?
- Tell me about the most enjoyable job you've had. What was there about it that made you feel this way?
- Describe a position where you felt that you learned a lot. What advantage was that to you? How have you used those skills?
- Describe the ideal job for you. What tasks would be required?
- Tell me about a situation that occurred as a result of a lack of communication.
- Have you ever had to rely on information given verbally in order to carry out your task? Give some examples. Did this ever cause a problem?
- Describe a situation where you had to change your work plan very quickly in order to accommodate a more urgent situation. How did you feel about that?
- Do you find yourself taking charge of situations? How?

Tips for Students on Attending Career Fairs

Why You Should Attend

- Provides an opportunity to meet and interact with a large number of companies at one time
- Provides an opportunity to market your knowledge, skills, and abilities to a targeted group of employers
- You will be able to meet and talk to people who already work for the companies you are interested in
- Contacts as career fairs can serve as a starting point for you to develop relationships with companies

What Companies are Looking For

- Solid GPA
- Relevant work experience (co-op/internship)
- Strong communication skills
- Demonstrated leadership abilities
- Involvement in extra-curricular activities
- Track record of achievement

What to Expect

- Spend significant time at the event
- Pace yourself
- Distribute a large number of résumés
- Manage what you carry

Preparation Checklist

- Visit Career Services website & office
- Know your target companies
- Buy the proper attire
- Rehearse your introduction
- Create a polished résumé(s)
- Develop a plan for follow-up

Do Your Homework

- Know which companies are attending
- Know which companies are hiring your major
- Know which companies are not hiring your major
- Prepare for a career fair as if you were going to an interview

What to Wear

- Two-piece matched business suit
- Navy, black, or dark gray
- Pants or skirt acceptable for females
- Conservative blouse for females/conservative tie for males
- Comfortable shoes

Introduction

- Be proactive if the recruiter doesn't start the conversation
- Tell the recruiter your name, class, major, and type of position you're seeking
- Practice – but don't sound like you're reading a script

Follow-up

- Follow-up within 48 hours with recruiters from companies you are interested in
- Email or handwrite a thank-you note
- Customize your note to each recruiter, drawing on some memorable aspect of your conversation
- Ask a follow-up question

USEFUL WEB SITES

https://www.cbe.ncsu.edu/	NCSU CBE Department
http://registrar.ncsu.edu/	Records and Registration
https://www.acs.ncsu.edu/php/transfer/	Course Equivalency Database
https://www.engr.ncsu.edu/	NCSU College of Engineering
https://careers.dasa.ncsu.edu/overview/	Co-op Program
https://cdc.dasa.ncsu.edu/	Career Center
https://studyabroad.ncsu.edu/	Study Abroad Program
https://tutorial.dasa.ncsu.edu/	On-Campus Tutoring
https://oucc.dasa.ncsu.edu/foreign-language-proficiency/	Foreign Language Requirement
https://studentservices.ncsu.edu/	NCSU Student Services
http://www.gre.org/	GRE Information
http://www.mba.com/us	GMAT Information
https://prehealth.dasa.ncsu.edu/	Pre-med Information
https://studentconduct.dasa.ncsu.edu/	Office of Student Conduct
https://studentservices.ncsu.edu/your-grades/transcripts/	Transcript Request Form
https://webappprd.acs.ncsu.edu/php/coursecat/directory.php	Course Catalog
http://www.nsf.gov/crssprgm/reu/	NSF Research for Undergrads
http://www.aiche.org/careers/	Careers in CHE
http://www.ncbels.org/	NC Engineering Board (FE Exam)
http://csleps.dasa.ncsu.edu/	Center for Student Leadership and Engagement
http://www.graduatingengineer.com/	Graduating Engineer magazine
http://www.careerkey.org/	Career Key
http://maps.ncsu.edu/#/	NCSU Campus Map
http://www.aiche.org/	AIChE (National)
https://www.ncsuaiche.com/	AIChE (NCSU Student Chapter)