Program Policies and Guidelines

Department of Biomedical Engineering and Chemical Engineering

B.S. in Chemical Engineering

The University of Texas at San Antonio

CME program policies and guidelines are in compliance with those established by the UT System and Board of Regents. In the event of discrepancies between CME program policies/guidelines and those established by UT governing components, those described by the governing components will prevail.

The policies of the CME Program are regularly reviewed and updated; therefore, this copy may not be the most current.

Table of Contents

On August 1st, 2017, The University of Texas at San Antonio (UTSA) received approval from the Texas Higher Education Coordinating Board (THECB) to establish a Chemical Engineering (CME) Bachelor of Science degree program. At that point, CME became the newest addition to the College of Engineering. Initially, the CME program was offered as an independent undergraduate program under the Department of Biomedical Engineering (BME). As of August 1st, 2019, The Academic Quality and Workforce Division at THECB approved the change of the department name to the Department of Biomedical Engineering and Chemical Engineering (BECE). UTSA's programs are accredited by the Southern Association of Colleges and Schools (SACS). The last SACSCOC accreditation was in 2020 with the next visit scheduled for 2030.

To initiate the program, three faculty members were hired; one at the associate level and two as assistant professors. In 2017, a new chair for the Department of Biomedical Engineering was also hired. Part of the chair's responsibilities was to oversee and expand the new CME program. As of June 2023, the department appointed a new acting chair to serve for a minimum of one year, who then became chair in June 2024. Since 2017, the department has added one or two new faculty members each year to specifically support the CME program. In addition to the Department Chair, the CME program currently consists of four tenured faculty, five tenure-track (TT) faculty and 2 fixed-term track (FTT). The BME program also has 4 tenured faculty who have academic degrees in CME and can contribute to the CME program as needed. The first intake for the program was in Fall 2017 with 18 students.

In June 2020, many of the CME faculty moved their research laboratories into the fourth floor of the newly opened Science and Engineering Building (SEB). A majority of the CME faculty have research laboratories and faculty offices in SEB. The SEB third floor also houses our unit operation laboratories with its signature two-story Canadian-manufactured distillation column. The ground floor of SEB houses the new Makerspace. The 17,000 square-foot space includes project assembly and meeting space, a design studio, a machine shop, a 3D printing room, and state-of-the-art equipment that will take the learning experience for engineering students to the next level.

During the program's first ABET evaluation cycle (2022/2023) no deficiencies, weaknesses, or concerns were identified. Moreover, the Klesse Unit Operations Teaching Laboratory, with its wide array of laboratory equipment, was highlighted as a particular strength of our Chemical Engineering program. ABET approved a retroactive accreditation from October 1, 2020; thus, every graduate from our program to date holds an ABET accredited degree.

Disclaimer

The information contained in this handbook does not constitute a contract, expressed or implied, between any applicant, student, or faculty member and the Biomedical Engineering Program at The University of Texas at San Antonio. The Biomedical Engineering and Chemical Engineering Department reserves the right to alter course offerings at any time or change the curriculum or any other procedures leading to the awarding of a degree and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine. The

changes will apply to prospective students and may apply to those already enrolled in the Program.

Revisions

Recommendations for improving the content of this handbook are welcomed from the students and any members of the faculty of the Chemical Engineering program at The University of Texas at San Antonio.

Program Overview

A Bachelor of Science (B.S.) degree in Chemical Engineering (CME) is the newest undergraduate program in the Klesse College of Engineering and Integrated Design at The University of Texas at San Antonio. The program, which began welcoming incoming freshman students in the fall of 2017, provides an exceptional learning environment and opportunities for discovery at UTSA.

Chemical engineering is unique, as it educates students to use chemistry, physics, biology, and mathematics to solve engineering problems related to production, transformation, and utilization of chemicals, materials, and energy.

The Chemical Engineering program provides high-quality education and training through structured coursework and hands-on experience in state-of-the-art laboratory facilities. Students are also required to take two technical electives from any of the four following study areas of Chemical Engineering: 1) Petroleum/Energy Engineering, a sector with burgeoning industry demand for well-trained individuals; 2) Materials Engineering, an enabling technical field for microelectronics, energy conversion, and process control; 3) Bioengineering, an emerging area where biology and chemistry interface with bio-systems and healthcare; and 4) Environmental Engineering, a strategic growth area finding resources and environmental solutions for manufacturers and consumers. In addition, students need to take one technical elective from a list of approved advanced chemistry and physics courses.

The chemical engineering program prepares graduates with the knowledge and skill sets to capture career opportunities — together, our goal is to make industry more efficient and our world cleaner and healthier.

Educational Objectives

The Chemical Engineering program is preparing graduates to achieve the following Educational Objectives:

1. Succeed in the practice of chemical engineering through chosen careers in industry, government, or in advanced graduate and/or professional studies.
2. Demonstrate leadership in their chosen field.
3. Contribute to the socio-economic development of Texas, the nation and the world through the ethical practice of engineering.
4. Embrace life-long learning for professional development and career advancement.

The minimum number of semester credit hours required for this degree is 128, at least 39 of which must be at the upper-division level. All candidates for this degree must fulfill the Core Curriculum requirements, the General Engineering requirements, and the Chemical Engineering requirements, which are listed below.

CME Leadership Organization

Dr. Nehal Abu-Lail is the Chair of the Biomedical Engineering and Chemical Engineering Department. She oversees both Biomedical Engineering as well as Chemical Engineering programs. Dr. Laura Gaviria is the Assistant Chair of the department. Dr. Gary Jacobs is the Undergraduate Program Director and Undergraduate advisor of Record (UGAR) for CME. Dr. Gabriela Romero Uribe is the Graduate Program Director and Graduate Advisor of Record (GAR).

Undergraduate Affairs Committee

Scope: The Undergraduate Affairs Committee is responsible for evaluating special admission cases to the CME program, proposing curriculum updates, evaluating student petitions, updating program policies, making edits to this handbook and addressing additional situations relevant to the program.

Members: Gary Jacobs (Chair), Ph.D., Abelardo Ramirez-Hernandez, Ph.D. and Gongchen Sun, Ph.D.

University Facilities and Student Resources

UTSA has several computer laboratories for general use by all students. The majority of these computers are available in the John Peace library (JPL). Availability of computers can be consulted in real time using the Libraries and Museums: Use a Computer Service.

Engineering specific software is available in the computer labs below. Engineering students also have access to a **virtual desktop (CEID VDI)** with specialized engineering software. This resource can be accessed through UTSA Virtual Desktop service.

Teaching Computer Labs.

Only available when there are no classes being held at that moment. Keep in mind if a class starts, students may be asked to leave.

- AET 0.210
- AET 0.204
- EB 2.04.22
- EB 3.04.68
- EB 3.04.70

Homework Computer Labs.

- EB 2.04.23
- EB 2.40.26B
- JPL Engineering Corner (2nd Floor)
- AET Library
- Makerspace common area

Office Staff

As of summer 2024, the Department of Biomedical Engineering and Chemical Engineering has two full-time staff members, a Senior Administrative Manager and a Senior Program Coordinator. The Senior Program Coordinator assists the Undergraduate and Graduate Program Directors (UGAR and GAR) with student-relevant duties such as admissions, issuing warnings and probations, and retention of student data. The University also provides funds to the Department to employ work-study students to help office staff and faculty with daily tasks. Additional students are hired on an as-needed basis to address issues, including lab maintenance, set up and record keeping.

Program Sequence and Options

The Chemical Engineering undergraduate curriculum offers a set of courses designed to build progressively on successive learning outcomes through a structured program consisting of 8-long semesters. A total of 128 Semester Credit Hours (SCHs) are required for the Bachelor's degree in Chemical Engineering. These SCHs consist of:

- 42 SCHs of Core Curriculum (9 SCHs overlap with math/science courses). A complete list of Core Curriculum options is available in the online catalog (Core Curriculum section),
- 45 SCHs of required chemical engineering courses,
- 3 SCHs of a required additional engineering course,
- 38 SCHs of required math/science courses (including 5 SCH of advanced chemistry),
- 3 SCHS of an elective in advanced chemistry or physics, and
- 6 SCHs of technical elective courses.

The 9 SCHs in the general Core Curriculum that overlap with the math/science courses are MAT 1213 – Calculus I (3 SCHs), PHY 1943 – Physics for Scientists and Engineers I (3 SCHs), and PHY 1963 – Physics for Scientists and Engineers II (3 SCHs). These are also general engineering requirements. All Core Curriculum and EGR required courses are offered every Fall and Spring semesters whereas **all CME courses are offered once a year**, either in the Fall or Spring semester.

Recommended Four-Year Program of Study (2024-2026 catalog)

- There are **128 Total Required Degree Hours**.
- An asterisk (*) indicates that the course is part of the Core Curriculum.
- A dagger (†) indicates a space for an elective. A list of electives organized by emphasis can be found in the online catalog (BECE Degrees).

Fall: Semester 1

Table 1. Breakdown of Courses to Complete - 16 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
AIS	1203	Academic Inquiry & Scholarship *	3
CHE	1103	General Chemistry I	3
CHE	1121	General Chemistry Lab	1
EGR	1343	Impact of Modern Tech. *	3
MAT	1213	Calculus I *	3
WRC	1013	Freshman Composition I *	3

Spring: Semester 2

It is strongly recommended to take CHE 1113: General Chemistry II during the first year (Fall, Spring or Summer), or else the student will fall behind 1 year.

Table 2. Breakdown of Courses to Complete - 16 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CHE	1113	General Chemistry II	3
CHE	1131	General Chemistry Lab II	1
CME	1202	Intro to Chemical Eng.	2
MAT	1223	Calculus II	3
PHY	1943	Physics for Sci. & Eng. I *	3
PHY	1951	Physics for Sci. & Eng. I Lab	1
WRC	1023	Freshman Composition II *	3

Fall: Semester 3

Table 3. Breakdown of Courses to Complete - 17 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CHE	2603	Organic Chemistry I	3
CHE	2612	Organic Chemistry I Lab	2
CME	2103	Chemical Process Principles	3
EGR	2302	Linear Algebra for Engineers	2
EGR	2313	Multivariable Calculus and Series for Engineers	3
PHY	1963	Physics for Sci. & Eng. II *	3
PHY	1971	Physics for Sci. & Eng. II Lab	1

Spring: Semester 4

Table 4. Breakdown of Courses to Complete - 18 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CME	2503	Thermodynamics I	3
CME	2303	Transport Phenomena I	3
EGR	3423	Differential Equations for Engineers	3
STA	2303	Applied Probability & Statistics for Eng.	3
CME	2403	Introduction to Programming for Engineers	3
CORE	-	Creative Arts Core *	3

Fall: Semester 5

Table 5. Breakdown of Courses to Complete - 15 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CME	3003	Intro to Materials Science & Eng.	3
CME	3123	Computational Methods in Chemical Engineering	3
CME	3203	Thermodynamics II	3
CME	3703	Transport Phenomena II	3
S.Elect	-	Elective I †	3

Spring: Semester 6

Table 6. Breakdown of Courses to Complete - 15 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CME	3403	Separation Processes	3
CME	3503	Kinetics and Reactor Design	3
CME	3601	Chemical Eng. Lab I	1
ECO	2023	Introductory Microeconomics *	3
CORE	-	American History *	3
CME	3302	Chemical Process Safety & Risk Management	2

Fall: Semester 7

Table 7. Breakdown of Courses to Complete - 16 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CME	4103	Process Dynamics and Control	3
CME	4163	ChemE Design Fundamentals	3
CME	4201	Chemical Eng. Lab II	1
S.Elect	-	Elective II †	3
CORE	-	Government – Political Science *	3
CORE	-	American History Core *	3

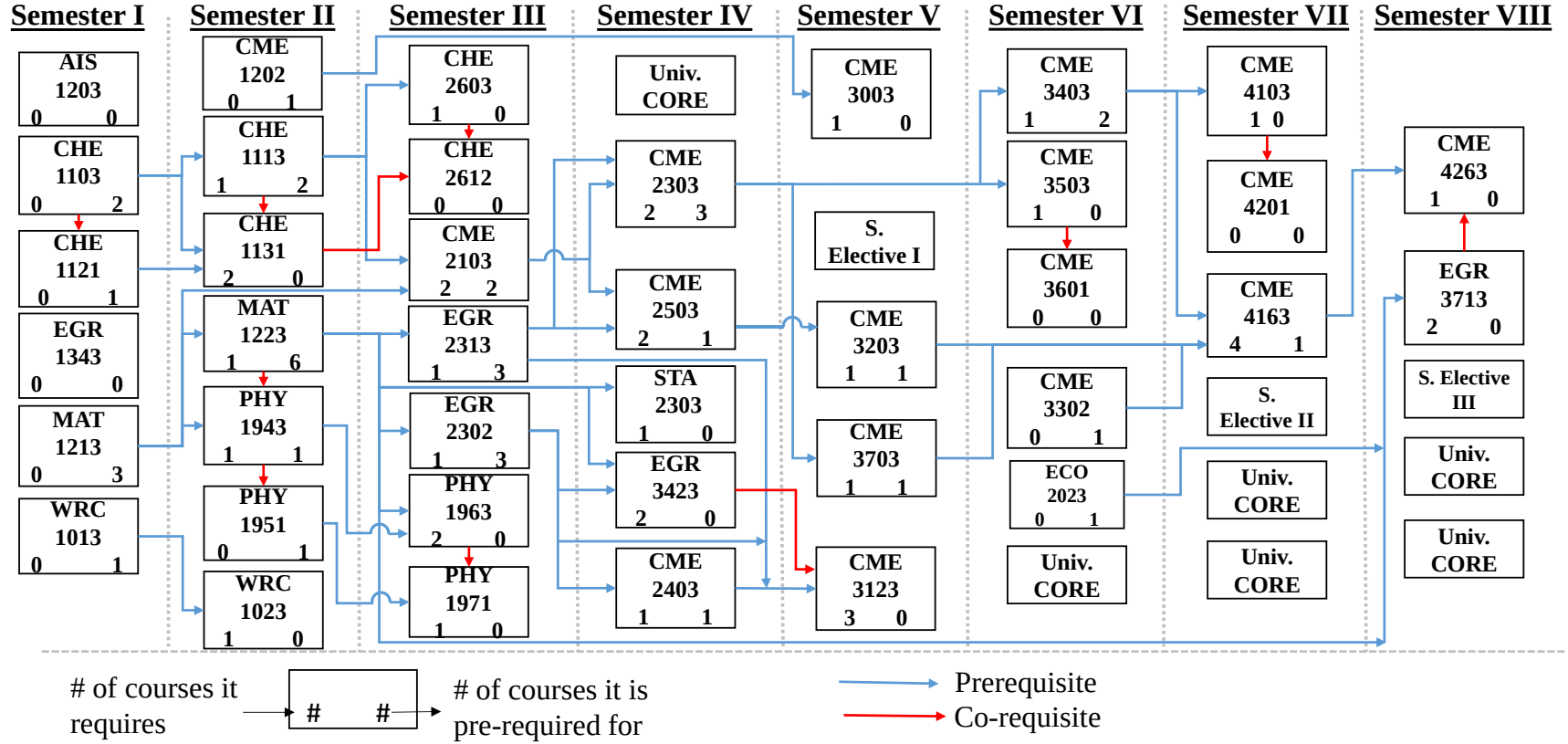
Spring: Semester 8

Table 8. Breakdown of Courses to Complete - 15 Total Semester Credit Hours.

Course Code	Course Number	Course Name	Credit Hours
CME	4263	Plant Design	3
EGR	3713	Engineering Economic Analysis	3
S. Elect	-	Elective III †	3
CORE	-	Language, Philosophy & Culture *	3
CORE	-	Government – Political Science *	3

Recommended Four-Year Flowchart and Prerequisites Map

We recommend taking the following courses during the corresponding semesters.



Jump to the Accessible Version of the Recommended Four-Year Flowchart and Prerequisites Map (end of document).

Emphasis Areas

The CME program offers four optional areas of specialization which are:

- **Petroleum and Energy Systems**: the sector with burgeoning industry demand for well-trained individuals in the oil and gas as well as in sustainable energy solutions.
- **Materials Engineering**: the enabling technical field for microelectronics, energy conversion, and process control.
- **Bioengineering**: the emerging area that interfaces biology, math and sciences with engineering to improve bio-systems used in energy, environment and health.
- **Environmental Engineering**: the strategic growth area finding resources and environmental solutions for manufacturers and consumers.

A minimum of 9 semester credit hours is required to receive a concentration. Six hours are selected from a list of technical elective courses, and 3 more hours are chosen from a list of advanced chemistry and physics courses. The list of elective courses can be found in the online catalog (BECE Degrees).

In addition to lectures and laboratories, CME students are allowed to count research studies and internships for elective credits. In lieu of research studies, students may opt to enroll in an independent study as an elective to educate themselves about a topic that is not covered by courses normally offered at UTSA. Policies for approval of internships, research and independent studies can be found in the policies section of this document.

CME students have the option to enroll in the Honors' College and take additional courses beyond what is required in the standard CME program of study or enroll in a minor with programs within the KCEID or the College of Sciences.

Electives Flowcharts and Prerequisites Mapping

Most elective courses can be taken without the need for prerequisites outside the general B.S. Chemical Engineering degree plan; however, there are some courses that require taking an extra course in order to satisfy prerequisites for the electives. Several flowcharts of prerequisites are provided next for all approved electives divided by emphasis track and elective type.

Legend for Track Flowcharts

- AE & Color: Black text on white background = Approved Elective
- NCE & Color: Blue = Pre-requisite, not within the Chemical Engineering program of study
- CME & Color: Red = Pre-requisite within the Chemical Engineering program of study
- ADV & Color: Green = Advanced Physics or Chemistry Elective

Bioengineering Track

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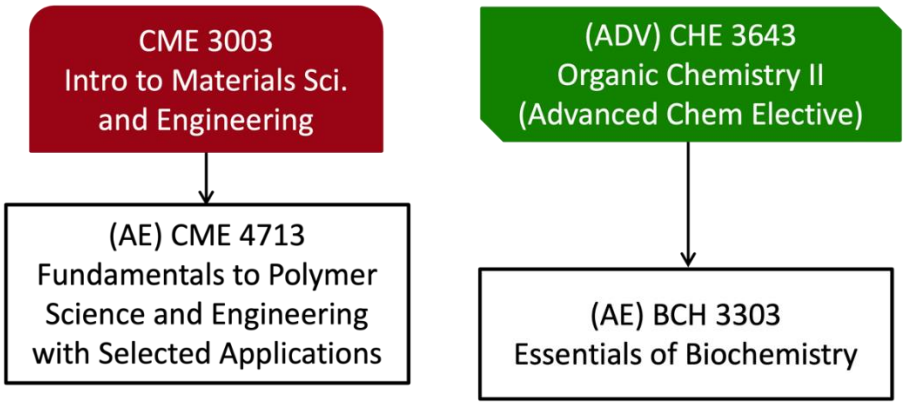
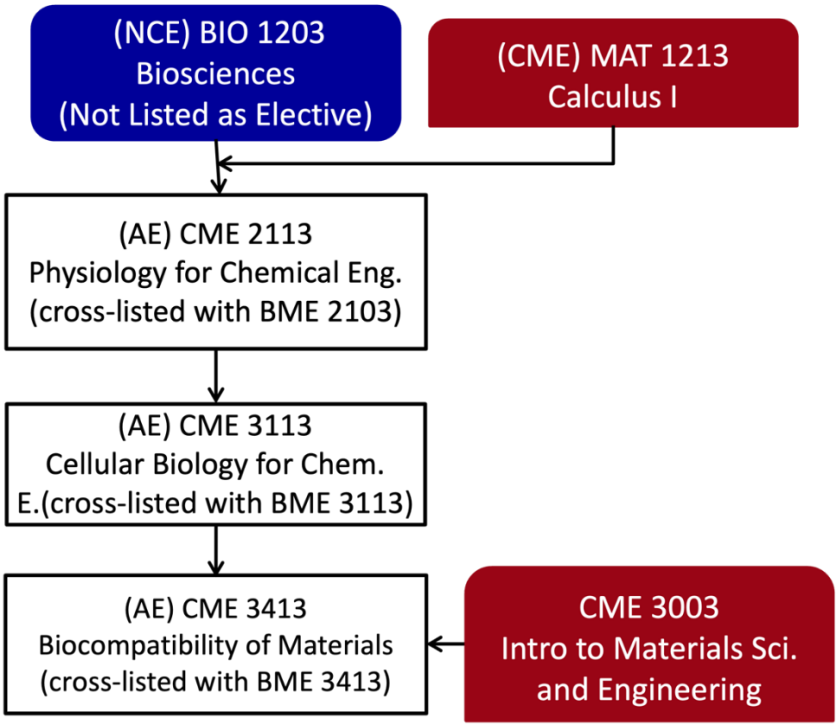
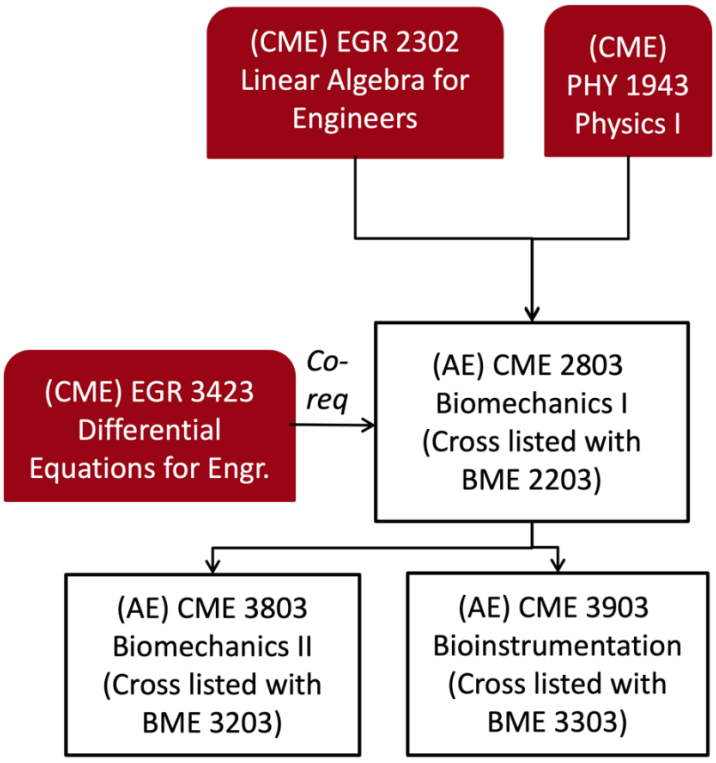
Flowchart 1



Flowchart 2



Flowchart 3



Materials Engineering Track

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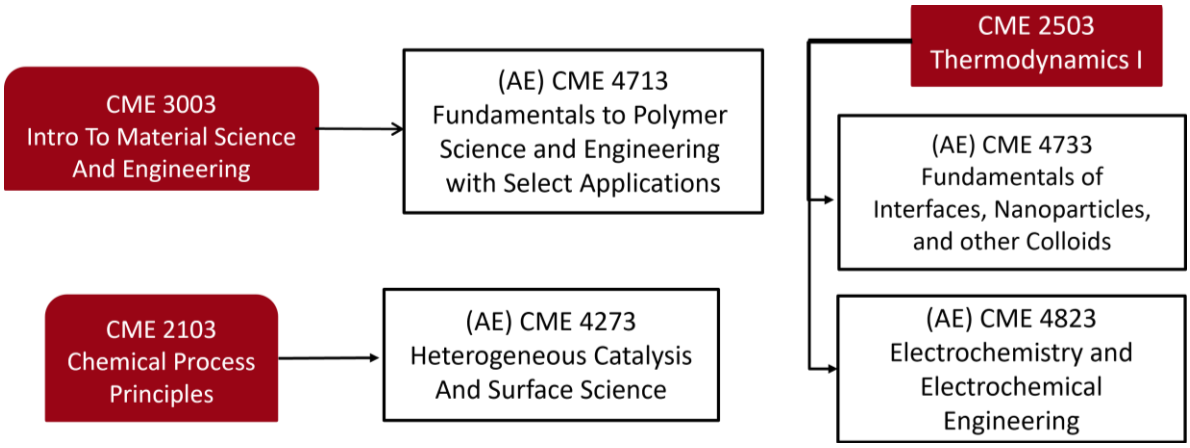
Flowchart 1



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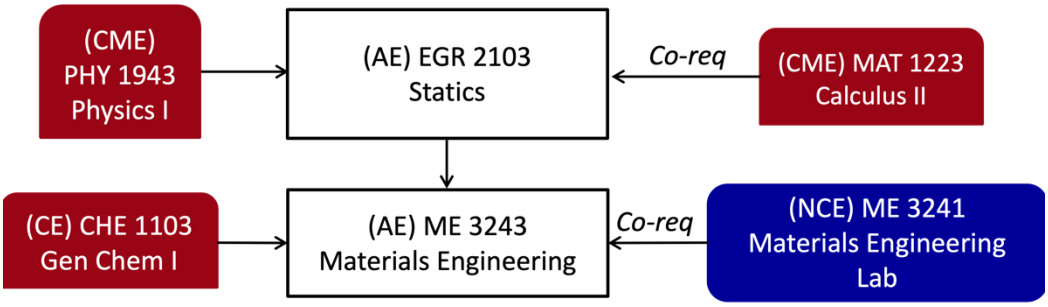
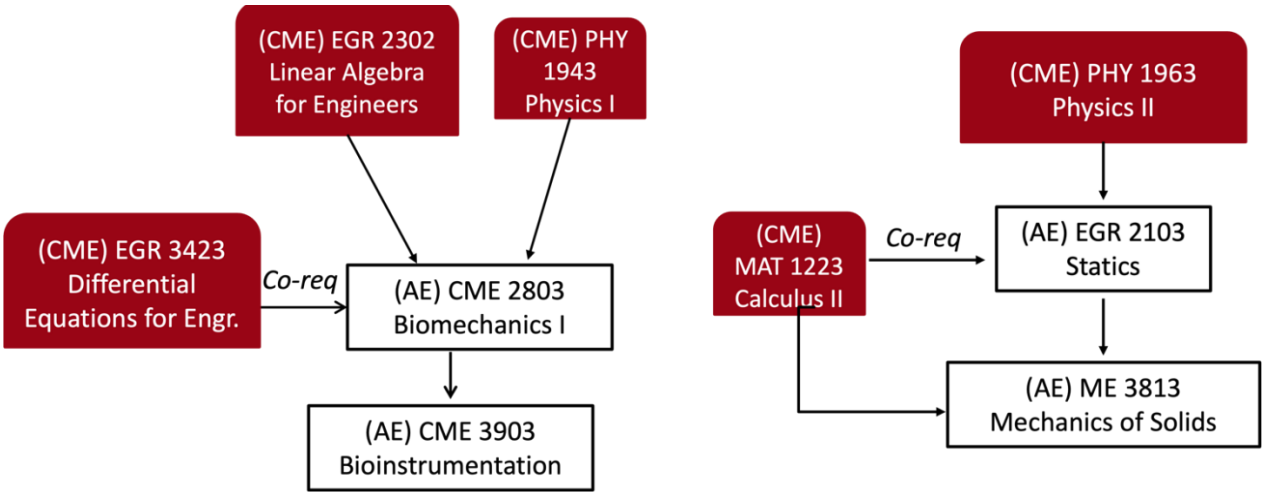
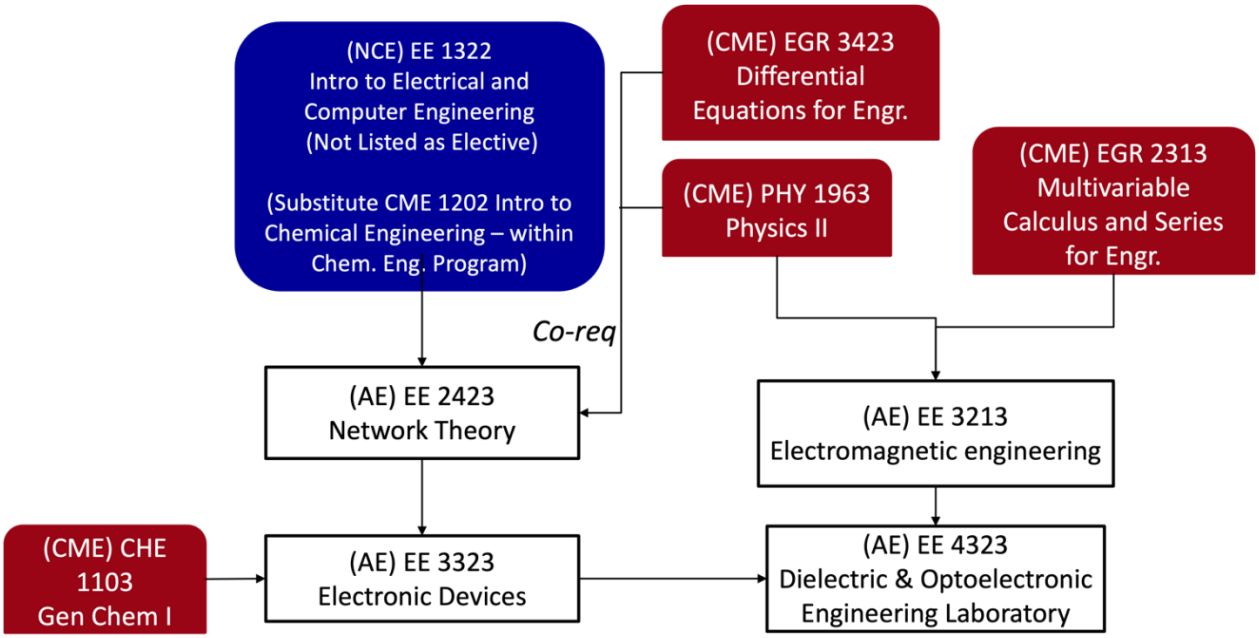


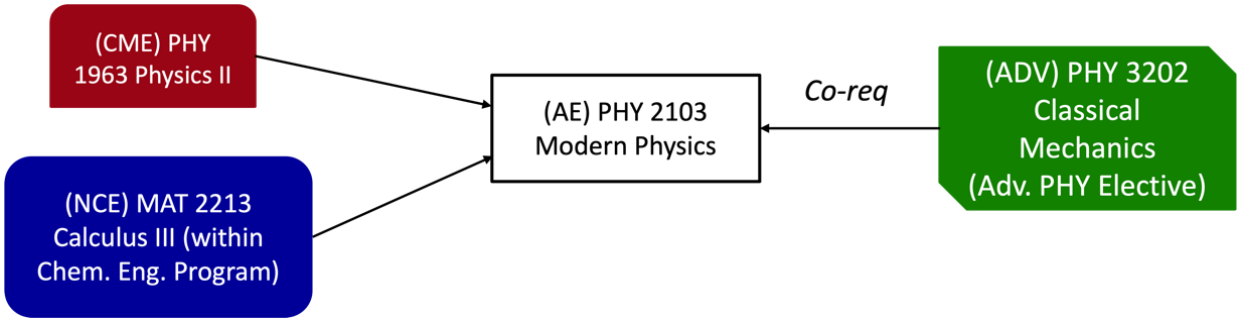
Flowchart 3



Flowchart 4



Flowchart 5



Environmental Engineering Track

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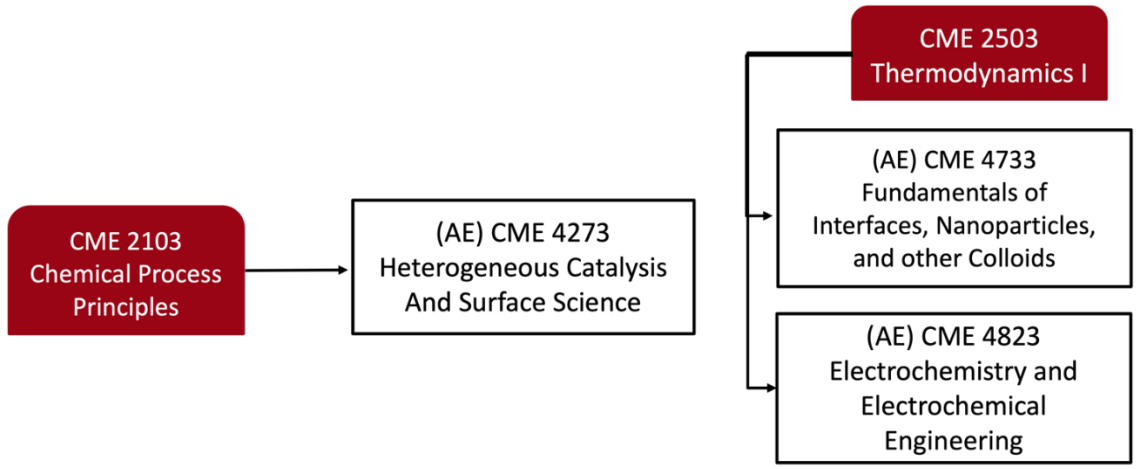
Flowchart 1



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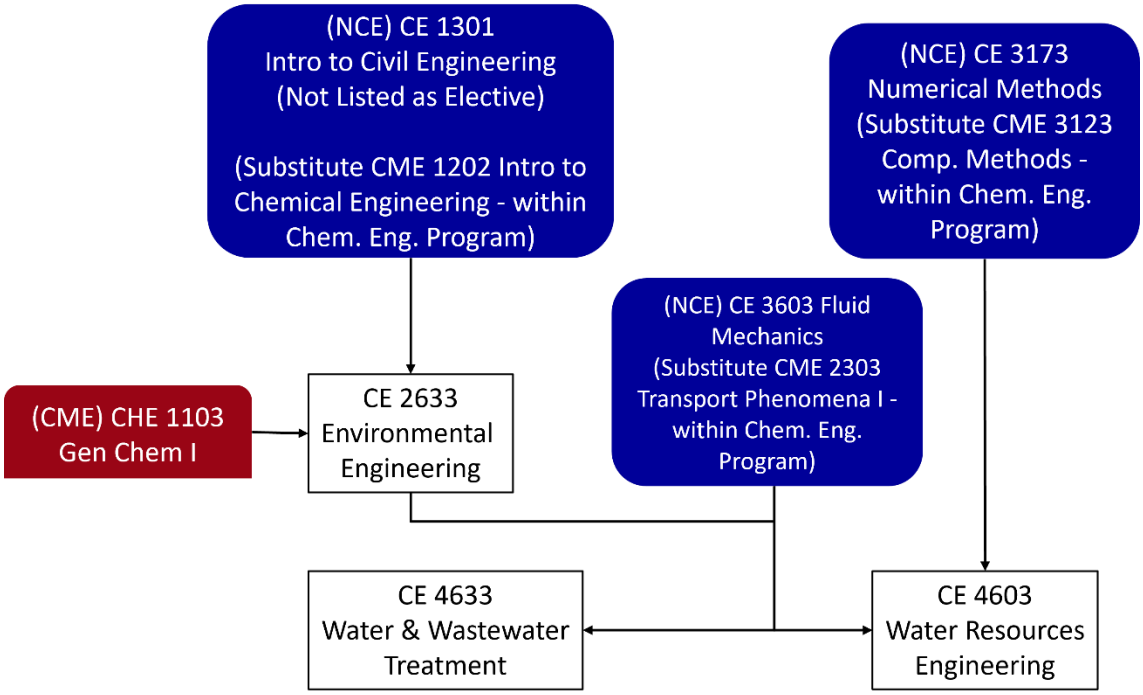

Petroleum and Energy Systems Track

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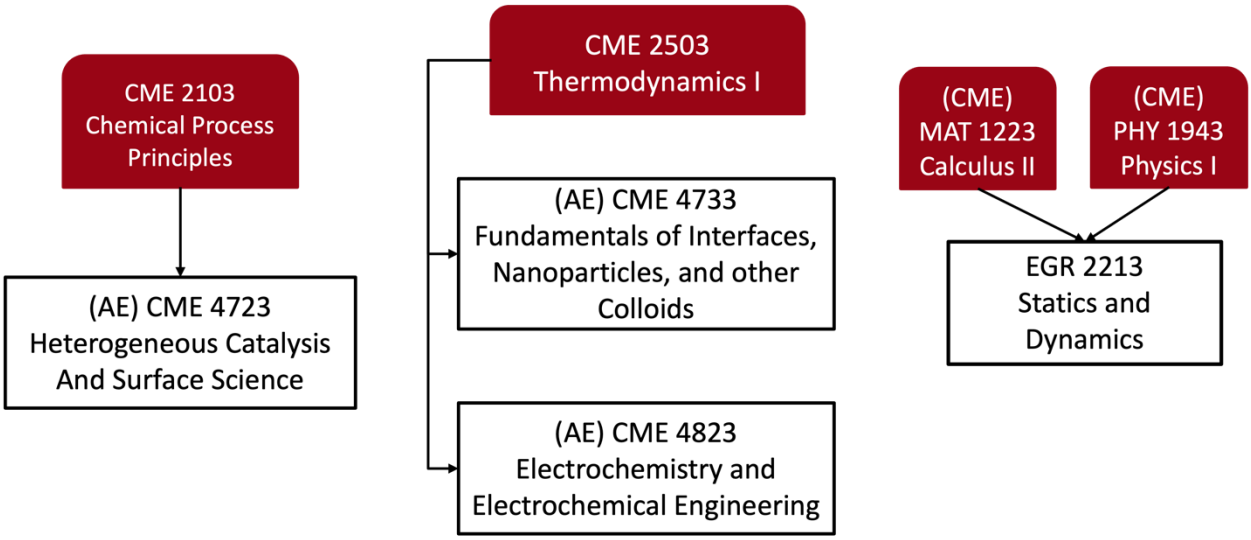
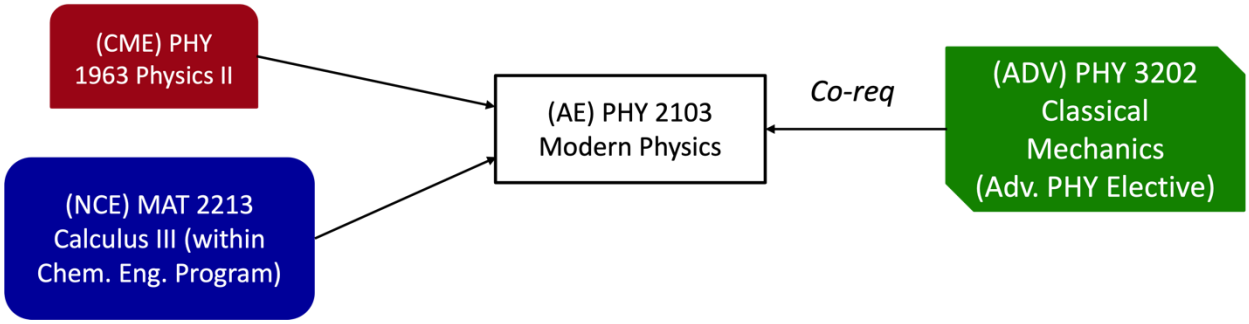
Flowchart 1



Flowchart 2



Advanced Chemistry

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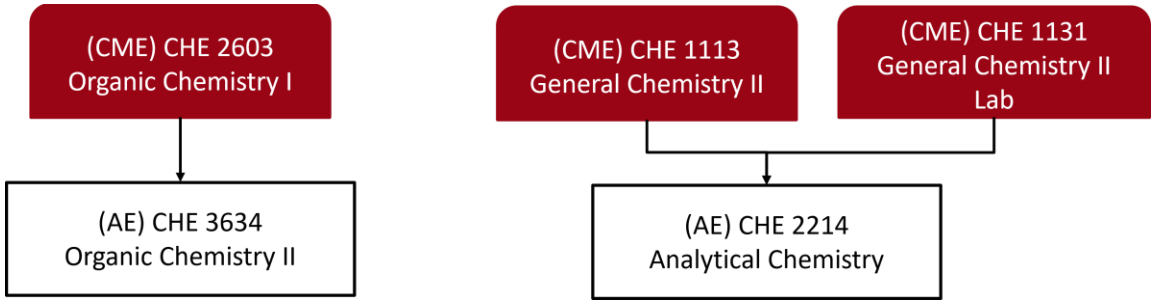
Flowchart 1



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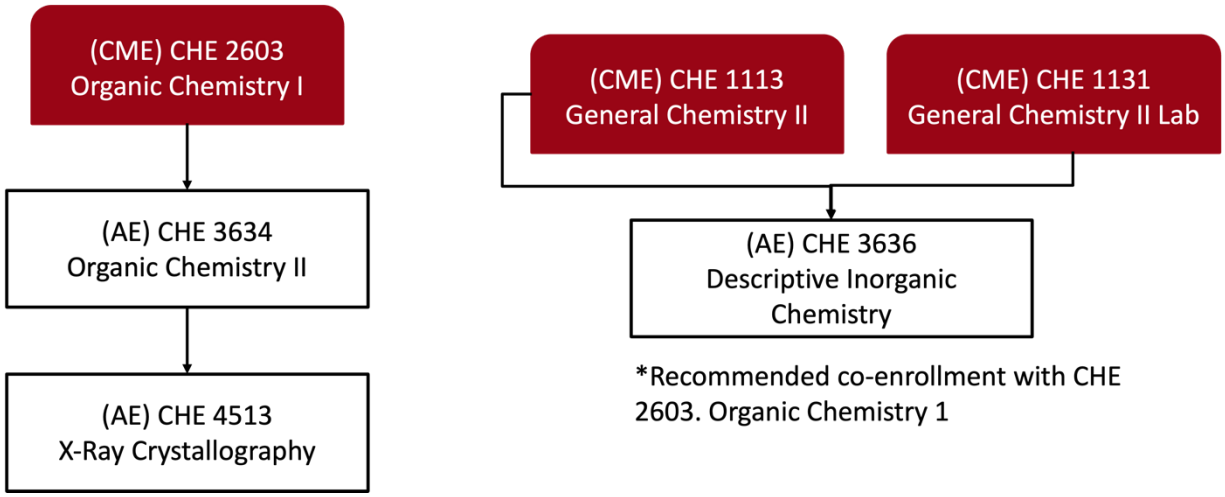
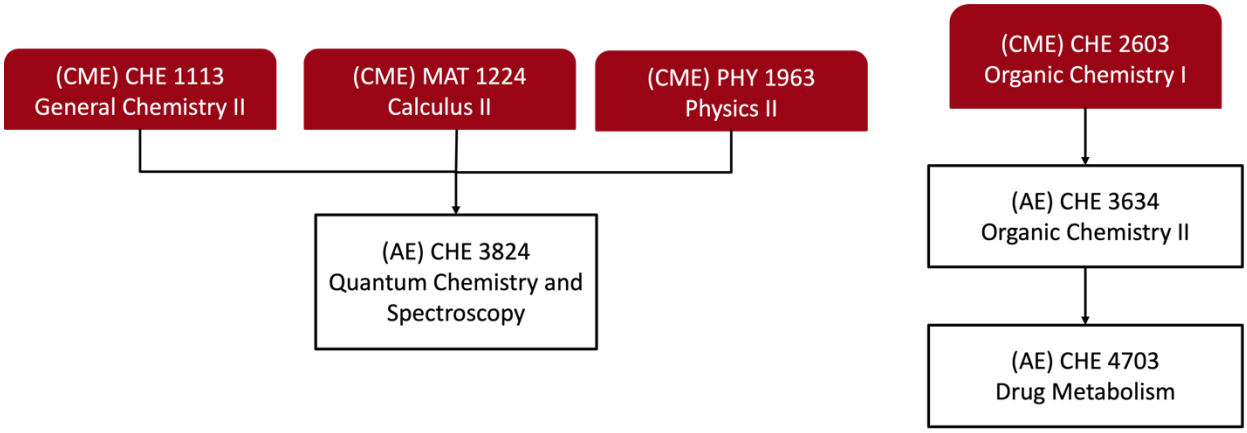


Flowchart 3



Advanced Physics

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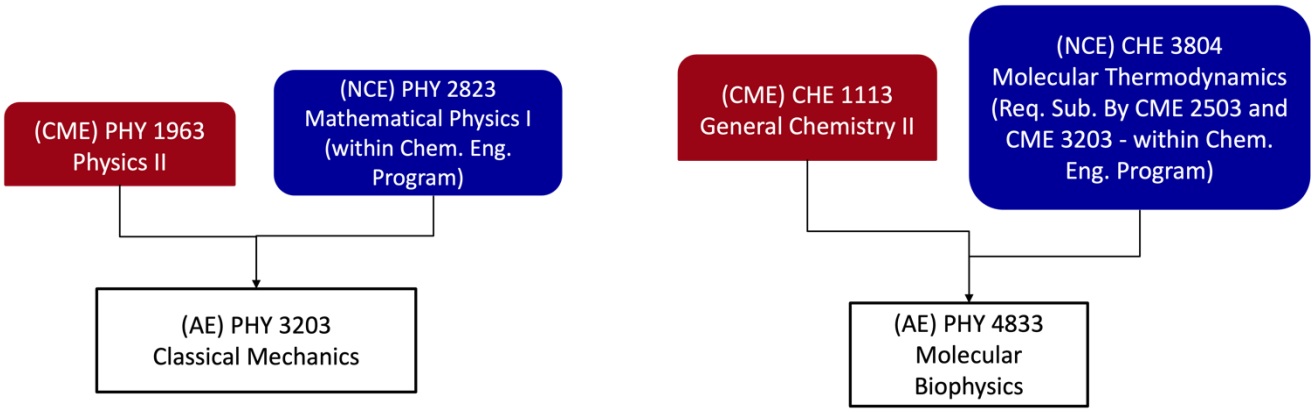
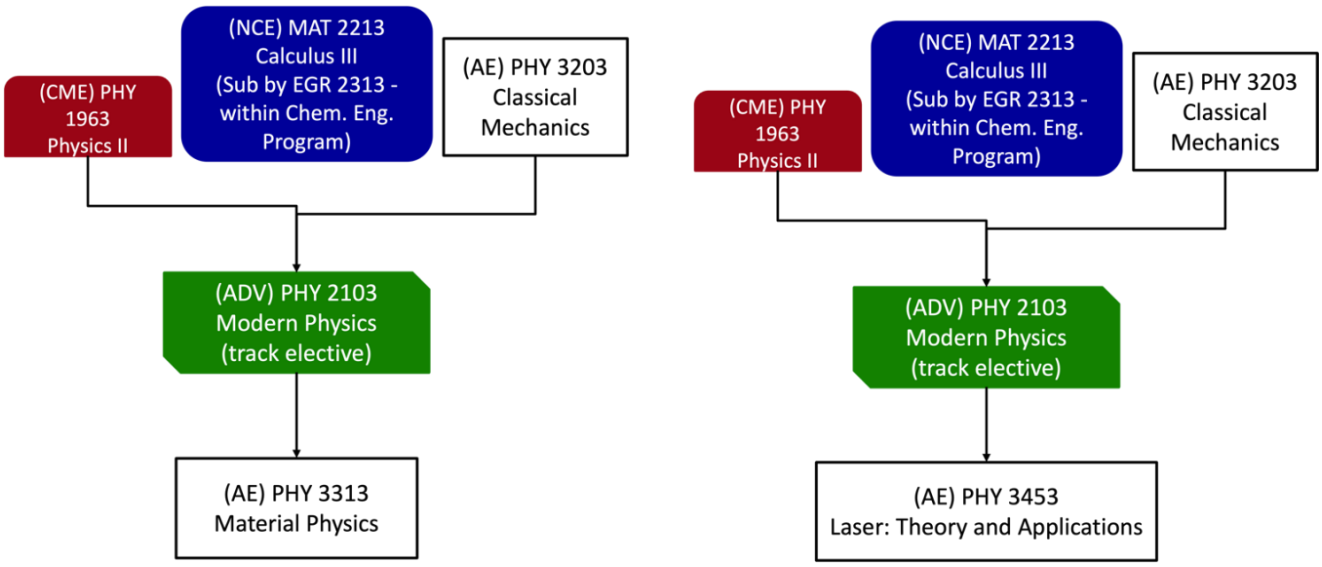
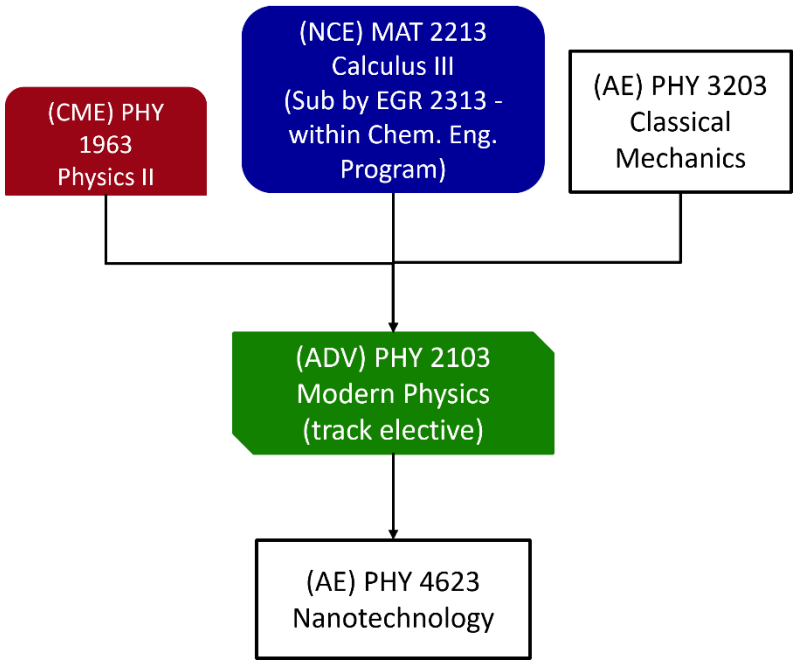
Flowchart 1



Flowchart 2



Flowchart 3



Student Policies

Admission into CME

Students who apply to the CME program must meet all UTSA admission requirements for first-time freshmen or admission requirements for transfer students, as appropriate, and additional chemical engineering program requirements.

Incoming students who meet all admission criteria either directly from high school or with transfer credits will be admitted into CME. If a student cannot meet all of the admission criteria for an engineering major, they may be admitted to the Engineering, Math, and Science Studies program in the University College. Students have three semesters to complete Calculus I with a grade of "C-" or better and meet the transfer requirements for the CME program.

Evaluating Student Performance

Formal evaluation of student performance is performed by the instructor of each course. At the beginning of each semester, the instructor of each course provide students with the course syllabus, course description, and the methodology on how the course performance will be evaluated. The university uses a 4.0 grading system ranging from A+ to F. A complete guide to UTSA's grading system and rules can be found in the online catalog (Grades).

Faculty report grades for first-time freshmen at mid-semester during the Fall and Spring Semesters. Students receiving mid-semester grades of "D" or "F" receive an alert from KCEID, reminding them about minimum passing grade criterion and additional college.

BECE Warnings, Probation and Dismissal

At the end of each semester, the UTSA grade point average (GPA) of all CME undergraduate students is evaluated. Students with UTSA's GPA below 3.0 but above 2.5 are issued warning letters to give them a chance to improve their performance. Students issued a warning can still enroll in CME courses. Students whose UTSA's GPA falls below 2.5 are placed on a probation. These students are sent probation letters and cannot enroll in CME courses until their UTSA GPA reaches 2.5 or above. Students who fail to improve their UTSA GPA to 2.5 or above after one semester are formally dismissed from the program. If the UTSA GPA is above 2.0 but below 2.5, the student will be given the option to switch to another engineering major within KCEID, except for BME which holds the same policy. Note that the standards for warning, probation and dismissal for the university are lower than those of the BECE. The general university standards can be found in the online catalog (Academic Standing).

Prerequisites

Prior to registering in any course, the UTSA BANNER system evaluates whether students have completed the prerequisites required. If the student misses any prerequisite, they will not be allowed to enroll in the course of interest.

In extreme scenarios, a student has the option to submit a request to allow them to take a course without having completed the prerequisite course. If this is the case, the student has the option to

submit a Prerequisite Override Request through OneStop. This form is automatically sent to the course instructor, who makes an initial assessment of the request. The request is then sent to the UGAR or department chair who makes a final decision. Override requests are evaluated based on the courses the student has taken, GPA, and demonstrated knowledge of prerequisite topics. If the override request is approved, the student is then permitted to enroll in the course.

In case of substitutions, if the student has taken an equivalent prerequisite at a different institution, the syllabus of the substitute course is reviewed. The override/substitution is approved if the syllabus contains 80% of the material covered in the pre-requisite and the assessments utilized to evaluate the students are consistent with the standard of rigor at UTSA. Once the override is approved and signed by the CME program director, it is sent back to advising to enroll the student in the desired course. See policy on Transfer Students and Transfer Courses for more details.

Minimum "C-" Grade Rule

A minimum grade of "C-" or better is required for all mathematics, science, engineering (EGR) and CME courses in the curriculum, or for any course that is a prerequisite for a required engineering (EGR) or CME course. Any course assigned a grade below a "C-" must be repeated before enrolling in any course for which it is a prerequisite. This requirement is subject to both the Gateway Course and Three-Attempt Limit.

Policy on "D" Grades

Chemical Engineering students are required to obtain a grade of "C-" or higher to pass any course in the program. However, under certain circumstances, students can petition to count a "D" or a "D+" as a passing grade. The following requirements must be met to receive this exception:

- The course must not be a prerequisite for any other course in the program.
- The student must have attempted the course 3 times (including instances of W grade), or one time if the course is senior level according to the recommended four-year academic plan of the student's catalog.
- The student must submit a "Petition for Substitution/Waiver of Major, Minor, Support Work" through their academic advisor within one year from the last time the course was attempted.
- No more than one course may be considered as passing with a "D" or "D+" in the Chemical Engineering program.

Protocol for Appeals in Chemical Engineering

Appeals can, for example, ask for a class that is not on our list of electives to count as an elective, for an industrial-like experience to count as an internship or for admission when the GPA is below 3.0 but close to our admission requirements. The protocol for such appeals will be as follows:

1. The student should submit an appeal to the program UGAR detailing in it the rationale for why the appeal should be approved.
2. The curriculum undergraduate committee will review the appeal and vote on whether the appeal is to be approved or denied.
3. A letter with the decision will be sent to the student and a copy of it will be kept in the student's file.
4. In the case of a denial of the appeal, the committee's rationale for the denial will be included in the letter.

Gateway Courses

Students pursuing an engineering degree in KCEID must successfully complete Gateway Courses with a grade of "C-" or better in no more than two attempts. If the student does not successfully complete a Gateway Course in two attempts, then the student is required to change their major. The Gateway courses for the CME program are CME 2103 Chemical Process Principles and EGR 2302 Linear Algebra.

For the purpose of this policy, dropping a course with a grade of "W" or taking an equivalent course at another institution of higher education counts as an attempt at taking the course.

Three-Attempt Limit for Engineering Programs in KCEID

A student unable to achieve the minimum required grade in a required engineering course or in a prerequisite to a required engineering course within three enrollment attempts is required to change his or her major to a field outside of KCEID. Enrollment in a course for a period of time sufficient for assignment of a grade, including a grade of "W", is considered an attempt.

The Six Drop Policy

Texas legislation (SB 1231) limits the number of classes a student may drop in their college career to six. This applies to all students who were first-time freshmen in Fall 2007 or later. Courses dropped at any public institution of higher education will count toward the limit. Courses dropped prior to the census date (12th day of class) will not count toward the limit. Courses dropped for the purpose of withdrawing from all courses for the semester will not count toward the limit.

Policy on Internship, Research and Independent Study Courses

Chemical Engineering students can count experiences including an internship, research in a UTSA lab or outside UTSA, and/or an independent study towards electives for a particular track in Chemical engineering. The following conditions apply:

1. Students can only count credits for an internship for a maximum of three credits; in addition, a student may earn up to a total of 3 credits for independent study/research. The latter may be separate (e.g., 3 h of independent study or 3 h of research) or in combination (e.g., 1 h of independent study plus 2 h of research).
2. If a student is pursuing an optional specialization, all experiences need to fall under the same track chosen by the student.
3. All experiences need to be pre-approved by the Chemical Engineering program prior to registering for the appropriate elective class.
4. Once the internship is approved, the student should get approval from the Department Chair of chemical engineering.
5. All students need to count at least one 3 credit hour course towards the three electives.
6. No experience will count for an elective for more than one optional specialization (e.g., if a student performs research on biomaterials, that course might count toward the bioengineering track or the materials track, but not both; it would also be subject to faculty approval).
7. Even though students are allowed to take as many classes as they wish to take, they are reminded that in Texas, they start to pay out of state tuition after exceeding 30 credits beyond the 128 required in our CME curriculum.
8. Additional requirements apply as detailed below.

CME 4803. Chemical Engineering Internship.

An internship is defined as a practical experience in the industry. Prior to registering for an internship, the student needs to do the following:

1. The experience has to be at least 40 hours per week for 8-10 weeks, or the equivalent.
2. If the student is pursuing an emphasis, the internship duties and description should align well with the track the student is choosing.
3. The students will communicate with the UGAR of the Chemical Engineering program to determine if the experience counts as an elective. If approved, the UGAR will assign a faculty member to serve as advisor.
4. Once the faculty member and Department Chair approves the student's internship, the student can register for CME 4803.
5. The student should also submit the internship statement of understanding form (located at the end of this document) to the chemical engineering program coordinator.
6. At the internship location, the student needs to know as soon as possible who is their mentor.
7. The student is responsible to providing the contact info of the mentor (email and phone) to the faculty instructor
8. The faculty member responsible for the section will contact the mentor to inform them that CME UTSA will need an evaluation form (located at the end of this document) from them at the end of the internship assessing student performance.
9. This form will help the faculty member assign a grade for the student.

10. The student will need to submit a report about the internship no later than one week before grades are due. A rubric for what to include in the report can be found at the end of this document.
11. The faculty member will assign the student the grade at the end of the semester.
12. Industrial-like experiences such as those in National labs or Southwest Research Institute are likely to be approved for an internship given the criteria defined above are met.

CME 460x. Independent Study.

An independent study is an educational activity undertaken by an individual with little to no supervision. It serves as an option for a student to fulfil a required class when such class is not offered or to learn about a specific subject that is not being taught at the University. Prior to registering for an independent study, the student needs to do the following:

1. The student needs to fill an independent study form available online.
2. The student needs to identify the faculty member who is capable of offering the independent study to the student on the topic of interest.
3. The student needs to obtain permission in writing from the instructor, the student's advisor, and the Department Chair to register for the class.
4. If pursuing an emphasis, the topic covered by the independent study should be appropriate for the student's chosen track.
5. If the independent study will be taken with a faculty outside of Chemical Engineering, the Chemical Engineering faculty responsible for the student's chosen track should be consulted and should approve the request.
6. Once all approvals are obtained, the faculty will submit a syllabus that details what will be covered in the independent study and how the student's performance will be assessed.
7. The student can enroll in 1, 2 or 3 credits for independent studies.
8. A typical time expected to spend on class is three times the registered credit hours.
9. The faculty member responsible for the section will assign a grade for the student.

Chemical Engineering 470x. Research in Chemical Engineering.

A student may count advanced research experiences carried at UTSA labs and relevant to Chemical Engineering for up to three credits towards an elective. The following needs to be ensured prior to registering for the class:

1. If a student is pursuing an emphasis, the research duties should align well with the track of chemical engineering the student is choosing.
2. The student should identify a faculty member whose research is appropriate for the student's track. If unsure, the student may ask the UGAR who will refer the student to an appropriate faculty member.
3. The student and faculty supervisor will complete a research contract, at the end of this document, that must be signed by both. Once the faculty member approves the student's research, the student can register for CME 4803.
4. Paid research will be accepted for credit.

5. The faculty member who approved the research will be the instructor for the section the student enrolls in and he or she will be assigning the student the grade at the end of the semester.
6. For a rule of thumb, the student is expected to spend 3 times the number of registered credit hours in the lab in a given week for the duration of the semester. For example, if a student is registered for 3 credit hours, then the student will need to spend 9 hours working in the lab for 15 weeks during the semester. If the experience is done during the 10-week summer term, then the student should spend 4.5 hours per week in the lab for each credit hour registered.
7. At the end of the experience and prior to the end of the semester, the student will need to submit a report about the experience. A rubric of what include in the report can be found at the end of this document.
8. The student will be required to present his/her research in a symposium (local or national) within six months of completing the experience.
9. An Honors' thesis if done on a relevant CME topic can count as a research experience.

Policy for Repeating Courses at UTSA

The policy for repeating courses only applies to courses completed and repeated at UTSA.

Courses That May Be Repeated Not Considered a Duplicate Course

Certain courses in the catalog state in their course description that they "may be repeated for credit." These are the only courses where repeating is not a duplication. All semester credit hours and grade points from each of these courses taken are included in the student's record, the number of hours earned at UTSA, and the student's GPA calculation.

Courses That May Be Repeated to Improve a Grade

Students may only repeat a course for credit if they have received a grade of "D+," "D," "D-," or "F." Credit can only be counted for one of these courses. Receipt of a higher grade in a repeated course in a subsequent semester does not alter the student's academic standing in the semester when the original grade was earned. Students may repeat any course in which they received a grade of "NC" (No Credit) in order to improve their grade; however, this does not alter the student's overall GPA.

If a student repeats a course in which he or she received a grade of "D+," "D," "D-," or "F" and receives a higher grade, the semester credit hours from the original grade of "D+," "D," "D-," or "F" are excluded from the student's grade point average. Only the semester credit hours associated with the higher grade are used in calculating the GPA. If the student earns the same grade or a lower grade, then the repeated course grade is not used in computing the GPA. The repeated course is marked as being excluded on the student's official record. All grades remain on the student's official academic record.

Limitations on Repeating Courses to Improve a Grade

An undergraduate student may repeat an individual course only once in an attempt to improve a grade, and may repeat at most four courses in attempts to improve grades. A grade of "W" does

not count as an attempt for purposes of grade replacement. For a course in which a student has received two grades of "D+," "D," "D-," or "F," all grades earned in any subsequent enrollments in the course will be included in the computation of the student's GPA. For a student who already has four total attempts at repeating courses to improve grades, all grades earned in any subsequent enrollments in which the student already has received grades of "D+," "D," "D-," or "F" will be used in the computation of the GPA.

Upon graduation, students may not repeat a course with the purpose to improve their undergraduate or graduate GPA. The GPA at the time of graduation is the official GPA.

Courses That May Not Be Repeated to Improve a Grade

If a student repeats a course in which a grade of "A+," "A," "A-," "B+," "B," "B-," "C+," "C," "C-," or "CR" was earned, and the course description does not indicate that the course "may be repeated for credit," then the repeated course is marked as a duplication and the grade and semester credit hours for the repeated course are not used in the calculation of the student's GPA or the number of hours earned at UTSA.

Procedures for Reinstatement

Students seeking reinstatement must reapply for admission to the Admissions Office and pay the reinstatement fee. The application for admission may be filed online. In addition to the application and fee payment, the applicant must complete a petition packet. The packet, including instructions, may be found on the Admissions: Returning Students. The application, reinstatement fee, petition form and all required supporting documentation, must be on file in the Admissions Office by June 15 for the Fall semester; October 15 for the Spring semester; and March 15 for the Summer semester.

If the student's petition for reinstatement is approved by the Dean (for first dismissals) or the reinstatement committee (for second dismissals), the Office of Admissions will process the application for admission for the requested semester of enrollment. If the petition for reinstatement is disapproved, a student may not file another petition until the following semester. Appeal of a denial for reinstatement may be made to the Vice Provost of Academic Affairs and Dean of University College found on the University Leadership Council page within two weeks after notice of the denial is postmarked. The decision of the Vice Provost of Academic Affairs and Dean of University College is final.

All students who are reinstated from academic dismissal are placed on academic probation and must maintain a minimum semester 2.0 GPA every semester until they reach a UTSA cumulative GPA of 2.0. Reinstated students can reenter the CME program if their UTSA GPA reaches 2.5. Students who have been reinstated following an academic dismissal must be advised by their academic advisor prior to registration. At that time, the student and the advisor will develop a remedial plan specifying the expectations that the student will be required to meet during the semester. Students who fail to follow the requirements set forth by the remedial plan will be subject to academic dismissal.

Advising for Reinstated Students

Each academic advisor sees students assigned to them concerning all matters of their academic status, such as progress toward degree completion, graduation status, academic probation, academic dismissal, and changing majors. Students who are on academic probation who are reinstated after academic dismissal, or who have a Texas Success Initiative (TSI) deficiency, are required to be advised and holds are placed on their registration records to ensure that the student meets with an advisor.

Transfer Students and Transfer of Courses

Transfer students applying for admission to UTSA undergo an official evaluation of transfer credit by the Transfer Evaluation Unit in the Office of Admissions. The following criteria are used:

- Courses completed at U.S. institutions are evaluated on the basis of UTSA's equivalency tables and the course catalog information of the transferring college or university, which must be accredited by a regional accrediting association.
- Transfer courses from Texas public institutions share course numbers from the Texas Common Course Numbering System (TCCNS), a standard set of course descriptions to aid in the transfer of lower division courses among colleges and universities in Texas. Most schools have adopted the TCCNS or cross-referenced them. For example, Calculus I, MAT 1214 at UTSA, is equivalent to MATH 2413 at several local community colleges.
- Applicants can receive credit for UTSA's Core Curriculum if they have successfully completed the core curriculum at another Texas public institution approved by The Texas Higher Education Coordinating Board.
- A maximum of 66 credit hours may be transferred from a community college and applied to the baccalaureate degree.
- Courses completed at institutions outside of the United States must be evaluated on an individual basis at the student's expense by the foreign credentials' evaluation service designated by the Office of Admissions. Credit is accepted by UTSA on the basis of this evaluation.
- UTSA grants credit to its students for 28 of the 33 College-Level Examination Program (CLEP) exams, most subject exams, a few SAT subject exams, and Departmental Competency-based exams in some core subject areas.
- The following types of courses are not accepted: Developmental Education, Orientation, Life Experience, High School Level, Below-Algebra Mathematics or Vocational-Technical courses.

Transfer of Credit for Admitted Students

Admitted students may submit a petition to receive credit earned from another US institution toward the UTSA degree plan for core courses within the CME curriculum. The applicability of such coursework is at the discretion of the major academic department. UTSA reserves the right to refuse recognition of credit from a college or university if it is determined the course does not

meet the department's standards of rigor, quality, comparability, and/or degree program relevance.

Students must contact their academic advisors to submit the appropriate petition form and a syllabus of the course taken at the other institution. It is the student's responsibility to provide the advisor with all supporting documents (i.e., course syllabus, description, etc.). CME evaluates these requests by ensuring that at least 80% of the content of the course agrees with the course being offered at UTSA, and the assessments used to evaluate the students are appropriate to maintain an equivalent standard of rigor. The CME program reserves the right to reevaluate the adequateness of transfer courses previously accepted based on student performance at UTSA. The form is reviewed by the Department Chair/School Director or Designee of Course Discipline. For non-engineering courses, KCEID requests that the department that typically offers the course outside the college review the petition. Then, the form is routed to the Associate Dean of Undergraduate Programs in the KCEID for a final review. The form is returned to Advising to process the course substitution.

Advising and Career Guidance

Academic advising plays an integral role in the education of undergraduate students at UTSA. It is Academic Advising's mission to support the holistic development of students by cultivating trusting and collaborative relationships. Academic Advising is a partnership between students and academic advisors. Every student is assigned a professional academic advisor to guide them through their journey at UTSA. Advisors engage students in their educational planning, teach them how to navigate the University system, and encourage them to take responsibility for their decisions. Academic advisor responsibilities are to:

- Communicate curriculum requirements, academic and state policies, and university procedures,
- Refer students to applicable support resources,
- Encourage and guide students as they define and cultivate goals,
- Teach decision-making skills and how to take responsibility for education progress, and
- Engage in training facilitated by the department to stay current and knowledgeable of department, college and university-wide programs and requirements.

Advising Procedure

Students who are declared as UTSA students are encouraged to meet with an academic advisor every semester for degree planning and course registration. All freshmen and transfer students admitted to UTSA are required to attend orientation and meet with an academic advisor in their corresponding advising unit for advising and to register for classes their first semester. Students who are declared Engineering or Engineering, Mathematics, and Sciences Studies (XEMS) majors are advised by the Engineering Advising unit. Students admitted who have not declared a major, or who have provisional status, are advised by the Exploratory Program (EXPL) advising unit. Once the student declares a major, advising is then transferred to an academic advisor in the

designated advising unit of the student's program. Refer to the contact information for the Engineering advising unit.

Academic Advising assists students via scheduled appointments, drop-ins, e-mail correspondence, and phone calls. All UTSA undergraduates are encouraged to meet with their assigned academic advisor to develop active, locked Degree Works planners showing semester-by-semester course recommendations for the next 2-3 semesters. Advisors use Degree Works to assist students, showing them the degree requirements, the courses they've completed, and the requirements left to complete as well as a semester-by-semester planner for three semesters out. Advisors identify required prerequisites which may be missing and decide whether scheduling accommodations are deemed necessary.

Undergraduate advisors track their student contacts based on data from Civitas Inspire. Advisors follow the basic standards of professional advising as outlined in the Council for the Advancement of Standards in Higher Education (CAS) Standards for Advising and NACADA Core Values.

Advisor meetings are optional for students who are on the expected academic track for their program and students have the ability to run their own degree audits in the DegreeWorks system. However, advisor meetings are mandatory for students receiving less than C- in a course in order to develop a remedial plan. Advisor meetings are also mandatory for freshmen students, as will be described below.

Freshman Orientation

A freshman orientation, sponsored by the Orientation and Family Programs Office, is held every semester. All advising units assist freshmen with the selection of core and major requirements. In addition to academic advising, freshmen learn first-hand what UTSA has to offer its students. Extensive support services such as counseling, learning assistance, and career guidance are introduced. In addition, strong emphasis is placed on skills necessary for academic and professional success. Students attend one-hour orientation appointments where they must meet with an academic advisor to recommend classes and assist with registration. In these orientation appointments, students are advised about the engineering program, prerequisites, and the importance of proper course selection, due to the structured nature of engineering curricula.

Career Advising

All current and new CME students are assigned a Faculty mentor as soon as they have been accepted into the College and declare a CME major. UTSA uses the Inspire program where faculty and students can communicate with each other via email. Students are reminded to schedule a meeting with the faculty mentor both by email and at the student forums held each semester. The CME faculty members are encouraged to provide career pathway advice and refer students to their Academic Advisor for detailed university academic advice concerning such matters as adds/drops/withdrawals/petitions, since the Academic Advisor is the person who is most familiar with the latest forms and policies. The assignment of students to faculty mentors is kept consistent so that the student can develop a sense of connection with the faculty member. The faculty are encouraged to talk about internships, co-ops, study abroad, and part-time

employment opportunities. Faculty mentors provide guidance and support to students as they consider career and/or graduate program opportunities with a CME degree. In addition, faculty are encouraged to reach out to their mentees in response to specific concerns, including low midterm grades, lack of class attendance, and other issues.

Students can also visit the KCEID Student Success Center, which is a one-stop shop for students to learn about and participate in opportunities available for their personal and professional growth and development. The Center serves as the main point-of-contact for industry professionals in order to connect with students regarding potential internships and job opportunities, as well as networking events and mentorships.

Students can also visit the UTSA Career Center to work with professional counselors in order to discover, pursue and achieve their unique career goals. Resources offered include:

- **Handshake** – to search for jobs and internships, view and attend virtual recruiting events, and schedule appointments with professional career counselors;
- **VMock** – to submit their resume for targeted suggestions and feedback;
- **Roadrunner Network** – a powerful online and in-person network of diverse mentors;
- **What Can I Do with This Major?** – to help students connect majors to careers and to become a more marketable job candidate;
- **Job Scam Alert** – for guidance regarding potential job scams;
- **Interview Stream** – to sharpen their interview skills by practicing responses to simulated interview questions;
- **Seek UT** – a free, online tool and website that presents data on the earnings and educational graduate outcomes from UTSA graduates; and
- **Runner Career Launch** – to demonstrate how students have gained and applied core competencies which form the foundation for workplace success across fields and job functions.

Graduation Requirements

In order to receive a bachelor's degree in CME from UTSA, a student must meet these minimum requirements:

1. Complete a minimum of 128 semester credit hours, at least 39 of which must be upper-division level.
2. Meet the minimum UTSA residency requirements.
3. No more than 66 community college hours can be used towards the degree.
4. Complete the major and support work requirements and the free elective requirements for the desired degree. Free electives refer to any semester credit hours accepted by UTSA in transfer or awarded by UTSA that, for degree purposes, are not applied to Core Curriculum, major, minor, or support work requirements. The only restrictions placed upon courses used as free electives are as follows:
    a. that a specific number of free elective credits must be at the upper-division level for some degree programs; and

    b. that a maximum of 6 semester credit hours of physical activities courses can be applied to the free electives allowed for any UTSA degree program.
5. Complete the University Core Curriculum requirements (General Education Requirements);
6. Meet all requirements for a degree as put forth by the Texas State Education Code, including the following:
    a. All students must complete 6 semester credit hours of American or Texas History.
    b. All students must complete 6 semester credit hours of Government or Political Science, including the Constitution of the United States and constitutions of states, with special emphasis on Texas.
7. Achieve an overall 2.5 grade point average in all work attempted at UTSA and a 2.5 grade point average in all work included within the major;
8. Be in good academic standing at UTSA;
9. Fulfill the KCEID Signature Experience requirement.
10. Apply formally for the degree before the deadline in the Office of the Registrar.

After the deadline to apply for graduation, Advisors receive a list from the Graduation Coordination Office of the students who have applied for graduation. The Engineering Advising Unit is responsible for auditing the student's degree plan to see that uniform requirements for each degree are met.

Graduation verification is a two-step process. The Advising Unit does a preliminary verification. An email is sent to students notifying them of any areas in which they are deficient in their degree plans. The student is responsible for completing all coursework and providing any adjustments to the assigned Academic Advisor by the end of the semester in which graduation is expected. A final verification occurs once all grades are posted for the semester of graduation; the degree plan is reviewed again, and the College Dean authorizes the Certification for Graduation. At the completion of this process, a diploma is printed and mailed to the eligible graduate.

Students who apply for the degree in a given semester but do not fulfill all requirements must submit a new application for graduation prior to the deadline for the semester in which they intend to graduate. Degrees are conferred at the end of each long semester and at the end of the Summer semester. Public commencement ceremonies are held at the end of the Fall and Spring semesters. Students are encouraged to apply for graduation at least one semester prior to the term of graduation.

A student who has completed all degree requirements but has failed to apply for the degree may obtain a Letter of Completion from the Academic Advising Unit after the close of the semester in which all degree requirements were met.

Signature Experience

Effective fall 2022, all incoming students are required to complete a Signature Experience as a condition of graduation from each of Klesse College's undergraduate programs.

Signature experiences are an integral part of UTSA's Classroom to Career initiative. Students are asked to complete one of the following INTERESTS: An INTErnship, a REsearch project, a STudy abroad experience, or a Service learning opportunity. Students may opt to meet their signature experience requirement in one of two ways:

1. Completing a Klesse College course associated with an INTERESTS category, with a grade of C- or better.
2. Successfully participating in an approved co-curricular experience.

CME Faculty

The name, position in the department, and contact information for the CME (Continuing Medical Education) faculty members.

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ATTACHMENTS

UTSA Engineering

Department of Biomedical Engineering-Chemical Engineering Program

STATEMENT OF UNDERSTANDING

This form must be scanned and returned to the instructor of the course as well as to the secretary in the main office of Chemical Engineering located on the first floor of the AET building.

STUDENT NAME: _____ STUDENT ID: _____

PHONE NUMBER: _____ EMAIL: _____

- I understand that participation in the internship program requires at least part-time employment in a company conducting practical tasks relevant to chemical engineering.
- It is also understood that no more than 3 semester credit hours of CME Internship may apply to a bachelor's degree.
- I agree to attach a signed job description on company letterhead from my employer/supervisor.
- I agree to register for CME 4803, CME Internship, at The University of Texas at San Antonio during the work period.
- I will register and pay for all required tuition and fees required by the University and the College of Engineering in accordance with the above and with published rules and guidelines.

Important: My signature below attests to my acceptance of the conditions listed above and required for the internship to count as a Chemical engineering elective at UTSA.

Company Information

Company Name:_____

Direct Mentor: _____

Mentor's Email: _____Mentor's phone number: _____

City/State/Zip: _____

Position Title: _____

Start Date: _____ End Date: _____

Hours / Week: _____ Paid Intern? Yes ☐ No ☐

How did you find this position? _____

Student Signature: _____ Date: _____

Faculty Advisor's Signature:_____ Date: _____

CME 4803 Department Assigned Course :_____

CME Department Chair Signature: _____ Date _____

Department of Biomedical Engineering-Chemical Engineering Program

Host Supervisor's EVALUATION of a Student Intern

Fall ☐ **Spring ☐** **Summer ☐** **Year**

University of Texas San Antonio

Chemical Engineering Program

Academic Internship Program

Student Name (Please Print): _____

Supervisor's Name:_____Title/Position:_____

Host Organization: _____ Location (City, State):_____

Instructions

Please evaluate the student honestly and objectively.

Please sign the form on the next page (you can type in your name).

Please return the original of this form to the faculty who will assign the grade after the internship.

I. Please respond to the following statements.

1. The student-intern reports to work as scheduled and on-time. Yes ☐ No ☐
2. Dress and appearance of the student intern are appropriate. Yes ☐ No ☐

II. Please rate the student's performance in the following areas, using the numerical scale below.

5	Exceptional	Consistently exceeds expectations
4	Commendable	Sometimes exceeds expectations
3	Good	Meets expectations
2	Uncomplimentary	Rarely meets expectations
1	Unsatisfactory	Does not meet expectations

Table 9. Student Work Habits Performance Rating

Work Habits Evaluation Statements	**5**	**4**	**3**	**2**	**1**	**NA**
Exhibits a positive and professional attitude	☐	☐	☐	☐	☐	☐
Effectively handles routine problems and/or sees routine tasks through to their conclusion	☐	☐	☐	☐	☐	☐
Effectively manages his/her time	☐	☐	☐	☐	☐	☐

Table 10. Student Ability and Willingness to Learn Performance Rating

Ability/Willingness to Learn Evaluation Statements	**5**	**4**	**3**	**2**	**1**	**NA**
Shows willingness to learn/be taught by supervising personnel	☐	☐	☐	☐	☐	☐
Asks pertinent and purposeful questions	☐	☐	☐	☐	☐	☐
Seeks out and utilizes appropriate resources	☐	☐	☐	☐	☐	☐
Accepts responsibility for mistakes and learns from experiences	☐	☐	☐	☐	☐	☐

Table 11. Reading and Writing Computation Skills Performance Rating

Reading/Writing Computation Skills Evaluation Statements	**5**	**4**	**3**	**2**	**1**	**NA**
Comprehends and follows written materials/instructions	☐	☐	☐	☐	☐	☐
Communicates ideas and concepts clearly in writing	☐	☐	☐	☐	☐	☐
Uses appropriate mathematical procedures and/or computer applications	☐	☐	☐	☐	☐	☐

Table 12. Listening & Oral Communication SkillsPerformance Rating

Listening & Oral Communication Skills Evaluation Statements	**5**	**4**	**3**	**2**	**1**	**NA**
Listens to others in active and attentive manner	☐	☐	☐	☐	☐	☐
Demonstrates effective communication skills in one-on-one settings	☐	☐	☐	☐	☐	☐
Demonstrates effective communication skills in group settings	☐	☐	☐	☐	☐	☐

Table 13. Listening & Oral Communication Skills Performance Rating

Creative Thinking and Problem-Solving Evaluation Statements	**5**	**4**	**3**	**2**	**1**	**NA**
Breaks down complex tasks/problems into manageable pieces	☐	☐	☐	☐	☐	☐
Incorporates a holistic perspective in addressing or managing problems	☐	☐	☐	☐	☐	☐
Demonstrates initiative in defining and solving non-routine problems	☐	☐	☐	☐	☐	☐

Table 14. Professionalism/Potential for Growth & Advancement Performance Rating

Professionalism/Potential for Growth & Advancement Evaluation Statements	**5**	**4**	**3**	**2**	**1**	**NA**
Exhibits a self-motivated approach to work	☐	☐	☐	☐	☐	☐
Demonstrates ability to set appropriate priorities/goals	☐	☐	☐	☐	☐	☐
Takes the initiative/is self-directed when appropriate	☐	☐	☐	☐	☐	☐

Table 15. Teamwork/Interaction with Colleagues and other Employees Performance Rating

Teamwork/Interaction with Colleagues and other Employees	**5**	**4**	**3**	**2**	**1**	**NA**
Establishes effective working relationships	☐	☐	☐	☐	☐	☐
Works within appropriate authority and decision-making channels	☐	☐	☐	☐	☐	☐
Accepts criticism in a professional and constructive manner	☐	☐	☐	☐	☐	☐
Is effective in a multidisciplinary environment	☐	☐	☐	☐	☐	☐

Table 16. Character Attributes Performance Rating

Character Attributes	**5**	**4**	**3**	**2**	**1**	**NA**
Brings a sense of values and integrity to the job	☐	☐	☐	☐	☐	☐
Respects the diversity (religious/cultural/ethnic) of co-workers	☐	☐	☐	☐	☐	☐

Table 17. Overall Performance Rating

Overall Performance	**5**	**4**	**3**	**2**	**1**	**NA**
Indicate the overall performance of work	☐	☐	☐	☐	☐	☐

III. COMMENTS:

1. What are the student's **strongest assets**?

2. What qualities and characteristics should the student **strive to improve**?

3. Other observations/comments:

4. Would you be willing to host another UTSA CME student? **Yes ☐** **No☐**

Evaluator's Signature (type name): _____Date:_____

This form can be returned to the faculty who will assign the grade

Thank you

Internship Report Requirements for CME 4803

Please follow the following structure for writing the internship report required to partially fulfill the requirements of the CME 4803: Internship in Chemical Engineering requirements.

1. The report should have the following sections:
    a. Title page: Include student name, ID#, email, company name, address, supervisor name, internship dates, and faculty instructor.
    b. Introduction: Briefly describe the internship and the goals of the internship
    c. The company: Introduce us to the company where you interned.
    d. Internship responsibilities: Briefly describe the tasks assigned to you during the internship and explain your procedures in detail.
    e. Internship Findings: Describe results obtained during your internship. What engineering skills have you learned?
    f. Internship Summary
2. The report should be written using Times New Roman font, 12 points, single-spaced, with 1" margins.
3. The report should not exceed 10 pages total.
4. The report is to be submitted to the instructor of the CME 4803 no later than one week prior to the end of the regular semester (before finals) and no later than two weeks prior to the date that faculty submit grades to the University.

UTSA Engineering

Department of Biomedical Engineering-Chemical Engineering Program

Contract for CME 470x
Research Studies in Chemical Engineering

Fall ☐ Spring ☐ Summer ☐ Year:_____# of credits _____

Student Name (Please Print):_____

Faculty mentor (Please Print):_____

Project description (to be filled out by the faculty mentor)

Project Goals (to be filled out by the faculty mentor)
By joining my lab, you are expected to do the following:

To assess your performance during this research experience, the following criteria will be used:

1. **Breadth and Depth of Discipline** – *Demonstrate knowledge in one or more core Chemical Engineering areas.* You are expected to utilize and integrate knowledge learned in various CME classes in your research experience.
2. **Communication** – *Communicate effectively (orally and in writing).* Summarization of literature and laboratory results orally in laboratory meetings and/or in discussions with your mentors is part of CME 470x. A written report at the end of this experience that summarizes what you have learned is required. Presenting your findings in a local or national symposium will be required.
3. **Information Literacy** – *Effectively (thoroughly) search, evaluate, and cite the appropriate literature.* Participation in the CME470x class requires students to gain a working knowledge of their project area through the reading of primary literature. This reading assumes a fundamental understanding of core Chemical Engineering knowledge areas.

4. **Quantitative and Symbolic Reasoning** – *Apply appropriate quantitative tools to data.* Mathematics and statistical methods are required subjects for the Chemical Engineering major. The application of symbolic logic, mathematical modeling, graphic analysis, and statistical methods are universally applied in Chemical Engineering.
5. **Thinking Critically and Creatively** – *The ability to appreciate the importance of a specific problem area is a sophisticated skill which develops with maturity.* The CME 470x course will enable the student to start to develop such skills.
6. **Self in Society** – *Be aware of the implications and significance of Chemical Engineering (results, etc.) to society.* During participation in this CME 470x research study, students are evaluated on demonstrating their awareness of the implications and impact of Chemical Engineering issues on individuals and society. Additionally, students are asked to defend their posters and presentations in relationship to the implications of their work to societal impacts and needs.

Name of student (Please Print): _____

Signature of student: _____

Date: _____

Name of faculty mentor (Please Print): _____

Signature of faculty mentor: _____

Date: _____

Report requirements for CME 470x Research Studies in Chemical Engineering

Please follow the following structure for writing the report required to partially fulfill the requirements of the CME 470x: Research Studies in Chemical Engineering

1. The report should have the following sections:
    - **Title page**: Include student name, ID#, email, name of faculty mentor, and dates of the research training.
    - **Abstract**
        - Less than 200 words
        - Includes appropriate content
    - **Introduction and Background**
        - Background information with citations
        - Purpose of experiment
    - **Materials and Methods**
        - Materials and equipment listed
        - Past tense
        - Detailed methods
    - **Results and Discussion**
        - Results listed
        - Proper use of figures and tables
        - Discussion of results
        - Equations used
    - **Conclusions**
        - Summary of findings
        - Discussion of error and future changes
    - **References**
2. The report should be written using Times New Roman font, 12 points, single-spaced, 1" margins.
3. The report should not exceed 10 pages in total.
4. The report is to be submitted to the instructor of the CME 470x no later than one week prior to the end of the regular semester (prior to final exams) and no later than two weeks prior to the date that faculty must submit grades to the University.

Research Studies Presentation Requirement

To count a research study for a technical elective (CME 4703), the student needs to present her/his work in a scientific symposium. The symposium can be local, regional, national, or international. The student should submit their poster or final PPT file for oral presentation as part of their required materials to meet class requirements.

Accessible Version of Recommended Four-Year Flowchart and Prerequisites Map

We recommend taking the following courses during the corresponding semesters.

Semester 1:

1. **AIS 1203 (Academic Introduction and Strategies):** No pre-/co-requisites.
2. **CHE 1103 (General Chemistry I):**
    - Prerequisite for: CHE 1113 and CHE 1131 (Semester 2)
    - Co-requisite for: CHE 1121 (Semester 1)
3. **CHE 1121 (General Chemistry I Laboratory):**
    - Prerequisite: CHE 1131 (Semester 3) Co-requisite: CHE 1103 (Semester 1)
4. **EGR 1343 (The Impact of Modern Technologies on Society):** No pre-/co-requisites.
5. **MAT 1213 (Calculus I):**
    - Prerequisite for: MAT 1223 (Semester 2), PHY 1943 (Semester 2), and CME 2103 (Semester 3)
6. **WRC 1013 (Freshman Composition I):**
    - Prerequisite for: WRC 1023 (Semester 2)

Semester 2:

1. **CME 1202 (Introduction to Chemical Engineering):** No prerequisites or co-requisites.
    - Prerequisite for: CME 3003 (Semester 5)
2. **CHE 1113 (General Chemistry II):**
    - Prerequisite: CHE 1103 (Semester 1)
    - Co-requisite for: CHE 1131 (Semester 2)
    - Prerequisite for: CHE 2603 (Semester 3) and CME 2103
3. **CHE 1131 (General Chemistry II Laboratory):**
    - Prerequisite: CHE 1103 and CHE 1121 from Semester 1
    - Co-requisite: CHE 1113 (Semester 2)
    - Co-requisite for: CHE 2612 (Semester 3)
4. **MAT 1223 (Calculus II):**
    - Prerequisite: MAT 1213 (Semester 1)
    - Co-requisite for: PHY 1943 (Semester 2)
    - Prerequisite for: EGR 2313, EGR 2302, PHY 1963 (Semester 3); STA 2303 (Semester 4); and EGR 3713 (Semester 8)
5. **PHY 1943 (Physics for Scientists and Engineers I):**
    - Prerequisite: MAT 1213 (Semester 2)
    - Co-requisite: MAT 1223 (Semester 2)
    - Co-requisite for: PHY 1951 (Semester 2)
    - Leads to: PHY 1963 (Semester 3)

6. **PHY 1951 (Physics for Scientists and Engineers I Laboratory):**
    - Co-requisite: PHY 1943 (Semester 2)
    - Prerequisite for: PHY 1971 (Semester 3)
7. **WRC 1023 (Freshman Composition II):**
    - Prerequisite: WRC 1013 (Semester 1)

Semester 3:

1. **CHE 2603 (Organic Chemistry I):**
    - Prerequisite: CHE 1113 (Semester 2)
    - Co-requisite for: CHE 2612 (Semester 3)
2. **CHE 2612 (Organic Chemistry I Laboratory):**
    - Co-requisites: CHE 1131 (Semester 2) and CHE 2603 (Semester 3)
3. **CME 2103 (Chemical Process Principles):**
    - Prerequisites: MAT 1213 (Semester 1) and CHE 1113 (Semester 2)
    - Prerequisite for: CME 2303 and CME 2503 (Semester 4)
4. **EGR 2313 (Multivariable Calculus and Series for Engineers):**
    - Prerequisite: MAT 1223 (Semester 2)
    - Prerequisite for: CME 2303 and CME 2503 (Semester 4), and CME 3123 (Semester 5)
5. **EGR 2302 (Linear Algebra for Engineers):**
    - Prerequisite: MAT 1223 (Semester 2)
    - Prerequisite for: EGR 3423, CME 2403 (Semester 4), and CME 3123 (Semester 5)
6. **PHY 1963 (Physics for Scientists and Engineers II):**
    - Prerequisites: MAT 1223 and PHY 1943 (Semester 2)
    - Co-requisite for: PHY 1971 (Semester 3)
7. **PHY 1971 (Physics for Scientists and Engineers II Laboratory):**
    - Prerequisite: PHY 1951 (Semester 2)
    - Co-requisite: PHY 1963 (Semester 3)

Semester 4:

1. **University Core Course:** verify any pre-/co-requisites in the course catalog.
2. **CME 2303 (Transport Phenomena I):**
    - Prerequisites: CME 2103 and EGR 2313 (Semester 3)
    - Prerequisite for: CME 3703 (Semester 5), CME 3403, and CME 3503 (Semester 6)

3. **CME 2503 (Thermodynamics I):**
    - Prerequisites: CME 2103 and EGR 2313 (Semester 3)
    - Prerequisite for: CME 3203 (Semester 5)
4. **STA 2303 (Applied Probability and Statistics for Engineers):**
    - Prerequisites: MAT 1223 (Semester 2)
5. **EGR 3423 (Differential Equations for Engineers):**
    - Prerequisites: MAT 1223 (Semester 2) and EGR 2302 (Semester 3)
    - Co-requisite for: CME 3123 (Semester 5)
6. **CME 2403 (Introduction to Programming for Engineers):**
    - Prerequisites: EGR 2302 (Semester 3)
    - Prerequisite for: CME 3123 (Semester 5)

Semester 5:

1. **CME 3003 (Introduction to Materials Science and Engineering):**
    - Prerequisite: CME 1202 (Semester 2)
2. **Specialization Elective I:** select and verify any pre-/co-requisites in the course catalog.
3. **CME 3203 (Thermodynamics II):**
    - Prerequisite: CME 2503 (Semester 4)
    - Prerequisite for: CME 4163 (Semester 7)
4. **CME 3703 (Transport Phenomena II):**
    - Prerequisite: CME 2303 (Semester 4)
    - Prerequisite for: CME 4163 (Semester 7)
5. **CME 3123 (Computational Methods in Chemical Engineering):**
    - Prerequisites: EGR 2313 (Semester 3) and CME 2403 (Semester 4)
    - Co-requisite: EGR 3423 (Semester 4)

Semester 6:

1. **CME 3403 (Separation Processes):**
    - Prerequisite: CME 2303 (Semester 4)
    - Prerequisite for: CME 4103 and CME 4163 (Semester 7)
2. **CME 3503 (Kinetics and Reactor Design):**
    - Prerequisite: CME 2303 (Semester 4)
    - Co-requisite for: CME 3601 (Semester 6)
3. **CME 3601 (Chemical Engineering Laboratory l):**
    - Co-requisite: CME 3503 (Semester 6)
4. **CME 3302 (Chemical Process Safety and Risk Management):**
    - Prerequisite for: CME 4163 (Semester 7)
5. **ECO 2023 (Introductory Microeconomics):**
    - Prerequisite for: EGR 3713 (Semester 8)
6. **University Core Course:** verify any pre-/co-requisites in the course catalog.

Semester 7:

1. **CME 4103 (Process Dynamics and Control):**
    - Prerequisite: CME 3403 from Semester 6
    - Co-requisite for: CME 4201 (Semester 7)
2. **CME 4201 (Chemical Engineering Laboratory II):**
    - Co-requisite: CME 4103
3. **CME 4163 (Chemical Engineering Design Fundamentals):**
    - Prerequisites: CME 3203, CME 3703 (Semester 5), CME 3403, and CME 3302 (Semester 6)
    - Prerequisite for: CME 4263 (Semester 8)
4. **Specialization Elective II:** select and verify any pre-/co-requisites in the course catalog.
5. **University Core Course:** verify any pre-/co-requisites in the course catalog.
6. **University Core Course:** verify any pre-/co-requisites in the course catalog.

Semester 8:

1. **CME 4263 (Plant Design):**
    - Prerequisite: CME 4163 (Semester 7)
    - Co-requisite: EGR 3713 (Semester 8)
2. **EGR 3713 (Engineering Economic Analysis):**
    - Prerequisites: MAT 1223 (Semester 2) and ECO 2023 (Semester 6)
    - Co-requisite for: CME 4263 (Semester 8)
3. **Specialization Elective III:** select and verify any pre-/co-requisites in the course catalog.
4. **University Core Course:** verify any pre-/co-requisites in the course catalog.
5. **University Core Course:** verify any pre-/co-requisites in the course catalog.

Return to Recommended Four-Year Flowchart and Prerequisites Map

Accessible Version Electives Flowcharts and Prerequisites Mapping

Most elective courses can be taken without the need for prerequisites outside the general B.S. Chemical Engineering degree plan; however, there are some courses that require taking an extra course in order to satisfy prerequisites for the electives. Several flowcharts of prerequisites are provided next for all approved electives divided by emphasis track and elective type.

Legend for Track Flowcharts

- AE & Color: Black text on white background = Approved Elective
- NCE & Color: Blue = Pre-requisite, not within the Chemical Engineering program of study
- CME & Color: Red = Pre-requisite within the Chemical Engineering program of study
- ADV & Color: Green = Advanced Physics or Chemistry Elective

Bioengineering Track (Accessible Version)

Flowchart 1

A flowchart showing two-course paths.

The first path has a red block labeled "CME 3003: Intro to Materials Sci. and Engineering" that leads to a white block labeled “(AE) CME 4713: Fundamentals to Polymer Science and Engineering with Selected Applications".

The second path has a green box labeled “(ADV) CHE 3643: Organic Chemistry II (Advanced Chem Elective)," that leads to a white block labeled "(AE) BCH 3303: Essentials of Biochemistry”.

Flowchart 2

A flow chart that shows three course paths. The first course path starts with a blue box labeled "(NCE) BIO 1203: Biosciences (Not Listed as Elective)".

The second course path starts with a red box labeled "(CME) MAT 1213: Calculus I." Both paths then connect to a white block labeled "(AE) CME 2113: Physiology for Chemical Engineering (cross-listed with BME 2103)," which then leads to a white block labeled “(AE) CME 3113: Cellular Biology for Chemical Engineers (cross-listed with BME 3113)”, which then leads to a white block “(AE) CME 3413: Biocompatibility of Materials (cross-listed with BME 3413)”.

The third course path starts with a red block labeled “CME 3003: Intro to Materials Sci. and Engineering” and leads directly into the last white block labeled, “(AE) CME 3413: Biocompatibility of Materials (cross-listed with BME 3413)”.

Flowchart 3

A flowchart that shows three course paths.

The first course path starts with a red box labeled “(CME) EGR 3423: Differential Equations for Engineers” and has an arrow labeled “Co-req” leading into another box.

The second course path starts with a red box labeled “(CME) EGR 2302: Linear Algebra for Engineers”.

The third course path starts with a red box labeled “(CME) PHY 1943: Physics 1”.

All three course paths lead to a white box labeled “(AE) CME 2803: Biomechanics 1 (cross-listed with BME 2203)”. From there, the course paths diverge into two options: a white box labeled “(AE) CME 3803: Biomechanics 2 (cross-listed with BME 3203”, or another white box labeled “(AE) CME 3903: Bioinstrumentation (cross-listed with BME 3303)”.

Return to Bioengineering Track Flowcharts

Materials Engineering Track (Accessible Version)

Flowchart 1

A flow chart showing three course paths.

The first, starts with a red box labeled, “CME 3003: Intro to Material Science and Engineering” and leads to a white box labeled, “(AE) CME 4713: Fundamentals to Polymer Science and Engineering with Select Applications”.

The second course path, starts with a red box labeled “CME 2103: Chemical Process Principles”, that leads to a white box labeled “(AE) CME 4273: Heterogeneous Catalysis and Surface Science”.

The final course path, starts with a red box labeled “CME 2503: Thermodynamics 1”, and leads to two white boxes labeled with follow-up course options, “(AE) CME 4733: Fundamentals of Interfaces, Nanoparticles, and other Colloids” or “(AE) CME 4823: Electrochemistry and Electrochemical Engineering”.

Flowchart 2

A flow chart showing 4 course pathways with different starting options.

The first path starts with a red box labeled “(CME) PHY 1943: Physics 1” and leads into a white box labeled “(AE) EGR 2103: Statics”, which leads to the final white course box labeled “(AE) ME 3243: Materials Engineering”.

The second pathway starts with a red box labeled “(CME) MAT 1223: Calculus 2”, with an arrow labeled “Co-req” that leads into the same second white box labeled “(AE) EGR 2103: Statics”, which then leads into the same final box labeled, “(AE) ME 3243: Materials Engineering”.

The third course pathway starts with a red box labeled “(CE) CHE 1103: Gen Chem 1,” and leads straight into the white box labeled “(AE) ME 3243: Materials Engineering”.

The final pathway starts with a blue box labeled “(NCE) ME 3241: Materials Engineering Lab”, with an arrow labeled “Co-req” that leads into the same white box labeled “(AE) ME 3243: Materials Engineering”.

Flowchart 3

A flowchart showing several course pathways.

The first set of pathways is on the left. There are three red boxes that each lead individually to the first white box. The first red box is labeled “(CME) EGR 3423: Differential Equations for Engr.” and has an arrow labeled “Co-req” leading into the next box. The second red box is labeled “(CME) EGR 2303: Linear Algebra for Engineers”.

The third red box is labeled, “(CME) PHY 1943: Physics 1”. All three red boxes lead to a white box labeled “(AE) CME 2803: Biomechanics 1” which then leads to a white box labeled “(AE) CME 3903: Bioinstrumentation”.

The second set of pathways is on the right. The first red box, labeled “(CME) MAT 1223: Calculus 2”, has two different white boxes it leads into. The first is labeled “(AE) EGR 2103: Statics,” and it is a co-req with the red box labeled “(CME) MAT 1223: Calculus 2”. The other white box it leads into is labeled, “(AE) ME 3813: Mechanics of Solids”. The second red box is labeled “(CME) PHY 1963: Physics 2” and leads into the white box labeled “(AE) EGR 2103: Statics”, which then leads into the white box labeled “(AE) ME 3813L Mechanics of Solids”.

Flowchart 4

A flowchart showing several course pathways.

The first set of pathways is on the left. There is a blue box labeled “(NCE) EE 1322 Intro to Electrical Engineering (not listed as an elective) (Substitute CME 1202 Intro to Chemical Engineering – within the Chemical Engineering Program)”. This blue box leads into a white box labeled “(AE) EE 2423 Network Theory”. There are also two red boxes that separately lead into this white box. They are labeled “(CME) EGR 3423 Differential Equations for Engineers” and “(CME) PHY 1963 Physics 2”. This white box, labeled “(AE) EE 2423 Network Theory” leads into another white box labeled “(AE) EE 3323 Electronic Devices”. There is also a red box labeled “CME CHE 1103 Gen Chem 1” that leads into the white box labeled “(AE) EE 3323 Electronic Devices”. From the white box labeled “(AE) EE 3323 Electronic Devices”, there is an arrow leading to a white box labeled “(AE) EE 4323 Dielectric and Optoelectronic Engineering Laboratory.”

The second set of pathways is on the right. There is a red box labeled “(CME) PHY 1963 Physics 2” and a red box labeled “(CME) EGR 2313 Multivariable Calculus and Series for Engineers” that separately lead into a box labeled “(AE) EE 3213 Electromagnetic

Engineering" which then leads into the white box labeled "(AE) EE 4323 Dielectric and Optoelectronic Engineering Laboratory."

Flowchart 5

A flowchart that shows three course paths.

The first has a red box labeled "(CME) PHY 1963: Physics 2," that leads into a white box labeled "(AE) PHY 2103: Modern Physics".

The second box is blue and labeled, "(NCE) MAT 2213: Calculus 3 (within the Chemical Engineering Program)", which leads into the same white box labeled "(AE) PHY 2103: Modern Physics)".

The last course path starts with a green box labeled, "(ADV) PHY 3202: Classical Mechanics (Adv. PHY Elective)", with an arrow labeled "Co-req" leading into the same white box labeled, "(AE) PHY 2103: Modern Physics".

Return to Materials Engineering Track Flowcharts

Environmental Engineering Track (Accessible Version)

Flowchart 1

Two flowcharts show two course pathways.

The first path has a red box labeled "CME 2103: Chemical Process Principles", and it leads into a white box labeled "(AE) CME 4273: Heterogeneous Catalysis and Surface Science".

The second path has a red box labeled, "CME 2503: Thermodynamics 1", which leads to two different white boxes. One is labeled "(AE) CME 4733: Fundamentals of Interfaces, Nanoparticles, and other Colloids," and the other is labeled "(AE) CME 4823: Electrochemistry and Electrochemical Engineering".

Flowchart 2

A flowchart showing four course paths.

The first starts with a red box labeled, "(CME) CHE 1103: Gen Chem 1", and leads to a white box labeled "CE 2633: Environmental Engineering", which then leads to two white box options. One labeled "CE 4633: Water and Wastewater Treatment" and the other labeled "CE 4603: Water Resources Engineering".

The second course path starts with a blue box labeled, "(NCE) CE 1301: Intro to Civil Engineering (Not Listed as Elective; Substitute CME 1202 Intro to Chemical Engineering- within the Chemical Engingeering Program)". It then leads to a white box labeled, "CE 2633: Environmental Engineering", which then leads to two white box options. One labeled "CE 4633: Water and Wastewater Treatment" and the other labeled "CE 4603: Water Resources Engineering".

The third course path starts with a blue box labeled, “(NCE) CE 3603: Fluid Mechanics (Substitute CME 2303 Transport Phenomena 1- within the Chemical Engineering Program)”. It then leads to two white box options. One labeled “CE 4633: Water and Wastewater Treatment” and the other labeled “CE 4603: Water Resources Engineering”.

The last path starts with a blue box labeled, “(NCE) CE 3173: Numerical Methods (Substitute CME 3123 Computational Methods- within the Chemical Engineering Program)”. It then leads to a white box labeled, “CE 4603: Water Resources and Engineering”.

Return to Environmental Engineering Track Flowcharts

Petroleum and Energy Systems Track (Accessible Version)

Flowchart 1

Three flowcharts showing three course options.

The first, starts with a red box labeled “CME 2103: Chemical Process Principles” and leads to a white box labeled “(AE) CME 4723: Heterogeneous Catalysis and Surface Science”.

The second course path starts with a red box labeled “CME 2503: Thermodynamics 1” and leads to two potential paths, a white box labeled “(AE) CME 4733: Fundamentals of Interfaces, Nanoparticles and other Colloids” or a white box labeled “(AE) CME 4823: Electrochemistry and Electrochemmical Engineering”.

The last course path starts with two red boxes. One is labeled “(CME) MAT 1223: Calculus 2” and the other is labeled “(CME) PHY 1943: Physics 1”. Both lead to a white box labeled “EGR 2213: Statics and Dynamics”.

Flowchart 2

A flowchart that shows 2 course paths.

The first has a red box labeled “(CME) PHY 1963: Physics 2,” that leads into a white box labeled “(AE) PHY 2103: Modern Physics”. The second box is blue and labeled “(NCE) MAT 2213: Calculus 3 (within the Chemical Engineering Program)” that leads into the same white box labeled “(AE) PHY 2103: Modern Physics)”.

The last course path starts with a green box labeled “(ADV) PHY 3202: Classical Mechanics (Adv. PHY Elective)” with an arrow labeled “Co-req” leading into the same white box labeled “(AE) PHY 2103: Modern Physics”.

Return to Petroleum and Energy Systems Track Flowcharts

Advanced Chemistry (Accessible Version)

Flowchart 1

Two flowcharts showing different course paths.

The first, starts with a red box labeled, “(CME) CHE 2603: Organic Chemistry 1” and leads to a white box labeled “(AE) CHE 3634: Organic Chemistry 2”.

The second flow chart starts with two red boxes. One is labeled “(CME) CHE 1113: General Chemistry 2,” and the other is labeled “(CME) CHE 1131: General Chemistry 2 Lab”. They both lead to a white box labeled “(AE) CHE 2214: Analytical Chemistry”.

Flowchart 2

Two flowcharts showing different course paths.

The first starts with a red box labeled “(CME) CHE 2603: Organic Chemistry 1” that leads to a white box labeled “(AE) CHE 3634: Organic Chemistry 1” that then leads to a white box labeled “(AE) CHE 4513: X-Ray Crystallography”.

The second flow chart starts with two red boxes. The first is labeled “(CME) CHE 1113: General Chemistry 2”, and the other is labeled “(CME) CHE 1131: General Chemistry 2 Lab”. They both lead to a white box labeled “(AE) CHE 3636: Descriptive Inorganic Chemistry”. There is an asterisk at the bottom that notes: Recommended co-enrollment with CHE 2603: Organic Chemistry 1.

Flowchart 3

Two flowcharts showing different course paths.

The first starts with three red boxes. The first box is labeled “(CME) CHE 1113: General Chemistry 2”, the second is labeled “(CME) MAT 1224: Calculus 2” and the third is labeled “(CME) PHY 1963: Physics 2”. All three boxes lead to a white box labeled “(AE) CHE 3824: Quantum Chemistry and Spectroscopy”.

The second flowchart starts with a red box labeled “(CME) CHE 2603: Organic Chemistry 1”. It then leads to a white box labeled “(AE) CHE 3634: Organic Chemistry 2”, which then leads to the last white box labeled “(AE) CHE 4703: Drug Metabolism”.

Return to Advanced Chemistry Flowcharts

Advanced Physics (Accessible Version)

Flowchart 1

Two flowcharts showing different course paths.

The first starts with two boxes. One is red and labeled “(CME) PHY 1963: Physics 2”, and the second box is blue labeled “(NCE) PHY 2823: Mathematical Physics 1 (within the Chemical Engineering Program)”. Both boxes lead to a white box labeled “(AE) PHY 3202: Classical Mechanics”.

The second flow chart starts with two boxes as well. A red box labeled, “(CME) CHE 1113: General Chemistry 2”, and a blue box labeled, “(NCE) CHE 3804: Molecular Thermodynamics (request substitution by CME 2503 and CME 3203- within the Chemical Engineering Program)”. Both boxes lead to a white box labeled “(AE) PHY 4833: Molecular Biophysics”.

Flowchart 2

Two flowcharts showing different course pathways.

Both flow charts start with the same three boxes. The first, a red box labeled “(CME) PHY 1963: Physics 2”, the second a blue box labeled “(NCE) MAT 2213: Calculus 3 (Substitute by EGR 2313- within the Chemical Engineering Program”, and the third a white box labeled “(AE) PHY 3203: Classical Mechanics”.

Both flow charts then lead to a green box labeled “(ADV) PHY 2103: Modern Physics (track elective)”. The left flow chart then leads to a white box labeled “(AE) PHY 3313: Material Physics”. The right flow chart leads to a white box labeled “(AE) PHY 3453: Laser: Theory and Applications”.

Flowchart 3

A flowchart showing 1 course pathway.

The chart starts with three boxes. The first, a red box labeled “(CME) PHY 1963: Physics 2”, the second a blue box labeled “(NCE) MAT 2213: Calculus 3 (Substitute by EGR 2313- within the Chemical Engineering Program”, and the third a white box labeled “(AE) PHY 3203: Classical Mechanics”. All three boxes then lead to a green box labeled “(ADV) PHY 2103: Modern Physics (track elective)”. The green box then leads to a white box labeled “(AE) PHY 4623: Nanotechnology”.

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