Academic Advising Handbook

Department of Chemical & Petroleum Engineering

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GENERAL ADVISING TOPICS

Academic advising is an integral part of your development as a chemical or petroleum engineer. We feel that it is an important part of our responsibility to assist you in meeting your academic and professional goals. This advising manual provides much of the information that you will need to get the most out of your academic advising sessions. Please review it often as it provides answers to many of the questions typically asked by students.

Advising Responsibilities

You are responsible for your course of study and the fulfillment of the graduation requirements. The development of your academic plan of study is done under the guidance of the advisor in partnership with you. For this to be successful, you should be open with your advisor about your capabilities, goals, and problems. Jayhawk Academic Advising has an assigned advisor for each student in our department, who will work with you to understand all of the degree requirements for your intended major. Ideally, you should meet with our Academic Advisor as you begin the major. They will help you plan your academic program to graduate in Chemical or Petroleum Engineering within the time frame that you select, and ensure that you do not take unnecessary courses. Our Academic Advisor is a good resource for information about major requirements, KU requirements, and outside offices such as Study Abroad or Career Services. You may also meet with the Academic Program Coordinator for assistance with any forms you might need.

In addition, every student in Chemical and Petroleum Engineering is assigned a faculty mentor after you complete your first year in the program. The name of your faculty mentor can be found on Jayhawk GPS. Information about each faculty member can be found on the Departmental website (http://cpe.ku.edu/faculty). Your faculty mentor is an excellent resource for discussing the content of your courses, possible internships, providing insight into opportunities for professional development, and answering questions specific to Engineering as a discipline. Your faculty mentor is available throughout the academic year and you are encouraged to use them as a resource. Our goal is for you to have the same faculty mentor throughout your study with us. In certain circumstances you may wish to change faculty mentors. This request can be made with the Academic Program Coordinator in the department. Occasionally, we will not be able to honor a specific request, but we try to accommodate all requests.

It is your responsibility to keep your plan of study up to date. You should work with your Academic Advisor to make sure you are on track for graduation according to your plan. Preparation of your Plan of Study is to be done for all classes. When you are unsure of what electives you might take in the future, you still must plan when you will take them. They can generically be shown as KU Core, Adv Science (Advanced Science Elective), or Engr (Engineering Elective). By doing so, you will have reserved a course slot in that future semester for an elective. Planning is intended to be a flexible guide to assist you in evaluating your progress toward graduation. However, each semester you should review your academic plan with your academic advisor during your enrollment advising meeting.

Advising Documentation

The majority of the documentation related to advising will be digital and accessible through Jayhawk GPS. When you meet with a faculty mentor or the Academic Advisor, they will document notes from the meeting in your Jayhawk GPS advising portal. Your Degree Progress Report (DPR) can be found in the myKU portal. It is your responsibility to check your DPR frequently for errors or problems. Your Academic Advisor can help you if you notice errors in your DPR. An electronic copy of your plan of study is kept by the department. You should ask your Academic Advisor to give you a copy of the Plan of Study when it is created. You can use this copy to keep track of and evaluate "what if" scenarios for graduation. The record of courses should be kept current as you progress through the curriculum. While it should be consistent with the DPR, there may be differences due to your individualized course of study. Differences, however, should be reconciled prior to the Application for Degree is filed.

Timing for Advising

You must see your academic advisor twice per year during the University advising periods. These two periods are usually in September/October and February/March. Prior to enrollment advising, you will be notified about how to schedule your appointment with your academic advisor.

We require that you meet with your academic advisor so that they can review your academic progress, discuss your performance during the current semester, plan future semesters, and assist in your selection for specific courses for the coming semester and, potentially, summer session. Advising appointments are generally 20-30 minutes in length so it is critical that you come to the appointment prepared. Prior to your appointment, you should use your personal Plan of Study to select the courses you need to take for the upcoming semester. Your advisor will make a record of your meeting in Jayhawk GPS for future reference.
We ask that you make a note of all the classes discussed for the upcoming semester with your advisor. The School of Engineering has imposed an 'Engineering Advising Hold (EAH)' on your enrollment. You will not be able to enroll until this hold is released by the Academic Advisor.

Once your hold is removed, you may sign on to the KU enroll & pay website and enroll (provided you have taken care of all the other holds on your account). **DRP (no drops hold) will NOT stop you from enrolling.** While you may enroll in any course you wish, subject to prerequisites, you should enroll in the courses agreed upon on during your advising meeting. It is important to note the many C&PE courses are only offered one time a year and are prerequisites for future courses. Changes in enrollment could result in significant delays in graduation.

Prerequisites

The Chemical and Petroleum Engineering course sequences are tightly woven. **You are responsible for being aware of and adhering to all pre-requisites, which can be checked online via the KU Course Catalog (http://catalog.ku.edu).** Each course depends upon you learning the knowledge and skills in the prerequisite courses. Should you fall behind developing this

foundation, we advise you stop and re-take the course. However, you must understand that this will likely result in an additional year of study. You may not take a chemical or petroleum engineering course without having successfully completed the prerequisite requirements.

Add/Drop Periods

The University has set three different periods during the course of a semester for adding and dropping courses. These roughly correspond to one third of the semester each. You should look at the University Calendar (http://registrar.ku.edu/calendar) to find out the beginning/ending dates for each period in any given semester as well as the Registrar's website (http://registrar.ku.edu/adddrop-class) for any specific rules, restrictions, and implications for adding or dropping courses.

Please do not wait to the last minute of an Add/Drop Period to see your advisor as they may not be immediately available.

Maximum Enrollment

You may not enroll in more than 19 credit hours during the fall or spring semester (9 credit hours during the summer session) except with approval of the Director for Student Services and the Associate Dean at the School of Engineering level.

'Sixty-Hour' Guideline

The faculty have developed the Chemical & Petroleum Engineering curricula with the proviso that students following these are well-prepared in the prerequisites, do not have substantial commuting time (i.e., are resident in Lawrence), do not have part-time job and/or do not have substantial extracurricular responsibilities. For those who must or want to work at a part-time job, for those with extracurricular time responsibilities and/or for those with substantial commuting times, we recommend the following 60-hour guideline (with needed adjustments depending on some special situations noted below):

The number of productive hours per week for a student is 60. Subtract from this the number of hours per week required for the job, extracurricular activity and/or commuting. Take the remainder and divide by 3.

This gives the absolute ***maximum*** number of hours for enrollment. For example, if a student must work 20 hours per week, the ***maximum*** number of hours for enrollment should be (60-20)/ 3 = 13 credit hours.

This formula ***over-estimates***, however, the maximum number of hours when any of the following apply:

1. The foundation in the prerequisite material is weak, e.g. a D in an earlier class such as Heat & Mass Transfer when enrolling in Design I;
2. A substantial number of hours to enroll in are junior/senior level, e.g. Fall Junior Year with 8 hours of junior-level chemical engineering courses;

3. A large percentage of the hours to be enrolled in are engineering courses, e.g. Spring Junior Year with 10 hours of chemical engineering courses;
4. The number of contact hours is larger than the number of credit hours, e.g. C&PE 626 with 8.5 contact hours for 3 credit hours;
5. Commuting time to the part-time job is substantial, e.g. from Lawrence to Johnson County; or,
6. Preparation time for work is extraordinary, e.g. a part-time job where the dress code is not student casual.

With respect to items 1 through 3, students should consider using a divisor of 4 instead of 3. This is in recognition that the number of extra hours required outside of the classroom increases with weak preparation or higher-level courses. With respect to items 4 through 6, students should consider subtracting these extra hours from 60 as well as the number of hours required for work or outside activities.

With the recommended cap on the maximum hours, the Plan of Study will, in all likelihood, span five academic years rather than the normal four years. While some students may be able to handle more commitments than others, the faculty experience indicates that, for most students, ignoring this guideline will result in lower grades and a weaker foundation in the prerequisite material for subsequent courses. This may result in decreased opportunities upon graduation. As always, your faculty advisor or the Academic Advisor will assist in modifying your Plan of Study to meet your individual needs.

Credit/No Credit Grading

Credit/no credit grading is not allowed for courses required for your major. In addition, the Chemical Engineering program does not allow any credit/no credit courses for any credits used towards a chemical engineering degree. In Petroleum Engineering courses used to fulfill Goals 2.1, 2.2, 3H, 3S, 4.1, and 4.2 can be taken as credit/no credit.

Non-traditional Credit and Placement Exams

KU accepts several kinds of non-traditional earned credit including Advanced Placement, International Baccalaureate, military courses, and the College Level Examination Program. Retroactive credit is also offered in foreign-language classes, and ACT/SAT scores may exempt you from certain requirements. Additional information can be on KU's Admissions website (http://www.admissions.ku.edu/earningcredit). The classes you are placed into often depend upon your ACT score or previous college work. If you want to take a more advanced class you will often need to take a placement exam. More information about placement and exams can be found on KU's First Year Experience website (http://firstyear.ku.edu/planning/placement).

C&PE Course Substitution Policies

Substitutions for required courses are occasionally permitted by petition. The petition must provide justification for the substitution. Your faculty advisor, a Department committee, and the Associate Dean of the School of Engineering must approve the petition. The form can be found on the School of Engineering website (http://engr.ku.edu/forms). **Do not assume approval until**

the petition has gone through the entire process. Petitions for substitutions should be made in the freshman-junior years where changes are still possible rather than in the senior year where it is more difficult to make adjustments.

Transfer Credits

For a student enrolling at KU for the first time:

- After the official transcript has been evaluated by the Office of Admissions at KU, a student may submit an electronic transfer contract for any course not directly transferable for an existing KU course.
- The student must submit a copy of the syllabus for each course with the transfer contract. The form is available on the School of Engineering website (http://engr.ku.edu/forms).
- The transfer contract will be evaluated by the Department of Chemical and Petroleum Engineering Academic Standards Committee. If the course is a chemical engineering course, the committee will seek input from faculty that have taught the in previous years to help determine if the course being transferred is a suitable alternative.
- The Academic Standards Committee will make a determination based on the syllabus, faculty input, and ABET standards. Courses transferred from non-accredited institutions are unlikely to be approved by the Academic Standards Committee.
- The Academic Standards Committee will forward its decision to the Dean's office.

For a student currently enrolled at KU seeking to take a class at another institution:

- Any course taken outside KU that has not been previously evaluated by the KU Office of Admissions will need to be evaluated by the Department of Chemical and Petroleum Engineering Academic Standards Committee **prior to taking the course**.
- The student must submit a transfer contract with a syllabus for the proposed course.
- The transfer contract must be evaluated by Academic Standards Committee prior to enrollment in and completion of the course. Transfer contracts submitted after completion of the course must be accompanied by an explanation of the extenuating circumstances that prevented approval prior to enrollment in the course.
- Previous approval of a course by the Academic Standards Committee does not guarantee approval for future offerings. Each course must be evaluated for the semester in which the course will be taken, as content may have changed from previous offerings.

Academic Minors

The School of Engineering does not have specific academic minors other than the Biomedical Engineering minor. Students may earn minor degrees based on the requirements of a particular School (Business or the College of Liberal Arts and Sciences, for example.) Minors are intended to be in an area beyond your normal field of study**. Chemical Engineering students will not be awarded a minor in chemistry because this is closely allied with chemical engineering and not viewed as an extension of the student's major field of study.**

To obtain a minor, the student must typically take at least 18 credit hours, 12 of which must be 300 level courses or above. The student must have at least a 2.0 GPA in the minor. If the department or program in the College of Liberal Arts and Sciences has additional requirements

for their minor, you must meet those requirements as well. Students should visit the relevant departmental website to learn about specific requirements. To declare your minor, contact the relevant department directly and the School of Engineering.

Scholarships in Chemical and Petroleum Engineering

Chemical and Petroleum Engineering scholarships are awarded to entering freshmen with outstanding academic records. The requirements for scholarship retention and the probation process can be found on the departmental website.

Departmental Honors

Students wishing to receive Departmental Honors in Chemical and Petroleum Engineering must apply to the Department in writing by October 1st for a December graduation or March 1st for a May graduation. The criteria for Departmental Honors are:

1. A cumulative 3.5 GPA in courses taken at KU
2. A cumulative 3.5 GPA in engineering courses taken at KU
3. Completion of an experience or an achievement that is deemed worthy of Departmental Honors. Examples of achievements include (not limited to):
    a. Completion of 3 hours of C&PE 661 (Honors research) or equivalent with an A or B
    b. Completion of Senior Thesis
    c. Co-author on a publication – may require research advisor verification
    d. Presentation at a National Conference – may require research advisor verification
    e. Receiving an award for scholarly work – may require research advisor verification

The application must include:

- Completed application form https://cpe.ku.edu/departmental-honor-application
- Approximately 200-500 word statement of the achievement or experience that is worthy of Departmental Honors.

A departmental committee will review all applications and make the final decision on the awarding of Departmental Honors. Some applications may require verification from the research advisor. Students awarded Departmental Honors will be recognized at the end of the year banquet.

Professional Registration

Registration is a process that ultimately identifies an individual as an engineer who has achieved professional excellence and is recognized among his/her peers. It is the legal certification of the ability to practice engineering in the public arena. Professional registration may be a requisite for such things as expert testimony, federal and state reporting, engineering design certification and professional consulting. Consequently, we encourage students to begin the process of seeking professional registration while completing your undergraduate degree.

Professional registration requires passing the Fundamentals of Engineering Examination, four years' experience as a practicing engineer and, subsequently, passing the Principles and Practice

of Engineering Examination. Juniors are eligible to take the examination in the spring semester. Seniors may take it fall or spring. Students are encouraged to take the Fundamentals of Engineering Examination during their junior or senior year at KU while the material covered in the examination is still fresh. Students who are planning to take the Fundamentals of Engineering Examination should speak with their faculty advisor about engineering elective courses that may assist in preparation for the exam. More information about the examination can be found on the National Council of Examiners for Engineering and Surveying website (https://ncees.org/).

Undergraduate Degrees Offered

The Department has a Bachelor of Science degree in Chemical Engineering and a Bachelor of Science degree in Petroleum Engineering. Specific requirements for each degree are discussed in the rest of this handbook.

CHEMICAL ENGINEERING PROGRAM

Department Mission Statement

The overall program mission for the B.S. degree in chemical or petroleum engineering is to provide a modern chemical or petroleum engineering education with proper balance between theory and practice. Graduates are prepared for professional practice in industry or government and for post-undergraduate training in chemical or petroleum engineering, medicine, etc. In addition to scientific and engineering training, students receive training in educational skills and in the humanities and social sciences.

Program Educational Objective

The principal objective of our program is to prepare graduates for professional practice in industry or government, and for post-undergraduate training in chemical engineering, medicine, and other related disciplines.

Student Outcomes (Goals)

Students must develop

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Chemical Engineering Program Criteria

Students must gain a thorough grounding in basic sciences including chemistry, physics, and biology appropriate to the objectives of the program. Sufficient knowledge in the application of basic sciences to enable graduates to design, analyze, and control physical, chemical and biological processes, consistent with the program educational objectives and address the hazards associated with these processes

CHEMICAL ENGINEERING CURRICULUM

Requirements for the Bachelor of Science Degree

The requirements for graduation are spelled out in the Undergraduate Catalog of the university. The Undergraduate Catalog is the official document of record and takes precedence over this handbook. The Department of Chemical and Petroleum Engineering imposes these additional requirements:

- Starting the Fall of 2020, Chemical Engineering students must earn a C- or better grade in all 100 and 200 level MATH, PHSX, and CHEM courses to progress to Junior level C&PE classes.
- Chemical Engineering students must earn a cumulative 2.0 GPA in C&PE 211, C&PE 221, and C&PE 325 in order to progress to C&PE 511, C&PE 512, C&PE 524, and C&PE 525. The cumulative GPA is calculated using the highest grade earned in each course.
- Chemical Engineering students must earn a cumulative 2.0 GPA in C&PE 511, C&PE 512, C&PE 522, C&PE 524, and C&PE 525 in order to progress to C&PE 613, C&PE 615, C&PE 616, C&PE 623, C&PE 624, or C&PE 626. The cumulative GPA is calculated using the highest grade earned in each course.
- Chemical Engineering students must attain a cumulative GPA of at least 2.0 in C&PE courses taken at KU for graduation with a B.S. degree in Chemical Engineering.

The School of Engineering imposes the following additional requirements.

- A student must attain a cumulative grade-point average of at least 2.0 in the courses applied toward the degree. A student must also have a KU cumulative grade-point average of 2.0 whether or not all courses are being applied to the degree.
- A student must attain a cumulative grade-point average of at least 2.0 in all courses taken in the school, including courses not applied toward a degree.
- A student entering with advanced standing must attain a cumulative grade-point average of at least 2.0 in the resident courses applied toward the degree and at least a 2.0 in all courses taken in the school.
- A student must take the last 30 hours of credit toward the degree at KU and be officially enrolled in the School of Engineering during this time.

Courses of Study

The Bachelor of Science in Chemical Engineering general curriculum is designed with flexibility in choosing advanced science and engineering electives. In addition to the general option in Chemical Engineering, students can select from five concentrations: Biomedical, Environmental, Material Science, Premedical, and Petroleum. Students completing a concentration are required to satisfy all the requirements for the Bachelor of Science in Chemical Engineering. The emphases may have specific requirements for the engineering and advanced science electives. The coursework required for the Bachelor of Science in Chemical Engineering and the requirements for each Concentration can be found in the catalog and on the departmental website. The department has created a curriculum guide (https://cpe.ku.edu/undergraduate-curriculum)

which provides a suggested plan of study to graduate with a Bachelor of Science degree in Chemical Engineering in four years. Although there is some flexibility when elective courses are taken, most C&PE courses are offered only in the semester indicated and are prerequisites for future courses. Changes in enrollment could result in significant delays in graduation.

The curricular requirements for the Bachelor of Science degree in Chemical Engineering can be broken down into the categories shown below:

- General Education – KU Core
- Math
- Chemistry
- Physics
- Advanced Science
- Chemical Engineering Courses
- Engineering Electives

The sections below describe the specific requirements in each of the categories for completion of the Bachelor of Science degree in Chemical Engineering.

General Education - The KU Core

Students must complete all requirements in the KU Core to graduate. For an in depth guide to these requirements visit the KU Core website (https://kucore.ku.edu/). Many of the courses in your major count towards the KU Core and require you to complete no additional coursework. Others will be fulfilled by choosing coursework from the list of courses provided. Below is a table which shows how the KU Core requirements are satisfied by the Bachelor of Science degree in Chemical Engineering.

Goal	Outcome	Courses which Satisfy Requirement
1	1	EPHX 210, PHSX 211 or PHSX 213
	2	CHEM 130 or CHEM 170 or CHEM 190
2	1	ENGL 101, ENGL 102, or ENGL 105
	2	C&PE 613 and C&PE 616 and C&PE 626 (3 course sequence)
3	Humanities	KU Core G3H Elective
	Natural Science	CHEM 135 or CHEM 175 or CHEM 195
	Social Science	KU Core G3S Elective
4	1	KU Core AE 4.1 Elective
	2	KU Core AE 4.2 Elective
5	1	C&PE 522 and C&PE 624 (2 course sequence)
6	1	C&PE 613

Goal 2, Learning Outcome 1, of the KU Core requires six hours of university coursework during the first two years, at least three hours of which require inquiry-based writing. You must enroll in the appropriate English course in your first semester at KU and maintain continuous enrollment in appropriate English courses, whether these are Applied English Center courses or

regular English courses, until you have completed the core requirement. If you are exempt from ENGL 101 this will satisfy the first of your Goal 2 Learning Outcome 1 courses without any actual credits received. You do not need to make up these credits for C&PE, but be aware that other majors may require you to take additional hours to make up this difference. You may not enroll in C&PE laboratory courses (C&PE 616 or C&PE 626) until you have completed your Goal 2 Learning Outcome 1 coursework.

If you are an international student, as soon as you are released by the AEC, you must enroll in ENGL 101. Credits for English Composition at a foreign institution are not accepted for the required English courses in any engineering curriculum.

Goal 3 of the KU core addresses humanities, natural sciences, and social sciences. You will satisfy your natural science requirement with your second semester of chemistry. You will choose an approved G3H and G3S course to complete those requirements.

Goal 4 of the KU Core addresses diversity and global awareness. You will choose an approved AE4.1 and AE4.2 elective to complete those requirements. If you satisfy Goal 4.2 with an experience or by nature of being an international student, you must take an additional MSEHS (math, science, engineering, humanities or social science) course to make up the 3 credits.

Without any exemptions or transferred credit, these general education requirements will total 18 hours. The list of courses that meet these requirements changes often. You can find the most current list of approved KU Core courses on the KU Core website (https://kucore.ku.edu/fulfilling-core-) or by searching the KU Schedule of Classes (https://Classes.ku.edu) for a specific goal.

Mathematics
A minimum of seventeen (17) hours of mathematics is required. The math classes that you need to complete are:

- MATH 125 – Calculus I (4 hrs)
- MATH 126 – Calculus II (4 hrs)
- MATH 127 – Calculus III (4 hrs)
- MATH 220 – Differential Equations (3 hrs)
- MATH 290 – Linear Algebra (2 hrs)

All requirements shown above can be satisfied by the honors equivalent of the course listed.

Transfer students may have fulfilled the course requirements but may be short on hours. In this case, an additional mathematics course must be taken. MATH 526, Applied Mathematical Statistics I (3 credits) is often used for this purpose. Other mathematics courses numbered 500 and above are acceptable. Substitution of natural science courses to meet the minimum mathematics requirement is not permitted.

Students may qualify for retroactive credit in mathematics by completing the second course in a sequence with a grade of "C" or better. Students seeking information on retroactive credit should contact the Mathematics Department.

Chemistry
A minimum of 19 hours of chemistry is required. The required chemistry courses are:

- CHEM 170 – Chemistry for Chemical Sciences I (5 hrs)
- CHEM 175 – Chemistry for Chemical Sciences II (5 hrs)
- CHEM 330 – Organic Chemistry I (3 hrs)
- CHEM 331 – Organic Chemistry I Laboratory (2 hrs)
- CHEM 525 – Physical Chemistry for Engineers (4 hrs)

All requirements shown above can be satisfied by the honors equivalent of the course listed. CHEM 130 and CHEM 135 are acceptable alternatives to CHEM 170 and CHEM 175. Students completing CHEM 150 prior to pursuing a chemical engineering degree are eligible to move to CHEM 175/135 (approved by the Department of Chemistry) and these CHEM credits will be used towards the chemical engineering degree requirement.

Transfer students may have fulfilled the course requirements but may be short on hours. In this case, an additional natural science or engineering elective hours may be used to make up the credit hours.

Physics
A minimum of 8 hours of physics is required. The required physics courses are:

- EPHX 210 – General Physics I for Engineers (3 hrs)
- PHSX 216 – General Physics I Laboratory (1 hrs)
- PHSX 212 – General Physics II (3 hrs)
- PHSX 236 – General Physics II Laboratory (1 hrs)

All requirements shown above can be satisfied by the honors equivalent of the course listed. PHSX 211 is also an acceptable alternative to EPHX 210.

Transfer students may have fulfilled the course requirements but may be short on hours. In this case, an additional natural science or engineering elective hours may be used to make up the credit hours.

If you have taken a non-calculus based physics I course such as PHSX 114, you are exempt from PHSX 216. You may complete the physics requirements by enrolling in PHSX 201 for 1 credit hour, taking EPHX 210 for 3 hours, or PHSX 211 for 4 hours. If you have taken a non-calculus based physics II course such as PHSX 115, you are exempt from PHSX 236. You may complete the physics requirements by enrolling in PHSX 202 for 1 credit hour or taking PHSX 212 for 3 hours.

Advanced Science Electives

A minimum of 6 hours of advanced science electives are required. The intent of the advanced science elective is to provide students with training at an advanced level in the sciences fundamental to the discipline of chemical engineering. Advanced generally means a course requiring introductory science (chemistry or physics) as a prerequisite. Based on this guideline a list of courses approved to for use towards the advanced science requirement is shown below.

Course	Hours	Prerequisites
BIOL 150 (Principles of Mole, & Cell Biology)	3	CHEM 130/150/170/CHEM 190 (pre/co-req)
BIOL 152 (Organismal Biology)	3	CHEM 130/150/170/CHEM 190 (pre/co-req)
C&PE 327 (Reservoir Engineering I)**	1	CHEM 135/175
C&PE 657 (Polymers)**	3	Senior Standing in Chem E
C&PE 715 (Solids Characterization)	3	Senior Standing in Chem E
C&PE 765/CE 715 (Corrosion Eng.)**	3	CHEM 135/150/175
CE 570 (Concepts of Environ. Chem)**	3	CE 477 (which req CHEM 135/175)
CE 573 (Biol. Prin. Of Env. Eng)**	3	CE 477 (which req CHEM 135/175)
CHEM 335/336 (Organic II)	3+2	CHEM 330/331
CHEM 400/401 (Analytical)	3+2	CHEM 330/331
CHEM 660/661 (Inorganic)	3+2	CHEM 535 (Physical Chem for Engg.)
GEOL 101/103 (Intro to Geology)	3+2	None*
ME 306 (Science of Materials)**	3	CHEM 130/150/170
PHSX 313/316 (General Physics III)	3+1	PHSX 212, PHSX 236
PHSX 521 (Mechanics)	3	PHSX 211, PHSX 216
PHSX 531 (Elec. And Mag)	3	PHSX 212 and PHSX 236

*Geology has no introductory course which requires chemistry or physics as a prerequisite. Geology 101 is the highest-level introductory course offered by the department.

** Engineering courses listed may be used as either engineering electives or advanced science electives or the hours may be split between the two categories. It is not acceptable to use the same hours to satisfy both requirements.

Higher-level science courses (biology, chemistry, physics, and geology) that have an approved course listed as a prerequisite are acceptable and would not require a petition. Honors versions of any of the above courses would always be acceptable without a petition. Other courses could be accepted by petition, but only if those courses require chemistry or physics as a prerequisite. Research in engineering or another science department could be accepted by petition, with a written final report and a letter from the supervisor attesting to the advanced science content. All petitions will be evaluated by the Academic Standards Committee.

Chemical Engineering Courses
The Bachelor of Science degree in Chemical Engineering requires 47 hours of coursework in the department. The specific courses required are:

- C&PE 111 - Introduction to the Chemical Engineering Profession I (1 hr)
- C&PE 112- Introduction to the Chemical Engineering Profession II (1 hr)
- C&PE 211 - Material & Energy Balances (4 hrs)
- C&PE 221 - Chemical Engineering Thermodynamics (3 hrs)
- C&PE 325 - Numerical Methods and Statistics for Engineers (3 hrs)
- C&PE 511 - Momentum Transfer (3 hrs)
- C&PE 512 - Chemical Engineering Thermodynamics II (3 hrs)
- C&PE 522 - Economic Appraisal of Chemical and Petroleum Projects (2 hrs)
- C&PE 524 - Chemical Engineering Kinetics and Reactor Design (3 hrs)
- C&PE 525 – Heat and Mass Transfer (4 hrs)
- C&PE 611 – Design of Unit Operations (3 hrs)
- C&PE 615 - Introduction to Process Dynamics and Control (3 hrs)
- C&PE 616 - Chemical Engineering Laboratory I (4 hrs)
- C&PE 613 - Chemical Engineering Design (4 hrs)
- C&PE 624 - Process Safety and Sustainability (3 hrs)
- C&PE 626 - Chemical Engineering Laboratory II (3 hrs)

If you are a transfer student, either from within KU, from another university, or from a community college, you are not required to take C&PE 111 or C&PE 112. Instead you must make up the 2 hours with 2 hours of engineering elective or 1 hour of engineering elective and 1 hour of math, science, engineering, humanities, or social science (MSEHS). In the case of a student transferring from another engineering department, you may transfer another introductory course for C&PE 111 and C&PE 112.

It is important to note that the C&PE courses are generally only offered 1 time per academic year and are prerequisites for subsequent courses. Failure to complete the courses during the scheduled semester will result in delaying graduation by at least 1 year. It is also important that you recognize that a thorough understanding of the material in these courses is critical to you success in the chemical engineering profession. Earning a “D”, while a passing grade for the course, may indicate that you are not suitably prepared for subsequent courses. Historically, students that earn a “D” in C&PE 211 (Material & Energy Balances) and do not retake the course, have a small probability of graduating with a Bachelor of Science degree in Chemical Engineering. Therefore, the faculty strongly recommend you retake C&PE 211 if you earn a “D” and want to graduate in Chemical Engineering.

Engineering Electives
Twelve hours of engineering electives are required for a Bachelor of Science degree in Chemical Engineering. At least 3 elective hours must be taken from C&PE courses. The only exception to this is for the Environmental Concentration, in which all four electives are CE environmental

courses. Research hours are restricted to a maximum for 6 hrs. irrespective of the department it is taken in for it to count towards engineering elective hours. Some engineering courses duplicate material that you are required to take as part of your degree program and cannot be counted as engineering electives. In addition, introductory courses in all departments are not acceptable as engineering electives. A list of courses that are commonly selected for engineering elective credit as well as those that cannot be used can be found on the departmental website (**https://cpe.ku.edu/degree-chemical**).

Petroleum engineering courses 200 level and above may be taken by students pursuing chemical engineering degrees as engineering electives, if the prerequisites are met. Other courses could be accepted by petition. *All petitions will be evaluated by the Academic Standards Committee prior to enrolling for the course.*

Concentration Requirements

Students completing the requirements described above will earn a Bachelor of Science in Chemical Engineering degree, also known as the general option. Within Chemical Engineering, students may also choose to complete a concentration: Biomedical, Environmental, Materials Science, Petroleum, and Premedical. Students completing a concentration are required to satisfy all the requirements for the Bachelor of Science degree in Chemical Engineering general option. In addition, each concentration has specific requirements for some of the engineering and advanced science electives. The coursework required for each concentration is described in the next section.

Biomedical Concentration

The following advanced science and engineering elective courses must be completed as part of the 6 hours of advanced science and 12 hours of engineering electives required for the biomedical Concentration:

- BIOL 150 Principles of Molecular and Cellular Biology (3 hrs) Counts towards advance science elective
- BIOL 600 Intro to Biochemistry (3 hrs) Counts towards advance science elective
  or
  BIOL 546 Mammalian Physiology (3 hrs) Counts towards advance science elective
- C&PE 656 Intro to Biomedical Engineering (3 hrs) Counts towards engineering elective

Environmental Concentration

The following engineering elective courses must be completed as part of the 12 hours of engineering electives required for the Environmental Concentration:

- CE 477 Introduction to Environmental Engineering and Sciences (3 hrs)
- CE 5XX/7XX Upper level Environmental Engineering Course (3 hrs)
- CE 5XX/7XX Upper level Environmental Engineering Course (3 hrs)
- CE 5XX/7XX Upper level Environmental Engineering Course (3 hrs)

Please check with your academic advisor to see if the specific CE 5XX/7XX will count for your environmental concentration. CE 610 will not count towards an engineering elective.

Material Science Concentration
4 courses from the following list must be completed as part of the 12 hours of engineering electives required for the material science Concentration:

- ARCE 350 Building Materials Science (3 hrs)
- AE 507 Aerospace Structures (3 hrs)
- AE 510 Aerospace Materials and Processes (4 hrs)
- CE 310 Strength of Materials (4 hrs)
- CE 412 Structural Engineering Materials (3 hrs)
- CE 461 Structural Analysis (4 hrs)
- C&PE 655 Introduction to Semiconductor Processing (3 hrs)
- C&PE 657 Polymer Science and Technology (3 hrs)
- C&PE 715 Solids Characterization (3 hrs)
- C&PE 751 Basic Rheology (3 hrs)
- C&PE 752 Tissue Engineering (3 hrs)
- C&PE 765 Corrosion Engineering (3 hrs)
- ME 211 Statics & Introduction to Mechanics (3 hrs)
- ME 306 Science of Materials (3 hrs)
- ME 311 Mechanics of Materials (3 hrs)
- ME 767 Molecular Biomimetics (3 hrs)
- CHEM 680, C&PE 715, BIOL 420, PHSX 600, EPHX 600 Introduction to nanotechnology (3 hrs)
- C&PE 651/661 Undergraduate Research (By petition)

In addition, it is recommended that students choose 1 of the following courses to satisfy part of the 6 hours of advanced science electives required for the material science Concentration:

- PHSX 313 Introduction to Modern Physics (3 hrs)
- BIOL 150 Principles of Molecular & Cellular Biology (3 hrs)
- CHEM 400 Analytical Chemistry (3 hrs)
- CHEM 401 Analytical Chemistry Laboratory (2 hrs)
- CHEM 635 Instrumental Methods of Analysis Laboratory (2 hrs)
- CHEM 636 Instrumental Methods of Analysis Laboratory (2 hrs)
- CHEM 660 Systematic Inorganic Chemistry (3 hrs)

Petroleum Concentration
The following advanced science and engineering elective courses must be completed as part of the 6 hours of advanced science and 13 hours of engineering electives required for the petroleum Concentration:

- GEOL 101 Introduction to Geology (3 hrs) Counts towards advanced science elective
- GEOL 103 Fundamentals of Geology Laboratory (2 hrs) Counts towards advanced science elective
- C&PE 327 Reservoir Engineering I (4 hrs) 1 hour counts towards advanced science elective, 3 hours counts towards engineering elective
- C&PE 527 Reservoir Engineering II (4 hrs) Counts towards engineering elective
- C&PE XXX Petroleum Engineering Elective (3 hrs) Counts towards engineering elective
- ENGR ELECT Engineering elective (3 hrs) from the approved engineering electives list

Premedical Concentration
The following advanced science courses must be completed as part of the 6 hours of advanced science required for the premedical Concentration:

- BIOL 150 Principles of Molecular and Cellular Biology (3 hrs) Counts towards advance science elective
- BIOL 152 Organismal Biology (3 hrs) Counts towards advance science elective
- CHEM 335 Organic Chemistry II (3 hrs)
- BIOL 600 Intro to Biochemistry (3 hrs)

While these courses complete the requirements for the Bachelor of Science in Chemical Engineering with the premedical Concentration, there may be additional requirements for medical school admission or for successful completion of the MCAT. You should check with any medical school that you are considering to determine if they have additional requirements for admission. Some additional recommended courses are:

- PSYC 104 General Psychology (3 hrs) Counts towards KU Core Goal 3S
- SOC 104 Elements of Sociology (3 hrs) Counts towards KU Core Goal 3S or 4.1
- BIOL 154 Intro Biology Lab for STEM majors (2 hrs)
- BIOL 350 Principles of Genetics (3 hrs)
- BIOL 416 Cell Structure and Function (3 hrs)
- BIOL 546 Mammalian Physiology (3 hrs)
- BIOL 547 Mammalian Physiology Laboratory (2 hrs)

PETROLEUM ENGINEERING PROGRAM

Department Mission Statement

The overall program mission for the B.S. degree in chemical or petroleum engineering is to provide a modern chemical or petroleum engineering education with proper balance between theory and practice. Graduates are prepared for professional practice in industry or government and for post-undergraduate training in chemical or petroleum engineering, medicine, etc. In addition to scientific and engineering training, students receive training in educational skills and in the humanities and social sciences.

Program Educational Objectives

The principal objective of our program is to prepare graduates for professional practice in industry, government, or post-undergraduate training in petroleum engineering and other related disciplines.

Student Outcomes (Goals)

Students must develop

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The Petroleum Engineering Program Criteria

The program must prepare graduates to be proficient in mathematics through differential equations, probability and statistics, fluid mechanics, strength of materials, and thermodynamics; design and analysis of well systems and procedures for drilling and completing wells; characterization and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods; design and analysis of systems for producing, injecting, and handling fluids; application of reservoir engineering principles and practices for optimizing resource development and management; the use of project economics and resource valuation methods for design and decision making under conditions of risk and uncertainty.

PETROLEUM ENGINEERING CURRICULUM

Requirements for the Bachelor of Science Degree

The requirements for graduation are spelled out in the Undergraduate Catalog of the university. The Undergraduate Catalog is the official document of record and takes precedence over this handbook. The Department of Chemical and Petroleum Engineering imposes these additional requirements:

- Starting the Fall of 2020, Petroleum Engineering students must earn a C- or better grade in all 100 and 200 level MATH, PHSX, and CHEM courses to progress to Junior level C&PE classes.
- A student must have an average GPA for the highest grade earned in C&PE 211, C&PE 221, C&PE 325 and C&PE 327 of at least a 2.0 to be eligible for the junior year courses: C&PE 527 and 528.
- A student must attain a cumulative grade-point average of at least 2.0 in C&PE 511, C&PE 522, C&PE 527, C&PE 528, C&PE 618 to be eligible for the senior year courses: C&PE 624, C&PE 625, C&PE 627, C&PE 617, and C&PE 628.
- A student must attain a cumulative grade-point average of at least 2.0 in C&PE courses taken at KU for graduation with a B.S. degree in chemical or petroleum engineering.

The School of Engineering imposes the following additional requirements.

- A student must attain a cumulative grade-point average of at least 2.0 in the courses applied toward the degree. A student must also have a KU cumulative grade-point average of 2.0 whether or not all courses are being applied to the degree.
- A student must attain a cumulative grade-point average of at least 2.0 in all courses taken in the school, including courses not applied toward a degree.
- A student entering with advanced standing must attain a cumulative grade-point average of at least 2.0 in the resident courses applied toward the degree and at least a 2.0 in all courses taken in the school.
- A student must take the last 30 hours of credit toward the degree at KU and be officially enrolled in the School of Engineering during this time.

Courses of Study

The curriculum guide (https://cpe.ku.edu/undergraduate-curriculum) provides a suggested plan of study to graduate with a Bachelor of Science degree in Petroleum Engineering in four years. Although there is some flexibility when elective courses are taken, most C&PE courses are offered only in the semester indicated and are prerequisites for future courses. Changes in enrollment could result in significant delays in graduation.

The curricular requirements for the Bachelor of Science degree in Petroleum Engineering can be broken down into categories shown below:

- General Education – KU Core
- Math
- Chemistry
- Physics
- Geology
- Science Electives
- Petroleum Engineering Courses
- Engineering Electives

The sections below describe the specific requirements in each of the categories for completion of the Bachelor of Science degree in Petroleum Engineering.

General Education - The KU Core

Students must complete all requirements in the KU Core to graduate. For an in depth guide to these requirements visit the KU Core website (https://kucore.ku.edu/). Many of the courses in your major count towards the KU Core and require you to complete no additional coursework. Others will be fulfilled by choosing coursework from the list of courses provided.

Below is a table which shows how the KU Core requirements are satisfied by the Bachelor of Science degree in Petroleum Engineering.

Goal	Outcome	Courses which Satisfy Requirement
1	1	EPHX 210, PHSX 211 or PHSX 213
	2	CHEM 130
2	1	ENGL 101, ENGL 102, or ENGL 105
	2	KU Core 2.2 Elective
3	Humanities	ENGL 203 – Writing for Engineers
	Natural Science	CHEM 135
	Social Science	KU Core G3S Elective
4	1	KU Core AE 4.1 Elective
	2	KU Core AE 4.2 Elective
5	1	C&PE 522 and C&PE 624 (or Goal 5.1 Elective)
6	1	C&PE 628

Goal 2, Learning Outcome 1, of the KU Core requires six hours of university coursework during the first two years, at least three hours of which require inquiry-based writing. You must enroll in the appropriate English course in your first semester at KU and maintain continuous enrollment in appropriate English courses, whether these are Applied English Center courses or regular English courses, until you have completed the core requirement. If you are exempt from ENGL 101 this will satisfy the first of your Goal 2 Learning Outcome 1 courses without any actual credits received. You do not need to make up these credits for C&PE, but be aware that other majors may require you to take additional hours to make up this difference. If you are an international student, as soon as you are released by the AEC, you must enroll in ENGL 101.

Credits for English Composition at a foreign institution are not accepted for the required English courses in any engineering curriculum.

Goal 2.2 of the KU Core addresses oral communications. You must take a Goal 2.2 requirement for the KU Core.

Goal 3 of the KU Core addresses humanities, natural sciences, and social sciences. You will satisfy your natural science requirement with your second semester of chemistry. You will satisfy the Goal 3H requirement with ENGL 203 – Writing for Engineers. You will choose an approved G3S course to complete this requirement.

Goal 4 of the KU Core addresses diversity and global awareness. You will choose an approved AE4.1 and AE4.2 elective to complete those requirements. If you satisfy Goal 4.2 with an experience or by nature of being an international student, you must take an additional MSEHS (math, science, engineering, humanities or social science) course to make up the 3 credits.

Without any exemptions or transferred credit, these general education requirements will total 24 hours. The list of courses that meet these requirements changes often. You can find the most current list of approved KU Core courses on the KU Core website (https://kucore.ku.edu/fulfilling-core-) or by searching the KU Schedule of Classes (https://Classes.ku.edu) for a specific goal.

Mathematics
A minimum of seventeen (17) hours of mathematics is required. The math classes that you need to complete are:

- MATH 125 – Calculus I (4 hrs)
- MATH 126 – Calculus II (4 hrs)
- MATH 127 – Calculus III (4 hrs)
- MATH 220 – Differential Equations (3 hrs)
- MATH 290 – Linear Algebra (2 hrs)

All requirements shown above can be satisfied by the honors equivalent of the course listed.

Transfer students may have fulfilled the course requirements but may be short on hours. In this case, an additional mathematics course must be taken. MATH 526, Applied Mathematical Statistics I (3 credits) is often used for this purpose. Other mathematics courses numbered 500 and above are acceptable. Substitution of natural science courses to meet the minimum mathematics requirement is not permitted.

Students may qualify for retroactive credit in mathematics by completing the second course in a sequence with a grade of "C" or better. Students seeking information on retroactive credit should contact the Mathematics Department.

Chemistry
A minimum of 10 hours of chemistry is required. The required chemistry courses are:

- CHEM 130 – General Chemistry I (5 hrs)
- CHEM 135 – General Chemistry II (5 hrs)

All requirements shown above can be satisfied by the honors equivalent of the course listed CHEM 150 is not an accepted for credit towards the Bachelor of Science degree in Petroleum Engineering.

Transfer students may have fulfilled the course requirements but may be short on hours. In this case, an additional natural science or engineering elective hours may be used to make up the credit hours.

Physics
A minimum of 8 hours of physics is required. The required physics courses are:

- EPHX 210 – General Physics I for Engineers (3 hrs)
- PHSX 216 – General Physics I Laboratory (1 hrs)
- PHSX 212 – General Physics II (3 hrs)
- PHSX 236 – General Physics II Laboratory (1 hrs)

All requirements shown above can be satisfied by the honors equivalent of the course listed. PHSX 211 is also an acceptable alternative to EPHX 210.

Transfer students may have fulfilled the course requirements but may be short on hours. In this case, an additional natural science or engineering elective hours may be used to make up the credit hours.

If you have taken a non-calculus based physics I course such as PHSX 114, you are exempt from PHSX 216. You may complete the physics requirements by enrolling in PHSX 201 for 1 credit hour, taking EPHX 210 for 3 hours, or PHSX 211 for 4 hours. If you have taken a non-calculus based physics II course such as PHSX 115, you are exempt from PHSX 236. You may complete the physics requirements by enrolling in PHSX 202 for 1 credit hour or taking PHSX 212 for 3 hours.

Geology Electives
A minimum of 13 hours of Geology is required. The required Geology courses are:

- GEOL 101 – Introduction to Geology (3 hrs)
- GEOL 103 – Fundamentals of Geology Laboratory (2 hrs)
- GEOL 332 – Sedimentology for Petroleum Engineers (4 hrs)
- GEOL 535 – Petroleum & Subsurface Geology (4 hrs)

Petroleum Engineering Courses
The Bachelor of Science degree in Petroleum Engineering requires 49 hours of coursework in the department. The specific courses required are:

- C&PE 127 - Introduction to the Petroleum Engineering Profession (1 hrs)
- C&PE 211 – Material & Energy Balances (4 hrs)
- C&PE 219 – Drilling Fluids Laboratory (1 hrs)
- C&PE 221 – Basic Engineering Thermodynamics (3 hrs)
- C&PE 325 - Numerical Methods and Statistics for Engineers (3 hrs)
- C&PE 327 – Reservoir Engineering I (4 hrs)
- C&PE 511 - Momentum Transfer (3 hrs)
- C&PE 522 - Economic Appraisal of Chemical and Petroleum Projects (2 hrs)
- C&PE 527 – Reservoir Engineering II (4 hrs)
- C&PE 528 – Well Logging (3 hrs)
- C&PE 617 – Drilling & Well Completion (3 hrs)
- C&PE 618 – Secondary Recovery (4 hrs)
- C&PE 619 – Petroleum Engineering Laboratory I (3 hrs)
- C&PE 624 - Process Safety and Sustainability (3 hrs)
- C&PE 625 – Unconventional Recovery (3 hrs)
- C&PE 627 – Petroleum Production (3 hrs)
- C&PE 628 - Petroleum Engineering Design (3 hrs)

If you are a transfer student, either from within KU, from another university or from a community college, you are not required to take C&PE 127. Instead you must make up the 1 hour of C&PE C&PE 127 with 1 hour of math, science, engineering, humanities, or social science (MSEHS). In the case of a student transferring from another engineering department, you may transfer another introductory course for C&PE 127.

It is important to note that the C&PE courses are generally only offered 1 time per academic year and are prerequisites for subsequent courses. Failure to complete the courses during the scheduled semester will result in delaying graduation by at least 1 year. It is also important that you recognize that a thorough understanding of the material in these courses is critical to you success in the chemical engineering profession. Earning a "D", while a passing grade for the course may indicate that you are not suitable prepared for subsequent courses.

Engineering and Basic Science Electives
ME 211 Statics & Mechanics (3 hrs) is required as an engineering course. In addition, 5 hours of electives are required for a Bachelor of Science degree in Petroleum Engineering. At least 3 elective hours must be engineering courses while up to 2 hours can be a basic science or engineering course. Some engineering courses duplicate material that you are required to take as part of your degree program and cannot be counted as engineering electives. In addition, introductory courses in all departments are not acceptable as engineering electives.