EXECUTIVE VICE PRESIDENT AND PROVOST
THE UNIVERSITY OF TEXAS AT AUSTIN

110 Inner Campus Drive, Suite 201 • G1000 • Austin, Texas 78712-1701 • (512) 471-4363 • FAX (512) 475-7385

January 26, 2016

Dr. Steven Leslie
Executive Vice Chancellor for Academic Affairs
The University of Texas System
P4300

Dear Dr. Leslie:

Enclosed for your consideration and approval are proposals to change degree programs in the Cockrell School of Engineering chapter in the *Undergraduate Catalog, 2016-2018* (D 13781-13831). Faculty Council approved these proposals on January 20, 2016. Final approval resides with UT System.

- Proposed Changes to the BS in Architectural Engineering (D 13781-13789)
- Proposed Changes to the BS in Aerospace Engineering (D 13790-13797)
- Proposed Changes to the BS in Biomedical Engineering (D 13798-13808)
- Proposed Changes to the BS in Civil Engineering (D 13809-13817)
- Proposed Changes to the BS in Geosystems Engineering and Hydrology (D 13818-13824)
- Proposed Changes to the BS in Petroleum Engineering (D 13825-13831)

Sincerely,

Judith H. Langlois
Executive Vice President and Provost, *ad interim*

JHL: lac

Enclosure

cc: Gregory Fenves, President
Carol Longoria, Assistant Deputy to the President
Sharon Wood, Dean, Cockrell School of Engineering
Gerald Speitel, Associate Dean for Academic Affairs, Cockrell School of Engineering
Brenda Schumann, Associate Registrar
IRRIS Team
Hillary Hart, Secretary, General Faculty and Faculty Council
Deborah Roberts, Executive Assistant, OGF
Victoria Cervantes, Senior Administrative Associate, OGF
Suzanne Revisore, Assistant to the EVCAA, UT System

OFFICE OF THE FACULTY COUNCIL

THE UNIVERSITY OF TEXAS AT AUSTIN

P. O. BOX 7816 • Austin, TX 78713-7816
(512) 471-5934 • Fax: (512) 471-5984 • http://www.utexas.edu/faculty/council

January 21, 2016

Judith H. Langlois
Interim Executive Vice President and Provost
The University of Texas at Austin
MAI 201
Campus Mail Code: G1000

Dear Dr. Langlois:

Enclosed for your consideration and action are proposals to change degree programs in the Cockrell School of Engineering chapter in the *Undergraduate Catalog, 2016-2018*. The proposals were classified as being of *exclusive* interest to only one college or school and were approved by the Faculty Council on a no-protest basis on January 20, 2016. The authority to grant final approval on these changes resides with UT System.

- Proposed Changes to the BS in Architectural Engineering (D 13781-13789)
- Proposed Changes to the BS in Aerospace Engineering (D 13790-13797)
- Proposed Changes to the BS in Biomedical Engineering (D 13798-13808)
- Proposed Changes to the BS in Civil Engineering (D 13809-13817)
- Proposed Changes to the BS in Geosystems Engineering and Hydrology (D 13818-13824)
- Proposed Changes to the BS in Petroleum Engineering (D 13825-13831)

Please let me know if you have questions or if I can provide other information concerning these items.

Sincerely,

Hillary Hart, Secretary
General Faculty and Faculty Council

HH:dlr

Enclosures

xc: Gregory L. Fenves, president
Janet Dukerich, senior vice provost

ec (letter only): Sharon L. Wood, dean, Cockrell School of Engineering
Gerald Speitel, associate dean for academic affairs, Cockrell School of Engineering
Carol Longoria, deputy to the president
Allen Walser, manager of reporting and analysis, IRRIS
Brenda Schumann, associate registrar
Lydia Cornell, Program Coordinator
Michelle George, administrative manager for faculty affairs, provost's office

DOCUMENTS OF THE GENERAL FACULTY

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN ARCHITECTURAL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG 2016-2018*

Dean Sharon L. Wood in the Cockrell School of Engineering has filed with the secretary of the Faculty Council the following changes to the *Undergraduate Catalog, 2016-2018*. The secretary has classified this proposal as legislation of *exclusive* interest to only one college or school.

The Committee on Undergraduate Degree Program Review recommended approval of the changes on January 6, 2016, and forwarded the proposal to the Office of the General Faculty. The Faculty Council has the authority to approve this legislation on behalf of the General Faculty. The authority to grant final approval on this legislation resides with UT System.

If no objection is filed with the Office of the General Faculty by the date specified below, the legislation will be held to have been approved by the Faculty Council. If an objection is filed within the prescribed period, the legislation will be presented to the Faculty Council at its next meeting. The objection, with reasons, must be signed by a member of the Faculty Council.

To be counted, a protest must be received in the Office of the General Faculty by January 20, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

13782

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN ARCHITECTURAL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG 2016-2018*

Type of Change ☒ Academic Change
☐ Degree Program Change (THECB form required)

Proposed classification ☒ Exclusive ☐ General ☐ Major

1. **IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.**
   - Is this a new degree program? Yes ☐ No ☒
   - Does the program offer courses that will be taught off campus? Yes ☐ No ☒
   - Will courses in this program be delivered electronically? Yes ☐ No ☒

2. **EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:**

   - Change to the introductory paragraph in order to more accurately describe the degree program in relation to the department's strategic plan.
   - Update of Student Outcomes and Program Educational Outcomes to align with ABET.
   - Removal of basic/major sequence language in preparation for the elimination of this process.
   - Addition of an undergraduate laptop requirement policy to ensure architectural engineering students meet course requirements within the Cockrell School of Engineering.
   - Update to the eight-semester suggested arrangement of courses in order to move C E 333T to the fourth semester. This change aligns the architectural engineering degree plan with other engineering degree plans and will better prepare architectural engineering students for upper-division coursework.
   - Update to the list of approved technical electives to include courses previously added to the inventory.
   - **M 427J:** Per Mathematics department changes to M 427K and 427J, either 427K or 427J will count toward the Advanced Calculus requirement for the BS BME degree. This was added to both the list of required courses and Suggested Arrangement of Courses sections.

3. **THIS PROPOSAL INVOLVES (Please check all that apply)**

☐ Courses in other colleges	☐ Courses in proposer's college that are frequently taken by students in other colleges	☐ Flags
☐ Course in the core curriculum	☒ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☐ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. **SCOPE OF PROPOSED CHANGE**
   a. Does this proposal impact other colleges/schools? Yes ☐ No ☒
      If yes, then how?
   b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
      If yes, how many more (or fewer) students do you expect?
   c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
      If yes, please indicate the number of students and/or class seats involved.

d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒
If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions. If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted?
Impacted schools must be contacted and their response(s) included:
Person communicated with:
Date of communication:
Response: Pending

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:
If yes, undergraduate studies must be informed of the proposed changes and their response included:
Person communicated with:
Date of communication:
Response:

f. Will this proposal change the number of hours required for degree completion? If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date: March 11, 2015
College approval date: March 27, 2015
Dean approval date: April 29, 2015

PROPOSED NEW CATALOG TEXT:

BACHELOR OF SCIENCE IN ARCHITECTURAL ENGINEERING

Buildings are the domain of architectural engineers and endpoints of this important engineering discipline. Americans spend over 70 total years of an average lifetime inside of buildings. As such, an important role of architectural engineers is to design buildings that are structurally resilient and able to withstand the loads that act on their exterior and interior surfaces. Because of the amount of time people spend in them, it is also important that buildings be designed, constructed, operated, and maintained to be healthy environments, free of airborne or surface contamination that can adversely affect occupants. Furthermore, buildings should also be comfortable environments that facilitate worker productivity and learning. In the United States, buildings account for nearly 40% of all energy use, over 70% of electricity use, and are major contributors to greenhouse gas emissions. As such, architectural engineers strive to design, construct, and operate both energy efficient and healthy buildings, with an increasing focus on the use of appropriate green building materials and products.

The building sector represents a major fraction of the United States economy, and buildings are by far the number one asset amongst all assets in the United States. Their appropriate design is critical for the people they serve, national and global economies, and for reasons of environmental sustainability. ~~An unprecedented growth in the building industry, already one of the largest industries in the nation, has created a pressing demand for engineers with specialized training to plan and direct the activities of the industry. This need has been further intensified by the introduction of new materials, new structural systems, and new methods and management techniques.~~ The curriculum in architectural engineering is designed to meet these needs ~~this demand~~. It offers training in the fundamentals of engineering, with specialization in structural analysis and design ~~structures~~, building energy and environments, ~~or~~ building construction, and materials.
This curriculum affords the student the opportunity to attain competence in the structural design of resilient buildings, from high-rise office buildings to single-family homes, and from hospitals to schools. ~~to long-span structures and from commercial buildings to complex industrial facilities~~. Courses in building energy

and environments ~~environmental control systems permit~~ provide graduates with knowledge relevant to the design and operation of both energy efficient and healthy buildings ~~to integrate modern electrical, mechanical, and utility distribution systems with the structural and architectural elements of buildings~~. Students will also gain important knowledge related to sustainable construction practices, construction management, and modern building materials. ~~Courses in construction methods and project management offer the student an opportunity to obtain a versatile background suitable for all areas of the building industry.~~

The extensive technical requirements, coupled with courses in arts and sciences, provide the architectural engineering student with an opportunity to obtain a background that is ideally suited for careers and positions of responsibility with consulting engineerings ~~firms~~, general contractors, manufacturers, government agencies, and architecture firms. The curriculum also serves as an excellent springboard to graduate study in the areas of structural engineering, building energy and environments, construction engineering and project management, or infrastructure ~~construction~~ materials engineering.

Student ~~Program~~ Outcomes

Graduates of the architectural engineering program are expected to have

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to function on multidisciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand what impact engineering solutions have in global, economic, environmental, and societal contexts
- Recognition of the need for and an ability to engage in lifelong learning
- Knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Program Educational Objectives

Graduates of the architectural engineering program should solve architectural engineering problems within a greater societal context. They should:

- Exhibit character and decision-making skills embodying professionalism and ethical behavior ~~Act professionally and ethically~~
- Apply knowledge, strong reasoning, and quantitative skills to design and implement creative and sustainable solutions
- Engage in lifelong learning ~~in order~~ to meet evolving engineering ~~the~~ challenges facing ~~the profession~~ society
- Exhibit strong communication, critical thinking, interpersonal, and ~~resource~~ management skills as leaders and contributors in the architectural engineering profession

Dual Degree program in Architectural Engineering and Architecture

A program that leads to both the Bachelor of Science in Architectural Engineering degree and the Bachelor of Architecture degree is available to qualified students. The program combines the course requirements of both degrees and requires six years for completion. Students who wish to pursue both degrees must apply for admission to the School of Architecture according to the procedures and deadlines established by the school. The program is described in Bachelor of Architecture/ Bachelor of Science in Architectural Engineering Dual

Degree Program; additional information is available from the undergraduate adviser for architectural engineering.

Portable Computing Devices

Students entering Architectural Engineering are required to have a laptop at their disposal. Laptops do not need to be brought to campus on a daily basis, but individual courses may require that a laptop be brought to class or lab sessions. For a list of minimum system requirements see: www.caee.utexas.edu/students/itss.

Curriculum

Course requirements include courses within the Cockrell School of Engineering ~~are divided into three categories: basic sequence courses, major sequence courses,~~ and other required courses. In addition, each student must complete the University's core curriculum. In some cases, a course required for the Bachelor of Science in Architectural Engineering may also be counted toward the core curriculum; these courses are identified below. To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in ~~ABET Criteria.~~ Liberal Education of Engineers.

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one quantitative reasoning flag, one ethics and leadership flag, one global cultures flag, one cultural diversity in the United States flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag, the global cultures flag, and one writing flag are carried by courses specifically required for the degree; these courses are identified below. Students are advised to fulfill the second writing flag requirement with a course that meets another requirement of the core curriculum~~, such as the first-year signature course~~. Courses that may be used to fulfill flag requirements are identified in the *Course Schedule*.

~~Enrollment in major sequence courses is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission and Registration. Enrollment in other required courses is not restricted by completion of the basic sequence.~~

	Requirements	Hours
~~Basic Sequence Courses~~		
Architectural Engineering Courses		
ARE 102	Introduction to Architectural Engineering	1
ARE 217	Computer-Aided Design and Graphics	2
ARE 320K	Introduction to Design I	3
ARE 320L	Introduction to Design II	3
ARE 323K	Project Management and Economics	3
ARE 335	Materials and Methods of Building Construction	3
ARE 346N	Building Environmental Systems	3
ARE 346P	HVAC Design	3
or ~~ARE 370~~	~~Design of Energy-Efficient and Healthy Buildings~~	
ARE 371	Energy Simulation in Building Design	
ARE 366	Contracts, Liability, and Ethics (ethics and leadership flag)	3
ARE 465	Integrated Design Project (independent inquiry flag)	4
~~**Chemistry**~~		
~~CH 301~~	~~Principles of Chemistry I (part II science and technology)~~	~~3~~
Civil Engineering		
C E 311K	Introduction to Computer Methods	3

C E 311S	Probability and Statistics for Civil Engineers	3
C E 319F	Elementary Mechanics of Fluids	3
C E 324P	Properties and Behavior of Engineering Materials	3
C E 329	Structural Analysis	3
C E 331	Reinforced Concrete Design	3
or C E 335	Elements of Steel Design	
C E 333T	Engineering Communication (writing flag)	3
C E 357	Geotechnical Engineering	3
Chemistry		
CH 301	Principles of Chemistry I (part II science and technology)	3
Engineering Mechanics		
E M 306	Statics	3
E M 319	Mechanics of Solids	3
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J or M 427K	Differential Equations with Linear Algebra (quantitative reasoning flag)	4
Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1
PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
~~**Rhetoric and Writing**~~		
~~RHE 306~~	~~Rhetoric and Writing (English composition)~~	~~3~~
~~UGS 302~~	~~First-Year Signature Course (some sections carry a writing flag)~~	~~3~~
~~or UGS 303~~	~~First-Year Signature Course (some sections carry a writing flag)~~	
~~Major Sequence Courses~~		
~~Architectural Engineering~~		
~~ARE 320K~~	~~Introduction to Design I~~	~~3~~
~~ARE 320L~~	~~Introduction to Design II~~	~~3~~
~~ARE 323K~~	~~Project Management and Economics~~	~~3~~
~~ARE 335~~	~~Materials and Methods of Building Construction~~	~~3~~
~~ARE 346N~~	~~Building Environmental Systems~~	~~3~~
~~ARE 346P~~	~~HVAC Design~~	~~3~~
~~or ARE 370~~	~~Design of Energy Efficient and Healthy Buildings~~	
~~ARE 465~~	~~Integrated Design Project (independent inquiry flag)~~	~~4~~
~~ARE 366~~	~~Contracts, Liability, and Ethics (ethics and leadership flag)~~	~~3~~
~~Civil Engineering~~		
~~C E 324P~~	~~Properties and Behavior of Engineering Materials~~	~~3~~
~~C E 329~~	~~Structural Analysis~~	~~3~~
~~C E 331~~	~~Reinforced Concrete Design~~	~~3~~

~~or C E 335~~	~~Elements of Steel Design~~	
~~C E 333T~~	~~Engineering Communication (writing flag)~~	~~3~~
~~C E 357~~	~~Geotechnical Engineering~~	~~3~~
~~Approved technical electives~~		~~9~~
Other Required Courses		
~~M 427J or M 427K~~	~~Advanced Calculus for Applications I (quantitative reasoning flag)~~	4
GEO 303	Introduction to Geology	3
M E 320	Applied Thermodynamics	3
Approved architectural history elective (visual and performing arts; global cultures flag)		3
Approved mathematics or science elective		3
Approved technical electives		9
Remaining Core Curriculum Courses		
RHE 306	Rhetoric and Writing (English composition)	3
E 316L	British Literature (humanities) (some sections carry a global cultures flag)	3
or E 316M	American Literature (humanities) (some sections carry a cultural diversity flag)	
or E 316N	World Literature (humanities) (some sections carry a global cultures flag)	
or E 316P	Masterworks of Literature (humanities)	
American and Texas government (some sections carry a global cultures and/or cultural diversity flag)		6
American history (some sections carry a cultural diversity flag)		6
Social and behavioral ~~behavioral~~ science (some sections carry a global cultures and/or cultural diversity flag)		3
UGS 302	First-Year Signature Course (all sections carry a writing flag)	3
or UGS 303	First-Year Signature Course (some sections carry a writing flag)	
Total Hours		126

Technical Electives

Technical electives in architectural engineering are listed in three areas of specialization below. Nine semester hours must be chosen from the following approved technical elective courses or selected with the approval of the department undergraduate adviser. Lower-division courses may not be used as technical electives.

Area 1, ~~Structures~~ Structural Engineering

Architectural Engineering 345K, *Masonry Engineering*
Architectural Engineering 362L, *Structural Design in Wood*
Civil Engineering 331, *Reinforced Concrete Design* or 335, *Elements of Steel Design*
Civil Engineering 360K, *Foundation Engineering* (carries an independent inquiry flag)
Civil Engineering 362M, *Advanced Reinforced Concrete Design* (carries an independent inquiry flag)
Civil Engineering 362N, *Advanced Steel Design* (carries an independent inquiry flag)
Civil Engineering 363, *Advanced Structural Analysis*
Civil Engineering 375, *Earth Slopes and Retaining Structures*
Engineering Mechanics 339, *Advanced Strength of Materials*

Area 2, Building Energy and Environments

Architectural Engineering 346P, *HVAC Design* or ~~370, *Design of Energy Efficient and Healthy Building*~~ 371, *Energy Simulation in Building Design*
Architectural Engineering 370, *Design of Energy Efficient and Healthy Building*

~~Architectural Engineering 371, *Energy Simulation in Building Design*~~
~~Architectural Engineering 372, *Modeling of Air and Pollutant Flows in Buildings*~~
Civil Engineering 341, *Introduction to Environmental Engineering*
Mechanical Engineering 339, *Heat Transfer*
Mechanical Engineering 374F, *Fire Science*
Mechanical Engineering 374S, *Solar Energy Systems Design*
Mechanical Engineering 379N, *Engineering Acoustics*

Area 3, Construction and Infrastructure Materials Engineering

Architectural Engineering 358, *Cost Estimating in Building Construction*
Architectural Engineering 376, *Building Information Modeling for Capital Projects*
Civil Engineering 351, *Concrete Materials*
Mechanical Engineering 349, *Corrosion Engineering*
Mechanical Engineering 378K, *Mechanical Behavior of Materials*
Mechanical Engineering 378P, *Properties and Applications of Polymers*

Suggested Arrangement of Courses

First Year

First Term	Hours	Second Term	Hours
ARE 102	1	Approved architectural history elective	3
CH 301	3	GEO 303	3
M 408C	4	M 408D	4
RHE 306	3	PHY 303K	3
UGS 302 or 303	3	PHY 103M	1
		Social and behavioral sciences	3
	14		17

Second Year

First Term	Hours	Second Term	Hours
C E 311K	3	ARE 217	2
E M 306	3	C E 311S	3
M 427J or M 427K	4	E M 319	3
PHY 303L	3	C E 319F	3
PHY 103N	1	~~M E 320~~ C E 333T	3
American history	3	American history	3
	17		17

Third Year

First Term	Hours	Second Term	Hours
ARE 320K	3	ARE 320L	3
C E 324P	3	ARE 335	3
C E 329	3	ARE 346N	3
~~ARE 323K~~ C E 357	3	C E 331 or 335	3
~~E 316L, 316M, 316N, or 316P~~ M E 320	3	~~C E 333T~~ E 316L, 316M, 616N, or 316P	3
	15		15

Fourth Year

First Term	Hours	Second Term	Hours
~~C E 357~~ ARE 323K	3	ARE 465	4

ARE 346P or ~~370~~ 371	3	ARE 366	3
Approved math/science elective	3	American government	3
Approved technical elective	3	Approved technical electives	6
American and Texas government	3		
	15		16

Total credit hours: 126

DOCUMENTS OF THE GENERAL FACULTY

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Dean Sharon L. Wood in the Cockrell School of Engineering has filed with the secretary of the Faculty Council the following changes to the *Undergraduate Catalog, 2016-2018*. The secretary has classified this proposal as legislation of *exclusive* interest to only one college or school.

The Committee on Undergraduate Degree Program Review recommended approval of the changes on January 6, 2016, and forwarded the proposal to the Office of the General Faculty. The Faculty Council has the authority to approve this legislation on behalf of the General Faculty. The authority to grant final approval on this legislation resides with UT System.

If no objection is filed with the Office of the General Faculty by the date specified below, the legislation will be held to have been approved by the Faculty Council. If an objection is filed within the prescribed period, the legislation will be presented to the Faculty Council at its next meeting. The objection, with reasons, must be signed by a member of the Faculty Council.

To be counted, a protest must be received in the Office of the General Faculty by January 20, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

13791

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Type of Change ☒ Academic Change
☐ Degree Program Change (THECB form required)

Proposed classification ☒ Exclusive ☐ General ☐ Major

1. **IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.**
   - Is this a new degree program? Yes ☐ No ☒
   - Does the program offer courses that will be taught off campus? Yes ☐ No ☒
   - Will courses in this program be delivered electronically? Yes ☐ No ☒

2. **EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:**
2. **Explain change to degree program and Give a detailed Rationale for each INDIVIDUAL change:**

-Paragraph 2: updated language to reflect degree content.
-Paragraph 3: updated language to reflect the elimination of major sequence
-Paragraph 3: added clarification to distinguish 'sub-discipline' from 'technical area'
-Paragraph 4: updated description of aerodynamics and propulsion sub-discipline
-Paragraph 9: updated language to reflect the elimination of major sequence
-Paragraph 11: eliminated the entire paragraph to reflect the elimination of major sequence
-Requirements Table: rearranged course listings to reflect the elimination of major sequence
-Area 1 Section: Updated course number to reflect inventory
-Area 2 Section: Updated course number to reflect inventory
-Suggested Arrangement of Courses: shifted order/timing of classes to reflect an upcoming change in prerequisites and recommended arrangement to include Modifying M 427K to M 427J or 427K to reflect the changes made by the
Mathematics department that denote either 427K or 427J will count toward the Advanced Calculus requirement

3. **THIS PROPOSAL INVOLVES (Please check all that apply)**

☐ Courses in other colleges	☐ Courses in proposer's college that are frequently taken by students in other colleges	☐ Flags
☐ Course in the core curriculum	☐ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☐ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. **SCOPE OF PROPOSED CHANGE**
   a. Does this proposal impact other colleges/schools? Yes ☐ No ☒
   If yes, then how?
   b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
   If yes, how many more (or fewer) students do you expect?
   c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
   If yes, please indicate the number of students and/or class seats involved.
   d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒

If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions. If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted?

Impacted schools must be contacted and their response(s) included:

Person communicated with:

Date of communication:

Response: Pending

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:

If yes, undergraduate studies must be informed of the proposed changes and their response included:

Person communicated with:

Date of communication:

Response:

f. Will this proposal change the number of hours required for degree completion? If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date: March 2, 2015
College approval date: March 27, 2015
Dean approval date: April 29, 2015

PROPOSED NEW CATALOG TEXT:

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING

The field of aerospace engineering developed because of humanity's desire for aircraft systems for military, commercial, and civilian purposes; it was first called aeronautical engineering or aeronautics. When the space age began, it was natural for aeronautical engineers to participate in the development of spacecraft systems for space exploration. This branch of engineering became known as astronautical engineering or astronautics, and the combined field is called aerospace engineering or aeronautics and astronautics. Because of the diverse nature of the work, the aerospace engineer must have a basic knowledge of physics, mathematics, digital computation, and the various disciplines of aerospace engineering: aerodynamics and propulsion, structural mechanics, flight mechanics and orbital mechanics, and control. Because of their extensive education in fundamental disciplines, aerospace engineers can work in areas other than aerospace engineering and are employed in a wide range of careers.

The objectives of the aerospace engineering degree program are to prepare students for professional practice in aerospace engineering and related engineering and scientific fields; to prepare students for such postbaccalaureate study as their aptitudes and professional goals may dictate; to instill in students a commitment to lifelong education and to ethical behavior throughout their professional careers; and to make students aware of the global and societal effects of technology. To meet these objectives, the faculty has designed a rigorous curriculum that emphasizes fundamentals in the basic sciences, mathematics, and the humanities, and integrates classroom and laboratory experiences in the engineering disciplines of aerodynamics and propulsion, structural mechanics, mechanics of materials, flight and orbital mechanics, controls, computation, ~~measurements and instrumentation~~ electromechanical systems, design, and technical communication. The curriculum requires students to use modern engineering tools, to work individually, and to practice teamwork.

The first two years of the aerospace engineering curriculum emphasize fundamental material along with engineering sciences, while the third year introduces concepts in the areas of fluid mechanics, structural mechanics, system dynamics and control, and experimentation. The fourth year provides further depth in aerospace engineering, with emphasis on design and laboratory courses. ~~After acceptance into the major~~

~~sequence, usually.~~ During the junior year, the student elects to pursue one of two technical areas, atmospheric flight or space flight. Both area options are complemented by general education courses and courses offered in other engineering disciplines. In addition, the student may choose technical electives that increase the breadth of the program or that provide additional depth within one or more subdisciplines within the department. All of the following subdisciplines are also represented in the required courses for both technical area options.

Aerodynamics and Propulsion

This subdiscipline ~~embraces study in one of the more traditional areas of aerospace engineering.~~ ~~It~~ involves fluid motion, propulsion, lift and drag on wings and other bodies, high-speed heating effects, and wind tunnel investigation of these problems. Topics of study include fluid mechanics, gas dynamics, heat transfer, aerodynamics, propulsion, computational fluid dynamics, and experimental fluid mechanics.

Structural Mechanics

This subdiscipline includes the study of airplane, spacecraft, and missile structures, the materials that make them efficient, and methods for testing, analysis, and design of new structural systems. Course topics include structural analysis, structural dynamics, materials (including advanced composites), aeroelasticity, experimental structural mechanics, and computer-aided design of structures.

Flight Mechanics and Orbital Mechanics

Flight mechanics involves the analysis of the motion of aircraft, missiles, rockets, reentry vehicles, and spacecraft that are subjected to gravitational, propulsive, and aerodynamic forces; the study of uncontrolled motion of satellites and coasting spacecraft is usually referred to as orbital mechanics. Subject matter in these areas includes trajectory analysis and optimization; attitude dynamics, stability, and control; flight test; orbit determination; orbital operations; systems engineering; sensors; satellite hardware applications; and simulation.

Flight Control

Control theory is applied in aerospace engineering to the development of automatic flight control systems for aircraft (autopilots and stability augmentation systems), attitude control systems for satellites, and guidance and control systems for missiles, rockets, reentry vehicles, and spacecraft. Course topics include linear system theory, classical control theory, digital control, and probability theory.

Portable Computing Devices

Students entering aerospace engineering are required to have access to a portable computing device capable of running the software tools required for undergraduate engineering analyses (MatLab, Word, Excel, etc). This device does not need to be brought to campus on a daily basis, but individual courses may require that the device be brought to certain lectures, labs, and/or exams. Once admitted, students will be informed by the Aerospace Engineering and Engineering Mechanics Department office about specific device requirements.

Curriculum

Course requirements ~~are divided into three categories: basic sequence courses, major sequence courses,~~ include courses within the Cockrell School of Engineering and other required courses. In addition, each student ~~much~~ must complete the University's Core Curriculum. In some cases, a course that fulfills one of the following requirements may also be counted toward core curriculum or flag requirements; these courses are identified below. ~~To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in ABET Criteria.~~

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one quantitative reasoning flag, one

ethics and leadership flag, one global cultures flag, one cultural diversity in the United States flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag, and both writing flags are carried by courses specifically required for the degree; these courses are identified below. Courses that may be used to fulfill flag requirements are identified in the *Course Schedule*.

~~Enrollment in major sequence courses is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission to a Major Sequence. Enrollment in other required courses is not restricted by completion of the basic sequence.~~

Courses used to fulfill technical elective requirements must be approved by the aerospace engineering faculty before the student enrolls in them.

The student must take all courses required for the degree on the letter-grade basis and must earn a grade of at least *C-* in each course, except for those listed as Remaining Core Curriculum Courses. He or she must also maintain grade point averages of at least 2.00 in the major area of study and in required technical courses as described in Academic Standards, and a cumulative University grade point average of at least 2.00 as described in *General Information*.

	Requirements	**Hours**
~~Basic Sequence Courses~~		
Aerospace Engineering Courses		
ASE 120K	Low-Speed Aerodynamics Laboratory	1
ASE 211K	Engineering Computation	2
ASE 301	Introduction to Computer Programming	3
ASE 320	Low-Speed Aerodynamics	3
ASE 324L	Aerospace Materials Laboratory	3
ASE 330M	Linear System Analysis	3
ASE 333T	Engineering Communication (writing flag and ethics and leadership flag)	3
ASE 362K	Compressible Flow	3
ASE 365	Structural Dynamics	3
ASE 366K	Spacecraft Dynamics	3
ASE 367K	**Flight Dynamics**	**3**
ASE 370L	Flight Control Systems	3
ASE 375	Electromechanical Systems	3
ASE 376K	Propulsion	3
Chemistry		
CH 301	Principles of Chemistry I (part II science and technology)	3
Engineering Mechanics		
E M 306	Statics	3
E M 311M	Dynamics	3
E M 319	Mechanics of Solids	3
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J or M427K	~~Advanced Calculus for Applications I~~ Differential Equations with Linear Algebra (quantitative reasoning flag)	4
M 427L	Advanced Calculus for Applications II	4

Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1
PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
Rhetoric and Writing		
RHE 306	Rhetoric and Writing (English composition)	3
~~Major Sequence Courses~~		
~~Aerospace Engineering~~		
~~ASE 320~~	~~Low-Speed Aerodynamics~~	~~3~~
~~ASE 119K~~	~~Low-Speed Aerodynamics Laboratory~~	~~1~~
~~ASE 324L~~	~~Aerospace Materials Laboratory~~	~~3~~
~~ASE 330M~~	~~Linear System Analysis~~	~~3~~
~~ASE 362K~~	~~Compressible Flow~~	~~3~~
~~ASE 365~~	~~Structural Dynamics~~	~~3~~
~~ASE 366K~~	~~Spacecraft Dynamics~~	~~3~~
~~ASE 367K~~	~~Flight Dynamics~~	~~3~~
~~ASE 370L~~	~~Flight Control Systems~~	~~3~~
~~ASE 375~~	~~Electromechanical Systems~~	~~3~~
~~ASE 376K~~	~~Propulsion~~	~~3~~
Technical area courses		13
Approved technical electives		6
Other required courses		
M E 210	Engineering Design Graphics	2
M E 320	Applied Thermodynamics	3
Remaining Core Curriculum Courses		
E 316L	British Literature (humanities) (some sections carry a global cultures flag)	3
or E 316M	American Literature (humanities) (some sections carry a cultural diversity flag)	
or E 316N	World Literature (humanities) (some sections carry a global cultures flag)	
or E 316P	Masterworks of Literature (humanities)	
American and Texas government (some sections carry a global cultures and/or cultural diversity flag)		6
American history (some sections carry a cultural diversity flag)		6
Social and behavioral sciences (some sections carry a global cultures and/or cultural diversity flag)		3
Visual and performing arts (some sections carry a global cultures and/or cultural diversity flag)		3
UGS 302	First-Year Signature Course (~~some~~ all sections carry writing flag)	3
or UGS 303	First-Year Signature Course (some sections carry a writing flag)	
Total Hours		126

Technical Area Options

The technical area option allows the student to choose thirteen semester hours of technical area courses in either atmospheric flight or space flight. Each student should choose a technical area by the end of the first semester of the junior year and plan an academic program to meet the area requirements in the next three semesters. Many students choose technical electives that will strengthen their backgrounds in one specialty area, but this is not required. It should be noted that a student may choose the technical area courses in the other technical area as technical electives.

Area 1, Atmospheric Flight

Also called aeronautics, this area provides the student with a well-rounded program of study emphasizing the major disciplines of aerodynamics, propulsion, structures, design, performance, and control of aircraft. These subjects are treated at a fundamental level that lays a foundation for work in a broad variety of specialties in the aircraft industry. This option is intended for the undergraduate student whose primary interest is aircraft.
Aerospace Engineering 321K, *Computational Methods for Structural Analysis*
Aerospace Engineering 361K, *Aircraft Design I* (carries an independent inquiry flag) Aerospace Engineering 361L, *Aircraft Design II* (carries a writing flag)
Aerospace Engineering 162M, *High-Speed Aerodynamics Laboratory*
Aerospace Engineering 364, *Applied Aerodynamics*

Area 2, Space Flight

Also called astronautics, this area offers a well-rounded program of study that provides a background in the traditional areas of fluid mechanics, materials, structures, propulsion, controls, and flight mechanics, while also giving the student a chance to learn about the space environment, attitude determination and control, orbital mechanics, mission design, and spacecraft systems engineering. These subjects are treated at a fundamental level that lays a foundation for work in a broad variety of specialties in space-related industries. This option is intended for the undergraduate student whose primary interest is space and spacecraft.
Aerospace Engineering 366L, *Applied Orbital Mechanics*

Aerospace Engineering 166M, *Spacecraft Systems Laboratory*
Aerospace Engineering 372K, *Attitude Dynamics*
Aerospace Engineering 374K, *Space Systems Engineering Design*
Aerospace Engineering 374L, *Spacecraft/Mission Design* (carries an independent inquiry flag and a writing flag)

Special Projects Laboratories

The department offers students the opportunity to participate in special projects such as student-built radio-controlled aircraft competitions and student satellite-building projects. These time-intensive projects are open to all aerospace engineering students with at least fifteen semester hours of University credit toward the degree and a grade point average of at least 2.50. Academic credit for participation in departmentally approved student projects is available on the pass/fail basis through the course Aerospace Engineering 128. Three such laboratory courses can be combined to count as one three-hour technical elective; one such laboratory course can be combined with a two-hour cooperative program to count as one three-hour technical elective.

Suggested Arrangement of Courses

First Year

First Term	Hours	**Second Term**	Hours
UGS 302 or 303	3	ASE 301	3
CH 301	3	M 408D	4
M 408C	4	PHY 303K	3
RHE 306	3	PHY 103M	1
Social and behavioral sciences or visual and performing arts	3	American and Texas government	3
		American history	3
	16		17

Second Year

First Term	Hours	Second Term	Hours
E M 306	3	ASE 211K	2
M 427J or M 427K	4	E M 311M	3
PHY 303L	3	E M 319	3
PHY 103N	1	M 427L	4
M E 210	2	ASE 333T	3
M E 320	3		
	16		15

Third Year

First Term	Hours	Second Term	Hours
ASE 320	3	ASE 362K	3
ASE 120K	1	ASE 367K	3
ASE 330M	3	Social and behavioral sciences or visual and performing arts	3
ASE 366K	3	Technical area courses	7
ASE 365	3		
E 316L, 316M, 316N, or 316P	3		
	16		16

Fourth Year

First Term	Hours	Second Term	Hours
ASE 375	3	ASE 370L	3
ASE 376K	3	ASE 324L	3
Technical area courses	6	American history	3
Technical elective	3	American and Texas government	3
		Technical area elective	3
	15		15

Total credit hours: 126

DOCUMENTS OF THE GENERAL FACULTY

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Dean Sharon L. Wood in the Cockrell School of Engineering has filed with the secretary of the Faculty Council the following changes to the *Undergraduate Catalog, 2016-2018*. The secretary has classified this proposal as legislation of *exclusive* interest to only one college or school.

The Committee on Undergraduate Degree Program Review recommended approval of the changes on January 6, 2016, and forwarded the proposal to the Office of the General Faculty. The Faculty Council has the authority to approve this legislation on behalf of the General Faculty. The authority to grant final approval on this legislation resides with UT System.

If no objection is filed with the Office of the General Faculty by the date specified below, the legislation will be held to have been approved by the Faculty Council. If an objection is filed within the prescribed period, the legislation will be presented to the Faculty Council at its next meeting. The objection, with reasons, must be signed by a member of the Faculty Council.

To be counted, a protest must be received in the Office of the General Faculty by January 20, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

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PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Type of Change ☒ Academic Change
☐ Degree Program Change (THECB form required)

Proposed classification ☒ Exclusive ☐ General ☐ Major

1. **IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.**
   - Is this a new degree program? Yes ☐ No ☒
   - Does the program offer courses that will be taught off campus? Yes ☐ No ☒
   - Will courses in this program be delivered electronically? Yes ☐ No ☒

2. **EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:**
   A. **M 427J:** Per Mathematics department changes to M 427K and 427J, either 427K or 427J will count toward the Advanced Calculus requirement for the BS BME degree. This was added to both the list of required courses and Suggested Arrangement of Courses sections.
   B. **Technical Area 1, Career Emphasis B:** Addition for **BME 354** *Molecular Sensors and Nanodevices for Biomedical Engineering Applications* to elective list offers more flexibility and options for students to complete Technical Electives requirements. Offered by Biomedical Engineering.
   C. **Technical Area 4:** Addition for **BME 346** *Computational Biomolecular Engineering*, and **BME 347** *Fundamentals of Biomedical Optics* to elective list offers more flexibility and options for students to complete Technical Electives requirements. Both offered by Biomedical Engineering.
   D. **Suggested Arrangement of Courses: BME 343** must be taken after BME 113L; therefore BME 343 was moved from Second Year Second Term to Third Year First Time. In order to adjust for this change so that the Third Year First Term does not exceed 17 hours and all prerequisites are accounted for, the following adjustments were made:
      a. BME 344 moved from Third Year First Term to Second Year Second Term.
      b. BME 349 moved from Third Year First Term to Third Year Second Term.
      c. BME 352 moved from Third Year Second Term to Third Year First Term.
      d. E 316L, 316M, 316N or 316P moved from Third Year Second Term to Third Year First Term.
      e. BME 353 moved from Third Year First Term to Third year Second Term.
   E. **Suggested Arrangement of Courses: GOV 312P** added as option for government core course requirement in Fourth Year Second Term.
   F. **Suggested Arrangement of Courses: CH 353 or 353M** will be removed from the required courses. (-3 credit hours)
      a. Aspects of physical chemistry and thermodynamics required for biomedical engineers will be covered in BME 355 Molecular Engineering, and will therefore be removed. College of Natural Sciences has been contacted on Friday, September 4, 2015, that 85-105 BME undergraduates will not be enrolling in CH 353 or 353M starting no later than spring 2018. See attached email correspondence documentation.
   G. **Suggested Arrangement of Courses: BME 203L and 113L** will be increased to BME 303L and 313L, respectively. **(+3 credit hours)**
      a. BME 203L and 113L are important first- and second-year laboratories that require more contact time. Starting in the 16-18 catalog, the hours for these courses will be increased to 3 credit hours each. The total change in the curriculum required hours is net 0 hours (removal of CH 353 or 353M requirement).

3. **THIS PROPOSAL INVOLVES (Please check all that apply)**
   ☒ Courses in other colleges ☐ Courses in proposer's college that ☒ Flags

	are frequently taken by students in other colleges	
☐ Course in the core curriculum	☒ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☐ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. SCOPE OF PROPOSED CHANGE

a. Does this proposal impact other colleges/schools? Yes ☒ No ☐
If yes, then how?

b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
If yes, how many more (or fewer) students do you expect?

c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
If yes, please indicate the number of students and/or class seats involved.

d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒
If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions. If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted? 85-105 students per year; all BME undergraduates
Impacted schools must be contacted and their response(s) included:
Person communicated with: Dr. Vanden Bout, College of National Sciences
Date of communication: September 4, 2015
Response: Pending

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:
If yes, undergraduate studies must be informed of the proposed changes and their response included:
Person communicated with:
Date of communication:
Response:

f. Will this proposal change the number of hours required for degree completion? If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date: February 19, 2015 for items A-D; August 24, 2015 for items E-G
College approval date: March 27, 2015 for items A-D; September 11, 2015 for items E-G
Dean approval date: April 29, 2015 for items A-D; September 25, 2015 for items E-G

PROPOSED NEW CATALOG TEXT:

BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING

The mission of the Department of Biomedical Engineering is to develop clinically translatable solutions for human health by training the next generation of biomedical engineers, cultivating leaders, and nurturing the integration of science, engineering, and medicine in a discovery-centered environment. The main educational objective is to provide a thorough training in the fundamentals of engineering science, design, and biology. The curriculum is designed to provide concepts central to understanding living systems from the molecular and cellular levels to the tissue and organismal levels. The curriculum incorporates principles of vertical integration, leading to the choice of a technical area (biomedical imaging and instrumentation, cellular and biomolecular engineering, computational biomedical engineering, or biomechanics), and culminates in a

team capstone design experience. Students are expected to develop an understanding of industrial, research, and clinical biomedical engineering environments; an understanding of regulatory issues and biomedical ethics; the ability to create, identify, formulate, and solve biomedical engineering problems; the ability to design systems to meet needs in medical/life science applications; an understanding of life processes at the molecular, cellular, tissue, and organismal levels; the ability to use instrumentation and to make measurements and interpret data in living systems; and an appreciation of the interdisciplinary nature of biomedical engineering research.

Portable Computing Devices

Students entering biomedical engineering are required to have a laptop computer at their disposal. Laptops do not need to be brought to campus on a daily basis, but individual courses may require that a laptop be brought to certain lectures, labs, and/or exams. Minimum requirements for the laptop are listed on the department's website.

~~Program~~ Student Outcomes

Graduates of the biomedical engineering program are expected to have:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to function on multidisciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand what impact engineering solutions have in global, economic, environmental, and societal contexts
- A recognition of the need for and an ability to engage in lifelong learning
- A knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Program Educational Objectives

Achievement of the preceding program outcomes gives students the foundation for accomplishing the biomedical engineering program educational objectives. A few years after graduation, students are expected to be able to:

- Conduct themselves with exemplary professional ethics and highest integrity
- Demonstrate a quantitative, analytical, and systems approach to problem solving in their professional practice
- Demonstrate a continuous quest for professional excellence and success
- Participate in continuing education to expand their knowledge of contemporary professional issues
- Exhibit effective scientific, technical, communication, and resource management skills in their professional practice

Curriculum

Course requirements include courses within the Cockrell School of Engineering ~~are divided into three categories: basic sequence courses, major sequence courses,~~ and other required courses. In addition, each student must complete the University's core curriculum. In some cases, a course that fulfills one of the following requirements may also be counted toward core curriculum or flag requirements; these courses are identified below.

~~To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in Degrees.~~

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one quantitative reasoning flag, one ethics and leadership flag, one global cultures flag, one cultural diversity in the United States flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag, and the two writing flags are carried by courses specifically required for the degree; these courses are identified below. Courses that may be used to fulfill flag requirements are identified in the *Course Schedule*.

~~The first three long semesters of the curriculum consist of basic sequence and supporting courses for all biomedical engineering students. Subsequent enrollment in major sequence courses starting the fourth semester, and one of four technical areas is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission and Registration. Enrollment in other required courses is not restricted by completion of the basic sequence.~~

Prior to registration, students must receive approval from the Biomedical Engineering Academic Advising Office for courses to be used to fulfill technical and nontechnical course requirements. The student must take all courses required for the degree on the letter-grade basis and must earn a grade of at least *C-* in each, except for those listed as Remaining Core Curriculum Courses.

	Requirements	Hours
~~Basic Sequence Courses~~		
~~Biology~~		
~~BIO 206L~~	~~Introductory Laboratory Experiments in Biology~~	~~2~~
~~BIO 311C~~	~~Introductory Biology I~~	~~3~~
Biomedical Engineering Courses		
BME ~~113L~~ 313L	Introduction to Numerical Methods in Biomedical Engineering	~~1~~ 3
BME ~~203L~~ 303L	Introduction to Biomedical Engineering Design	~~2~~ 3
BME 214L	Computational Fundamentals of Biomedical Engineering Design	2
BME 245L	Experimental Principles of Biomedical Engineering Design (writing flag)	2
BME 261L	Development and Analysis in Biomedical Engineering Design	2
BME 303	Introduction to Computing	3
BME 311	Network Analysis in Biomedical Engineering	3
BME 333T	Engineering Communication (writing and an ethics and leadership flag)	3
BME 335	Engineering Probability and Statistics	3
BME 343	Biomedical Engineering Signal and Systems Analysis	3
BME 344	Biomechanics	3
BME 349	Biomedical Instrumentation	3
BME 352	Engineering Biomaterials	3
BME 353	Transport Phenomena in Living Systems	3
BME 355	Molecular Engineering	3
BME 365R	Quantitative Engineering Physiology I	3
BME 365S	Quantitative Engineering Physiology II	3
BME 370	Biomedical Engineering Capstone Design I (writing flag)	3
BME 371	Biomedical Engineering Capstone Design II (independent inquiry flag)	3
Approved technical area electives		12

Biology		
BIO 206L	Introductory Laboratory Experiments in Biology	2
BIO 311C	Introductory Biology I	3
Biochemistry and Chemistry		
BCH 369	Fundamentals of Biochemistry	3
CH 128K	Organic Chemistry Laboratory	1
CH 204	Introduction to Chemical Practice	2
CH 301	Principles of Chemistry I	3
CH 302	Principles of Chemistry II	3
CH 320M	Organic Chemistry I	3
or CH 328M	Organic Chemistry I-CH/BCH Major	
~~CH 353~~	~~Physical Chemistry I~~	~~3~~
~~or CH 353M~~	~~Physical Chemistry I for Life Sciences~~	
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427K or M 427J	Advanced Calculus for Applications I (quantitative reasoning flag)	4
Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1
PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
Rhetoric and Writing		
RHE 306	Rhetoric and Writing (English composition)	3
~~Major Sequence Courses~~		
~~Biomedical Engineering~~		
~~BME 335~~	~~Engineering Probability and Statistics~~	~~3~~
~~BME 343~~	~~Biomedical Engineering Signal and Systems Analysis~~	~~3~~
~~BME 344~~	~~Biomechanics~~	~~3~~
~~BME 245L~~	~~Experimental Principles of Biomedical Engineering Design (writing flag)~~	~~2~~
~~BME 349~~	~~Biomedical Instrumentation~~	~~3~~
~~BME 352~~	~~Engineering Biomaterials~~	~~3~~
~~BME 353~~	~~Transport Phenomena in Living Systems~~	~~3~~
~~BME 355~~	~~Molecular Engineering~~	~~3~~
~~BME 261L~~	~~Development and Analysis in Biomedical Engineering Design~~	~~2~~
~~BME 365R~~	~~Quantitative Engineering Physiology I~~	~~3~~
~~BME 365S~~	~~Quantitative Engineering Physiology II~~	~~3~~
~~BME 370~~	~~Biomedical Engineering Capstone Design I (writing flag)~~	~~3~~
~~BME 371~~	~~Biomedical Engineering Capstone Design II (independent inquiry flag)~~	~~3~~
~~**Other Required Courses**~~		
~~CH 128K~~	~~Organic Chemistry Laboratory~~	~~1~~
~~CH 353~~	~~Physical Chemistry I~~	~~3~~
~~or CH 353M~~	~~Physical Chemistry I for Life Sciences~~	
~~BCH 369~~	~~Fundamentals of Biochemistry~~	~~3~~
Remaining Core Curriculum Courses		
E 316L	British Literature (humanities) (some sections carry a global cultures flag)	3

	American Literature (some sections carry a cultural diversity flag)	
or E 316M	World Literature (some sections carry a global cultures flag)	
or E 316N	Masterworks of Literature	
or E 316P		
American and Texas government (some sections carry a global cultures and/or cultural diversity flag)		6
American history (some sections carry a cultural diversity flag)		6
Social and behavioral sciences (some sections carry a global cultures and/or cultural diversity flag)		3
Visual and performing arts (some sections carry a global cultures and/or cultural diversity flag)		3
UGS 302	First-Year Signature Course (~~some~~ all sections carry a writing flag)	3
or UGS 303	First-Year Signature Course (some sections carry a writing flag)	
Minimum Required		133

Technical Area Options

The technical area option allows the student to build on the biomedical engineering core curriculum by choosing twelve semester hours of technical area coursework in biomedical imaging and instrumentation, cellular and biomolecular engineering, computational biomedical engineering, or biomechanics. Within some technical areas, career emphases are available for students to focus coursework toward a particular career track. Students have flexibility to take technical elective coursework from more than one career emphasis under the same technical area. Each student should choose a technical area by the end of the sophomore year and plan an academic program to meet the area requirements during the next two years.

Preparation for health professions. Students who plan to attend medical, veterinary, or dental school in Texas must complete coursework in addition to that required for the BS in Biomedical Engineering in order to meet professional school admission requirements; those who plan to attend schools outside Texas may need additional coursework. The student is responsible for knowing and meeting these additional requirements, but assistance and information are available from full-time pre-health professions coaches and part-time peer mentors in the Health Professions Office in the College of Natural Sciences, PAI 5.03. Additional information about preparation for health professions is available online at http://cns.utexas.edu/careers/health-professions/.

Preparation for law. There is no sequential arrangement of courses prescribed for a pre-law program. The Association of American Law Schools puts special emphasis on comprehension and expression in words, critical understanding of the human institutions and values with which the law deals, and analytical power in thinking. Courses relevant to these objectives deal with communication of ideas, logic, mathematics, social sciences, history, philosophy, and the physical sciences. Services for pre-law students are provided to students in all colleges by Liberal Arts Career Services in FAC 18 ~~the Center for Strategic Advising & Career Counseling, JES A115~~ and to engineering students by the Engineering Career Assistance Center (ECAC) in ECJ 3.256 ~~2.400~~. Additional information about preparation for law is available online.

Plan II Honors Program. Students enrolled in the Plan II Honors Program are encouraged to contact the Biomedical Engineering Academic Advising Office, in addition to the Plan II Office to ensure that requirements for both programs are met. Plan II courses may count toward biomedical engineering program requirements.

Certificate programs. Biomedical engineering students may enrich their education through the following certificate programs.

Business Foundations Program. Students who wish to learn about fundamental business concepts and practices may take supplemental coursework that leads to the Business Foundations Certificate, awarded by the Red McCombs School of Business. The program is described in Degrees and Programs of the McCombs School. More information about the Business Foundations Program is available at http://new.mccombs.utexas.edu/bba/business-foundations and from the McCombs School.

Elements of Computing. Students who wish to learn about computer science may take the coursework that leads to the certificate in the Elements of Computing, awarded by the Department of Computer Science. The program is described in Degrees of the College of Natural Science. More information about the Elements of Computing Program is available at https://www.cs.utexas.edu/undergraduate-program/academics/elements-computing, and from the Department of Computer Science.

Technical Area 1, Biomedical Imaging and Instrumentation

This technical area is designed for students interested in the general area of medical imaging science and instrumentation design. Two career emphases are available in this area: biomedical imaging and biomedical instrumentation.

Career Emphasis A: Biomedical Imaging

The main objective of this emphasis is to prepare students for a career in biomedical imaging. A solid foundation, practical knowledge, and skills are established in optics, imaging modalities, and image and signal processing.

While students are required to select twelve hours from any of the Technical Area 1 electives, the following are recommended for the biomedical imaging career emphasis:

Biomedical Engineering 347, *Fundamentals of Biomedical Optics*
Biomedical Engineering 357, *Biomedical Imaging Modalities*
Electrical Engineering 347, *Modern Optics*
Electrical Engineering 351M, *Digital Signal Processing*
Electrical Engineering 371R, *Digital Image and Video Processing*
An approved upper-division biomedical engineering, electrical engineering, or physics course

Career Emphasis B: Biomedical Instrumentation

The main objective of this emphasis is to prepare students to design and use biomedical instrumentation for imaging, diagnostic, and therapeutic applications. A solid foundation, practical knowledge, and skills are established in analog and digital network analysis, software and hardware programming, electronic circuits, sensors, data acquisition systems, image and signal processing, and computational analysis of data as it applies to living systems.

While students are required to select twelve hours from any of the Technical Area 1 course options, the following are recommended for the biomedical instrumentation career emphasis:

Biomedical Engineering 354, *Molecular Sensors and Nanodevices for Biomedical Engineering Applications*
Biomedical Engineering 374K, *Biomedical Instrument Design*
Biomedical Engineering 374L, *Applications of Biomedical Engineering Laboratory*
Electrical Engineering 312, *Software Design and Implementation I*
Electrical Engineering 319K, *Introduction to Embedded Systems*
Electrical Engineering 438, *Fundamentals of Electronic Circuits I Laboratory*
Electrical Engineering 445L, *Embedded Systems Design Laboratory* Electrical
Engineering 445M, *Embedded and Real-Time Systems Laboratory* Electrical
Engineering 445S, *Real-Time Digital Signal Processing Laboratory* Electrical
Engineering 351M, *Digital Signal Processing*

Technical Area 2, Cellular and Biomolecular Engineering

The major objective of this area is to teach students how to integrate knowledge in cell and molecular biology with engineering analysis, so that they can address problems in molecular-based medicine. Two career emphases are available in this area: biomaterials/regenerative medicine and nanotechnology.

Career Emphasis A: Biomaterials/Regenerative Medicine

The objective of this emphasis is to prepare students for a career in biomaterials and regenerative medicine engineering. This emphasis includes solid foundation in cell and tissue engineering, biomaterials, and pharmacology. While students are required to select twelve hours from any of the Technical Area 2 course options, the following are recommended for the biomaterials/regenerative medicine career emphasis:

Biology 320, *Cell Biology*
Biology 325, *Genetics*
Biology 326M, *Introductory Medical Microbiology and Immunology*
Biomedical Engineering 339, *Biochemical Engineering*
Biomedical Engineering 376, *Cell Engineering*
Biomedical Engineering 379, *Tissue Engineering*
An approved topic of Chemical Engineering 379, *Topics in Chemical Engineering*
Chemistry 320N, *Organic Chemistry II* and 220C, *Organic Chemistry Laboratory*; or 328N, *Organic Chemistry II* and 128L, *Organic Chemistry Laboratory*
Pharmacy 338, *Introduction to Pharmacology*
An approved upper-division biomedical engineering, chemical engineering or mechanical engineering course

Career Emphasis B: Nanotechnology

The objective of this emphasis is to prepare students for a career in nanotechnology. This emphasis includes solid foundation in nanodevices and sensors, biological physics, and nanocomposites. While students are required to select twelve hours from any of the Technical Area 2 course options, the following are recommended for the nanotechnology career emphasis:

Biomedical Engineering 346, *Computational Biomolecular Engineering*
Biomedical Engineering 354, *Molecular Sensors and Nanodevices for Biomedical Engineering Applications*
Chemical Engineering 322, *Thermodynamics*
Chemical Engineering 339P, *Introduction to Biological Physics*
An approved topic of Chemical Engineering 379, *Topics in Chemical Engineering*
Chemistry 320N, *Organic Chemistry II* and 220C, *Organic Chemistry Laboratory*; or 328N, *Organic Chemistry II* and 128L, *Organic Chemistry Laboratory*
An approved topic of Mechanical Engineering 379M, *Topics in Mechanical Engineering*
An approved upper-division biomedical engineering, chemical engineering or mechanical engineering course

Technical Area 3, Computational Biomedical Engineering

The objective of this area is to provide students with the knowledge and skills that will enable them to design and use computational algorithms to address problems in biomedical research and health care. Examples include (a) designing medical decision aids using statistical and machine learning models, (b) dynamic modeling and computer simulation to study the biomechanics and control of movement, (c) development of thermodynamic models of dynamic processes at the microscopic and macroscopic scales in biological systems, and (d) image processing techniques for quantitative measurement and interpretation of biomedical images.

Students must select twelve hours from the following:
Biomedical Engineering 345, *Graphics and Visualization Laboratory* Biomedical
Engineering 346, *Computational Biomolecular Engineering*
Biomedical Engineering 348, *Modeling of Biomedical Engineering Systems* Biomedical
Engineering 358, *Medical Decision Making*
Electrical Engineering 312, *Software Design and Implementation I*
Electrical Engineering 319K, *Introduction to Embedded Systems*
Electrical Engineering 422C, *Software Design and Implementation II*
Electrical Engineering 360C, *Algorithms*

Electrical Engineering 371R, *Digital Image and Video Processing*
Mathematics 325K, *Discrete Mathematics*
Mathematics 340L, *Matrices and Matrix Calculations*
A computer science course from an approved list

Technical Area 4, Biomechanics

The major objective of this area is to provide students with knowledge of the structure and function of biological systems by means of the methods of mechanics. Students will learn skills to apply engineering principles to understand how living systems function at all scales of organization and to translate this understanding to the design of devices and procedures that will improve diagnostic and therapeutic methods in health care.

Students must select twelve hours from the following:
Biomedical Engineering 342, *Biomechanics of Human Movement*
Biomedical Engineering 346, *Computational Biomolecular Engineering*
Biomedical Engineering 347, *Fundamentals of Biomedical Optics*
Biomedical Engineering 359, *Cellular and Molecular Biomechanics*
Biomedical Engineering 362, *Introduction to Nonlinear Dynamics in Biological Systems*
Chemical Engineering 339P, *Introduction to Biological Physics*
Kinesiology 326K, *Kinesiology: Biomechanical Analysis of Movement*
Mechanical Engineering 324, *Dynamics*
Mechanical Engineering 326, *Thermodynamics*
Mechanical Engineering 344, *Dynamic Systems and Controls* and 144L, *Dynamic Systems and Controls Laboratory*
Mechanical Engineering 354, *Introduction to Biomechanical Engineering*
Mechanical Engineering 372J, *Robotics and Automation*
An approved upper-division biomedical engineering or mechanical engineering course

Suggested Arrangement of Courses

First Year

First Term	Hours	**Second Term**	Hours
BIO 311C	3	BME 303	3
BME ~~203L~~ 303L	~~2~~ 3	CH 302	3
UGS 302 or 303	3	CH 204	2
BIO 206L	2	M 408D	4
CH 301	3	PHY 303K	3
M 408C	4	PHY 103M	1
		RHE 306	3
	~~17~~ 18		19

Second Year

First Term	Hours	**Second Term**	Hours
BME 214L	2	BME 333T	3
CH 320M or 328M	3	BME ~~113L~~ 313L	~~1~~ 3
CH 128K	1	BME 344 ~~BME 343~~	3
BME 311	3	BME 335	3
M 427J or M 427K	4	~~CH 353M or 353~~	~~3~~
PHY 303L	3	BCH 369	3
PHY 103N	1		

	17		~~16~~ 15
		Third Year	
First Term	Hours	**Second Term**	Hours
BME 245L	2	BME 261L	2
BME 343 ~~BME 344~~	3	BME 355	3
BME 352 ~~BME 349~~	3	BME 349 ~~BME 352~~	3
BME 365R	3	BME 365S	3
E 316L, 316M, 316N, or 316P ~~BME 353~~	3	Technical area elective	3
Technical area elective	3	BME 353 ~~E 316L, 316M, 316N, or 316P~~	3
	17		17
		Fourth Year	
First Term	Hours	**Second Term**	Hours
BME 370	3	BME 371	3
GOV 310L	3	GOV 312L/P	3
Technical area elective	3	Visual and performing arts	3
American history	3	Technical area elective	3
Social and behavioral sciences	3	American history	3
	15		15

Total credit hours: 133

DOCUMENTS OF THE GENERAL FACULTY

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN CIVIL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Dean Sharon L. Wood in the Cockrell School of Engineering has filed with the secretary of the Faculty Council the following changes to the *Undergraduate Catalog, 2016-2018*. The secretary has classified this proposal as legislation of *exclusive* interest to only one college or school.

The Committee on Undergraduate Degree Program Review recommended approval of the changes on January 6, 2016, and forwarded the proposal to the Office of the General Faculty. The Faculty Council has the authority to approve this legislation on behalf of the General Faculty. The authority to grant final approval on this legislation resides with UT System.

If no objection is filed with the Office of the General Faculty by the date specified below, the legislation will be held to have been approved by the Faculty Council. If an objection is filed within the prescribed period, the legislation will be presented to the Faculty Council at its next meeting. The objection, with reasons, must be signed by a member of the Faculty Council.

To be counted, a protest must be received in the Office of the General Faculty by January 20, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

Posted on the Faculty Council website (http://www.utexas.edu/faculty/council/) on January 13, 2016.

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PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN CIVIL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Type of Change ☒ Academic Change
☐ Degree Program Change (THECB form required)

Proposed classification ☒ Exclusive ☐ General ☐ Major

1. **IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.**
   - Is this a new degree program? Yes ☐ No ☒
   - Does the program offer courses that will be taught off campus? Yes ☐ No ☒
   - Will courses in this program be delivered electronically? Yes ☐ No ☒

2. **EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:**
   - Change to the introductory paragraph in order to more accurately describe the degree program in relation to the department's strategic plan.
   - Update of Student Outcomes and Program Educational Outcomes to align with ABET.
   - Removal of basic/major sequence language in preparation for the elimination of this process.
   - Addition of an undergraduate laptop requirement policy to ensure architectural engineering students meet course requirements within the Cockrell School of Engineering.
   - Update to the eight-semester suggested arrangement of courses in order to move C E 333T to the fourth semester. This change aligns the architectural engineering degree plan with other engineering degree plans and will better prepare architectural engineering students for upper-division coursework.
   - Update to the list of approved technical electives to include courses previously added to the inventory.
   - M 427J: Per Mathematics department changes to M 427K and 427J, either 427K or 427J will count toward the Advanced Calculus requirement for the BS BME degree. This was added to both the list of required courses and Suggested Arrangement of Courses sections.

3. **THIS PROPOSAL INVOLVES (Please check all that apply)**

☐ Courses in other colleges	☐ Courses in proposer's college that are frequently taken by students in other colleges	☐ Flags
☐ Course in the core curriculum	☐ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☐ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. **SCOPE OF PROPOSED CHANGE**
   a. Does this proposal impact other colleges/schools? Yes ☐ No ☒
      If yes, then how?
   b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
      If yes, how many more (or fewer) students do you expect?
   c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
      If yes, please indicate the number of students and/or class seats involved.
   d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒
      If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions. If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted?

Impacted schools must be contacted and their response(s) included:

Person communicated with:

Date of communication:

Response: Pending

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:

If yes, undergraduate studies must be informed of the proposed changes and their response included:

Person communicated with:

Date of communication:

Response:

f. Will this proposal change the number of hours required for degree completion? If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date: March 11, 2015
College approval date: March 27, 2015
Dean approval date: April 29, 2015

PROPOSED NEW CATALOG TEXT:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Civil engineers design, construct, operate and maintain the physical fabric of society. In doing so, civil engineers work toward continuous improvement of the human condition and natural environment, tackling many of the grand challenges that face humankind today. Much of the work of civil engineers is highly visible, such as roadways, bridges, airports, levees, buildings, bike paths, and city parks, while other parts are rarely seen but equally vital to the health of communities, such as the water and wastewater treatment, distribution, and collection systems or the energy infrastructure. Civil engineers keep human beings safe by designing resilient infrastructure that does not fail in extraordinary events, but that is also socially, economically, and environmentally sustainable.

~~Engineering is the application of scientific principles and technical knowledge to real-world problems. Civil engineering is the segment of the engineering profession that strives to provide for the basic needs of humanity. The civil engineer is involved with the physical environment through the planning, design, construction, and operation of building and housing systems, transportation systems, and systems for the protection and use of air and water resources.~~

The civil engineering student has the opportunity to obtain a broad background in mathematics and the physical sciences and their applications to all areas of civil engineering. This flexible curriculum allows the student to elect eighteen semester hours of approved technical coursework to emphasize the areas of civil engineering of most interest to the student. In addition, courses in the humanities and social sciences are included.

To excel as a civil engineer, a student should have an aptitude for mathematics and science, an interest in the practical application of technical knowledge to societal problems, the motivation to study and prepare for engineering practice, and the desire to be a professional, and a desire to work with others to better the lives of humankind. Civil engineering graduates of the University may seek a wide variety of positions in planning, design, and construction with government agencies, industry, and private consulting firms. Those who plan to pursue graduate work in engineering, or in other professions such as business, medicine, law, or journalism, have an excellent base on which to build.

~~Program~~ Student Outcomes

Graduates of the civil engineering program should attain the following outcomes:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to function on multidisciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand what impact engineering solutions have in global, economic, environmental, and societal contexts
- Recognition of the need for and an ability to engage in lifelong learning
- Knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Program Educational Objectives

Graduates of the civil engineering program should solve civil engineering problems within a greater societal context. They should:

- Exhibit character and decision-making skills embodying professionalism and ethical behavior ~~Act professionally and ethically~~
- Apply knowledge, strong reasoning, and quantitative skills to design and implement creative and sustainable solutions
- Engage in lifelong learning ~~in order~~ to meet evolving engineering ~~the~~ challenges facing society ~~the profession~~
- Exhibit strong communication, critical thinking, interpersonal, and ~~resource~~ management skills as leaders and contributors in the civil engineering profession

Portable Computing Devices

Students entering Civil Engineering are required to have a laptop at their disposal. Laptops do not need to be brought to campus on a daily basis, but individual courses may require that a laptop be brought to class or lab sessions. For a list of minimum system requirements see: www.caee.utexas.edu/students/itss.

Curriculum

Course requirements include courses within the Cockrell School of Engineering ~~are divided into three categories: basic sequence courses, major sequence courses,~~ and other required courses. In addition, each student must complete the University's core curriculum. In some cases, a course required for the Bachelor of Science in Civil Engineering ~~as part of the basic sequence~~ may also be counted toward the core curriculum; these courses are identified below. ~~To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in ABET Criteria.~~

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one quantitative reasoning flag, one ethics and leadership flag, one global cultures flag, one cultural diversity in the US flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag and one writing flag are carried by courses specifically required for the degree; these courses are identified below.

Students are advised to fulfill the second writing flag requirement with a course that meets another requirement of the core curriculum~~, such as the first-year signature course~~. Courses that may be used to fulfill flag requirements are identified in the *Course Schedule*.

~~Enrollment in major sequence courses is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission to a Major Sequence. Enrollment in other required courses is not restricted by completion of the basic sequence.~~

Requirements		Hours
~~Basic Sequence Courses~~		
~~**Chemistry**~~		
~~CH 301~~	~~Principles of Chemistry I (part II science and technology)~~	~~3~~
~~CH 302~~	~~Principles of Chemistry II~~	~~3~~
Civil Engineering Courses		
C E 301	Civil Engineering Systems	3
C E 311K	Introduction to Computer Methods	3
C E 311S	Probability and Statistics for Civil Engineers	3
C E 319F	Elementary Mechanics of Fluids	3
C E 321	Transportation Systems	3
C E 324P	Properties and Behavior of Engineering Materials	3
C E 329	Structural Analysis	3
C E 333T	Engineering Communication (writing flag)	3
C E 341	Introduction to Environmental Engineering	3
C E 356	Elements of Hydraulic Engineering	3
C E 357	Geotechnical Engineering	3
C E 171P	Engineering Professionalism (ethics and leadership flag)	1
Architectural Engineering		
ARE 323K	Project Management and Economics	3
Chemistry		
CH 301	Principles of Chemistry I (part II science and technology)	3
CH 302	Principles of Chemistry II	3
Engineering Mechanics		
E M 306	Statics	3
E M 319	Mechanics of Solids	3
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J or M 427K	Differential Equations with Linear Algebra (quantitative reasoning flag)	4
Mechanical Engineering		

M E 210	Engineering Design Graphics	2
Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1
PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
~~**Rhetoric and Writing**~~		
~~RHE 306~~	~~Rhetoric and Writing (English composition)~~	~~3~~
~~UGS 302~~	~~First-Year Signature Course (some sections carry writing flag)~~	~~3~~
~~or UGS 303~~	~~First-Year Signature Course~~	
~~Major Sequence Courses~~		
~~ARE 323K~~	~~Project Management and Economics~~	~~3~~
~~C E 324P~~	~~Properties and Behavior of Engineering Materials~~	~~3~~
~~C E 321~~	~~Transportation Systems~~	~~3~~
~~C E 329~~	~~Structural Analysis~~	~~3~~
~~C E 341~~	~~Introduction to Environmental Engineering~~	~~3~~
~~C E 356~~	~~Elements of Hydraulic Engineering~~	~~3~~
~~C E 357~~	~~Geotechnical Engineering~~	~~3~~
~~C E 333T~~	~~Engineering Communication (writing flag)~~	~~3~~
~~C E 171P~~	~~Engineering Professionalism (ethics and leadership flag)~~	~~1~~
~~Level I electives~~		~~15~~
~~Level II elective~~		~~3~~
Other Required Courses		
~~M 427K~~	~~Advanced Calculus for Applications I (quantitative reasoning flag)~~	~~4~~
E M 311M	Dynamics	3
or M E 320	Applied Thermodynamics	
Approved science elective		3
Approved mathematics, science, or engineering science elective		3
Level I electives		15
Level II elective		3
Remaining Core Curriculum Courses		
RHE 306	Rhetoric and Writing (English composition)	3
E 316L	British Literature (humanities) (some sections carry a global cultures flag)	3
or E 316M	American Literature (humanities) (some sections carry a cultural diversity flag)	
or E 316N	World Literature (humanities) (some sections carry a global cultures flag)	
or E 316P	Masterworks of Literature (humanities)	
American and Texas government (some sections carry a global cultures and/or cultural		6

diversity flag)	
American history (some sections carry a cultural diversity flag)	6
Social and behavioral science (some sections carry a global cultures and/or cultural diversity flag)	3
Visual and performing arts (some sections carry a global cultures and/or cultural diversity flag)	3
UGS 302 First-Year Signature Course (~~some~~ all sections carry writing flag)	3
or UGS 303 First-Year Signature Course (some sections carry a writing flag)	
Total Hours	125

Level I and Level II Technical Electives

The civil engineering curriculum does not require the student to declare a specific technical area option. However, for the guidance of students with particular interests, level I electives in civil engineering are listed in areas of specialization. The fifteen semester hours of level I electives must be chosen from the following civil engineering and architectural engineering courses; in special cases, with the written permission of the department chair, this requirement may be relaxed, provided the student demonstrates in advance that the courses to be substituted for civil engineering or architectural engineering courses are part of a consistent educational plan. To provide a broad general background, at least one technical elective from each of three different areas of specialization must be included in each student's program.

Each student must take at least one technical area option level II elective. Level II electives may be substituted for technical area option level I electives, but the requirement of at least one technical elective from each of three different areas of specialization still applies.

The following lists reflect current course offerings and are subject to change by the faculty. Current lists are available in the departmental undergraduate office.

Level I Electives

Construction Engineering and Project Management
Architectural Engineering 335, *Materials and Methods of Building Construction*
Architectural Engineering 358, Cost Estimating in Building Construction
Architectural Engineering 366, Contracts, Liability, and Ethics (carries an ethics and leadership flag)
Architectural Engineering 376, *Building Information Modeling for Capital Projects*

Infrastructure ~~Construction~~ Materials Engineering
Civil Engineering 351, *Concrete Materials*
Civil Engineering 366K, *Design of Bituminous Mixtures*

Environmental Engineering
Civil Engineering 342, *Water and Wastewater Treatment Engineering*
Civil Engineering 346, *Solid Waste Engineering and Management*
Civil Engineering 369L, *Air Pollution Engineering*
Civil Engineering 369R, *Indoor Air Quality*
Civil Engineering 370K, *Environmental Sampling and Analysis*

Geotechnical Engineering
Civil Engineering 375, *Earth Slopes and Retaining Structures*

Structural Engineering
Architectural Engineering 345K, *Masonry*
Engineering Architectural Engineering 362L,

Structural Design in Wood Civil Engineering 331,
Reinforced Concrete Design
Civil Engineering 335, *Elements of Steel Design*
Civil Engineering 363, *Advanced Structural Analysis*
Transportation Engineering
Civil Engineering 367P, *Pavement Design and Performance*
Civil Engineering 367T, *Traffic Engineering*

Water Resources Engineering
Civil Engineering 358, *Introductory Ocean Engineering*
Civil Engineering 374K, *Hydrology*
Civil Engineering 374L, *Groundwater Hydraulics*

Level II Electives (Design)

Environmental Engineering
Civil Engineering 364, *Design of Wastewater and Water Treatment Facilities* (carries an independent inquiry flag)

Geotechnical Engineering
Civil Engineering 360K, *Foundation Engineering* (carries an independent inquiry flag)

Structural Engineering
Civil Engineering 362M, *Advanced Reinforced Concrete Design* (carries an independent inquiry flag)
Civil Engineering 362N, *Advanced Steel Design* (carries an independent inquiry flag)

Transportation Engineering
Civil Engineering 367G, *Design and Evaluation of Ground-Based Transportation Systems* (carries an independent inquiry flag)

Water Resources Engineering
Civil Engineering 365K, *Hydraulic Engineering Design* (carries an independent inquiry flag)

Suggested Arrangement of Courses

First Year

First Term	Hours	**Second Term**	Hours
C E 301	3	CH 302	3
CH 301	3	M E 210	2
M 408C	4	M 408D	4
RHE 306	3	PHY 303K	3
UGS 302 or 303	3	PHY 103M	1
		Social and behavioral sciences or visual and	3
	16		16

Second Year

First Term	Hours	**Second Term**	Hours
C E 311K	3	C E 311S	3
E M 306	3	E M 319	3
M 427J or M 427K	4	C E 319F	3
PHY 303L	3	C E 333T	3
PHY 103N	1	American history	3
American history	3		

	17		15

Third Year

First Term	Hours	Second Term	Hours
C E 324P	3	E M 311M or M E	3
Base level course	3	Base level course	3
Base level course	3	Base level course	3
Base level course	3	Base level course	3
		Social and behavioral sciences or visual and	
	15		15

Fourth Year

First Term	Hours	Second Term	Hours
Level I elective	3	C E 171P	1
Level I elective	3	Level I elective	3
Level I elective	3	Level I elective	3
Approved science elective	3	Level II elective	3
American and Texas government	3	American government	3
		Approved math, science, or engineering	3
	15		16

Total credit hours: 125

DOCUMENTS OF THE GENERAL FACULTY

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN GEOSYSTEMS ENGINEERING AND HYDROLOGY DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Dean Sharon L. Wood in the Cockrell School of Engineering has filed with the secretary of the Faculty Council the following changes to the *Undergraduate Catalog, 2016-2018*. The secretary has classified this proposal as legislation of *exclusive* interest to only one college or school.

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To be counted, a protest must be received in the Office of the General Faculty by January 20, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

Posted on the Faculty Council website (http://www.utexas.edu/faculty/council/) on January 13, 2016.

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PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN GEOSYSTEMS ENGINEERING AND HYDROLOGY DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Type of Change ☒ Academic Change
☐ Degree Program Change (THECB form required)

Proposed classification ☒ Exclusive ☐ General ☐ Major

1. **IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.**
   - Is this a new degree program? Yes ☐ No ☒
   - Does the program offer courses that will be taught off campus? Yes ☐ No ☒
   - Will courses in this program be delivered electronically? Yes ☐ No ☒

2. **EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:**

Item 1
Change to Curriculum: Modifying M 427K to M 427J or 427K.
Rationale: To reflect the changes made by the Mathematics department that denote either 427K or 427J will count toward the Advanced Calculus requirement for all Bachelor of Science in engineering degrees. This is reflected in both the list of required courses and Suggested Arrangement of Courses sections.

Item 2
Change to Curriculum: Remove statements referencing basic sequence and major sequence courses.
Rationale: A proposal to eliminate major sequence has been approved by the school. As a result, the wording is being changed to reflect the approval.

Item 3
Change to Curriculum: Adding Portable Computing Devices requirement
Rationale: Students enrolled in the Geosystems Engineering degree program will be expected to own a portable computing device

3. **THIS PROPOSAL INVOLVES (Please check all that apply)**

☐ Courses in other colleges	☐ Courses in proposer's college that are frequently taken by students in other colleges	☐ Flags
☐ Course in the core curriculum	☐ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☒ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. **SCOPE OF PROPOSED CHANGE**
   a. Does this proposal impact other colleges/schools? Yes ☐ No ☒
      If yes, then how?
   b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
      If yes, how many more (or fewer) students do you expect?
   c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
      If yes, please indicate the number of students and/or class seats involved.

d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒
If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions. If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted?
Impacted schools must be contacted and their response(s) included:
Person communicated with:
Date of communication:
Response: Pending

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:
If yes, undergraduate studies must be informed of the proposed changes and their response included:
Person communicated with:
Date of communication:
Response:

f. Will this proposal change the number of hours required for degree completion? If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date: April 20, 2015 for item 1 and July 24, 2015 for item 2 and 3
College approval date: August 20, 2015 for all items
Dean approval date: September 25, 2015 for all items

PROPOSED NEW CATALOG TEXT:

BACHELOR OF SCIENCE IN GEOSYSTEMS ENGINEERING AND HYDROLOGY ENGINEERING

Geosystems engineers and hydrogeologists are concerned with the development and use of engineering approaches in the management of natural resources from the earth's surface and subsurface, environmental restoration of subsurface sites, and other processes related to the earth sciences. This degree program, offered jointly by the Cockrell School of Engineering and the Jackson School of Geosciences, is designed to teach students the geological and engineering principles needed to solve subsurface resource development and environmental problems. The curriculum includes a fundamental sequence of engineering and geological sciences courses in such areas as multiphase fluid flow, physical hydrology, heat and mass transfer, field methods, and engineering design. This interdisciplinary systems approach, combining engineering and geological sciences, is increasingly required to address complex real-world problems such as characterization and remediation of aquifers. The degree program is designed to prepare graduates for employment with environmental, water resource management, and energy companies in addition to many government agencies. Better-qualified graduates of the program may pursue graduate study in subsurface environmental engineering, petroleum engineering, geology, and other related fields.

The objective of the degree program is to prepare graduates for successful careers in the fields of subsurface environmental engineering (including carbon dioxide sequestration), oil and gas production and services, or similar pursuits. Graduates are expected to understand the fundamental principles of science and engineering behind the technology of geosystems engineering and hydrogeology to keep their education from becoming outdated and to give them the capability of self-instruction after graduation. They should also be prepared to serve society by applying the ideals of ethical behavior, professionalism, and environmentally responsible stewardship of natural resources.

Containing the following elements, the technical curriculum provides both breadth and depth in a range of topics.

- A combination of college-level mathematics and basic sciences (some with experimental work) that includes mathematics through differential equations, physics, chemistry, and geology
- Basic engineering and geologic topics that develop a working knowledge of fluid mechanics, strength of materials, transport phenomena, material properties, phase behavior, and thermodynamics
- Engineering and geosciences topics that develop competence in characterization and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods, including field methods; design and analysis of systems for producing, injecting, and handling fluids; application of hydrogeologic and reservoir engineering principles and practices for water and energy resource development and management; contamination evaluation and remediation methods for hydrologic resources; and use of project economics and resource valuation methods for design and decision making under conditions of risk and uncertainty
- A major capstone design experience that prepares students for engineering and hydrogeologic practice, based on the knowledge and skills acquired in earlier coursework and incorporating engineering and geological standards and realistic constraints

Portable Computing Devices

Students entering Geosystems Engineering and Hydrogeology are required to have access to a portable computing device capable of running programs suitable for use in the classroom and on the university wireless network. The use of this device will be necessary in many required courses, and individual instructors may require the device be brought to class or lab sessions. For a list of minimum system requirements see: http://www.pge.utexas.edu/portabledevicereqs.

Curriculum

Course requirements ~~are divided into three categories: basic sequence courses, major sequence courses,~~ include courses within the Cockrell School of Engineering and other required courses. In addition, each student ~~much~~ must complete the University's Core Curriculum. In some cases, a course that fulfills one of the following requirements may also be counted toward core curriculum or flag requirements; these courses are identified below. ~~To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in ABET Criteria.~~

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one course with a quantitative reasoning flag, one ethics and leadership flag, one global cultures flag, one cultural diversity in the US flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag, and both writing flags are carried by courses specifically required for the degree; these courses are identified below. Courses that may be used to fulfill flag requirements are identified in the *Course Schedule*.

~~Enrollment in major sequence courses is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission to a Major Sequence. Enrollment in other required courses is not restricted by completion of the basic sequence.~~

	Requirements	Hours
~~Basic Sequence Courses~~		
~~Chemistry~~		
~~CH 301~~	~~Principles of Chemistry I (part II science and technology)~~	~~3~~
~~CH 302~~	~~Principles of Chemistry II~~	~~3~~
Petroleum and Geosystems Engineering		
PGE 310	Formulation and Solution of Geosystems Engineering Problems	3
PGE 322K	Transport Phenomena in Geosystems	3

PGE 323K	Reservoir Engineering I: Primary Recovery	3
PGE 323L	Reservoir Engineering II: Secondary and Tertiary Recovery	3
PGE 326	Thermodynamics and Phase Behavior	3
PGE 333T	Engineering Communication (writing flag and ethics and leadership flag)	3
PGE 365	Resource Economics and Valuation	3
PGE 368	Fundamentals of Well Logging	3
PGE 373L	Geosystems Engineering Design and Analysis (independent inquiry flag)	3
PGE 424	Petrophysics	4
PGE 427	Properties of Petroleum Fluids (Properties of Petroleum Fluids)	4
Chemistry		
CH 301	Principles of Chemistry I (part II science and technology)	3
CH 302	Principles of Chemistry II	3
Civil Engineering		
C E 357	Geotechnical Engineering	3
Engineering Mechanics		
E M 306	Statics	3
E M 319	Mechanics of Solids	3
Geological Sciences		
GEO 303	Introduction to Geology	3
GEO 376L	Field Methods in Groundwater Hydrology	3
GEO 376S	Physical Hydrology	3
GEO 416K	Earth Materials	4
GEO 416M	Sedimentary Rocks	4
GEO 420K	Introduction to Field and Stratigraphic Methods	4
GEO 428	Structural Geology	4
GEO 476K	Groundwater Hydrology (writing flag)	4
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427~~K~~J or M427K	~~Advanced Calculus for Applications I~~ Differential Equations with Linear Algebra (quantitative reasoning flag)	4
~~Petroleum and Geosystems Engineering~~		
~~PGE 310~~	~~Formulation and Solution of Geosystems Engineering Problems~~	~~3~~
~~PGE 427~~	~~Properties of Petroleum Fluids (Properties of Petroleum Fluids)~~	~~4~~
~~PGE 322K~~	~~Transport Phenomena in Geosystems~~	~~3~~
~~PGE 326~~	~~Thermodynamics and Phase Behavior~~	~~3~~
~~PGE 333T~~	~~Engineering Communication (writing flag and ethics and leadership flag)~~	~~3~~
Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1
PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
Rhetoric and Writing		
RHE 306	Rhetoric and Writing (English composition)	3

~~UGS 302~~	~~First-Year Signature Course (some sections carry a writing flag)~~	~~3~~
~~or UGS 303~~	~~First-Year Signature Course~~	
~~Major Sequence Courses~~		
~~Geological Sciences~~		
~~GEO 420K~~	~~Introduction to Field and Stratigraphic Methods~~	~~4~~
~~GEO 428~~	~~Structural Geology~~	~~4~~
~~GEO 476K~~	~~Groundwater Hydrology (writing flag)~~	~~4~~
~~GEO 376L~~	~~Field Methods in Groundwater Hydrology~~	~~3~~
~~GEO 376S~~	~~Physical Hydrology~~	~~3~~
~~Petroleum and Geosystems Engineering~~		
~~PGE 323K~~	~~Reservoir Engineering I: Primary Recovery~~	~~3~~
~~PGE 323L~~	~~Reservoir Engineering II: Secondary and Tertiary Recovery~~	~~3~~
~~PGE 424~~	~~Petrophysics~~	~~4~~
~~PGE 365~~	~~Resource Economics and Valuation~~	~~3~~
~~PGE 368~~	~~Fundamentals of Well Logging~~	~~3~~
~~PGE 373L~~	~~Geosystems Engineering Design and Analysis (independent inquiry flag)~~	~~3~~
~~**Civil Engineering**~~		
~~C E 357~~	~~Geotechnical Engineering~~	~~3~~
Approved engineering elective		3
Approved geosciences technical elective		3
Remaining Core Curriculum Courses		
E 316L	British Literature (humanities) (some sections carry a global cultures flag)	3
or E 316M	American Literature (some sections carry a cultural diversity flag)	
or E 316N	World Literature (some sections carry a global cultures flag)	
or E 316P	Masterworks of Literature	
American government (some sections carry a global cultures and/or cultural diversity flag)		6
American history (some sections carry a cultural diversity flag)		6
Visual and performing arts (some sections carry a global cultures and/or cultural diversity flag)		3
Social and behavioral sciences (some sections carry a global cultures and/or cultural diversity flag)		3
UGS 302	First-Year Signature Course (~~some~~ all sections carry a writing flag)	3
or UGS 303	First-Year Signature Course (some sections carry a writing flag)	
Total Hours		132

Suggested Arrangement of Courses

First Year

First Term	Hours	Second Term	Hours
CH 301	3	CH 302	3
GEO 303	3	M 408D	4
M 408C	4	PHY 303K	3
RHE 306	3	PHY 103M	1
UGS 302 or 303	3	PGE 333T	3
		American history	3
	16		17

Second Year

First Term	Hours	Second Term	Hours
E M 306	3	E M 319	3
GEO 416K	4	PGE 310	3
GEO 416M	4	PGE 427	4
M 427J or K	4	PGE 326	3
		PHY 303L	3
		PHY 103N	1
	15		17

Third Year

First Term	Hours	Second Term	Hours	Summer Term	Hours
GEO 476K	4	C E 357	3	GEO 376L	3
PGE 322K	3	GEO 420K	4		
PGE 323K	3	PGE 323L	3		
PGE 424	4	PGE 368	3		
Social and behavioral sciences	3	American government	3		
	17		16		3

Fourth Year

First Term	Hours	Second Term	Hours
E 316L, 316M, 316N, or 316P	3	PGE 373L	3
GEO 428	4	Geoscience technical elective	3
GEO 376S	3	American government	3
PGE 365	3	American history	3
Engineering technical elective	3	Visual and performing arts	3
	16		15

Total credit hours: 132

DOCUMENTS OF THE GENERAL FACULTY

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN PETROLEUM ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Dean Sharon L. Wood in the Cockrell School of Engineering has filed with the secretary of the Faculty Council the following changes to the *Undergraduate Catalog, 2016-2018*. The secretary has classified this proposal as legislation of *exclusive* interest to only one college or school.

The Committee on Undergraduate Degree Program Review recommended approval of the changes on January 6, 2016, and forwarded the proposal to the Office of the General Faculty. The Faculty Council has the authority to approve this legislation on behalf of the General Faculty. The authority to grant final approval on this legislation resides with UT System.

If no objection is filed with the Office of the General Faculty by the date specified below, the legislation will be held to have been approved by the Faculty Council. If an objection is filed within the prescribed period, the legislation will be presented to the Faculty Council at its next meeting. The objection, with reasons, must be signed by a member of the Faculty Council.

To be counted, a protest must be received in the Office of the General Faculty by January 20, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

Posted on the Faculty Council website (http://www.utexas.edu/faculty/council/) on January 13, 2016.

13826

PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN PETROLEUM ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

Type of Change ☒ Academic Change
☐ Degree Program Change (THECB form required)

Proposed classification ☒ Exclusive ☐ General ☐ Major

1. **IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.**
   - Is this a new degree program? Yes ☐ No ☒
   - Does the program offer courses that will be taught off campus? Yes ☐ No ☒
   - Will courses in this program be delivered electronically? Yes ☐ No ☒

2. **EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:**

Item 1
Change to Curriculum: Modifying M 427K to M 427J or 427K.
Rationale: To reflect the changes made by the Mathematics department that denote either 427K or 427J will count toward the Advanced Calculus requirement for all Bachelor of Science in engineering degrees. This is reflected in both the list of required courses and Suggested Arrangement of Courses sections.

Item 2
Change to Curriculum: Remove statements referencing basic sequence and major sequence courses.
Rationale: A proposal to eliminate major sequence has been approved by the school. As a result, the wording is being changed to reflect the approval.

Item 3
Change to Curriculum: Adding Portable Computing Devices requirement
Rationale: Students enrolled in the Petroleum Engineering degree program will be expected to own a portable computing device

3. **THIS PROPOSAL INVOLVES (Please check all that apply)**

☒ Courses in other colleges	☐ Courses in proposer's college that are frequently taken by students in other colleges	☐ Flags
☐ Course in the core curriculum	☐ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☐ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. **SCOPE OF PROPOSED CHANGE**
   a. Does this proposal impact other colleges/schools? Yes ☐ No ☒
      If yes, then how?
   b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
      If yes, how many more (or fewer) students do you expect?
   c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
      If yes, please indicate the number of students and/or class seats involved.
   d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒
      If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions. If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted?

Impacted schools must be contacted and their response(s) included:

Person communicated with:

Date of communication:

Response: Pending

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:

If yes, undergraduate studies must be informed of the proposed changes and their response included:

Person communicated with:

Date of communication:

Response:

f. Will this proposal change the number of hours required for degree completion? If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date: July 24, 2015
College approval date: August 20, 2015 for all items
Dean approval date: September 25, 2015 for all items

PROPOSED NEW CATALOG TEXT:

BACHELOR OF SCIENCE IN PETROLEUM ENGINEERING

Energy is a key component to people's everyday lives. Petroleum engineers are able to address and solve important technology challenges that will lead to energy security and societal prosperity, so the position is in high demand. This challenging and rewarding field of engineering requires creative application of a wide spectrum of knowledge, including, but not limited to mathematics, physics, geology, and chemistry. Worldwide energy demand is growing, and experts agree that oil and gas will continue to play an important role in the world's energy supply. The decision making for complex projects falls to a great extent upon petroleum engineers, providing them with a high degree of responsibility. In addition, since hydrocarbon reserves are found in such diverse areas as Asia, South America, and Europe, petroleum engineers will have opportunities for exciting assignments all over the globe.

Petroleum engineers play a variety of roles within the energy business. They design and monitor the drilling of exploratory and development wells used to locate and produce the oil and gas from the subsurface. They work with technologies that can describe the characteristics of rocks deep beneath the surface and detect the type of fluids contained in those rocks. They install and maintain the equipment that lifts fluids from subsurface reservoirs to the surface, and they design surface collection and treatment facilities to prepare produced hydrocarbons for delivery to a refinery or pipeline. Hydraulic fracturing of shale gas and tight oil is the responsibility of a petroleum engineer, as is the development and implementation of enhanced oil recovery methods that capture stranded or bypassed hydrocarbons from old oilfields. In addition to these traditional petroleum engineering career choices, there are other emerging careers for petroleum engineering graduates in pollution clean-up, underground waste disposal (including the subsurface injection of carbon dioxide to reduce atmospheric greenhouse gases), and hydrology.

The objective of the petroleum engineering program is to graduate practical, qualified engineers who can successfully pursue careers in the oil and gas production and services industries or similar areas. Graduates of the program are expected to understand the fundamental principles of science and engineering behind the technology of petroleum engineering to keep their education current and to give them the capability of self-instruction after graduation. They should be prepared to serve society by using the ideals of ethical behavior, professionalism, and environmentally responsible stewardship of natural resources.

The technical curriculum contains the following elements:

- A combination of college-level mathematics and basic sciences (some with experimental work) that includes mathematics through differential equations, probability and statistics, physics, chemistry, and geology
- Engineering topics that develop a working knowledge of fluid mechanics, strength of materials, transport phenomena, material properties, phase behavior, and thermodynamics
- Petroleum engineering topics that develop competence in (1) design and analysis of well systems and procedures for drilling and completing wells; (2) characterization and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods; (3) design and analysis of systems for producing, injecting, and handling fluids; (4) application of reservoir engineering principles and practices to optimize resource development and management; and (5) use of project economics and resource valuation methods for design and decision making under conditions of risk and uncertainty
- A major capstone design experience that prepares students for engineering practice, based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints

Portable Computing Devices

Students entering Petroleum Engineering are required to have access to a portable computing device capable of running programs suitable for use in the classroom and on the university wireless network. The use of this device will be necessary in many required courses, and individual instructors may require the device be brought to class or lab sessions. For a list of minimum system requirements see: http://www.pge.utexas.edu/portabledevicereqs.

Curriculum

Course requirements ~~are divided into three categories: basic sequence courses, major sequence courses,~~ include courses within the Cockrell School of Engineering and other required courses. In addition, each student ~~much~~ must complete the University's Core Curriculum. In some cases, a course that fulfills one of the following requirements may also be counted toward core curriculum or flag requirements; these courses are identified below. ~~To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in ABET Criteria.~~

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one course with a quantitative reasoning flag, one ethics and leadership flag, one global cultures flag, one cultural diversity in the US flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag, and both writing flags are carried by courses specifically required for the degree; these courses are identified below. Courses that may be used to fulfill flag requirements are identified in the *Course Schedule*.

~~Enrollment in major sequence courses is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission to a Major Sequence. Enrollment in other required courses is not restricted by completion of the basic sequence.~~

Courses used to fulfill technical and nontechnical elective requirements must be approved by the petroleum and geosystems engineering undergraduate adviser before the student enrolls in them.

Requirements	Hours
~~Basic Sequence Courses~~	

~~Chemistry~~		
~~CH 301~~	~~Principles of Chemistry I (part II science and technology)~~	~~3~~
~~CH 302~~	~~Principles of Chemistry II~~	~~3~~
Petroleum and Geosystems Engineering		
PGE 301	Engineering, Energy, and the Environment	3
PGE 310	Formulation and Solution of Geosystems Engineering Problems	3
PGE 322K	Transport Phenomena in Geosystems	3
PGE 323K	Reservoir Engineering I: Primary Recovery	3
PGE 323L	Reservoir Engineering II: Secondary and Tertiary Recovery	3
PGE 326	Thermodynamics and Phase Behavior	3
PGE 333T	Engineering Communication (writing flag and ethics and leadership flag)	3
PGE 334	Reservoir Geomechanics	3
PGE 337	Introduction to Geostatistics	3
PGE 362	Production Technology and Design	3
PGE 365	Resource Economics and Valuation	3
PGE 368	Fundamentals of Well Logging	3
PGE 373L	Geosystems Engineering Design and Analysis	3
PGE 424	Petrophysics	4
PGE 427	Properties of Petroleum Fluids	4
PGE 430	Drilling and Well Completions	4
Chemistry		
CH 301	Principles of Chemistry I (part II science and technology)	3
CH 302	Principles of Chemistry II	3
Engineering Mechanics		
E M 306	Statics	3
E M 319	Mechanics of Solids	3
Geological Sciences		
GEO 303	Introduction to Geology	3
GEO 316P	Sedimentary Rocks	3
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427~~K~~J or M427K	~~Advanced Calculus for Applications~~ I Differential Equations with Linear Algebra (quantitative reasoning flag)	4
~~Petroleum and Geosystems Engineering~~		
~~PGE 301~~	~~Engineering, Energy, and the Environment~~	~~3~~
~~PGE 310~~	~~Formulation and Solution of Geosystems Engineering Problems~~	~~3~~
~~PGE 427~~	~~Properties of Petroleum Fluids~~	~~4~~
~~PGE 322K~~	~~Transport Phenomena in Geosystems~~	~~3~~
~~PGE 326~~	~~Thermodynamics and Phase Behavior~~	~~3~~
~~PGE 333T~~	~~Engineering Communication (writing flag and ethics and leadership flag)~~	~~3~~
Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1

PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
Rhetoric and Writing		
RHE 306	Rhetoric and Writing (English composition)	3
~~UGS 302~~	~~First-Year Signature Course~~	~~3~~
~~or UGS 303~~	~~First-Year Signature Course~~	
~~Major Sequence Courses~~		
~~Petroleum and Geosystems Engineering~~		
~~PGE 323K~~	~~Reservoir Engineering I: Primary Recovery~~	~~3~~
~~PGE 323L~~	~~Reservoir Engineering II: Secondary and Tertiary Recovery~~	~~3~~
~~PGE 424~~	~~Petrophysics~~	~~4~~
~~PGE 430~~	~~Drilling and Well Completions~~	~~4~~
~~PGE 334~~	~~Reservoir Geomechanics~~	~~3~~
~~PGE 337~~	~~Introduction to Geostatistics~~	~~3~~
~~PGE 362~~	~~Production Technology and Design~~	~~3~~
~~PGE 365~~	~~Resource Economics and Valuation~~	~~3~~
~~PGE 368~~	~~Fundamentals of Well Logging~~	~~3~~
~~PGE 373L~~	~~Geosystems Engineering Design and Analysis~~	~~3~~
Approved technical area electives		12
Remaining Core Curriculum Courses		
E 316L	British Literature (humanities) (some sections carry a global cultures flag)	3
or E 316M	American Literature (some sections carry a cultural diversity flag)	
or E 316N	World Literature (some sections carry a global cultures flag)	
or E 316P	Masterworks of Literature	
American and Texas government (some sections carry a global cultures and/or cultural diversity flag)		6
American history (some sections carry a cultural diversity flag)		6
Visual and performing arts (some sections carry a global cultures and/or cultural diversity flag)		3
Social and behavioral sciences (some sections carry a global cultures and/or cultural diversity flag)		3
UGS 302	First-Year Signature Course (all sections carry a writing flag)	3
or UGS 303	First-Year Signature Course (some sections carry a writing flag)	
Total Hours		128

Suggested Arrangement of Courses

First Year

First Term	Hours	Second Term	Hours
CH 301	3	CH 302	3
GEO 303	3	M 408D	4
M 408C	4	PHY 303K	3
RHE 306	3	PHY 103M	1
UGS 302 or 303	3	PGE 301	3
		Social and behavioral sciences or visual and performing arts	3
	16		17

Second Year

First Term	Hours	Second Term	Hours
E M 306	3	E M 319	3
PHY 303L	3	PGE 322K	3
PHY 103N	1	PGE 333T	3
M 427J or K	4	GEO 316P	3
PGE 310	3	PGE 427	4
PGE 326	3		
	17		16

Third Year

First Term	Hours	Second Term	Hours
PGE 323K	3	PGE 323L	3
PGE 424	4	PGE 362	3
PGE 430	4	PGE 368	3
Social and behavioral sciences or visual and performing arts	3	American history	3
American government	3	Approved technical area elective	3
	17		15

Fourth Year

First Term	Hours	Second Term	Hours
PGE 334	3	E 316L, 316M, 316N, or 316P	3
PGE 337	3	PGE 373L	3
PGE 365	3	American history	3
Approved technical area elective	3	Approved technical area electives	6
American government	3		
	15		15

Total credit hours: 128