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

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

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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