

**Chemical and Biomolecular  
Engineering**

**Student Handbook  
2019-2020**

## **Introduction**

Welcome to the Department of Chemical and Biomolecular Engineering at Clarkson University! Chemical engineering merges the application of chemistry and biology with mathematics and physics to create and develop new engineering platforms, theories and products. It is a versatile discipline offering opportunities for graduates in traditional and emerging markets, such as in the design of plastic parts for automobiles and aircraft, specialized fuels and biofuels, biomaterials, therapeutic proteins and other drugs, processed foods, computer chips, paints, fibers, batteries and solar cells. Example tasks that chemical engineers direct include product development, process design, manufacturing, quality control, pollution control, marketing, and technical sales. Why is Clarkson a great place to prepare for that career? Because we provide a challenging curriculum in a supportive environment and encourage the individual development of each student.

Upon graduation, some of our students seek employment directly, while others go on to graduate school or other professional programs (*e.g.*, medical school, law school). Chemical engineering truly opens the door to many career choices! To prepare for these diverse career paths, your education will include fundamentals of chemistry, applied math, science and engineering with hands-on practical experience. In addition, the curriculum is well rounded with course requirements in the liberal arts, including history, ethics, and communications; these courses are vital towards your development as a professional engineer able to make significant, meaningful contributions to society.

This handbook has been written to answer questions that you might have upon entering Clarkson University in the Chemical and Biomolecular Engineering Department. I encourage you to use this handbook as a reference source throughout your career here. You will find information about academic advising, the curriculum, some Clarkson services, special programs, and advice about semester planning. If the information you need is not present, or you require more details, consult the references listed on page 18; they will lead you to the information you need. If these sources lack the answer you are looking for, see your advisor, he or she is always willing to help you. If you cannot locate your advisor, contact the department office (220 CAMP, Tel. (315) 268-6665).

Again, welcome to the Department of Chemical and Biomolecular Engineering, and I look forward to meeting you. All the best for the upcoming academic year!



Elizabeth J. Podlaha-Murphy  
Department Chair

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#### APPENDIX A

- Chemical Engineering Curriculum
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- Biomolecular Engineering Concentration
- Biomedical and Rehabilitation Engineering (BRE) Minor
- Sustainable Energy Systems Engineering Minor
- Materials Engineering Concentration
- Environmental Engineering Concentration

#### APPENDIX B

- Forms

#### APPENDIX C

- AICHe Code of Ethics

## **Chemical Engineering Program Objectives**

Chemical Engineering Program graduates are expected to:

1. practice chemical engineering\* in continuing and emerging fields and/or
2. be successful in pursuing advanced degrees
3. be motivated to continually develop their knowledge and skills by, for example, taking continuing education or industry training course(s), and acquiring professional engineering certification
4. contribute to society and the engineering profession.

\* Here we define chemical engineering as the discipline that requires a thorough grounding in chemistry and a working knowledge of advanced chemistry; material and energy balances applied to chemical processes; thermodynamics of physical and chemical equilibria; heat, mass and momentum transfer; chemical reaction engineering; continuous and stage-wise separation processes; process dynamics and control; process design and appropriate modern experimental and computing techniques

## **Being a Student**

### **Introduction**

You may have already heard from friends, family members, or guidance counselors that you will experience a different form of education when you enter college; it is not like high school. Now, that does not imply that you should be apprehensive about college, but it does mean that you should keep your eyes open to the new environment and learn to adjust.

### **Self-reliance**

During the next four years, you will find yourself gaining more and more self-reliance. But self-reliance does not mean that you have to do everything yourself; it does mean that you ask for help when you need it and stand on your own two feet when you do not. Developing self-reliance should be one of your goals in college.

### **Professionalism**

One adjustment to college is to think of yourself as a student-professional, a student who will be a professional engineer. In any professional position, there are certain expectations that you must fulfill. The best way to meet these expectations is to keep on top of things; do not let yourself fall behind.

Also, go to classes prepared; have all your work and reading done, and have questions ready. Participate in the discussions, practice the problems the professors assign, and push yourself to do your best. Make the best of every opportunity offered to you. You are building the base for your professional career; build a strong base.

The faculty may not always cover in class everything you need to know, so study beyond the lecture. You will find that the faculty are more like guides, and you have to be both the teacher

as well as the student more than you had to in high school. That is not saying they do not want to help or teach; they are just forcing you to take responsibility for your education. They are preparing you for the professional world where there are no obvious teachers. While you may feel some courses tax your abilities, the faculty are striving to give you the best opportunities for your career.

Near the end of the semester, you will fill out a "course evaluation form" for each of your courses. Your constructive comments regarding the course and the instructor are taken seriously. Your comments help your instructor to improve the course. In addition, the information on the course evaluation form is used in making salary, tenure, and promotion decisions.

### **Code of Ethics**

Clarkson values personal integrity. Matriculation at Clarkson carries with it the obligation that a student will not claim as his or her own, the work of another, or any work that has not been honestly performed, will not take any examination by improper means, and will not aid and abet another in any dishonesty.

## **Advisors**

### **Introduction**

Guidance in selecting from the smorgasbord of career paths and course offerings is always available from your family, your roommate, your professors, and most importantly, from your faculty advisor. Each chemical engineering major has been assigned an advisor. All advisors are faculty members of the Chemical and Biomolecular Engineering Department and have offices in the CAMP building. Your advisor will be your primary link with the Chemical and Biomolecular Engineering Department, particularly in your freshman year when you take relatively few engineering courses. Try to get to know your advisor early and well.

You may wish to change your advisor, perhaps because you have developed career interests that overlap those of another member of the ChBE faculty, or for other reasons. To make a change, go to the ChBE Department Office, 220 CAMP. Changing an advisor is not difficult; however, the department would like to be aware of any potential conflicts or problems that may have occurred.

### **Advisor – Student Relationship**

Visit your advisor more frequently than once a semester so that he or she will become familiar with you, and you with your advisor. This will make the advising process easier and more productive. For example, your advisor will be able to write more effective employment or scholarship recommendations for you if he/she knows you well. Advisors want to help, but it is important to note that they also have many other things to do. Like you, their time is restricted. So, call ahead or email for an appointment. That way they are not caught off guard and can be prepared for the meeting with you.

### **What is the Advisor's Responsibility?**

The advisor is there to help you; help may include career advice, or help in choosing courses. All advisors meet with their advisees during course selection week. Your advisor will have a sign-up sheet posted outside of his/her office door prior to course selection week so that you can make an appointment. The advisor prepares for these meetings by knowing the curriculum well. That means knowing substitute courses, course options available, and the best courses for a certain area of interest. Finally, the advisor must know you, the student. Knowing your goals and interests will help him/her to suggest courses that suit you. After discussing your curriculum, the advisor will clear you for course selection using PeopleSoft.

Your course schedule can be changed through completion of an Add/Drop form. A copy of this form is found in Appendix B. Copies are also available in the department office and on-line off the SAS webpage. Your advisor needs to sign this form.

### **What is the Student's Responsibility?**

The student, not the advisor, is responsible for meeting Clarkson's graduation requirements. Therefore, begin now to plan your Clarkson career. Then you can go into the course selection meeting with your choices for classes pre-selected. Try to see your advisor early in the semester, as was mentioned above. That way many details and problems can be ironed out before the hectic course selection period. Course selection advising is held in March for the fall semester and in late October for the spring semester. Consult the ChBE curriculum sheet (Appendix A) to plan ahead. At course selection time, visit the SAS webpage to learn about course offerings for the next semester.

Planning ahead is often of particular importance to transfer students. Within the two and sometimes fewer years that transfer students need to complete degree requirements, a carefully planned sequence of courses is often necessary in order to take the prerequisite courses needed for more advanced courses of particular interest.

## **Curriculum**

### **Introduction**

Included in this section are the requirements for degree completion, the elective options, special interest concentrations, the Chemical Engineering Honors Program, information concerning the Clarkson Common Experience, and the Fundamentals of Engineering (FE) Exam. Academic options beyond the major include minors, concentrations, dual degrees, a second degree, and double majors. These are all explained below.

Course descriptions may be found on the SAS website just click on the Courses and Schedules link. Course information may also be obtained at the Student Administrative Services (SAS) Center, Graham Hall, or in the Chemical and Biomolecular Engineering Department office, 220 CAMP.

## **Chemical Engineering Curriculum**

The Chemical Engineering curriculum for both traditional and transfer students is outlined in Appendix A. Any student can take 19 credit hours a semester. Beyond this, the student's advisor must approve and must inform the Student Administrative Services in writing. An additional tuition fee will be charged per credit hour over 19 credit hours a semester. A student must be registered for 12 credits to be classified as a full-time student. This could be important in matters of financial aid and health insurance.

## **Requirements of the Clarkson Common Experience**

All Clarkson students must satisfy the requirements of the Common Experience.

### **First Year Seminar (FY 100)**

First Year Seminar treats personal and social adjustment topics as well as Clarkson values, ethics and diversity. [Fall semester] [Required only for first-year students, i.e. anyone entering Clarkson with fewer than 24 credit hours.]

### **The Clarkson Seminar (UNIV 190)**

The Clarkson Seminar welcomes first year students into a world of cultures, histories, and the global forces that will shape their personal and professional lives beyond Clarkson. Students will learn to define issues within a broad cultural context and gain experience evaluating and interpreting literary and nonliterary texts. [Each Semester]

## **Knowledge Areas and University Courses**

Students must achieve learning outcomes in six broad areas of knowledge listed below. The knowledge area requirement is met by completing five individual courses including at least one University Course that encompasses two areas of knowledge. Together, these courses must cover at least four of the following areas of knowledge:

- Cultures and Societies
- Contemporary and Global Issues
- Imaginative Arts
- Science, Technology, and Society
- Economics and Organizations,
- Individual and Group Behavior.

All students must take at least one University course. University Courses will address learning outcomes in two of the six areas of knowledge. University courses are multidisciplinary, and students observe and participate in the interaction of disciplines.



### **Mathematics, Science and Technology Courses**

Students must achieve learning outcomes in basic mathematics, science and technology by completing five courses in these areas. Students develop quantitative literacy through the study of mathematics, including probability and statistics. Students must take two courses in mathematics as specified by the major. Students develop an understanding of the principles of science and technology through two natural science courses, at least one of which must have an integrated laboratory component. Students gain an understanding of how technology is developed through a course that addresses the theme of technology serving humanity. Chemical engineering students meet the requirements with their required courses.

### **Communications**

Clarkson places a strong emphasis on developing students' abilities to communicate effectively in a variety of contexts using diverse forms of communication. Students must select coursework and possibly extra-curricular activities that carry a total of at least six communications points. Courses and activities with a communications component are identified as carrying either one or two points. At least two points must come from within the student's major discipline in a course at the 300 or 400 level. Chemical engineering students will earn one communication point in CH350 and two communication points each in CH410 and in CM244. Therefore, chemical engineering students must take at least one other course carrying one communication point.

### **Major Field of Study**

A significant characteristic of the Common Experience is the integration of requirements from both outside and within a major field of study. Each student pursues a degree program in a major field and must complete a set of prescribed courses to demonstrate mastery of that field. As part of these courses, students achieve outcomes to meet requirements of the Common Experience as described below.

#### Information Technology Expertise

Students will gain expertise in using information technology and computational software appropriate to their major field of study.

#### Communications

Students must complete course work in the major field at the 300 or 400 level that includes discipline-specific communication for a total of at least two communications points, (i.e. CH410).

## Professional Requirement

The Professional Requirement incorporates learning outcomes involving professionalism, ethics, and diversity. These outcomes include understanding the concepts of professionalism, professional responsibility, and professional ethics, and knowing how the student's professional community promotes, supports, and enforces these concepts. Students should develop an appreciation for the value of diversity in the workplace.

## Professional Experience

All students participate in a project-based professional experience following the first-year such as co-op, internship, directed research, or community project clearly related to the student's professional goals.

## **Bachelor's Degree Graduation Requirements**

1. At least 120 credit hours.
2. At least a 2.000 cumulative average.
3. At least a 2.000 cumulative average in the major field of study.
4. Meet the requirements of the Clarkson Common Experience.
5. Meet the requirements for a degree program as determined by the offering department or school.
6. A student entering as a first semester freshman must have been in residence for at least four semesters, including the final undergraduate semester; or, if entering with advanced standing, have completed at least half the remaining upper-level undergraduate work in residence at Clarkson. The program must include a minimum of two semesters (30 credit hours) including the final undergraduate semester.

## **ESL Requirement**

Students for whom English is a second language must take an English language placement examination upon entering Clarkson. Based on the outcome of this examination, a student may be required to complete one or more EAP courses prior to enrolling in the Clarkson Seminar or any course assigned one or two communications points.

## **Other Electives**

The math, engineering science, technical, and undesignated electives should be carefully chosen to further career goals. It is recommended that students concentrate electives rather than make random selections. For example, if you are planning to attend medical school, you will probably fill your undesignated and technical electives with courses related to biology and biochemistry.

The two engineering science electives must be taken from two of three categories: electrical science, materials science, and mechanics. Technical electives are any science, engineering or math course. Engineering electives are any engineering course, i.e., courses with designator AE, Handbook 2019-2020

BR, CH, CE, EE, ES, ME or MP. Safety related courses such as EHS309, 406, and 416 also are considered engineering electives.

Undesignated electives and coursework beyond the 120 credits required for graduation can be taken as “Pass/No Entry”. A Pass/No Entry form is available at the SAS office.

You can use your electives to work towards a concentration, minor, dual degree, second degree, or double major. If you are planning to go to graduate school or want a deeper understanding of chemical engineering fundamentals, you should consider participating in the Chemical Engineering Honors Program. All these options are described in the next section.

## **Special Programs**

### **Certificate Programs**

A student may pursue a concentration, which is a group of classes related to a specific area of interest. There are several concentrations offered by various departments. Some are the Chemical Engineering Honors Program, Biomolecular Engineering, Manufacturing Engineering, Materials Engineering. When the appropriate courses are completed, a certificate or letter from the Dean or Chair will be awarded. For further information contact the department office offering the concentration or consult the Clarkson Catalog. Completion of the concentration is indicated on a student’s official transcript. Several of the certificate programs are summarized below.

### **Chemical Engineering Honors Program**

This program was developed to offer qualified students advanced and challenging material. Students having a cumulative GPA of 3.5 or higher and a 3.5 or better average in CH courses are invited during the summer following their sophomore year or in January of their junior year to enter the program. Additional course requirements include CH490 Elementary Transport Phenomena, one additional math elective, chosen from MA321, MA331, MA339, MA377, STAT383, CH561, ES405, and at least 3 credit hours of undergraduate research. Contact the Chemical Engineering Department for more information.

### **Biomolecular Engineering Concentration**

Information and requirements for the Biomolecular Engineering Concentration can be found at <https://www.clarkson.edu/node/35896>. A curriculum plan for this concentration is shown in Appendix A.

### **Materials Engineering Concentration**

Information and requirements for the Materials Engineering Concentration can be found at <https://www.clarkson.edu/concentration-materials-engineering>. A curriculum plan for this concentration is shown in Appendix A.

## **Minors**

A minor is a group of courses that impart in-depth knowledge of an area distinct from that of a student's major. Completion of the minor is indicated by notation on a student's official transcript. Students wishing to pursue a minor should complete a Minor Form and submit the completed form to Student Administrative Services.

Several minors and their websites are listed below. See the Clarkson University Undergraduate Catalog for a complete listing of minors. Note that students must have a minimum GPA of 2.0 for all minor course requirements.

### **Biomedical and Rehabilitation Engineering Minor**

Information and requirements for the Biomedical and Rehabilitation Engineering Minor can be found at

<https://www.clarkson.edu/crest>. A curriculum plan for this minor is shown in Appendix A. The official list of course requirements is available in the Center for Rehabilitation Engineering, Science & Technology in room 2206 CAMP.

### **Business**

Information and requirements for the Business Minor can be found at <https://www.clarkson.edu/business-minor-curriculum>.

### **Chemistry**

Information and requirements for the Chemistry Minor can be found at <https://www.clarkson.edu/department-chemistry-biomolecular-science/minor-chemistry>.

### **Environmental Engineering**

Information and requirements for the Environmental Engineering Minor can be found at [internal.clarkson.edu/cee/undergraduate/env\\_engineering\\_minor.html](http://internal.clarkson.edu/cee/undergraduate/env_engineering_minor.html). A curriculum plan for this concentration is shown in Appendix A.

### **Environmental Policy**

Information and requirements for the Environmental Policy Minor can be found at <https://www.clarkson.edu/minor-environmental-policy>. See Professor Rosner for additional information.

### **Environmental Science**

Information and requirements for the Environmental Science Minor can be found at <https://www.clarkson.edu/minor-environmental-science>. See Professor Rosner for additional information.

### **Liberal Arts**

Requires a coherent set of five related courses. Contact the Associate Dean, School of Arts and Sciences, for information.

## **Mathematics**

Information and requirements for the Math Minor can be found at <https://www.clarkson.edu/department-mathematics/mathematics-minor-curriculum>.

## **Physics**

Information and requirements for the Physics Minor can be found at <https://www.clarkson.edu/department-physics/minor-physics>.

## **Sustainable Energy Systems Engineering**

Information and requirements for the Sustainable Energy Systems Engineering Minor can be found at <https://www.clarkson.edu/minor-sustainable-energy-systems-engineering>.

## **Other Areas of Study**

You are not limited to only one degree or one specific area of study. You may decide to obtain dual degrees, a double major, or a second degree. Clarkson also has an Engineering MBA-MS 4+1 program.

### **Dual Degree**

Dual degrees are two different bachelor's degrees at one commencement; for instance, a Chemistry Degree and a Chemical Engineering Degree. To do this you must complete at least 150 credit hours with at least 30 credit hours unique to each program. To obtain a dual degree you must complete a form that can be obtained from the department secretaries or from Student Administrative Services Center. A copy of this form is shown in Appendix B.

### **Second Degree**

A second degree means that you could receive two degrees at TWO different commencements. To do this, you need at least 150 credit hours with at least 30 credit hours unique to each program. Also, at least 12 credit hours (6 of which are upper level courses) toward the second degree must be completed in residence after the awarding of the first degree. To obtain a second degree you have to be readmitted to Clarkson through the Student Administrative Services Center.

### **Double Majors**

You may decide to pursue two majors while at Clarkson. Your advisor should be able to direct you to a source that can tell you the courses needed to complete the second major. The form in Appendix B must be completed to establish your double major. A double major requires completion of all requirements for both programs prior to graduation.

### **Engineering MBA-MS 4 + 1 Program**

The Schools of Business and Engineering have an option which allows a freshman undergraduate engineer who wants an MBA or Master of Science in Management Systems to plan required courses so that the graduate degree can be completed at Clarkson in one year beyond the baccalaureate. This may require taking more than fifteen credit hours in some semesters and will require careful planning.

Students in this option will be in a dual major (engineering and either MBA or MS). They will be classified as engineering students with engineering advisors. Their admission to the MBA/MS program is conditional until they meet traditional School of Business admission requirements (GMAT's, etc.). Contact the School of Business for more information.

### **Student Academic Records**

Your academic record is kept by your assigned advisor and also by the Chemical and Biomolecular Engineering Department, 220 CAMP. This record will be used to determine if you have met Clarkson's graduation requirements. Take an interest in this record and make sure that it is up-to-date. You are entitled to a copy of this record at any time. You can also track your progress toward graduation in PeopleSoft.

### **Changing Majors**

You may decide to change majors. This is accomplished by notifying the Department that you wish to enter and signing a "Change of Major" form prepared by that Department.

### **Transfer Credit**

Advanced Placement Credit can be granted to you. See the Student Administrative Services Center for information and to get the credit applied to your transcript. It is best to do this as soon as possible or prior to arriving on campus for your first semester.

Transfer credit from another college or university is also dealt with through the Student Administrative Services Center. Before taking a course from another university, an Off-Campus Work Permission form is to be filled out and approved. (See Appendix B).

### **Cross Registration**

The Associated Colleges of the St. Lawrence Valley (Clarkson University, SUNY at Potsdam, St. Lawrence University, and SUNY at Canton) allow students to cross register for up to two courses per year at any of the other member colleges. Information may be obtained from the Student Administrative Services Center.

## **English as a Second Language Test**

All non-native English speaking undergraduates are required to take the English as a Second Language (ESL) Placement Test. Depending on the results, the foreign student must take up to two semesters of ESL. A student who is at the intermediate level must pass both the intermediate and advanced ESL courses (EAP250 and EAP350). Contact the Liberal Studies Center for further information.

## **Fundamentals of Engineering Exam (FE Exam)**

To obtain registration as a Professional Engineer, an examination called the Professional Engineering Exam must first be passed. It is a two part exam. The first part, Fundamentals of Engineering (FE exam), is typically taken in the spring of the senior year, and the second part is taken after having at least four years of work experience satisfactory to the State Licensing Board. The School of Engineering offers review sessions for the FE exam. The various subjects are Electrical Science, Materials Science, Strength of Materials, Dynamics, Thermodynamics, Statics, Economics, and Fluid Mechanics. Dates and Times are announced at the beginning of the Spring semester or you can contact Carrie Hayes in CAMP 102 or at (315) 268-6446. Registration information for this exam can be found at <https://ncees.org/engineering/#new-york>.

## **Graduate School**

Many of you should consider graduate school, particularly if you find you would like to become more focused within the broad spectrum of chemical engineering. As an undergraduate you may take a graduate-level course. To take a 500-level graduate course, you must have a 3.0 GPA and approval of the Chair. For taking a 600-level graduate course you must have a 3.5 GPA and approval of the Chair and Dean of Engineering. Your advisor or other faculty members can provide information.

The Chemical and Biomolecular Engineering Department offers the Master of Engineering, the Master of Science, and the Doctor of Philosophy degrees. Chemical engineering students also frequently pursue graduate degrees in chemistry, environmental engineering, or the School of Business. Consult the Clarkson Catalog, or contact the department office for more information.

## **Career Planning**

There are many things that you can do to plan your career. The best place to start is to decide on your interests. Build a career on the aspects of engineering that you enjoy. Talking to your advisor is a good way to see what is out in the work world. Many faculty members have held industrial positions before entering teaching, or are working for industry or government as a researcher. Make contact with the staff of the Career Development Center in the Educational Resources Center (ERC), Suite 2300 or call (315) 268-6477 and find out what they can do for you. Also, attend the Career Fairs held each fall and spring. Many company representatives

come to Clarkson for the fair; some of them are Clarkson graduates. This is a good opportunity to speak to them about opportunities in the world today.

After discovering your interests, your curriculum can be chosen. Consult the on-line Course Catalog for when courses are offered and what are their prerequisites. Discuss your plans with your faculty advisor.

### **Cooperative Education Program**

The Cooperative Education Program (Co-op Program) is a good way to get practical experience by working in a company for one semester. To find out more about this program contact the Career Development Center located in the ERC.

### **Study Abroad Program**

Some students, usually in their junior year, participate in exchange programs that Clarkson has with many overseas, technical universities. The total number of credits transferred to Clarkson should not exceed 15. Prior to departure, an Off-Campus Coursework Permission form must be completed and approved for each course. To find out more details contact the Career Development Center in the ERC.

### **Societies and Activities**

There are many professional and honor societies on campus that relate to Chemical Engineering. These societies may give further information about what types of jobs are available and what kind of work is presently being done in the field. To learn more about these organizations check the Student Activities Office, 2nd floor of the Student Center, or call the presidents of the organizations (contact information on the Student Directory).

#### **Professional Societies**

- American Institute of Chemical Engineers (AIChE), Faculty Advisor is Prof. R. Taylor
- Society of Women Engineers (SWE), Faculty Advisor is Prof. J. DeWaters

#### **Honor Societies**

- Omega Chi Epsilon (Chemical Engineering), Advisor is Prof. E. Podlaha-Murphy
- Tau Beta Pi (Engineering) Department Advisor, Prof. S. Krishnan
- Phi Kappa Phi (All Disciplines), A Chapter officer is Prof. R. McCluskey



## Awards

The Department honors deserving students each year with the following awards:

- **The Outstanding Chemical Engineering Senior Award** is presented annually to an outstanding chemical engineering senior selected by the faculty of the Chemical and Biomolecular Engineering Department. The recipient receives a certificate and a three-year subscription to the magazine “*Chemical Engineering*”. The recipient’s name is also inscribed on a plaque in the department.
- **The Pablo Guttman Award** is presented annually to the most conscientious chemical engineering junior. The recipient receives a copy of Poling, Prausnitz, and O’Connell’s, “*Properties of Gases and Liquids*”. The recipient’s name is also inscribed on a plaque in the department.
- **R Shankar Subramanian Prize for Outstanding Scholarly Achievement in Chemical Engineering:** Established in 2011 by R. Shankar Subramanian to recognize and honor a Chemical Engineering junior at Clarkson each year who has best demonstrated a scholarly approach toward studies, and who shows promise for continuing accomplishments in the future. R. Shankar Subramanian is a faculty member in the Department of Chemical and Biomolecular Engineering, and a past Chair of the Department from 1986 to 1996. The recipient receives \$1,000 from the endowment, and the recipient’s name is inscribed on a plaque in the Department.

## Clarkson Services

### **The Student Administrative Services Center**

This center is located in Graham Hall and provides information on enrollment, financial aid, course schedules, student employment, and many other topics. You can also pay bills, order transcripts, correct personal data, pick up and drop off various academic and financial aid forms, etc. Their phone number is (315) 268-6451.

### **The Counseling Center**

The Counseling Center (located on the first floor of the ERC) offers counseling, workshops and seminars. Topics for the workshops and seminars include, for example: time management, understanding your personality, long-distance relationships, stress control, alcohol and drug awareness, and dealing with shyness. For appointments or further information on this service call (315) 268-6633.

### **Student Success Center**

The Student Success Center (located in the first floor of the ERC) provides services including: tutoring, counseling related to time management, study skills and aids for students needing accommodative services. For appointments and information concerning student support services call (315) 268-2209. For Office of Accessibility Services (OAS) related to the American Disabilities Act, please call (315) 268-7643. They are located on the first floor of Price Hall.

### **The Student Health Center**

This facility is located on the first floor of the ERC. It provides outpatient services, emergency care, health screening, and health counseling and education. For further information, see the Clarkson Catalog or call (315) 268-6633.

### **The Writing Center**

Peer tutoring is provided for students who need help with writing assignments. The center is located in the Bertrand H. Snell Hall, Room 139 or by calling (315) 268-4439.

### **Career and International Center**

Foreign Student Advising is available in room 2300 on the second floor of the ERC. The service includes orientation and special advising for such topics as visa, status requirements, and work regulations. For further information on this service or an appointment call Tess Casler at (315) 268-3943.

### **Extracurricular Activities**

Potsdam offers many extracurricular activities: lectures, concerts, seminars, club meetings, professional societies, sports, movies, etc. Student organizations at Clarkson hold an Activities Fair each fall to gain publicity and recruit enthusiastic new members. Chemical engineering majors are urged to participate in student clubs both for relaxation and to gain leadership experience, especially the professional societies listed on page 15.

### **References**

**Clarkson Catalog.** The Clarkson Catalog is available online at:  
[https://www.clarkson.edu/sites/default/files/2017-10/17-18-ugrad-catalog\\_0.pdf](https://www.clarkson.edu/sites/default/files/2017-10/17-18-ugrad-catalog_0.pdf).

**Clarkson Regulations.** The Clarkson Regulations are available online at:  
<https://www.clarkson.edu/student-administrative-services-sas/clarkson-regulations>.

**Courses.** This information is available online at:  
[http://internal.clarkson.edu/sas/classes\\_schedules/index.html](http://internal.clarkson.edu/sas/classes_schedules/index.html).

**University Directory.** The University Directory is available online at:  
<http://internal.clarkson.edu/directories/index.html>.

## **Important Phone Numbers**

### **Chemical and Biomolecular Engineering Department:**

#### **Chair:**

Professor Elizabeth Podlaha-Murphy, 222A CAMP, (315) 268-6650

#### **Executive Officer:**

Professor Sitaraman Krishnan, 220 CAMP, (315) 268-2303

#### **Department Secretaries:**

Ms. Jean Gang, 220 CAMP, (315) 268-6665

#### **Emergency:**

- Campus Safety, Educational Resource Center (ERC), (315) 268-6666

**Dial "911" (off campus emergencies) Potsdam police and rescue squad**

## Faculty

<p><b>S.V. Babu</b> Distinguished University Professor and Director, CAMP 350 CAMP, (315) 268-2336, <a href="mailto:babu@clarkson.edu">babu@clarkson.edu</a> Dr. Babu's research interests are in the areas of chemical-mechanical planarization of metal and dielectric films and thin films for photovoltaic applications.</p>	<p><b>Shunsuke Nakao</b> Assistant Professor 227 CAMP, (315) 268-4471, <a href="mailto:snakao@clarkson.edu">snakao@clarkson.edu</a> Dr. Nakao's research interests are on aerosol-cloud-climate interaction, air quality, atmospheric chemistry, and aerosol physics.</p>
<p><b>Ruth E. Baltus</b> Professor 226 CAMP, (315) 268-2368, <a href="mailto:baltus@clarkson.edu">baltus@clarkson.edu</a> Dr. Baltus' research interests are in the area of membrane separations, membrane characterization and room temperature ionic liquids for gas separations.</p>	<p><b>Eunsu Paek</b> Assistant Professor 233 CAMP, (315) 268-6621, <a href="mailto:epaek@clarkson.edu">epaek@clarkson.edu</a> Dr. Paek's research focuses on developing theoretical foundations for guiding the rational design and synthesis of novel nanomaterials for energy and environmental applications</p>
<p><b>Yuncheng Du</b> Assistant Professor 238 CAMP, (315) 268-2284 Dr. Du's research is in uncertainty quantification, control theory and their applications in process systems engineering and biomedical engineering. Some specific applications include: (i) Design of computationally efficient algorithms for optimal process control and improved fault diagnosis of chemical processes; (ii) Multi-scale modeling and control systems development for optimal clinical decision-making and advanced healthcare service.</p>	<p><b>Elizabeth Podlaha Murphy</b> Professor and Chair 222A CAMP, (315) 268-4167, <a href="mailto:epodlaha@clarkson.edu">epodlaha@clarkson.edu</a> Dr. Podlaha Murphy's electrochemical research focusses on the electrodeposition of alloys and composites of different length scales for the advancement of nano and micro devices, and catalytic materials for water splitting reactions, fuel cells and batteries. Experimental examination together with theoretical modeling are used to gain fundamental understanding of these electrochemical processes.</p>
<p><b>Sitaraman Krishnan</b> Professor and Executive Officer 229 CAMP, (315) 268-6661, <a href="mailto:skrishna@clarkson.edu">skrishna@clarkson.edu</a> Dr. Krishnan's research interests are in the field of self-assembly of soft condensed matter, and engineering of well defined biointerfaces.</p>	<p><b>Ross Taylor</b> Kodak Professor 244 CAMP, (315) 268-6652, <a href="mailto:taylor@clarkson.edu">taylor@clarkson.edu</a> Transfer student evaluator and advisor. Dr. Taylor's research interests are in the areas of multi-component mass transfer, separation process simulation and applications of computer algebra in engineering.</p>
<p><b>Richard J. McCluskey</b> Emeritus professor 220A CAMP, (315) 268-2303, <a href="mailto:bq02@clarkson.edu">bq02@clarkson.edu</a> Dr. McCluskey's research interests are in the areas of reaction kinetics and thermodynamics.</p>	<p><b>Selma Mededovic Thagard</b> Associate Professor 243 CAMP, (315) 268-4423, <a href="mailto:smededov@clarkson.edu">smededov@clarkson.edu</a> Dr. Thagard's research interests are in the areas of non-thermal plasma for pollution control and material synthesis, plasma chemistry, reactor design, transport phenomena, chemical kinetics, advanced oxidation technologies, mathematical modeling of plasma etching and electrical discharges.</p>

# **APPENDIX A**

## *CHEMICAL ENGINEERING CURRICULUM*

# The Chemical Engineering Curriculum

## For Class of 2019 and Later

### Freshman Year

#### Fall

CM131 (or CM103/105) Gen. Chemistry I  
 PH131 Physics I or ES110 Eng. and Society\*  
 MA131 Calculus I  
 UNIV190 Clarkson Seminar  
 FY100 First Year Seminar (1cr)

#### Spring

CM132 (or CM104) Gen. Chemistry II  
 PH132 Physics II or PH131 Physics I  
 MA132 Calculus II  
 ES100 Intro to Use of the Computer (2cr)  
 Knowledge Area Elective\*

### Sophomore Year

#### Fall

CH210 Molecular Properties  
 CH220 Material Balances  
 CM241 Organic Chemistry I  
 MA231 Calculus III  
 ES Elective or PH132 Physics II

#### Spring

BY160 Bio II: Cellular and Molecular  
 Biology  
 CH260 Thermodynamics & Energy Balances  
 CM242 Organic Chemistry II  
 MA232 Differential Equations  
 Knowledge Area Elective or ES Elective

### Junior Year

#### Fall

CH320 Phase Equilibria  
 CH330 Transfer Process Fundamentals  
 CM244 Organic Chemistry Lab  
 EC350 Econ. Prin. & Engr. Econ\*\*  
 Technical Elective

#### Spring

CH350 Chemical Eng. Lab I (1 cr)  
 CH360 Chemical Reactor Analysis I  
 CH370 Design of Transfer Process  
 Equipment  
 ES Elective  
 Math Elective  
 Knowledge Area Elective

#### Summer

Professional Experience

### Senior Year

#### Fall

CH410 Chemical Eng Lab II (2 cr)  
 CH420 Process Econ. & Conceptual Design  
 ES499 Professional Experience (0 cr)  
 Engineering Elective\*\*\*  
 Knowledge Area Elective  
 Undesignated Elective

#### Spring

CH460 Process Dynamics & Control  
 Technical Elective  
 Engineering Elective\*\*\*  
 Engineering Elective  
 Undesignated Elective

\*Engineering majors must take ES110, BR200 or ES238. Each is an STS knowledge area course.

\*\* Satisfies the Knowledge Area "Economics and Organizations" requirement.

\*\*\*A safety related course such as CH430, EHS309, EHS406, or EHS416 is recommended as one engineering elective.

# A Typical Chemical Engineering Transfer Student Course Schedule

## Junior Year

### Fall

CH210 Molecular Properties  
 CH220 Material Balances  
 CH330 Transfer Process Fundamentals  
 Elective (ES)  
 EC350 Econ. Prin. & Engr. Econ\*\*

### Spring

BY160 Bio II: Cellular and Molecular  
 Biology  
 CH260 Thermodynamics & Energy Balances  
 CH350 Chemical Eng. Lab I (1 cr)  
 CH360 Chemical Reactor Analysis I  
 Engineering Elective\*\*\*  
 Knowledge Area Elective

### Summer

Professional Experience

## Senior Year

### Fall

CH320 Phase Equilibria  
 CH410 Chemical Engineering Lab II (2 cr)  
 CH420 Process Economics & Conceptual  
 Design  
 ES499 Professional Experience (0 cr)  
 Elective (Math)  
 Knowledge Area Elective

### Spring

CH370 Design of Transfer Process Equipment  
 CH460 Process Dynamics & Control  
 Elective (ES)  
 Engineering Elective\*\*\*  
 Engineering Elective

\*\* Satisfies the Knowledge Area "Economics and Organizations" requirement.

\*\*\*A safety related course such as CH430, EHS309, EHS406, or EHS416 is recommended as one engineering elective.

# BS in Chemical Engineering with Biomolecular Engineering Concentration

## Freshman Year

### Fall

CM131 (or CM103/105) Gen. Chemistry I  
PH131 Physics I or ES110 Eng. and Society\*  
MA131 Calculus I  
UNIV190 Clarkson Seminar  
FY100 First Year Seminar (1 cr)

### Spring

CM132 (or CM104) Gen. Chemistry II  
PH132 Physics II or PH131 Physics I  
MA132 Calculus II  
ES100 Intro to Use of the Computer (2 cr)  
Knowledge Area Elective

## Sophomore Year

### Fall

CH210 Molecular Properties  
CH220 Materials Balances  
CM241 Organic Chemistry I  
MA231 Calculus III  
ES Elective or PH132 Physics II

### Spring

CH260 Thermodynamics & Energy Balances  
CM242 Organic Chemistry II  
BY160/162 Cellular & Molecular Biology/Lab  
MA232 Differential Equations  
Knowledge Area Elective or ES Elective

## Junior Year

### Fall

CH320 Phase Equilibria  
CH330 Transfer Process Fundamentals  
CM244 Organic Chemistry Lab  
++Restricted Elective or STAT383  
EC350 Econ. Prin. & Engr. Econ\*\*

### Spring

CH350 Chemical Eng. Lab I (1 cr)  
CH360 Chemical Reactor Analysis I  
CH370 Design of Transfer Process Equipment  
CH465 Biochemical Eng. or ES Elective  
Technical Elective  
STAT383 Prob. & Stat. or Restricted Elective++

## Summer

Professional Experience

## Senior Year

### Fall

CH410 Chemical Engineering Lab II (2 cr)  
CH420 Process Econ. & Conceptual Design  
CM460 Biochemistry I  
Undesignated Elective  
ES499 Professional Experience (0 cr)  
Knowledge Area Elective

### Spring

CH460 Process Dynamics & Control  
CH465 Biochemical Engineering or  
ES Elective  
Engineering Elective  
Engineering Elective  
Knowledge Area Elective

++selected from: BR200; BY214; BY310; BY320/2; BY330; BY360/2; BY412; BY419; BY/CM452; BY460; BY471/3; CM453; EE485; EHS416; ES380; ES452.

\* Satisfies the Knowledge Area "Science, Technology, and Society" requirement.

\*\* Satisfies the Knowledge Area "Economics and Organizations" requirement.



# BS in Chemical Engineering with Biomedical and Rehabilitation Engineering

## (BRE) Minor

### Freshman Year

#### Fall

CM131 (or CM103/105) Gen. Chemistry I  
PH131 Physics I or ES110 Eng. and Society\*  
MA131 Calculus I  
UNIV190 Clarkson Seminar  
FY100 First Year Seminar (1cr)

#### Spring

CM132 (or CM104) Gen. Chemistry II  
PH132 Physics II or PH131 Physics I  
MA132 Calculus II  
ES100 Intro to Use of the Computer (2 cr)  
Knowledge Area Elective

### Sophomore Year

#### Fall

CH210 Molecular Properties  
CH220 Material Balances  
CM241 Organic Chemistry I  
MA231 Calculus III  
BR200 Intro. To Biomed. & Rehabilitation  
Eng., Science & Technology\*

#### Spring

CH260 Thermodynamics and Energy Balances  
CM242 Organic Chemistry II  
BY160 Cellular & Molecular Bio.  
MA232 Differential Equations  
Knowledge Area Elective or PH132 Physics II

### Junior Year

#### Fall

CH320 Phase Equilibria  
CH330 Transfer Process Fundamentals  
CM244 Organic Chemistry Lab  
EC350 Econ. Prin. & Engr. Econ\*\*  
BY471/473 Anatomy and Physiology (5 cr)

#### Spring

CH350 Chemical Eng. Lab I (1 cr)  
CH360 Chemical Reactor Analysis I  
CH370 Design of Transfer Process Equip.  
BR400 Biomedical Engineering  
Math Elective  
ES Elective

#### Summer

Professional Experience

### Senior Year

#### Fall

CH410 Chemical Engineering Lab II (2 cr)  
CH420 Process Economics & Conceptual Design  
ES499 Professional Experience (0 cr)  
BR450 Biomedical Engineering Capstone Design  
BME Breadth or Depth Elective or ES Elective\*\*\*  
Undesignated Elective (1 cr)

#### Spring

CH460 Process Dynamics & Control  
BME Breadth or Depth Elective\*\*\*  
ES Elective\*\*\*  
Knowledge Area Elective  
Undesignated Elective

\* Satisfies the Knowledge Area "Science, Technology, and Society" requirement

\*\* Satisfies the Knowledge Area "Economics and Organizations" requirement.

\*\*\* ME380 or ES452 can satisfy Engineering Depth Elective as well as ES Elective

# BS in Chemical Engineering with Sustainable Energy Systems Engineering Minor

(See website: <https://www.clarkson.edu/minor-sustainable-energy-systems-engineering>)

## Freshman Year

### Fall

CM131 (or CM103/105) Gen. Chemistry I  
PH131 Physics I or ES110 Eng. and Society^  
MA131 Calculus I  
UNIV190 Clarkson Seminar  
FY100 First Year Seminar (1 cr)

### Spring

CM132 (or CM104) Gen. Chemistry II  
PH132 Physics II or PH131 Physics I  
MA132 Calculus II  
ES100 Intro to Use of the Computer (2 cr)  
Knowledge Area Elective

## Sophomore Year

### Fall

CH210 Molecular Properties  
CH220 Material Balances  
CM241 Organic Chemistry I  
MA231 Calculus III  
Knowledge Area Elective\* or PH132 Physics II

### Spring

BY160 Bio II: Cellular and Molecular Biology  
CH260 Thermodynamics and Energy Balances  
CM242 Organic Chemistry II  
MA232 Differential Equations  
ES238 Intro to Energy Systems^

## Junior Year

### Fall

CH320 Phase Equilibria  
CH330 Transfer Process Fundamentals  
CM244 Organic Chemistry Lab  
EC350 Econ. Prin. & Engr. Econ\*\*  
Knowledge Area Elective\* or ES250 Elec. Sci.

### Spring

CH350 Chemical Eng. Lab I (1 cr)  
CH360 Chemical Reactor Analysis I  
CH370 Design of Transfer Process Equipment  
ES Elective  
Math Elective  
Knowledge Area Elective or ES250 Elec. Sci.

### Summer

Professional Experience

## Senior Year

### Fall

CH410 Chemical Eng Lab II (2 cr)  
CH420 Process Econ. & Conceptual Design\*\*\*  
ES499 Professional Experience (0 cr)  
Engineering Elective\*\*\*\*  
Knowledge Area Elective or Undesignated Elective

### Spring

CH460 Process Dynamics & Control  
Technical Elective  
Engineering Elective\*\*\*\*  
Engineering Elective\*\*\*\*  
Undesignated Elective

\*One Knowledge Area course must be one of the following: EC360 (EC,IG), PHIL370 (STS), PHIL405 (STS), POL372 (EC,STS), POL375 (CGI), POL470 (STS), or POL471 (EC, STS).

\*\*Satisfies the Knowledge Area "Economics and Organizations" requirement.

\*\*\*Design course project must have an energy focus

\*\*\*\*Engineering electives should be CE486 OR ES436, and any two of: (CE409 or CH434), EE331, EE438, ES443 EV305 or ME310

^Satisfies the Knowledge Area "Science, Technology, and Society" requirement.

# BS in Chemical Engineering with Materials Engineering Concentration

(See website: <https://www.clarkson.edu/concentration-materials-engineering>)

## Freshman Year

### Fall

CM131 (or CM103/105) Gen. Chemistry I  
PH131 Physics I or ES110 Eng. and Society\*  
MA131 Calculus I  
UNIV190 Clarkson Seminar  
FY100 First Year Seminar (1cr)

### Spring

CM132 (or CM104) Gen. Chemistry I  
PH132 Physics II or PH131 Physics I  
MA132 Calculus II  
ES100 Intro to Use of the Computer (2 cr)  
Knowledge Area Elective \*

## Sophomore Year

### Fall

CH210 Molecular Properties  
CH220 Material Balances  
CM241 Organic Chemistry I  
MA231 Calculus III  
  
ES260 Materials Science & Eng I

### Spring

BY160 Bio II: Cellular and Molecular Biology or PH132 Physics II  
CH260 Thermodynamics and Energy Balances  
CM242 Organic Chemistry II  
MA232 Differential Equations  
ES360 Materials Science & Eng II

## Junior Year

### Fall

CH320 Phase Equilibria  
CH330 Transfer Process Fundamentals  
CM244 Organic Chemistry Lab  
Materials+ or Math Elective  
EC350 Econ. Prin. & Engr. Econ\*\*

### Spring

CH350 Chemical Eng. Lab I (1 cr)  
CH360 Chemical Reactor Analysis I  
CH370 Design of Transfer Process Equipment  
Math or Materials Elective+  
Knowledge Area Elective or BY160 Bio II  
Materials Elective+

### Summer

Professional Experience

## Senior Year

### Fall

CH410 Chemical Eng. Lab II (2 cr)  
CH420 Process Economics & Conceptual Design  
ES499 Professional Experience (0 cr)  
ES or Materials Elective+  
Engineering Elective  
Knowledge Area Elective

### Spring

CH460 Process Dynamics & Control  
Engineering Elective  
ES or Materials Elective+  
Knowledge Area Elective  
Undesignated Elective

\*Engineering majors must take ES110, BR200 or ES238. Each is an STS knowledge area course.

Students have considerable freedom as to when electives are taken.

Any engineering course taken as a "materials elective" will satisfy an engineering elective requirement.

+Mat'l's Electives must be: Any three of CE411, CM430, CM450, EE439, ES357, ES361, ES452, ES464, ME390, ME457, ME492, ME591, PH341 or PH442.

# BS in Chemical Engineering with Environmental Engineering Minor

(See website: [http://internal.clarkson.edu/cee/undergraduate/env\\_engineering\\_minor.html](http://internal.clarkson.edu/cee/undergraduate/env_engineering_minor.html))

## Freshman Year

### Fall

CM131 (or CM103/105) Gen. Chemistry I  
PH131 Physics I or ES110 Eng and Society\*  
MA131 Calculus I  
UNIV190 Clarkson Seminar  
FY100 First Year Seminar (1 cr)

### Spring

CM132 (or CM104) Gen. Chemistry II  
PH132 Physics II or PH131 Physics I  
MA132 Calculus II  
ES100 Intro to Use of the Computer (2 cr)  
Knowledge Area Elective

## Sophomore Year

### Fall

CH210 Molecular Properties  
CH220 Material Balances  
CM241 Organic Chemistry I  
MA231 Calculus III  
ES Elective or PH132 Physics II

### Spring

BY160 Bio II: Cellular and Molecular  
Biology  
CH260 Thermodynamics & Energy Balances  
CM242 Organic Chemistry II  
MA232 Differential Equations  
Knowledge Area Elective or ES Elective

## Junior Year

### Fall

CH320 Phase Equilibria  
CH330 Transfer Process Fundamentals  
CM244 Organic Chemistry Lab  
EC350 Econ. Prin. & Engr. Econ\*\*  
Or BY222 and BY244^  
Knowledge Area Elective

### Spring

CH350 Chemical Engr. Lab I (1 cr)  
CH360 Chemical Reactor Analysis I  
CH370 Design of Transfer Process Equipment  
Math Elective  
ES Elective  
EC350 Econ. Prin. & Engr. Econ.\*\* or  
BY320^

## Summer

Professional Experience

## Senior Year

### Fall

CH410 Chemical Eng Lab II (2 cr)  
CH420 Proc. Econ. & Conc. Design  
ES499 Professional Experience (0 cr)  
Environmental Engineering Elective\*\*\*  
Undesignated Elective  
Engineering Elective

### Spring

CH460 Process Dynamics & Control  
CE491 or MP401 or ES443  
Environmental Engineering Elective\*\*\*  
Knowledge Area Elective  
Undesignated Elective

\* Satisfies the Knowledge Area "Science, Technology, and Society" requirement.

\*\* Satisfies the Knowledge Area "Economics and Organizations" requirement.

^ Students must take either BY214 or (BY222 and BY224) or BY320 or BY330

\*\*\*Students must take one of the following: CE479, CE481, CE482, CE486, ES432

Students must take one of the following: A second from the above list or one of CE430, CE434, CE477, CE478, CH434, ES436, EHS309, EHS416

# **APPENDIX B**

## *FORMS*

## ADVISING FORM FOR CHEMICAL ENGINEERING MAJORS

**CLASS of 2022+**

Freshman Engineering [ES]	100					ES499 Prof. Exp. <sup>5</sup>		
FY – First Year Seminar/ UNIV190	100		UNIV190					
Chemistry [CM] (5)	131 <sup>1</sup>		132 <sup>1</sup>	241	242	244		
Physics [PH] & Biology [BY] (2)/(1)	131		132				BY160	
Mathematics [MA] (5)	131		132	231	232	MA Elective		
Knowledge Area Electives <sup>2</sup> (5)	UC		CGI	CSO	IA	IG	STS	EC350
Chemical Engineering [CH] (11)	210		220	260	320	330	350	
	360	370	410	420	460			
Mechanics/Electrical Sci/Materials Sci [ES] <sup>3</sup> (2)				ES		ES		
Engineering Electives (3)								
Technical (Science/Engineering/Mathematics) (2)								
Undesignated Electives <sup>4</sup> (2)								

( ) = Number of courses needed.

<sup>1</sup> CM103 & CM105 may be substituted for CM131: CM104 for CM132. The laboratory course CM106 (2 credit hours) may be used toward a technical elective.

<sup>2</sup> Six Knowledge Area courses, including UNIV190 and EC350, are required. Four of each Knowledge Area designators must be covered: CGI-Contemporary & Global Issues, CSO-Cultures & Societies, EC-Economics & Organizations, IA-Imaginative Arts, IG-Individual & Group Behavior, STS-Science, Technology, & Society. One UC course must cover two areas. Contact Dr. McCluskey about the suitability of transfer or cross-registration courses. Eng. Majors should take one of the following STS courses: ES110, BR200, or ES238.

<sup>3</sup> One course in each of two of these areas, as listed on the back of this sheet.

<sup>4</sup> Six credits of advanced Military Science or Aerospace Studies can be substituted for two undesignated electives.

<sup>5</sup> Students typically complete an ES499 Pre-Approval Worksheet late in their junior year and enroll in ES499 (0 cr) in fall of their senior year.

For the Biomolecular Engineering Concentration-BY162 is required, and the MA elective must be STAT383. The following required courses replace an engineering and a technical elective-CH465 & CM460. Finally, one course must be selected from: BR200, BY214, BY320/322, BY330, BY360/2, BY419, BY452, BY460, BY471/473, CM425, CM444, CM453, EHS416, ES380 or ES452.

Permissible ES Electives		
Electrical Science	Material Science	Mechanics
*ES250-Electrical Science	ES260-Materials Science ES360-Materials Science II *ES452-Biomaterials Engr. *ES464-Corrosion of Metals	ES220-Statics ES380-Biomechanics

Suggested Technical Electives	
<p style="text-align: center;"><b>Biology</b></p> <p>BY162-Cellular &amp; Molec. Bio. II Lab (2 cr.) BY320-Microbiology BY471 Anatomy &amp; Physiology I /BY473 Lab</p> <p style="text-align: center;"><b>Chemical Engineering</b></p> <p>CH430-Chemical Process Safety CH434-Air Pollution Control CH465-Biochemical Engineering CH490-Transport Phenomena</p> <p style="text-align: center;"><b>Chemistry</b></p> <p>CM221-Spectroscopy CM312-Survey of Inorganic Chemistry CM460-Biochemistry I</p> <p style="text-align: center;"><b>Civil Engineering</b></p> <p>CE479-Water and Wastewater Treatment CE480-Chemical Fate &amp; Trans. in the Env. CE481-Hazardous Waste Mgmt. Engr.</p> <p style="text-align: center;"><b>Electrical Engineering</b></p> <p>EE264-Intro to Digital Design EE341-Microelectronics</p> <p style="text-align: center;"><b>Engineering Science</b></p> <p>ES222-Strength of Materials ES238-Intro. To Energy Systems</p>	<p style="text-align: center;"><b>Engineering Science (Continued)</b></p> <p>ES360-Materials Science II ES452 Biomaterials Engr. *ES464-Corrosion of Metals</p> <p style="text-align: center;"><b>Industrial Hygiene</b></p> <p>*EHS309-Industrial Hygiene EHS406- Industrial Hygiene Control Methods EHS416-Toxicology &amp; Epidemiology</p> <p style="text-align: center;"><b>Mathematics</b></p> <p>MA330-Advanced Engineering Math MA331-Fourier Series &amp; BV Problems MA339-Applied Linear Algebra MA363-Mathematical Modeling MA377-Numerical Methods *MA381-Probability *STAT383-Probability and Statistics STAT384-Applied Statistics II</p> <p style="text-align: center;"><b>Mechanical Engineering</b></p> <p>ME390-Manufacturing Processes ME444-Computer Aided Engineering ME492-Welding Metallurgy</p> <p style="text-align: center;"><b>Physics</b></p> <p>PH231-Fundamentals of Modern Physics</p>

Undesignated Electives
Undesignated electives are selected by the student based on his/her career interests.

**\*Highly recommended**

**Revised 6/27/19**

## Application Form for a Certificate in Materials Engineering Concentration

Student Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Major: \_\_\_\_\_

I am applying for a certificate in Materials Engineering Concentration. I have completed the following required and elective courses:

### Required Courses

	Semester at which the course was taken	Grade Received
ES260 Materials Science & Engineering	Fall/Spring/Summer Yr. _____	
ES360 Materials Science And Engineering II	Spring/Yr. _____	

### Elective Courses (See reverse side for acceptable courses)

Course Number	Semester at which the course was taken	Grade Received
Elective 1 _____	Fall/Spring/Summer Yr. _____	
Elective 2 _____	Fall/Spring/Summer Yr. _____	
Elective 3 _____	Fall/Spring/Summer Yr. _____	

Student \_\_\_\_\_

Date \_\_\_\_\_

Academic Advisor or  
Department Chair \_\_\_\_\_

Date \_\_\_\_\_

Chair of Materials Engineering  
Concentration Committee \_\_\_\_\_

Date \_\_\_\_\_



Three additional electives are to be chosen from the following list:

Undergraduate Research (a materials related undergraduate research project with consent of the Materials Engineering Committee (3 Credit Hours))

CE411 Construction Materials Engineering

CM372 Physical Chemistry II

CM430 Colloid and Interfaces

CM450 Introduction to Polymer Chemistry

EE439 Dielectrics

ES222 Strength of Materials

ES357 Microelectronic Circuit Fabrication

ES361 Fine Particle Technology

ES452 Biomaterials & Biomedical

Engineering Applications

ES464 Corrosion of Metals

ME390 Manufacturing Processes

ME393 Analysis of Materials Processing

ME457 Composites

ME492 Welding Metallurgy

ME591 Special Topics in Materials Engineering

PH341 Solid State Physics

PH442 Solid State Physics II

Please refer to <http://internal.clarkson.edu/sas/forms/index.html> for the following forms:

Add/Drop Form

Off-Campus Coursework Permission Form

**Please refer to <http://internal.clarkson.edu/sas/cusasforms/index.html> for instructions for completing the following processes in PeopleSoft:**

Undergraduate Change of Major Form

Concentration Declaration Form

Undergraduate Double Major Declaration Form

Undergraduate Dual Degree Declaration Form

Undergraduate Minor Declaration Form

# AIChE

## Code of Ethics

The Board of Directors of the American Institute of Chemical Engineers adopted this Code of Ethics to which it expects that the professional conduct of its members shall conform, and to which every applicant attests by signing his or her membership application.

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 clients, 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:

- Hold paramount the safety, health, and welfare of the public in performance of their professional duties
- 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.
- 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.
- Issue statements or present information only in an objective and truthful manner.
- Act in professional matters for each employer or client as faithful agents or trustees, and avoid conflicts of interest.
- Treat fairly and respectfully all colleagues and co-workers, recognizing their unique contributions and capabilities.
- Perform professional services only in areas of their competence.
- Build their professional reputations on the merits of their services.
- Continue their professional development throughout their careers, and provide opportunities for the professional development of those under their supervision.
- Never tolerate harassment.
- Conduct themselves in a fair, honorable and respectful manner.