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The College of Engineering offers programs leading to undergraduate and graduate degrees in computer science and the following engineering disciplines – biosystems, chemical, civil, computer, electrical, materials, mechanical, and mining. Graduate training in biomedical engineering is also offered through the Colleges of Engineering and Medicine. The College also offers a highly multidisciplinary master of science in manufacturing systems engineering to address the growing need for enhancing manufacturing productivity and quality.

Creative accomplishment in the career of an engineer or computer scientist depends upon an education that stresses major ideas and fundamental concepts of engineering rather than specific technologies. The academic programs in engineering provide a sound background in the mathematical, physical and engineering sciences blended with the social sciences and humanities to ensure both a thorough education in engineering and a liberal education. Such an approach provides the best preparation for the engineer or computer scientist who must envisage and develop the technologies of the future and deal with scientific advances at present unknown.

The various curricula in the College of Engineering are broad, so that no student is limited to a narrow field of specialized knowledge but receives sufficient technical depth to provide a sound preparation for a professional career.

The first engineering degree from the University of Kentucky was granted in 1890. Since that time over 21,000 degrees have been awarded in the various fields of engineering. Among the alumni of the College of Engineering are those who have distinguished themselves in the major fields of industry, government and education.

Concern for the individual is a most important feature of education in the College of Engineering. Close faculty-student relationships are necessarily a meaningful part of the educational process. The faculty, in addition to their duties related to instruction and research, serve as advisors to the student in the preparation of the academic program best matched to the student's needs and intellectual capabilities.

Accreditation

The undergraduate program in Computer Science is accredited by the Computing Accreditation Commission of ABET, www.abet.org.

The undergraduate programs in Biosystems Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Materials Engineering, Mechanical Engineering and Mining Engineering are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Undergraduate Programs in Engineering

The University of Kentucky grants the following degrees in the College of Engineering:

- Bachelor of Science in Biosystems Engineering
- Bachelor of Science in Chemical Engineering
- Bachelor of Science in Civil Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science

- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Materials Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Mining Engineering

While these are the official degrees granted at the bachelor's level in the college, the prospective student is encouraged to study the wide variety of options available through technical electives, some of which are listed following the degree requirements of each department. Technical electives are included in each curriculum to allow the student to apply the fundamentals of a particular discipline to an area of special interest during the senior year.

Students in any department interested in biomedical engineering may make special arrangements to include a limited amount of such studies in the undergraduate program. The Department of Biosystems and Agricultural Engineering and the Center for Biomedical Engineering have approved an optional program in pre-biomedical engineering. Biomedical engineering is primarily



the application of engineering principles to the solution of medical problems.

The Department of Chemical Engineering has approved an optional program in premedicine or predentistry. Students majoring in chemical engineering may arrange through their advisor to take courses that will satisfy the degree requirements for this program.

In response to industry requests, the College of Engineering and the Gatton College of Business and Economics have joined to offer a coordinated Bachelor of Science in Engineering and Masters of Business Administration. The intense five-year program may require summer courses to remain on track to complete the engineering part in four years. The MBA will be taken during a student's fifth year of study beginning in June and finishing the following May. In addition, students in the program will be required to complete a study abroad program designed specifically for the engineering/business student. This program will be conducted immediately upon completion of the MBA course requirements and the majority of costs will be paid by the program. Students earning a 3.25 or better GPA and having completed their junior year will be identified and will receive a letter asking them to apply for the program. Admission is highly competitive and is limited based upon the financial resources available. Selection is based on past academic performance, communication skills, and commitment to the program.

For engineering students interested in manufacturing, the University offers a dual-degree program. This program allows students pursuing a B.S. in Electrical Engineering or Mechanical Engineering to concurrently enroll in the M.S. in Manufacturing Systems Engineering. The BSEE/MSMSE or BSME/MSMSE dual-degree programs can be completed in five years. Students in the program can participate in intensive summer courses in Lean Manufacturing. Students in the program are strongly encouraged to be Co-op students or to do industry internships to supplement their course work with industry experience. During their junior year, students should apply to the Graduate School for admittance into the dual-degree program.

Graduate programs in the engineering fields of study are listed in *The Graduate School* section of this Bulletin.

ADMISSION POLICY

The minimum entry requirement for admission into the College of Engineering is:

- ACT math score of **23** or higher, or the SAT equivalent.

Four alternative admission routes include:

1. **3** or above on the Calculus AB portion of the Advanced Placement Exam;
2. Eligibility to enter **MA 110** based on the UK Math Department Placement Exam;

3. Completion of *or* the equivalent of **MA 110** with a grade of **C** or higher;
4. Completion of *or* the equivalent of **MA 109 and MA 112** with a grade of **C** or higher.

Newly admitted pre-engineering or pre-computer science students are allowed to choose an open major for one semester (12 credit minimum) called General Engineering. All students must select a program before the end of their first semester, preferably when they register for classes for their second semester.

Application must be made for admission to a specific pre-engineering program. However, subsequent transfer between programs will be permitted and may be accomplished by applying and satisfying the appropriate specified criteria.

All undergraduate degree programs are divided into pre-engineering and engineering. Pre-engineering is broadly defined as the first two years of a program, while engineering is broadly defined as the last two years of the program. Every student must be admitted to engineering standing in a specific program prior to graduation.

Engineering Standing Admission

Admission to engineering standing in a degree program is necessary in order to be granted a baccalaureate degree in engineering or computer science. Specific departmental requirements for admission to engineering standing are noted below. The same criteria are applied to transfer students with the equivalence of courses determined by the Director of Undergraduate Studies. A student must apply to the specific department for admission to engineering standing. **Note:** The cumulative grade-point average includes all listed college-level work taken at the University of Kentucky or elsewhere.

Students can request qualification for engineering standing after completing the required set of standing courses in the first three semesters of the published curriculum in their chosen program. Each program can specify its engineering standing requirements, but no program may specify a GPA higher than 2.50 for engineering standing.

Requirements by a program for engineering standing may include many items, such as courses counted in first three semesters, repeat options allowed, number of applications for engineering standing allowed, restrictions on taking upper-level courses, minimum course grades, etc. A student should refer to the UK *Bulletin* and the undergraduate advisor in their program of choice to identify the specific requirements.

Biosystems Engineering: Completion of a minimum of 35 semester hours acceptable towards the degree in biosystems engineering with a minimum cumulative grade-point average of 2.50. Completion of CIS/WRD 110, MA 113, MA 114, MA 213, CHE 105 and PHY 231 with a minimum cumulative GPA of 2.5 in these

courses. University repeat options may be utilized as appropriate. Students who do not meet these GPA requirements may request consideration based upon departmental review if both of these GPA values are 2.25 or greater.

Chemical Engineering: Completion of CHE 105, CHE 107, CHE 111, CHE 113, MA 113, MA 114, MA 213, PHY 231, PHY 241, CIS/WRD 110 with a minimum cumulative grade-point average of 2.50 in these courses. Completion of CME 200 with a grade of **C** or better. University repeat options may be applied as appropriate.

Civil Engineering: Completion of CE 106, CE 120, CE 211, CHE 105, CHE 107, EM 221, CIS/WRD 110, MA 113, MA 114, MA 213, PHY 231, PHY 241 with a minimum cumulative grade-point average (GPA) of 2.50 in these classes and a **C** or better in each of them as well as 45 or more semester credit hours. University repeat options may be utilized. Students who do not meet this GPA requirement may request consideration based upon departmental review if this core GPA is 2.25 or greater. Students are limited to two applications for engineering standing.

Computer Engineering: Completion of a minimum of 35 semester hours acceptable towards the degree in engineering with a minimum cumulative grade-point average of 2.50. Completion of MA 113, MA 114, MA 213, PHY 231, CHE 105, and CIS/WRD 110 with a minimum cumulative GPA of 2.50 in these courses. Completion of EE 211, EE 280, CS 115 and CS 215 with a minimum cumulative GPA of 2.50 in these courses. University repeat options may be utilized as appropriate. In addition, the Electrical and Computer Engineering Department will not permit a third admission into any of these courses. Students who do not meet these GPA requirements may request consideration based upon departmental review if the first two GPAs are 2.25 or greater and they receive a **C** or better in EE 211, EE 280, CS 115 and CS 215.

Computer Science: Completion of the following courses with a grade-point average of at least 2.50: CS 100, CS 115, CS 215, CS 275, CIS/WRD 110, MA 113, MA 114, PHY 231, PHY 241.

Electrical Engineering: Completion of a minimum of 35 semester hours acceptable towards the degree in engineering with a minimum cumulative grade-point average of 2.50. Completion of MA 113, MA 114, MA 213, PHY 231, CHE 105, and CIS/WRD 110 with a minimum cumulative GPA of 2.50 in these courses. Completion of EE 211 and EE 280 with passing grades. University repeat options may be utilized as appropriate. In addition, the Electrical and Computer Engineering Department will not permit a third admission into any of these courses. Students who do not meet these GPA requirements may request consideration based upon departmental review if the first two GPAs are 2.25 or

greater and they receive a C or better in both EE 211 and EE 280.

Materials Engineering: Completion of CHE 105, CHE 107, CHE 111, CHE 113, MA 113, MA 114, MA 213, PHY 231, PHY 241, CIS/WRD 110 with a minimum cumulative grade-point average of 2.50 in these courses. Completion of MSE 201 with a grade of C or better. University repeat options may be applied as appropriate.

Mechanical Engineering: Mechanical Engineering students must have completed at least 35 semester credit hours applicable to the degree program with a minimum cumulative GPA of 2.50. In addition, completion of ME 101, CIS/WRD 110 and CIS/WRD 111 (or transfer equivalent courses), CHE 105, MA 113, MA 114, MA 213, PHY 231 and PHY 241 with a minimum cumulative GPA of 2.50 in these courses.

Transfer students who have received more than 35 hours transfer credit in the degree program will be considered without the inclusion of ME 101. A student may exercise one of his/her official University repeat options to improve this grade-point average.

Written request, for exception to the allowed number of repeats, should be submitted to the Director of Undergraduate Studies. In no case will there be an exception made to the minimum acceptable grade-point averages listed above.

Mining Engineering: Completion of a minimum of 36 semester hours acceptable towards the degree in mining engineering with a minimum cumulative grade-point average of 2.50. Completion of CIS/WRD 110, MA 113, MA 114, MA 213, CHE 105 and PHY 231 with a minimum cumulative GPA of 2.50 in these courses. University repeat options may be utilized as appropriate. Students who do not meet these GPA requirements may request consideration based upon departmental review if both of these GPA values are 2.25 or greater.

COMBINED DEGREE PROGRAM

The College of Engineering has transfer agreements with several institutions throughout the state. Some of these institutions offer a “3/2” year dual degree program. Other academic institutions choose to offer this option to their students without benefit of a formal agreement. These programs enable students to enroll in a pre-engineering curriculum for the first three years at their respective schools and then transfer to the College of Engineering for the final two years. Upon completion, they receive two degrees, one from the school at which they originally enrolled and the other a Bachelor of Science in the appropriate field of engineering from the University of Kentucky.

COOPERATIVE EDUCATION PROGRAM

The nationally recognized engineering co-op program provides students the opportunity to gain practical work experience before graduation. By alternating semesters of academic study with semesters of salaried, full-time career-related employment, a full year of engineering work experience can be presented on a graduate resume. Students who wish to participate in the Cooperative Education program in the College of Engineering should contact the Director of Cooperative Education.

To be eligible for this program, students should have a minimum grade-point average of 2.50. In addition, students should be making sufficient progress in their curriculum prior to the first work tour, which should begin after the sophomore year has been completed. Students will remain on a full-time, continuing student status while they are at work by registering for a one-hour, pass/fail course. The grade, assigned by the director, is based on both a work report written by the student and an evaluation completed by the immediate supervisor. Six months of the year’s co-op experience counts toward total experience required to sit for the Professional Engineer exam in Kentucky.

The Cooperative Education program contributes significantly to the student’s academic motivation, career preparation, and success with job offers upon graduation. One-third of our students and nearly 100 employers nationwide participate in the UK program.

CONTINUING EDUCATION AND EXTENSION

The College of Engineering recognizes the rapid changes occurring in modern engineering technology. Students in engineering are made aware of the need to continue their studies after graduation. One of the ways to keep abreast of advances in engineering is for graduates and other engineering practitioners to participate in continuing education programs now available through the engineering colleges throughout the country.

The responsibilities of the Technology Exchange Program within the Kentucky Transportation Center, the Lean Manufacturing Program within the Center for Manufacturing at the University of Kentucky and the staff of the former Office for Informational Services and Technical Liaison (OISTL), now administratively housed in the Department of Mining Engineering, are to:

1. create and manage appropriate intensive noncredit technical courses of interest to and needed by practicing engineers;
2. develop appropriate video-based courses and materials to be of interest to practicing engineers. Such activity includes taping, live satellite uplinking, and two-way video/audio of engineering-related courses and activities, Web-based instruction; and,

3. provide assistance in extension activities with other college and University units to be of assistance to engineers throughout the state.

SCHOLARSHIPS

The College of Engineering awards merit-based scholarships to incoming freshman and transfer students as well as to students already enrolled in the College. Freshman scholarship applications are due January 15; transfer scholarship applications are due April 15 for students incoming in the fall, and November 15 for students incoming in the spring; and continuing student applications are due April 15. Awards are made for the upcoming academic year; no new awards are made for the spring semester for freshmen and continuing students.

For further information, visit www.engr.uky.edu/scholarships.

ENGINEERING DEAN’S LIST

Students enrolled in the College of Engineering can make the Engineering Dean’s List for a fall or spring semester by meeting the following requirements during the semester:

- 3.6 or better semester GPA;
- 12 or more credit hours;
- no E, I or F grades;
- no grades out; and
- no more than 3 hours pass/fail.

MINIMUM REQUIREMENTS FOR GRADUATION

NOTE: The following graduation requirements apply to engineering programs only. Separate graduation requirements currently apply to the Computer Science program as described in the corresponding section.

To be awarded a Bachelor of Science degree in any field of engineering, a student must:

1. complete the University and College requirements relating to writing and the UK Core.
2. complete a minimum of 128 hours, exclusive of those earned in freshman college algebra and freshman college trigonometry, with a cumulative standing of not less than 2.0 on a 4.0 scale. In all departments the course requirements exceed this 128 hour minimum.
3. be admitted to engineering standing in an engineering program for at least the final semester, and complete the requirements of that program.
4. complete a minimum of 24 credit hours of departmental courses at or above the 300 level.
5. complete all departmental courses and technical electives with a cumulative standing of 2.0 or higher.
6. complete any additional departmental graduation requirements that may be listed below.

Additional Departmental Graduation Requirements

In the B.S. program in Civil Engineering, the student must earn a **C** or better in each CE prefix course, except that a maximum of one **D** is permitted in a CE prefix course numbered 400 or higher. In addition, a **C** or better must be earned in EM 221 and EM 302.

In the Mining Engineering Department, the student must have earned a grade of **C** or better in the following courses that are valuable for safe operation of mines: MNG 341, Mine Ventilation; MNG 551, Rock Mechanics; MNG 591, Mine Design Project I; and MNG 592, Mine Design Project II.

Second Bachelor's Degree Requirements

A student who has earned a bachelor's degree in the College of Engineering may earn a second bachelor's degree by meeting the following three conditions on the work applicable to the second degree:

1. The student must have been admitted to engineering standing in the program leading to the second degree at least for the final semester, or equivalent terms, prior to the completion of the degree requirements, and must be enrolled as a student in that degree program during the final semester or term.

2. The student must complete a minimum of 15 credit hours of departmentally approved courses at or above the 300 level.

3. To earn a second degree, a student must complete all degree requirements in that program.

ACADEMIC ADVISING

Sophomores, juniors, and seniors are advised jointly by faculty and professional staff in the department of the student's major. Professional staff provide academic advising and support services to entering freshman students through the Freshman Advising Center.

It is the students' responsibility to satisfy University and College requirements with consultation from their advisor.

PROBATION AND ACADEMIC SUSPENSION

Students should refer to the *Academic Requirements* section of this Bulletin for information concerning the College of Engineering's probation and academic suspension rules.

BACHELOR OF SCIENCE IN BIOSYSTEMS ENGINEERING

Biosystems engineering provides an essential link between the biological sciences and the engineering profession. This linkage is essential for the development of production and processing systems involving biological materials that preserve our natural resource base. Students have

the latitude to develop an area of specialization relating to bioenvironmental engineering, food and bioprocessing, machine systems, or controlled environment engineering. The curriculum is also ideal preparation for those students wanting to pursue a graduate or professional degree in biomedical engineering or veterinary medicine through pre-biomedical engineering and pre-veterinary medicine options.

Engineers completing this program of study find employment in industries related to the production and processing of biological products. Opportunities include placement with manufacturers, consulting firms, or state and federal regulatory agencies. Biosystems engineers may work in the areas of biomedical/biotechnology engineering; environmental engineering; agricultural equipment; heating, ventilation and refrigeration equipment; food processing industries; livestock equipment and housing or greenhouse structures; and bioenergy.

The program educational objectives of the biosystems engineering program are based on the intellectual and professional development of our students such that after graduation they will be able to:

- design systems, components, and/or processes for advancement of agricultural, biological, or environmental systems; and
- secure employment and advance in careers in industry, government, consulting firms, or academia. Successful careers begin with employment in their chosen field or admission to graduate and professional programs, continue with steady advancement, and include professional development.

Degree Requirements

Each student must complete the following:

UK Core Requirements

See the *UK Core* section of this Bulletin for the complete **UK Core** requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

Choose one course from approved list 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

CHE 105 General College Chemistry I 4

CHE 111 Laboratory to Accompany

General Chemistry I 1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

BAE 202 Statistical Inferences

for Biosystems Engineering 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours **33**

Premajor Requirements Hours

CIS/WRD 110 Composition and Communication I 3

CIS/WRD 111 Composition and Communication II 3

CHE 105 General College Chemistry I 4

CHE 107 General College Chemistry II 3

MA 113 Calculus I 4

MA 114 Calculus II 4

MA 213 Calculus III 4

MA 214 Calculus IV 3

PHY 231 General University Physics 4

PHY 241 General University Physics Laboratory 1

PHY 232 General University Physics 4

PHY 242 General University Physics Laboratory 1

CS 221 First Course in Computer Science

for Engineers 2

EM 221 Statics 3

Subtotal: Premajor Hours **43**

Major Requirements Hours

BAE 102 Introduction to Biosystems Engineering 1

BAE 103 Energy in Biological Systems 2

BAE 201 Economic Analysis for Biosystems 2

BAE 202 Statistical Inferences

for Biosystems Engineering 3

BAE 305 DC Circuits and Microelectronics 3

BAE 400 Senior Seminar 1

BAE 402 Biosystems and Agricultural

Engineering Design I 2

BAE 403 Biosystems Engineering Design II 2

BIO 150 Principles of Biology I 3

BIO 152 Principles of Biology II 3

EE 305 Electrical Circuits and Electronics 3

EM 302 Mechanics of Deformable Solids 3

EM 313 Dynamics 3

CE 106 Computer Graphics and Communication 3

ME 220 Engineering Thermodynamics 3

ME 325 Elements of Heat Transfer 3

ME 330 Fluid Mechanics 3

ME 340 Introduction of Mechanical Systems 3

Subtotal: Major Hours **46**

Electives

Biological Science Elective 3

Free Elective 3

Core Electives (choose 3 of the following 4 courses)

BAE 417 Design of Machine Systems 3

BAE 427 Structures and Environment Engineering 3

BAE 437 Land and Water Resources Engineering 3

BAE 447 Bioprocess Engineering Fundamentals 3

Technical Electives (chosen by the student and leading to a concentration in one area of study) 12

Subtotal: Electives **27**

TOTAL HOURS **131**

Curriculum

The following curriculum meets the requirements for a B.S. in biosystems engineering, provided the student satisfies the graduation requirements listed earlier.

Freshman Year

First Semester	Hours
BAE 102 Introduction to Biosystems Engineering	1
CHE 105 General College Chemistry I	4
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
CE 106 Computer Graphics and Communication	3

Second Semester

BAE 103 Energy in Biological Systems	2
CHE 107 General College Chemistry II	3
CS 221 First Course in Computer Science for Engineers	2
MA 114 Calculus II	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1

Sophomore Year

First Semester	Hours
BAE 201 Economic Analysis for Biosystems	2
BIO 150 Principles of Biology I	3
EM 221 Statics	3
MA 213 Calculus III	4
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1

Second Semester

BAE 202 Statistical Inferences for Biosystems Engineering	3
BIO 152 Principles of Biology II	3
CIS/WRD 111 Composition and Communication II or UK Core*	3
EM 302 Mechanics of Deformable Solids	3
MA 214 Calculus IV	3
ME 220 Engineering Thermodynamics I	3

Junior Year

First Semester	Hours
EE 305 Electrical Circuits and Electronics	3
EM 313 Dynamics	3
ME 330 Fluid Mechanics	3
Biological Science Elective	3
Core** or Technical Elective***	3

Second Semester

ME 325 Elements of Heat Transfer	3
BAE 305 DC Circuits and Microelectronics	3
Core** or Technical Elective***	3
Technical Elective***	3
UK Core*	6

Senior Year

First Semester	Hours
BAE 402 Biosystems and Agricultural Engineering Design I	2
ME 340 Introduction to Mechanical Systems	3
BAE 400 Senior Seminar	1
Core** or Technical Elective***	3
Free Elective†	3
UK Core*	3

Second Semester

BAE 403 Biosystems Engineering Design II	2
Core** or Technical Elective***	3
Technical Electives***	6
UK Core*	6

†To be selected from the UK Core requirements in consultation with the academic advisor. A minimum of 15 credits in the humanities and social sciences are required.

**A minimum of 9 hours are required from the biosystems engineering core courses: BAE 417 Design of Machine Systems, BAE 427 Structures and Environment Engineering, BAE 437 Land and Water Resources Engineering, and BAE 447 Bioprocess Engineering Fundamentals.

***A minimum of 12 hours are to be taken in addition to the 9 core hours selected by the student. The technical electives allow the student an opportunity to concentrate or gain depth in one or more of the various specialty areas of biosystems engineering. The technical electives must be selected from the courses listed below and approved by the student's academic advisor. Other courses may be considered, each on its individual merit. In selecting technical electives students must concentrate their work in one or more of the professional areas of biosystems engineering. These areas include: bio-environmental engineering, food and bioprocess engineering, machine systems/automation engineering, controlled environment engineering, and pre-biomedical engineering. Pre-veterinary medicine students typically specialize in controlled environment engineering or pre-biomedical engineering. Interested students are encouraged to contact the Director of Undergraduate Studies for the Biosystems Engineering program to discuss technical elective sequences.

Approved technical electives: BAE 435G, 438G, 450, 503, 504, 513, 515, 517, 532, 536, 537, 538, 541, 549, 580, 599; BCH 401G; BME 481G, 501, 530; CE 211, 351, 451, 471G; CHE 230, 236; CME 599; EE 402G; FSC 434G, 530, 536, 538; ME 321, 344, 440, 501, 503, 513, 532; PGY 412G.

†Free electives are any University course excluding more elementary versions of required courses such as pre-calculus math or PHY 211.

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

A foundation in mathematics, chemistry, and physics is required for the study of chemical engineering. Fundamental principles related to the transformation of matter and energy are developed in subjects including thermodynamics, fluid flow, separations, heat and mass transfer, reactor design, and chemical process design. Undergraduate electives are available in biopharmaceutical engineering, energy and fuels, environmental engineering, and materials engineering and nanotechnology. A program is also available to fulfill pre-medical requirements simultaneously with requirements for the B.S. in chemical engineering.

The educational objectives of the chemical engineering undergraduate program are as follows:

- Produce graduates who are successful in chemical engineering practice and/or academic pursuits.
- Produce graduates who function independently and in teams to carry out in-depth solution strategies to chemical engineering problems.
- Produce graduates who continue to advance in their careers and participate in professional development activities.

Degree Requirements

The following curriculum meets requirements for the B.S. in chemical engineering, provided the student satisfies the graduation requirements listed earlier.

Each student must complete the following:

UK Core Requirements

See the UK Core section of this Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

CME 455 Chemical Engineering Process Design I 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

CHE 105 General College Chemistry I 4

CHE 111 Laboratory to Accompany

General Chemistry I 1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

STA 210 Making Sense of Uncertainty:

An Introduction to Statistical Reasoning 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours 33

Premajor Requirements

Hours

CIS/WRD 110 Composition and Communication I 3

CIS/WRD 111 Composition and Communication II 3

CHE 105 General College Chemistry I 4

CHE 107 General College Chemistry II 3

CHE 111 Laboratory to Accompany

General Chemistry I 1

CHE 113 Laboratory to Accompany

General Chemistry II 2

CME 200 Process Principles 3

MA 113 Calculus I 4

MA 114 Calculus II 4

MA 213 Calculus III 4

PHY 231 General University Physics 4

PHY 241 General University Physics

Laboratory 1

Subtotal: Premajor Requirements: 36

Major Requirements

Hours

CME 101 Introduction to Chemical Engineering 1

CHE 230 Organic Chemistry I 3

CHE 231 Organic Chemistry Laboratory I 1

CHE 232 Organic Chemistry II 3

CHE 446G Physical Chemistry for Engineers 3

MA 214 Calculus IV 3

PHY 232 General University Physics 4

MSE 201 Materials Science 3

CME 220 Computational Tools

in Chemical Engineering 3

CME 320 Engineering Thermodynamics 3

CME 415 Separation Processes 3

CME 471 Seminar 1

CME 006 The Engineering Profession

(3 semesters) 0

CME 330 Fluid Mechanics 3

CME 470 Professionalism, Ethics and Safety 1

CME 420 Process Modeling

in Chemical Engineering 3

CME 425 Heat and Mass Transfer 4

CME 432 Chemical Engineering Laboratory I 2

CME 433 Chemical Engineering Laboratory II 3

CME 455 Chemical Engineering Process Design I 3

CME 550 Chemical Reactor Design	3
CME 456 Chemical Engineering Process Design II	4
CME 462 Process Control	3

Subtotal: Major Hours 60

In addition to the premajor and major requirements, students must complete the following:

Chemical Engineering Electives Hours

Total of 6 credit hours must be chosen. Courses recommended are listed below. Other courses may be considered, each on its individual merit. CME 395 (Research) may count for one elective, but not both.

CME 395 Special Problems in Chemical Engineering ...	3
CME 404G Polymeric Materials	3
CME 505 Analysis of Chemical Engineering Problems	3
CME 515 Air Pollution Control	3
CME 554 Chemical and Physical Processing of Polymer Systems	3
CME 556 Introduction to Composite Materials	3
CME 580 Design of Rate and Equilibrium Processes for Water Pollution Control	3
CME 599 Topics in Chemical Engineering	3

Technical Electives

Select one (must be a 3 or more credit hour course) from the following:

CME 395, 404G, 505, 515, 554, 556, 580, 599; CHE 226, 510 and above; CS 321 and above; MA 321, 322, 416G, 432G, 433G, 471G, 481G; PHY any above 241; STA 381 and higher; BCH 401G; MSE 401G, 402G, 403G; any BIO 150 and above; any Engineering course above that required, e.g. above ME 330.

Chemistry Elective (must total 3 credits)

CHE 226, 510 and above (if not taken as technical elective).

Bio or Materials Elective (must total 3 credits)

BIO 148 and above; MSE 301 and above.

Supportive Elective

The supportive elective can be any course that carries college credit and is not a more elementary version of a required course. The student completing 3 co-op tours (EGR 399) may count the co-op experience toward the supportive elective.

Subtotal: Electives: 18

Graduation Writing Requirement

ENG 2XX Writing Intensive Course

TOTAL HOURS: 133

Curriculum

Freshman Year

First Semester	Hours
CME 101 Introduction to Chemical Engineering	1
CHE 105 General College Chemistry I	4
CHE 111 Laboratory to Accompany General Chemistry I	1
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
UK Core	3

Second Semester

MSE 201 Materials Science	3
CHE 107 General College Chemistry II	3
CHE 113 Laboratory to Accompany General Chemistry II	2
MA 114 Calculus II	4
CIS/WRD 111 Composition and Communication II	3

Sophomore Year

First Semester Hours

CME 200 Process Principles	3
MA 213 Calculus III	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
CHE 230 Organic Chemistry I	3
CHE 231 Organic Chemistry Laboratory I	1

Second Semester

CME 320 Engineering Thermodynamics	4
CHE 232 Organic Chemistry II	3
CME 220 Computational Tools in Chemical Engineering	3
MA 214 Calculus IV	3
PHY 232 General University Physics	4

Junior Year

First Semester Hours

CME 415 Separation Processes	3
CME 471 Seminar	1
CHE 446G Physical Chemistry for Engineers	3
CME 330 Fluid Mechanics	3
ENG 2XX Writing Intensive Course	3
Technical Elective	3
UK Core	3

Second Semester

CME 006 The Engineering Profession (Junior and Senior)	0
CME 420 Process Modeling in Chemical Engineering	3
CME 425 Heat and Mass Transfer	4
CME 432 Chemical Engineering Laboratory I	2
Chemistry Elective	3
Supportive Elective	3
UK Core	3

Senior Year

First Semester Hours

CME 006 The Engineering Profession (Junior and Senior)	0
CME 470 Professionalism, Ethics and Safety	1
CME 433 Chemical Engineering Laboratory II	3
CME 455 Chemical Engineering Process Design I	3
CME 550 Chemical Reactor Design	3
CME Elective	3
UK Core	3

Second Semester

CME 006 The Engineering Profession (Junior and Senior)	0
CME 456 Chemical Engineering Process Design II	4
CME 462 Process Control	3
CME Elective	3
Bio Elective or Materials Elective	3
UK Core	3

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING – PADUCAH

In addition to the program on the Lexington campus, students can pursue a B.S. degree in chemical engineering through the College's Extended Campus Program in Paducah, Kentucky. The Paducah program uses the same curriculum as the main campus, but provides the opportunity for students to complete all B.S. degree requirements without having to relocate to Lexington.

Consistent with our Vision and Mission statements, the chemical engineering program at the University of Kentucky, including the Extended Campus in Paducah, strives to meet the following specific educational objectives:

- prepare our graduates to successfully pursue careers in engineering practice and/or academia;
- provide a broad education as a foundation for life-long learning; and
- equip our graduates with the ability to carry out problem-solving strategies in engineering.

The Paducah chemical engineering program collaborates with West Kentucky Community and Technical College to provide the foundational math and science courses, as well as the general studies course requirements. Murray State University faculty members teach upper-level non-engineering courses on the Paducah campus. On-site UK chemical engineering faculty members and jointly-appointed Murray engineering faculty members teach the upper-division engineering courses. Program admission, course registration, student advising and other student services all can be completed at the Paducah site.

Degree Requirements

The curriculum requirements for the B.S. degree in chemical engineering in Paducah are identical to those on the Lexington campus. Refer to those degree requirements for the Paducah degree program. Not all electives listed for the Lexington program will be available in Paducah. The student must satisfy the College graduation requirements listed earlier.

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

The student of civil engineering has a broad field of study to provide a strong foundation for entry into the profession or graduate school. Major areas include construction engineering and project management, environmental engineering, geotechnical engineering, materials engineering, structural engineering, transportation engineering, and water resources engineering. Consistent with the Vision and Mission statements, civil engineering graduates from the University of Kentucky will be prepared to:

- Use their technical, teamwork, and communication skills along with leadership principles to pursue civil engineering careers in areas such as structural, transportation, geotechnical, materials, environmental, construction, and water resources engineering, and/or other fields.
- Pursue graduate degrees in civil engineering and other fields.
- Function ethically in their professional civil engineering roles.

- Pursue professional licensure.
- Engage in life-long learning through independent study and by participating in professional conferences, workshops, seminars, or continuing education.

Degree Requirements

The following curriculum meets the requirements for a B.S. in civil engineering, provided the student satisfies the graduation requirements listed earlier.

Each student must complete the following:

UK Core Requirements

See the *UK Core* section of this Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

Choose one course from approved list 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

PHY 231 General University Physics 4
 PHY 241 General University Physics Laboratory 1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

BAE 202 Statistical Inferences for Biosystems Engineering or CE approved equivalent 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours 33

Premajor Requirements

Hours

CE 106 Computer Graphics and Communication	3
CE 120 Introduction to Civil Engineering	1
CE 211 Surveying	4
CHE 105 General College Chemistry I	4
CHE 107 General College Chemistry II	3
EM 221 Statics	3
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
MA 114 Calculus II	4
MA 213 Calculus III	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
Subtotal: Premajor Hours	38

Major Requirements

Hours

CE 303 Introduction to Construction Engineering	3
CE 329 Civil Engineering Communications and Teams Lab	1
CE 331 Transportation Engineering	3
CE 341 Introduction to Fluid Mechanics	4

CE 351 Introduction to Environmental Engineering	3
CE 381 Civil Engineering Materials I	3
CE 382 Structural Analysis	3
CE 401 Seminar	1
CE 429 Civil Engineering Systems Design	3
CE 461G Water Resources Engineering	4
CE 471G Soil Mechanics	4
CS 221 First Course in Computer Science	

for Engineers	2
EM 302 Mechanics of Deformable Solids	3
MNG 303 Deformable Solids Laboratory	1
GLY/EES 220 Principles of Physical Geology	4
MA 214 Calculus IV	3
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
Subtotal: Major Hours	50

Electives

Hours

CE Technical Design Electives	6
Engineering Science Elective	3
Structures Elective	3
CE Technical Elective	3
Supportive Elective	3
Math or Science Elective	3
UK Core Electives	15
Supportive/Free Elective	3
Subtotal: Electives	39

TOTAL HOURS: 130

Curriculum

Freshman Year

First Semester	Hours
CE 120 Introduction to Civil Engineering	1
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
UK Core – Arts and Creativity	3
UK Core – Social Sciences	3
Second Semester	
CE 106 Computer Graphics and Communication	3
CHE 105 General College Chemistry I	4
MA 114 Calculus II	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1

Sophomore Year

First Semester	Hours
CE 211 Surveying	4
CHE 107 General College Chemistry II	3
EM 221 Statics	3
BAE 202 Statistical Inferences for Biosystems Engineering	3
MA 213 Calculus III	4
Second Semester	
CS 221 First Course in Computer Science for Engineers	2
EM 302 Mechanics of Deformable Solids	3
MNG 303 Deformable Solids Laboratory	1
MA 214 Calculus IV	3
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
CIS/WRD 111 Composition and Communication II	3

Junior Year

First Semester	Hours
CE 303 Introduction to Construction Engineering*	3
CE 329 Civil Engineering Communications and Teams Lab	1
CE 341 Introduction to Fluid Mechanics	4
CE 381 Civil Engineering Materials I*	3
GLY/EES 220 Principles of Physical Geology	4

Second Semester

CE 331 Transportation Engineering*	3
CE 351 Introduction to Environmental Engineering	3
CE 382 Structural Analysis	3
Engineering Science Elective [1]	3
Math Elective or Science Elective [2]	3
UK Core – Humanities	3

Senior Year

First Semester	Hours
CE 461G Water Resources Engineering*	4
CE 471G Soil Mechanics*	4
CE 48X Structures Elective [3]	3
CE Technical Design Elective [4]	3
UK Core – Citizenship - US	3

Second Semester

CE 401 Seminar*	1
CE 429 Civil Engineering Systems Design*	3
CE Technical Design Elective [4]	3
CE Technical Elective [5]	3
Supportive Elective [6]	3
UK Core – Global Dynamics	3

*CE communication throughout the curriculum component.

[1] To be chosen from ME 220 or EM 313.

[2] Math or Science Elective Options: MA 321, MA 322, MA 416G, MA 432G, BIO 208, CHE 230, CHE 236, EE 305, GEO 409, GLY/EES 550, GLY/EES 585, MNG 551, or the other half of the Engineering Science Elective in [2]. NOTE: MA 322 is required for a math minor.

[3] To be selected from: CE 482 or CE 486G.

[4] Students are required to select two design electives from different areas. Choose from: CE 508, CE 531 or CE 533, CE 534, CE 549, CE 551, CE 579, CE 589. Design elective courses are typically taught once a year.

[5] CE Technical Elective is chosen from any of the courses at the 300-level or above that carry a CE prefix and in which a student is qualified to enroll, exclusive of required courses. Engineering elective courses are typically taught once a year.

[6] Supportive elective is to be chosen from any University course, excluding a more elementary version of a required course, such as precalculus mathematics or PHY 211. However, each CE area has at least one recommendation for the supportive elective. Please review the Optional Concentration section in the Civil Engineering Undergraduate Handbook. The supportive elective can be taken pass-fail.

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Joint-Degree Program Offered by Western Kentucky University (WKU) and the University of Kentucky (UK)

As part of the “Strategy for Statewide Engineering Education in Kentucky,” adopted July 17, 2000 by all the chief executive officers of Kentucky universities and endorsed by the Kentucky Council on Postsecondary Education (CPE), the vision was expressed that “access to undergraduate engineering education will expand primarily through the creation of joint programs managed by multiple postsecondary institutions.” In response, WKU and UK now jointly offer an ABET-accredited baccalaureate degree in civil engineering on the WKU campus in Bowling Green, Kentucky. By CPE definition, a joint-degree program is “a program that is mutually sponsored by two or more institutions leading to a single credential or degree, which is

conferred by both or all participating institutions. All institutions share responsibility for all aspects of the program's delivery and quality."

The joint civil engineering program is one of only three such joint-degree programs in Kentucky; the others include a joint-degree program between WKU and UK in mechanical engineering, between WKU and the University of Louisville (UL) in electrical engineering.

The WKU/UK joint programs emphasize a project-oriented educational approach. Courses are provided by both WKU and UK faculty. Students are required to complete a minimum of 15 credit hours of engineering course work taught by UK engineering faculty. At present, the UK contribution is provided primarily by distance delivery via interactive television. The curriculum of the joint civil engineering program is under the direction of a joint program faculty, with equal representation from each participating institution. The curriculum for entering students requires 137 credit hours, with the General Studies component based on the requirements of WKU. Students who complete the program will receive a B.S. degree conferred jointly by WKU and UK. Under the terms of the agreements between the degree-awarding institutions, WKU provides basic administrative support for students in the joint-degree program, including admission services, registration, and student financial aid. In addition, academic advising, laboratory and equipment support, and library and media resources are supplied by WKU.

The civil engineering curriculum approved within UK is listed below. The joint program faculty are responsible for on-going review of the curricular requirements.

Degree Requirements

Freshman Year

Fall Semester	Hours
ENGR 175 Univ Experience – ENGR	1
CE 176 CE Freshman Design	1
AMS 163 Architectural Drafting	3
MATH 136 Calculus I	4
GEOL 111/113 The Earth and Lab	3/1
Category E World Cultures Elective	3
Total	16

Spring Semester

CE 160/161 Surveying I and Lab	3/1
MATH 137 Calculus II	4
PHYS 255/256 Physics I and Lab	4/1
ENG 100 Freshman English	3
COMM 161 or 145 Public Speaking	3
Total	19

Sophomore Year

Fall Semester	Hours
CE 303/304 Construction Mgt and Lab	3/1
EM 221 or 222 Statics	3
MATH 237 Multivariable Calculus	4
CHEM 120/121 College Chemistry I and Lab	4/1
Category F Health and Wellness Elect	1
Total	17

Spring Semester

EM 302 or 303 Mechanics of Deform Solids	3
CE 310 Strength of Materials Lab	1
MATH 331 Differential Equations	3
PHYS 265/266 Physics II and Lab	4/1
Category A-II Foreign Language (102)	3
ENG 200 Intro to Literature	3
Total	18

Junior Year

Fall Semester	Hours
CE 382 or 373 Structural Analysis	3
CE 410/411 Soil Mechanics and Lab	3/1
CE 342 Fluid Thermal Science	4
CE 370/371 Materials of Constr and Lab	2/1
STAT 301 Probability and Statistics	3
Category F Health and Wellness Elect	1
Total	18

Spring Semester

CE 316 Equipment and Methods	3
CE 331 UK - Transportation Engineering	3
ENG 300 Junior English	3
CE 412 Foundation Engineering	3
CE 384 Reinforced Concrete Design [1]	3
CE Technical Elective [2]	3
Total	18

Senior Year

Fall Semester	Hours
CE 351 or 352 Intro Environmental Eng	3
CE Technical Elective [2]	3
CE 400 Senior Design Seminar	1
ECON 202 Economics (Micro)	3
HIST 119 or 120 Western Civilization	3
Category B-II Humanities Elective	3
Total	16

Spring Semester

CE 461 Hydrology	3
CE Technical Elective [2]	3
CE 498 Senior Project	3
Category B-II Humanities Elective	3
Category C Social and Behavior Sc Elect	3
Total	15

TOTAL HOURS 137

[1] Instead of CE 384 Reinforced Concrete Design, students may take CE 482 Elementary Structural Design or CE 483 UK-Elementary Structural Design if offered.

[2] A two (2) course sequence in four different civil engineering areas is required. The curriculum already includes a two (2) course sequence in structures, geotechnical engineering, and construction. Therefore, each student must select one of their technical electives to cover an additional area such as surveying, materials, environmental engineering, hydrology, or transportation.

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

Program Educational Objectives

Computer engineering involves modeling, design, implementation, testing, evaluation and integration of computer hardware and software to create computing systems. Computer engineers use both hardware concepts from electrical engineering and system software concepts from computer science. Graduates will be well prepared to work in areas such as digital logic design, computer organization/architecture and design, algorithm design and analysis, embedded sys-

tems, compilers, and operating systems. Elective options in the curriculum offer preparation in software engineering, databases, dependable systems, networking and communications, VLSI, graphics, image processing, visualization, artificial intelligence, and control systems. The program is offered through a partnership between the Department of Electrical and Computer Engineering and the Department of Computer Science.

The program educational objectives related to expectations of program graduates include the following:

- Graduates of the program employed in industry will demonstrate, within five years after graduation, professional advancements, such as technical accomplishments, supervisory responsibilities, or other recognitions of their contributions.
- Graduates of the program who continue their formal education will, within five years after graduation, receive advanced degrees, complete specialized training, or receive professional certifications.
- Graduates of the program will appreciate the preparation received in the program as it relates to their careers and their roles in society.

Degree Requirements

Each student must complete the following:

UK Core Requirements

See the *UK Core* section of this Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

Choose one course from approved list 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

CHE 105 General College Chemistry I 4

CHE 111 Laboratory to Accompany

General Chemistry I 1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

Choose one course from approved list 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours 33

Premajor Requirements	Hours
CIS/WRD 110 Composition and Communication I	3
CS 115 Introduction to Computer Programming	3
CS 215 Introduction to Program Design, Abstraction, and Problem Solving	4
EE 211 Circuits I	4
EE 280 Design of Logic Circuits	3
MA 113 Calculus I	4
MA 114 Calculus II	4
MA 213 Calculus III	4
PHY 231 General University Physics	4
Subtotal: Premajor Hours	33

Major Requirements	Hours
EE 101 Creativity and Design in Electrical and Computer Engineering	
or	
CS 100 The Computer Science Profession	1-3
CHE 105 General College Chemistry I	4
CS 216 Introduction to Software Engineering	3
CS 275 Discrete Mathematics	4
PHY 241 General University Physics Laboratory	1
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
MA 214 Calculus IV	3
EE 221 Circuits II	3
EE 222 Electrical Engineering Laboratory I	2
EE 281 Logical Design Laboratory	2
EE/CS 380 Microcomputer Organization	3
EE 383 Introduction to Embedded Systems	3
CS 315 Algorithm Design and Analysis	3
CS 441G Compilers for Algorithmic Languages**	3
CS 470G Introduction to Operating Systems	3
EE 480/CS 480G Advanced Computer Architecture**	3
EE 421G Signals and Systems	3
EE 461G Introduction to Electronics	3
STA 381 Introduction to Engineering Statistics	3
CS 499 Senior Design Project	3
Subtotal: Major Hours	58-60

Electives	Hours
Supportive Elective*	6
Technical Elective†	3
EE/CS Technical Electives††	12
Subtotal: Electives	21
Total Minimum Hours for Program	133

Curriculum

Freshman Year

First Semester	Hours
MA 113 Calculus I	4
EE 101 Creativity and Design in Electrical and Computer Engineering	
or	
CS 100 The Computer Science Profession	1-3
CIS/WRD 110 Composition and Communication I	3
CHE 105 General College Chemistry I	4
CS 115 Introduction to Computer Programming	3
UK Core – Humanities	3

Second Semester	Hours
EE 280 Design of Logic Circuits	3
MA 114 Calculus II	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
CIS/WRD 111 Composition and Communication II	3
UK Core – Arts and Creativity	3

Sophomore Year

First Semester	Hours
CS 215 Introduction to Program Design, Abstraction, and Problem Solving	4
MA 213 Calculus III	4
EE 211 Circuits I	4
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
EE 281 Logical Design Laboratory	2

Second Semester	Hours
MA 214 Calculus IV	3
CS 275 Discrete Mathematics	4
CS 216 Introduction to Software Engineering	3
EE/CS 380 Microcomputer Organization	3
UK Core – Social Sciences	3

Junior Year

First Semester	Hours
EE 221 Circuits II	3
EE 222 Electrical Engineering Laboratory I	2
CS 315 Algorithm Design and Analysis	3
EE 383 Introduction to Embedded Systems	3
UK Core – Citizenship - USA	3
STA 381 Introduction to Engineering Statistics	3

Second Semester	Hours
EE 461G Introduction to Electronics	3
CS 470G Introduction to Operating Systems	3
EE 480/CS 480G Advanced Computer Architecture**	3
UK Core – Statistical/Inferential Reasoning	3
EE 421G Signals and Systems	3

Senior Year

First Semester	Hours
CS 441G Compilers for Algorithmic Languages**	3
EE/CS Technical Electives††	6
Supportive Elective*	3
Technical Elective†	3

Second Semester	Hours
CS 499 Senior Design Project†	3
EE/CS Technical Electives††	6
Supportive Elective*	3
UK Core – Global Dynamics	3

**Supportive elective is to be chosen from any University courses, excluding more elementary versions of required courses, such as precalculus mathematics or PHY 211.*

***EE 480/CD 480G is only taught in the spring semester. CS 441G is only taught in the fall semester.*

†Technical elective may be selected from upper-division engineering, mathematics, statistics, computer science, physics, or other technically-related fields excluding more elementary version of required courses. EE 490 and EE 491 fulfill the technical elective, senior design and the Graduation Writing Requirement. To be selected in consultation with academic advisor.

††EE/CS technical electives are senior level courses in either the computer science or electrical engineering disciplines. These include 400-level CS courses and 500-level CS and EE courses with emphasis in the computer engineering area and excluding EE 595. To be selected in consultation with academic advisor.

Recommended EE/CS Technical Electives:

CS 405G Introduction to Database Systems
 CS 415G Combinatorics and Graph Theory
 CS 416G Principles of Operations Research I
 CS 422 Numerical Solutions of Equations
 CS 450G Fundamentals of Programming Languages
 CS 463G Introduction to Artificial Intelligence
 CS 471G Networking and Distributed Operating Systems
 CS 485G Topics in Computer Science (Subtitle required)
 EE 512 Digital Communication Systems
 EE 560 Semiconductor Device Design
 EE 564 Digital Electronic Circuits

EE 572 Digital Control of Dynamic Systems
EE 582 Hardware Description Languages and Programmable Logic
EE 584 Introduction of VLSI Design and Testing
EE 585 Fault Tolerant Computing
EE 586 Communication and Switching Networks
EE 587 Microcomputer Systems Design
EE 599 Topics in Electrical Engineering (Subtitle required)

**BACHELOR OF SCIENCE IN
COMPUTER SCIENCE**

The computer science program prepares students to identify computational problems in all areas of modern life, to design, implement, and analyze algorithmic solutions, and to build software for a variety of applications. Through required, elective and special topics courses students are exposed to the foundations and current practices of computing and algorithms, software engineering, programming languages, operating systems, graphics and multimedia, scientific computing and numerical analysis, databases, artificial intelligence and networks. The program's educational objective is to equip graduates to succeed in their chosen career path. Specifically, within three to five years after graduation:

- Those employed in industry or entrepreneurial endeavors will demonstrate professional advancement through expanded leadership responsibility, significant technical accomplishment, or other recognition of their contributions.
- Those who continue their formal education will achieve an advanced degree or other technical certification

In addition, graduates will appreciate the preparation received in the program as it relates to their chosen careers, to their role as educated citizens in a global society, and to continued learning.

Degree Requirements

Each student must complete the following:

UK Core Requirements

See the UK Core section of this Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

- I. Intellectual Inquiry in Arts and Creativity**
Choose one course from approved list 3
- II. Intellectual Inquiry in the Humanities**
Choose one course from approved list 3
- III. Intellectual Inquiry in the Social Sciences**
Choose one course from approved list 3
- IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences**
PHY 231 General University Physics 4
PHY 241 General University Physics Laboratory 1
- V. Composition and Communication I**
CIS/WRD 110 Composition and Communication I 3
- VI. Composition and Communication II**
CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations	
MA 113 Calculus I	4
VIII. Statistical Inferential Reasoning	
Choose one course from approved list	3
IX. Community, Culture and Citizenship in the USA	
Choose one course from approved list	3
X. Global Dynamics	
Choose one course from approved list	3
UK Core Hours	33
Premajor Requirements	Hours
CS 100 The Computer Science Profession	1
CS 115 Introduction to Computer Programming	3
CS 215 Introduction to Program Design, Abstraction, and Problem Solving	4
CS 216 Introduction to Software Engineering	3
CS 275 Discrete Mathematics	4
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
MA 114 Calculus II	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
Subtotal: Premajor Hours	31
Major Requirements	Hours
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
Additional Science Electives	6
MA 213 Calculus III	4
EE 280 Design of Logic Circuits	3
STA 281 Probability and Statistics Using Interactive Computer Techniques	3
CS 315 Algorithm Design and Analysis	3
CS/MA 321 Introduction to Numerical Methods	3
CS 375 Logic and Theory of Computing	3
CS/EE 380 Microcomputer Organization	3
CS 470G Introduction to Operating Systems	3
CS 499 Senior Design Project	3
Subtotal: Major Hours	39
Computer Science Electives	Hours
Choose three from the following list:	
CS 335 Graphics and Multimedia	3
CS 405G Introduction to Database Systems	3
CS 441G Compilers for Algorithmic Languages	3
CS 450G Fundamentals of Programming Languages	3
CS 463G Introduction to Artificial Intelligence	3
Any other CS class at the 300-level or above	3
Subtotal: CS Electives	9
Technical Electives	
Choose 12 credit hours of the following:	
MA 214 Calculus IV or any 300-level or higher classes selected from computer science, electrical engineering, math- ematics, or the College or Business and Economics	
Subtotal: Technical Electives	12
Electives (Non-Technical and Free Electives)	
Two courses must be in areas other than computer science, science, engineering, or mathematics. Any remaining elec- tives should be selected to meet the minimum total of 128 hours required for graduation	
Subtotal: Electives	minimum of 6
TOTAL HOURS	128

Curriculum

Freshman Year

First Semester	Hours
CS 100 The Computer Science Profession	1
CS 115 Introduction to Computer Programming	3
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
UK Core [U]	3

Second Semester

CS 215 Introduction to Program Design, Abstraction, and Problem Solving	4
Natural Science Elective [N]	3
MA 114 Calculus II	4
UK Core – Statistical/Inferential Reasoning [U]	3

Sophomore Year

First Semester	Hours
CS 216 Introduction to Software Engineering	3
EE 280 Design of Logic Circuits	3
MA 213 Calculus III	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
CIS/WRD 111 Composition and Communication II	3

Second Semester

CS 275 Discrete Mathematics	4
CS/EE 380 Microcomputer Organization	3
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
STA 281 Probability and Statistics Using Interactive Computer Techniques	3
UK Core [U]	3

Junior Year

First Semester	Hours
CS 315 Algorithm Design and Analysis	3
CS/MA 321 Introduction to Numerical Methods	3
UK Core [U]	3
ENG 2XX Writing Intensive Course	3
Elective [E]	3

Second Semester

CS 375 Logic and Theory of Computing	3
Computer Science Elective [C]	3
Technical Elective [T]	3
UK Core [U]	3
Natural Science Elective [N]	3
Elective [E]	3

Senior Year

First Semester	Hours
CS 470G Introduction to Operating Systems	3
Computer Science Elective [C]	3
Technical Elective [T]	3
UK Core [U]	3
Elective [E]	4

Second Semester

CS 499 Senior Design Project	3
Computer Science Elective [C]	3
Technical Electives [T]	6
Elective [E]	3

[U] – Select to satisfy the UK Core areas Arts and Creativity, Humanities, Social Sciences, Citizenship, Global Dynamics).

[N] – Any natural science course excluding more elementary versions of completed required courses.

[C] – Computer Science Elective – include 300-level and above computer science courses with two to be selected from: CS 335, CS 405G, CS 441G, CS 450G and CS 463G. Students are encouraged to take advantage of special topics courses, cooperative education, independent studies and undergraduate research.

[T] Technical Elective – include any 300-level and above courses in computer science, electrical engineering, mathematics and business and economics. MA 214 is also an acceptable technical elective. Cooperative education credit may be used to satisfy this requirement.

[E] Elective – including one Free Elective and Non-Technical Elective. At least two of the electives (6 credits) cannot be in computer science, mathematics, science or engineering. Note: At least 128 credit hours; a foreign language requirement.

Minor in Computer Science

The minor in computer science requires a minimum of 20 hours of course work in CS, to include the following:

CS 115 (3), CS 215 (4), CS 216 (3), CS 275 (4), CS 315 (3), or equivalent, plus three additional hours of upper-division courses (300 or higher) in computer science. A GPA of at least 2.5 across these courses is required. At least 10 of the credit hours required to complete the minor must be earned at the University of Kentucky.

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

The electrical engineering undergraduate degree program seeks to produce graduates who are trained in the theory and practice of electrical and computer engineering and are well prepared to handle the professional and leadership challenges of their careers. The program allows students to specialize in high performance and embedded computing, microelectronics and nanotechnology, power and energy, signal processing and communications, high frequency circuits and fields, and control systems, among others.

The following objectives relate to expectations for program graduates while in the early stages of their careers. The EE program objectives are:

- Graduates of the electrical engineering program employed in industry will demonstrate, within five years after graduation, professional advancements, such as technical accomplishments, supervisory responsibilities, or other recognitions of their contributions.
- Graduates of the electrical engineering program who continue their formal education will, within five years after graduation, receive advanced degrees in electrical engineering or other fields, complete specialized training, or receive professional certifications.
- Graduates of the electrical engineering program will appreciate the preparation received in the program as it relates to their careers and their roles in society.

The electrical engineering undergraduate program has identified **curriculum tracks** as recommended groups of courses for undergraduate students interested in a particular area of electrical engineering. Each track consists of a list of three recommended electives (typically EE Technical Electives) and possibly a recommended lab elective. A student will be considered to have completed a track if these course requirements have been satisfied with a grade of **C** or better.

Students are not required to participate in a track. Tracks are intended for students as a guide of classes to take in a particular area. Student transcripts will not explicitly mention completion of a track. However, any student completing a track will receive an official recognition of this completion from the department.

The current set of tracks are:

Electric Power and Energy

EE Technical Electives EE 537 and EE 538, and one of the following: EE 518, EE 531, or EE 539. Also, EE 416G as a Lab Elective.

Signals and Systems

Any three of the following EE Technical Electives: EE 511, EE 512, EE 513, EE 521, EE 586. Also, EE 422G as a Lab Elective.

Digital Systems

EE Technical Electives EE 582 and EE 584, and one of the following: EE 585, EE 586, EE 587, EE 589. Also, EE 281 as a Lab Elective.

High Frequency Circuits and Fields

EE Technical Electives EE 521 and EE 522, and one of the following additional: EE 523, EE 525, EE 527.

Degree Requirements

Each student must complete the following:

UK Core Requirements

See the *UK Core* section of this Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

Choose one course from approved list 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

CHE 105 General College Chemistry I 4
CHE 111 Laboratory to Accompany
General Chemistry I 1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

Choose one course from approved list 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours **33**

Premajor Requirements Hours

CIS/WRD 110 Composition and Communication I	3
CHE 105 General College Chemistry I	4
MA 113 Calculus I	4
MA 114 Calculus II	4
MA 213 Calculus III	4
PHY 231 General University Physics	4
EE 211 Circuits I	4
EE 280 Design of Logic Circuits	3

Subtotal: Premajor Hours **30**

Major Requirements Hours

CS 115 Introduction to Computer Programming	3
CS 215 Introduction to Program Design, Abstraction, and Problem Solving	4
EE 101 Creativity and Design in Electrical and Computer Engineering†	3
EE 221 Circuits II	3
EE 222 Electrical Engineering Laboratory I	2
EE 360 Introduction to Semiconductor Devices	3
EE 380 Microcomputer Organization	3
EE 415G Electromechanics	3
EE 421G Signals and Systems	3
EE 461G Introduction to Electronics	3
EE 468G Introduction to Engineering Electromagnetics	4
EE 490 Electrical Engineering Capstone Design I††	3
EE 491 Electrical Engineering Capstone Design II††	3
CIS/WRD 111 Composition and Communication II	3
MA 214 Calculus IV	3
MA 320 Introductory Probability	3
PHY 232 General University Physics	4
PHY 241 General University Physics Laboratory	1
PHY 242 General University Physics Laboratory	1

Choose **three** of the following lab courses:

EE 281 Logical Design Laboratory	2
EE 416G Energy Conversion Laboratory	2
EE 462G Electronic Circuits Laboratory	2
EE 422G Signals and Systems Laboratory	2

Subtotal: Major Hours **61**

Electives Hours

Engineering/Science Electives [E]	6
EE Technical Electives**	12
Math/Statistics Elective [M]	3
Supportive Elective*	3
Technical Elective [T]	3

Subtotal: Electives **27**

TOTAL HOURS: **134**

Curriculum

Freshman Year

First Semester Hours

EE 101 Creativity and Design in Electrical and Computer Engineering†	3
MA 113 Calculus I	4
CS 115 Introduction to Computer Programming	3
CIS/WRD 110 Composition and Communication I	3
UK Core – Humanities	3

Second Semester

MA 114 Calculus II	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
CHE 105 General College Chemistry I	4
EE 280 Design of Logic Circuits	3
UK Core – Social Sciences	3

Sophomore Year

First Semester Hours

MA 213 Calculus III	4
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
EE 211 Circuits I	4
CIS/WRD 111 Composition and Communication II	3

Second Semester

MA 214 Calculus IV	3
EE 221 Circuits II	3
EE 222 Electrical Engineering Laboratory I	2
EE 360 Introduction to Semiconductor Devices	3
CS 215 Introduction to Program Design, Abstraction, and Problem Solving	4
UK Core – Citizenship - USA	3

Junior Year

First Semester Hours

EE 415G Electromechanics	3
EE 421G Signals and Systems	3
Elective EE Laboratory [L]	2
EE 380 Microcomputer Organization	3
EE 461G Introduction to Electronics	3
MA 320 Introductory Probability	3

Second Semester

EE 468G Introduction to Engineering Electromagnetics	4
Elective EE Laboratory [L]	2
Engineering/Science Elective [E]	3
Technical Elective [T]	3
UK Core – Statistical/Inferential Reasoning	3

Senior Year

First Semester Hours

EE 490 Electrical Engineering Capstone Design I††	3
EE Technical Electives**	6
Elective EE Laboratory [L]	2
Math/Statistics Elective [M]	3
UK Core – Global Dynamics	3

Second Semester

EE 491 Electrical Engineering Capstone Design II††	3
EE Technical Electives**	6
Supportive Elective*	3
Engineering/Science Elective [E]	3

**Supportive elective* is to be chosen from any University courses, excluding more elementary versions of required courses, such as precalculus mathematics or PHY 211.

[M] *Math/Statistics Elective:* Any upper-division (300-level or higher) math or statistics course (3 credit hours total).

[E] *Engineering/Science Electives:* Any engineering, physics, computer science, or math course at the 200-level or higher, other than an electrical engineering course and excluding more elementary versions of required courses (6 credit hours total). Cooperative education credit may not be used to satisfy this requirement.

[T] *Technical elective* may be selected from upper-division (300-level or higher) engineering, mathematics, statistics, computer science, physics, or other technically-related fields and excluding more elementary versions of required courses, to be selected in consultation with the academic advisor (3 credit hours total). Cooperative education credit may not be used to satisfy this requirement.

[L] *Electrical Engineering Laboratory Elective:* EE 281, EE 462G, EE 422G, EE 416G (6 credit hours total).

†EE 101 is transitioning to a 3-hour course that will satisfy the UK Core I. – Intellectual Inquiry in Arts and Creativity requirement. The initial offering of the new format is under an EGR 199 course number titled: *Tops in EGR: Creativity and Design in ECE.*

††EE 490 is only taught in the fall semester. EE 491 is only taught in the spring semester. EE 490 satisfies the Graduation Writing Requirement.

**EE Technical Electives (must be 500-level courses). Courses recommended as electrical engineering technical electives are listed below (each course is 3 credit hours):

EE 511 Introduction to Communication Systems
EE 512 Digital Communication Systems
EE 513 Audio Signals and Systems
EE 517 Advanced Electromechanics
EE 518 Electric Drives
EE 521 Introduction to Wireless Communications
EE 522 Antenna Design
EE 523 Microwave Circuit Design
EE 525 Numerical Methods and Electromagnetics
EE 527 Electromagnetic Compatibility
EE 531 Alternative and Renewable Energy Systems
EE 535 Power Systems: Generation, Operation and Control
EE 536 Power System Fault Analysis and Protection
EE 537 Electric Power Systems I
EE 538 Electric Power Systems II
EE 539 Power Distribution Systems
EE 560 Semiconductor Device Design
EE 561 Electric and Magnetic Properties of Materials
EE 562 Analog Electronic Circuits
EE 564 Digital Electronic Circuits
EE 565 Circuit Design With Analog Integrated Circuits
EE 567 Introduction to Lasers and Masers
EE 568 Fiber Optics
EE 569 Electronic Packaging Systems and Manufacturing Processes
EE 571 Feedback Control Design
EE 572 Digital Control of Dynamic Systems
EE 581 Advanced Logical Design
EE 582 Hardware Description Languages and Programmable Logic
EE 584 Introduction of VLSI Testing and Design
EE 585 Fault Tolerant Computing
EE 586 Communication and Switching Networks
EE 587 Microcomputer Systems Design
EE 589 Advanced VLSI
EE 599 Topics in Electrical Engineering (Subtitle required)

BACHELOR OF SCIENCE IN MATERIALS ENGINEERING

The materials engineer is responsible for the selection, preparation and application of existing materials and for the development of new and improved materials. Materials engineers study the relationships between atomic and/or molecular constitution, microstructure and physical properties including mechanical, thermal, electrical, and optical behavior. Classes of materials include metals, ceramics, polymers, and electronic materials.

The educational objectives of the materials engineering undergraduate program are as follows:

- Produce graduates with an understanding of materials science and engineering who can function independently as professionals in the practice of engineering or as successful members of related graduate and professional programs.
- Produce graduates who can use their materials science and engineering education to continue their careers with steady advancement and professional development.

Degree Requirements

The following curriculum meets requirements for the B.S. in Materials Engineering, provided the student satisfies the graduation requirements listed earlier. Each student must complete the following:

UK Core Requirements

See the **UK Core** section of this Bulletin for the complete **UK Core requirements**. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

Choose one course from approved list 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

CHE 105 General College Chemistry I 4

CHE 111 Laboratory to Accompany General Chemistry I 1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

STA 210 Making Sense of Uncertainty: An Introduction to Statistical Reasoning 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours **33**

Premajor Requirements Hours

CIS/WRD 110 Composition and Communication I 3

CIS/WRD 111 Composition and Communication II 3

CHE 105 General College Chemistry I 4

CHE 107 General College Chemistry II 3

CHE 111 Laboratory to Accompany General Chemistry I 1

CHE 113 Laboratory to Accompany General Chemistry II 2

MA 113 Calculus I 4

MA 114 Calculus II 4

MA 213 Calculus III 4

MSE 201 Materials Science 3

PHY 231 General University Physics 4

PHY 241 General University Physics Laboratory 1

Subtotal: Premajor Hours **36**

Major Requirements Hours

MSE 101 Materials Engineering 1

CS 221 First Course in Computer Science for Engineers 2

CME 200 Process Principles 3

MSE 202 Materials Science Laboratory 1

CHE 236 Survey of Organic Chemistry 3

EM 221 Statics 3

MA 214 Calculus IV 3

PHY 232 General University Physics 4

MSE 301 Materials Science II 3

MSE 351 Material Thermodynamics	3
EM 302 Mechanics of Deformable Solids	3
EE 305 Electrical Circuits and Electronics	3
PHY 361 Principles of Modern Physics	3
MSE 401G Metal and Alloys	3
MSE 402G Electronic Materials and Processing	3
MSE 403G Ceramic Engineering and Processing	3
MSE 404G Polymeric Materials	3
MSE 407 Materials Laboratory I	3
MSE 408 Materials Laboratory II	3
MSE 436 Material Failure Analysis	3
MSE 480 Materials Design	3
MSE 535 Mechanical Properties of Materials	3
MSE 538 Metals Processing	3
MSE 585 Materials Characterization Techniques	3

Subtotal: Major Hours **68**

Technical Electives Hours

Choose 6 credit hours from the following:

MSE 395 Independent Work in Materials Engineering	3
MSE 506 Mechanics of Composite Materials	3
MSE 531 Powder Metallurgy	3
MSE/CME 554 Chemical and Physical Processing of Polymer Systems	3
MSE 556 Introduction to Composite Materials	3
MSE 569 Electronic Packaging Systems and Manufacturing Processes	3
MSE 599 Topics in Materials Science and Engineering (Subtitle required)	3

Subtotal: Technical Electives **6**

Supportive Elective (must total 3 credits)

The supportive elective can be any course that carries college credit and is not a more elementary version of a required course. The student completing 3 co-op tours (EGR 399) may count the co-op experience toward the supportive elective.

Subtotal: Supportive Elective **3**

Graduation Writing Requirement

ENG 2XX Writing Intensive Course 3

TOTAL HOURS: **134**

Curriculum

Freshman Year

First Semester Hours

MSE 101 Materials Engineering	1
CHE 105 General College Chemistry I	4
CHE 111 Laboratory to Accompany General Chemistry I	1
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
UK Core	3

Second Semester

CHE 107 General College Chemistry II	3
CHE 113 Laboratory to Accompany General Chemistry II	2
MA 114 Calculus II	4
CS 221 First Course in Computer Science for Engineers	2
CIS/WRD 111 Composition and Communication II	3
UK Core	3

Sophomore Year

First Semester Hours

MSE 201 Materials Science	3
CHE 236 Survey of Organic Chemistry	3
MA 213 Calculus III	4
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
MSE 202 Materials Science Laboratory	1

Second Semester

MSE 301 Materials Science II	3
MSE 351 Material Thermodynamics	3
MA 214 Calculus IV	3
PHY 232 General University Physics	4
EM 221 Statics	3

Junior Year

First Semester

Hours

MSE 401G Metal and Alloys	3
MSE 404G Polymeric Materials	3
CME 200 Process Principles	3
EM 302 Mechanics of Deformable Solids	3
ENG 2XX Writing Intensive Course	3
STA 210 Making Sense of Uncertainty: An Introduction to Statistical Reasoning	3

Second Semester

MSE 403G Ceramic Engineering and Processing	3
MSE 402G Electronic Materials and Processing	3
PHY 361 Principles of Modern Physics	3
MSE 535 Mechanical Properties of Materials	3
MSE 407 Materials Laboratory I	3
UK Core	3

Senior Year

First Semester

Hours

MSE 585 Materials Characterization Techniques	3
MSE 436 Material Failure Analysis	3
EE 305 Electrical Circuits and Electronics	3
MSE 408 Materials Laboratory II	3
Technical Elective**	3
UK Core	3

Second Semester

MSE 480 Materials Design	3
MSE 538 Metals Processing	3
Technical Elective**	3
Supportive Elective*	3
UK Core	3

*Supportive elective is any university course, excluding more elementary versions of required courses, such as precalculus mathematics or PHY 211.

**Choose from the list of Technical Electives above.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

The training of the mechanical engineer is the broadest among the several fields of engineering. The mechanical engineer uses the techniques of mathematics combined with a specialized knowledge of the thermal and energy sciences, solid and fluid mechanics, and the properties of materials. This information is supplemented by an understanding of manufacturing processes, the design and control of systems, and the economics of the technological community.

Our graduates will be able to apply knowledge of mathematics, science and mechanical engineering to the solution of problems, particularly in the areas of thermodynamics and energy systems; heat transfer; fluid mechanics; mechanical systems and controls; mechanical design; finite element methods and computer-aided graphics; manufacturing; instrumentation; and experimental method.

Consistent with the Vision and Mission statements of the University of Kentucky and the College of Engineering, the undergraduate program in mechanical engineering will prepare our

graduates for successful practice or academic pursuits in mechanical engineering. Our educational objectives are:

1. Our graduates will practice mechanical engineering in a variety of fields as professionals and/or be recruited to graduate and professional schools in their career paths.
2. Our graduates will communicate effectively, work in diverse teams, address the challenges of a global society, and exhibit leadership, ethics, and creativity in their work places.
3. Our graduates will value continuing education and professional growth by supporting or participating in professional societies, licensure programs, short courses, or other professional development activities.

Degree Requirements

Each student must complete the following:

UK Core Requirements

See the *UK Core* section of this Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

ME 411 ME Capstone Design I	3
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II. Intellectual Inquiry in the Humanities

Choose one course from approved list	3
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III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list	3
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IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1

V. Composition and Communication I

CIS/WRD 110 Composition and Communication I	3
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VI. Composition and Communication II

CIS/WRD 111 Composition and Communication II	3
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VII. Quantitative Foundations

MA 113 Calculus I	4
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VIII. Statistical Inferential Reasoning

Choose one course from approved list	3
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Recommended:

STA 210 Making Sense of Uncertainty: An Introduction to Statistical Reasoning	
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IX. Community, Culture and Citizenship in the USA

Choose one course from approved list	3
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X. Global Dynamics

Choose one course from approved list	3
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UK Core Hours 33

Premajor Requirements

Hours

CIS/WRD 110 Composition and Communication I	3
CIS/WRD 111 Composition and Communication II	3
CHE 105 General College Chemistry I	4
CHE 107 General College Chemistry II	3
MA 113 Calculus I	4
MA 114 Calculus II	4
MA 213 Calculus III	4
MA 214 Calculus IV	3
PHY 231 General University Physics	4
PHY 232 General University Physics	4

PHY 241 General University Physics Laboratory	1
PHY 242 General University Physics Laboratory	1

Subtotal: Premajor Hours: 38

Major Requirements

Hours

ME 101 Introduction to Mechanical Engineering	3
ME 151 Manufacturing Engineering	3
ME 205 Computer Aided Engineering Graphics	3
ME 220 Engineering Thermodynamics I	3
CS 221 First Course in Computer Science for Engineers	2
EM 221 Statics	3
EM 302 Mechanics of Deformable Solids	3
EM 313 Dynamics	3
EE 305 Electrical Circuits and Electronics	3
ME 310 Engineering Experimentation I	3
ME 311 Engineering Experimentation II	3
ME 321 Engineering Thermodynamics II	3
ME 325 Elements of Heat Transfer	3
ME 330 Fluid Mechanics	3
ME 340 Introduction to Mechanical Systems	3
ME 344 Mechanical Design	3
ME 411 ME Capstone Design I	3
ME 412 ME Capstone Design II	3
ME 440 Design of Control Systems	3
ME 501 Mechanical Design with Finite Element Methods	3

Subtotal: Major Hours 59

In addition to the premajor and major requirements, students must complete the following:

Technical Electives

Hours

Choose 9 hours from the following:

ME 380 Topics in Mechanical Engineering (Variable Topics)	3
ME 395 Independent Work in Mechanical Engineering	3
ME/MFS 503 Lean Manufacturing Principles and Practices	3
ME/MFS 505 Modeling of Manufacturing Processes and Machines	3
ME/MSE 506 Mechanics of Composite Materials	3
ME/MFS 507 Design for Manufacturing	3
ME 510 Vibro-Acoustic Design in Mechanical Systems	3
ME/MFS 512 Manufacturing Systems	3
ME 513 Mechanical Vibrations	3
ME 514 Computational Techniques in Mechanical System Analysis	3
ME 527 Applied Mathematics in the Natural Sciences I	3
ME 530 Gas Dynamics	3
ME 531 Fluid Dynamics I	3
ME 532 Advanced Strength of Materials	3
ME 548 Aerodynamics of Turbomachinery	3
ME 549 Power Generation	3
ME/MSE 556 Introduction to Composite Materials	3
ME 560 Engineering Optics	3
ME 563 Basic Combustion Phenomena	3
ME 565 Scale Modeling in Engineering	3
ME/BAE 580 Heating, Ventilating and Air-Conditioning	3
ME 599 Topics in Mechanical Engineering (Subtitle required)	3
MFS 599 Topics in Manufacturing Systems Engineering (Subtitle required)	3
EGR 599 Topics in Engineering	3
MSE 201 Materials Science	3
BAE 502 Modeling of Biological Systems	3
BME 501 Foundations of Biomedical Engineering	3
BME 530 Biomedical Instrumentation	3

Subtotal: Technical Electives: 9

Mathematics Elective Hours

Choose one course from the following:

MA 320 Introductory Probability	3
MA 321 Introduction to Numerical Methods	3
MA 322 Matrix Algebra and Its Applications	3
MA 416G Principles of Operations Research I	3
MA 432G Methods of Applied Mathematics I	3
MA 433G Introduction to Complex Variables	3
MA 481G Differential Equations	3
STA 381 Introduction to Engineering Statistics	3

Subtotal: Mathematics Elective 3**Supportive Elective Hours**

The supportive elective can be any course that carries college credit and is not a more elementary version of a required course. For example, college algebra would not be satisfactory because it is more elementary than the required calculus courses. The student completing 3 co-op tours (EGR 399) may count the co-op experience toward the supportive elective.

Subtotal: Supportive Elective 3**Graduation Writing Requirement Hours**

Graduation Writing Requirement to be fulfilled with one course selected from approved list

Subtotal: Graduation Writing Requirement 3**TOTAL HOURS: 130****Curriculum****Freshman Year****First Semester**

ME 101 Introduction to Mechanical Engineering	3
CHE 105 General College Chemistry I	4
MA 113 Calculus I	4
CIS/WRD 110 Composition and Communication I	3
UK Core*	3

Second Semester

ME 151 Manufacturing Engineering	3
CHE 107 General College Chemistry II	3
MA 114 Calculus II	4
CIS/WRD 111 Composition and Communication II	3
UK Core*	3

Sophomore Year**First Semester**

PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
MA 213 Calculus III	4
CS 221 First Course in Computer Science for Engineers	2
ME 205 Computer Aided Engineering Graphics	3
UK Core*	3

Second Semester

ME 220 Engineering Thermodynamics I	3
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
MA 214 Calculus IV	3
EM 221 Statics	3
Graduation Writing Requirement	3

Junior Year**First Semester**

ME 321 Engineering Thermodynamics II	3
ME 330 Fluid Mechanics	3
EM 302 Mechanics of Deformable Solids	3
EM 313 Dynamics	3
EE 305 Electrical Circuits and Electronics	3

Second Semester

ME 310 Engineering Experimentation I	3
ME 344 Mechanical Design	3

ME 325 Elements of Heat Transfer	3
ME 340 Introduction to Mechanical Systems	3
Mathematics Elective	3

Senior Year**First Semester**

ME 411 ME Capstone Design I	3
ME 311 Engineering Experimentation II	3
ME 440 Design of Control Systems	3
ME 501 Mechanical Design with Finite Element Methods	3
Technical Elective†	3

Second Semester

ME 412 ME Capstone Design II	3
Technical Electives†	6
Supportive Elective	3
UK Core*	3
UK Core*	3

*To be selected from UK Core courses in consultation with the academic advisor.

†Technical Electives – see list above.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING – PADUCAH

In addition to the program on the Lexington campus, students can pursue a B.S. degree in mechanical engineering through the College's Extended Campus Program in Paducah, Kentucky. The Paducah program uses the same curriculum as the main campus, but provides the opportunity for students to complete all B.S. degree requirements without having to relocate to Lexington.

Consistent with the Vision and Mission statements of the University of Kentucky, the mechanical engineering program at the UK Extended Campus in Paducah strives to meet the following educational objectives:

The mechanical engineering program will prepare our students for successful practice or academic pursuits in mechanical engineering.

- Our graduates will have the technical skills needed to begin engineering practice or to continue their education. These will include the knowledge of how to design and conduct experiments, mathematics and analytical skills, principles for the design of components and systems, as well as a familiarity with software tools common to the field.
- Our graduates will have the broad education and communication skills needed for a variety of career options, and an appreciation of the need for life-long learning to maintain their competency.
- Our graduates will have an understanding of the social and ethical responsibilities of engineers, and the impact that engineers have in environmental and societal issues.

The Paducah mechanical engineering program collaborates with West Kentucky Community and Technical College to provide the basic math and science courses, as well as the general studies

course requirements. Murray State University faculty members teach upper-level non-engineering courses on the Paducah campus. On-site UK mechanical engineering faculty members and jointly-appointed Murray engineering faculty members teach the upper-division engineering courses. Program admission, course registration, student advising and other student services all can be completed at the Paducah site.

Degree Requirements

The curriculum requirements for the B.S. degree in mechanical engineering in Paducah are identical to those on the Lexington campus. Refer to those degree requirements for the Paducah degree program. Not all the technical electives listed for the Lexington program will be available in Paducah. The student must satisfy the College graduation requirements listed earlier.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Joint-Degree Program Offered by Western Kentucky University (WKU) and the University of Kentucky (UK)

As part of the "Strategy for Statewide Engineering Education in Kentucky," adopted July 17, 2000 by all the chief executive officers of Kentucky universities and endorsed by the Kentucky Council on Postsecondary Education (CPE), the vision was expressed that "access to undergraduate engineering education will expand primarily through the creation of joint programs managed by multiple postsecondary institutions." In response, WKU and UK now jointly offer an ABET-accredited baccalaureate degree in mechanical engineering on the WKU campus in Bowling Green, Kentucky. By CPE definition, a joint-degree program is "a program that is mutually sponsored by two or more institutions leading to a single credential or degree, which is conferred by both or all participating institutions. All institutions share responsibility for all aspects of the program's delivery and quality."

The joint mechanical engineering program is one of only four such joint-degree programs in Kentucky; the others include a joint-degree program between WKU and UK in civil engineering, between WKU and the University of Louisville (UL) in electrical engineering, and between Murray State University and UL in electrical and telecommunications engineering.

The WKU/UK joint programs emphasize a project-oriented educational approach. Courses are provided by both WKU and UK faculty. Students are required to complete a minimum of 16 credit hours of engineering course work taught by UK engineering faculty. At present, the UK contribution is provided primarily by distance delivery via interactive television. The curriculum of the joint mechanical engineering program is under the direction of a joint program faculty,

with equal representation from each participating institution. The curriculum for entering students requires 135 credit hours, with the General Studies component based on the requirements of WKU. Students who complete the program will receive a B.S. degree conferred jointly by WKU and UK. Under the terms of the agreements between the degree-awarding institutions, WKU provides basic administrative support for students in the joint-degree program, including admission services, registration, and student financial aid. In addition, academic advising, laboratory and equipment support, and library and media resources are supplied by WKU.

The mechanical engineering curriculum of the joint program is listed below. The joint program faculty are responsible for on-going review of the curricular requirements.

Curriculum

Freshman Year

Fall Semester	Hours
ME 175 University Experience	2
CHEM 120/121 Chemistry I and Lab	5
MATH 126 Calculus I	4.5
ENG 100 Freshman English	3
COMM 161 Business Speaking	3
Total	17.5

Spring Semester

ME 180 Freshman Design II	3
MATH 227 Calculus II	4.5
PHYS 250/251 Intro. Mech. & Lab	4
HIST 119/120 Western Civilization	3
*Foreign Language / Modern Language	3
Total	17.5

Sophomore Year

Fall Semester	Hours
MATH 327 Multivariable Calculus	4
EM 221 UK Statics	3
ME 240/241 Mats./Meth. and Lab	4
PHYS 260/261 Intro E&M and Lab	4
ENG 200 Introduction to Literature	3
Total	18

Spring Semester

ME 200 Sophomore Design	3
MATH 331 Differential Equations	3
EM 313 UK Dynamics	3
EM 303 WKU Mech. Def. Solids	3
ME 285 Intro to Ind. Automation	1
ME 347 Mechanics Lab	1
Category B / Elective 1 of 2	3
Total	17

Junior Year

Fall Semester	Hours
ME 220 Eng. Thermo. I	3
ME 344 UK Mechanical Design	3
EE 350 EE Fundamentals	4
Math Elective 1 of 1	3
Category C / Engineering Econ.	3
Category F / Elective 1 of 2	1
Total	17

Spring Semester

ME 300 Junior Design	2
ME 310 Eng. Instrumentation	3
ME 321 UK Eng. Thermo II	3
ME 330 Fluid Mechanics	3
ME Tech. Elective 1 of 3	3
ENG 300 Junior English	3
Total	17

Senior Year

Fall Semester	Hours
ME 325 Heat Transfer	3
ME 416 UK Dyn. Systems Elect.	3
ME 400 Mech. Engr. Design	2
ME 440 Thermal/Fluid Sys. Lab	2
ME 445 Dynamic Syst. Lab	2
ME Tech. Elective 2 of 3	3
Total	15

Spring Semester

ME 412 ME Senior Project	3
ME Tech. Elective 3 of 3	3
Category C / Elective 1 of 1	3
Category B / Elective 2 of 2	3
Category E / Elective 1 of 1	3
Category F / Elective 2 of 2	1
Total	16

TOTAL HOURS 135

Each student's transcript must have at least 16 hours of credit in the major taught by a UK faculty member.

UK faculty are scheduled to deliver the following courses to the ME Joint Program: EM 221, EM 313, ME 321, ME 344, ME 416, and a range of technical electives: ME 498 (Fa) or 499 (Sp).

Check the ME Student Handbook for the latest institutional course offering plan, including technical electives and a list of suitable Mathematics electives.

**Review the WKU Undergraduate Catalog for the current policies concerning the foreign language course.*

Consult the WKU Undergraduate Catalog and ICAP for category B, C, E, and F electives. Categories A and D are covered by the plan of study shown.

BACHELOR OF SCIENCE IN MINING ENGINEERING

Mining engineering requires the broadest knowledge of sciences and other fields of engineering in its practice after graduation. The curriculum below prepares the student for a career in the field of mining.

The objectives of the undergraduate program in mining engineering take into consideration the intellectual and personal development of students so that after graduation they will be able to:

- Advance in their careers, adapting to new situations and emerging problems, through the application of general purpose engineering skills and the core technical disciplines, analytical procedures, and design practices of the mining engineering profession.
- Function ethically in a variety of professional roles such as mine planner, designer, production manager, mineral processing engineer, consultant, technical support representative and regulatory specialist with emphasis on the mineral industries of Kentucky and the surrounding region.

- Pursue advanced degrees in mineral-related fields and also those fields that support the mineral industries such as business and law.
- Utilize professional skills such as effective communication, teamwork, and leadership.
- Demonstrate an understanding of the critical role mining engineers play in society with respect to health, safety, and the environment in tangible ways such as achieving professional licensure.

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www.engr.uky.edu/mng

Degree Requirements

Each student must complete the following:

UK Core Requirements

See the *UK Core* section of this Bulletin for the complete **UK Core requirements**. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

MNG 592 Mine Design Project II 3

II. Intellectual Inquiry in the Humanities

Choose one course from approved list 3

III. Intellectual Inquiry in the Social Sciences

Choose one course from approved list 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Sciences

PHY 231 General University Physics 4

PHY 241 General University Physics Laboratory 1

V. Composition and Communication I

CIS WRD 110 Composition and Communication I 3

VI. Composition and Communication II

CIS WRD 111 Composition and Communication II 3

VII. Quantitative Foundations

MA 113 Calculus I 4

VIII. Statistical Inferential Reasoning

Choose one course from approved list 3

IX. Community, Culture and Citizenship in the USA

Choose one course from approved list 3

X. Global Dynamics

Choose one course from approved list 3

UK Core Hours 33

Premajor Requirements Hours

CIS WRD 110 Composition and Communication I 3

MA 113 Calculus I 4

MA 114 Calculus II 4

MA 213 Calculus III 4

CHE 105 General College Chemistry I 4

PHY 231 General University Physics 4

plus an additional 13 credit hours acceptable towards the degree in mining engineering 13

Subtotal: Premajor Hours 36

Graduation Writing Requirement Hours

MNG 371 Professional Development of Mining Engineers 3

Major Requirements	Hours
CHE 107 General College Chemistry II	3
CS 221 First Course in Computer Science for Engineers	2
EE 305 Electrical Circuits and Electronics	3
EM 221 Statics	3
EM 313 Dynamics	3
EM 302 Mechanics of Deformable Solids	3
GLY/EES 220 Principles of Physical Geology	4
GLY/EES 230 Fundamentals of Geology I	3
MA 214 Calculus II	3
ME 220 Engineering Thermodynamics I	3
ME 330 Fluid Mechanics	3
MNG 101 Introduction to Mining Engineering	1
MNG 191 Mine Graphics	1
MNG 211 Mine Surveying	2
MNG 264 Mining Methods	3
MNG 291 Mineral Reserve Modeling	2
MNG 301 Minerals Processing	3
MNG 302 Minerals Processing Laboratory	1
MNG 303 Deformable Solids Laboratory	1
MNG 322 Mine Safety and Health Management and Processes	2
MNG 331 Explosives and Blasting	2
MNG 332 Mine Plant Machinery	3
MNG 335 Introduction to Mine Systems Analysis	3
MNG 341 Mine Ventilation	3
MNG 371 Professional Development of Mining Engineers	3
MNG 435 Mine Systems Engineering and Economics	4
MNG 463 Surface Mine Design and Environmental Issues	3
MNG 551 Rock Mechanics	4
MNG 591 Mine Design Project I†	1
MNG 592 Mine Design Project II	3
PHY 232 General University Physics	4
PHY 241 General University Physics Laboratory	1
PHY 242 General University Physics Laboratory	1
Subtotal: Major Hours	84
†At the time of publication, MNG 591 was being changed from 2 credit hours to 1 credit hour.	
Electives	Hours
Mineral Processing Technical Elective	3
Technical Electives	6
Supportive Elective	3
Subtotal: Electives	12
TOTAL HOURS:	137

Curriculum	Hours
Freshman Year	
First Semester	
CHE 105 General College Chemistry I	4
CS 221 First Course in Computer Science for Engineers	2
CIS/WRD 110 Composition and Communication I	3
MA 113 Calculus I	4
MNG 101 Introduction to Mining Engineering	1
UK Core – Social Sciences	3
Second Semester	
CHE 107 General College Chemistry II	3
MA 114 Calculus II	4
MNG 191 Mine Graphics	1
MNG 264 Mining Methods	3
PHY 231 General University Physics	4
PHY 241 General University Physics Laboratory	1
Sophomore Year	
First Semester	
EM 221 Statics	3
GLY/EES 220 Principles of Physical Geology	4
MA 213 Calculus III	4
MNG 331 Explosives and Blasting	2
PHY 232 General University Physics	4
PHY 242 General University Physics Laboratory	1
Second Semester	
EM 302 Mechanics of Deformable Solids	3
MA 214 Calculus IV	3
ME 220 Engineering Thermodynamics I	3
CIS/WRD 111 Composition and Communication II	3
MNG 291 Mineral Reserve Modeling	2
MNG 303 Deformable Solids Laboratory	1
MNG 322 Mine Safety and Health Management and Processes	2
Junior Year	
First Semester	
EE 305 Electrical Circuits and Electronics	3
GLY/EES 230 Fundamentals of Geology I	3
ME 330 Fluid Mechanics	3
MNG 211 Mine Surveying	2
MNG 301 Minerals Processing	3
MNG 302 Minerals Processing Laboratory	1
MNG 335 Introduction to Mine Systems Analysis	3
Second Semester	
EM 313 Dynamics	3
MNG 371 Professional Development of Mining Engineers	3
MNG 435 Mine Systems Engineering and Economics	4
MNG 463 Surface Mine Design and Environmental Issues	3
Minerals Processing Technical Elective*	3

Senior Year	Hours
First Semester	
MNG 332 Mine Plant Machinery	3
MNG 341 Mine Ventilation	3
MNG 551 Rock Mechanics	4
MNG 591 Mine Design Project I***	1
UK Core – Statistical Inferential Reasoning	3
UK Core – Citizenship - USA	3
Second Semester	
MNG 592 Mine Design Project II (UK Core – Arts and Creativity)	3
UK Core – Global Dynamics	3
Technical Electives**	6
Supportive Elective	3
UK Core – Humanities	3
*The Mineral Processing Technical Elective is to be chosen between MNG 575, Coal Preparation Design, and MNG 580, Mineral Processing Plant Design.	
**Courses recommended as technical electives are listed below. These courses must be chosen with the approval of the student's advisor to ensure that the curriculum in- cludes sufficient engineering design content.	
***At the time of publication, MNG 591 was being changed from 2 credit hours to 1 credit hour.	
Technical Electives: Of the two technical electives in the undergraduate program, students are required to select at least one from departmental courses. The remaining course, chosen with the approval of the student's advisor, can be used to fulfill specific educational goals.	
MNG 511 Mine Power System Design	
MNG 531 Advanced Blast Design and Technology	
MNG 541 Computer Design of Mine Ventilation Systems	
MNG 561 Mine Construction Engineering I	
MNG 563 Simulation of Industrial Production Systems	
MNG 572 Advanced Coal Preparation	
MNG 575 Coal Preparation Design	
MNG 580 Mineral Processing Plant Design	
MNG 581 Geostatistics	
MNG 599 Topic in Mining Engineering	
BAE 438G Fundamentals of Groundwater Hydrology	
CE 471G Soil Mechanics	
CE 541 Intermediate Fluid Mechanics	
GLY/EES 450G Sedimentary Geology	
GLY/EES 585 Hydrogeology	
PLS 501 Reclamation of Disturbed Land	