COMPUTATIONAL ENGINEERING DEGREE PROGRAM

PROPOSED CHANGES TO THE COMPUTATIONAL ENGINEERING DEGREE PROGRAM IN THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG 2018-2020*

TYPE OF CHANGE:[1] ☒ Academic Change
☐ Degree Program Change (THECB[2] form required)

PROPOSED CLASSIFICATION:[3] ☒ 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 SACSCOC APPROVAL IS REQUIRED.

- Is this a new degree program? Yes ☐ No ☒
- Is this program being deleted? 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:

Deleted the 'Design systems…' bullet-point from the Program Educational Objectives to better reflect the implementation of the degree program.

Updated the 'Portable Computing Devices' section: 1) changed listed software to reflect the proper capitalization of the name of the software, 2) added additional software that is now a component of a required class, 3) added information about the need to access a remote server, and 4) updated the information about where to find minimum and required computing specifications.

Degree requirement updates (reflected in the 'Requirements' section and the 'Suggested Arrangement of Courses') that will not require inventory updates: 1) remove COE 111L from required coursework-- the content of this course will be moved to a new course added as COE 322 and outlined below; 2) remove SDS 322 from required coursework and change to an optional substitute for COE 322 outlined below; 3) remove SDS 329C from required coursework; 4) remove COE 373 from required coursework—the intention of this class will be covered in a new course added as COE 332 and outlined below; and 5) add three hours of technical elective coursework.

Inventory updates (reflected in the 'Requirements' section and the 'Suggested Arrangement of Courses') already submitted for Fall 2017 and Spring 2018: 1) changed ASE 321K to COE 321K to reflect the content of the coursework that is more Computational than Aerospace-related; 2) changed ASE 347 to COE 347 to reflect the content of coursework that is more Computational than Aerospace-related; and 3) changed ME 320 to ME 310T to reflect the inventory change that was completed by the Department of Mechanical Engineering in Fall 2016.

Inventory updates (reflected in the 'Requirements' section and the 'Suggested Arrangement of Courses') planned to be submitted for Fall 2018: 1) Change COE 211K to 311K (2-hour to 3-hour) in order to reflect the actual coursework and teaching hours needed for the course content; 2) Add COE 322 (Intro to Scientific Computation)—this course will take the place of SDS 322 in degree requirements (although SDS 322 will also still be allowed to count as a substitute for COE 322) and will be designed alongside TACC to incorporate content once covered in COE 111L as well as new content in data structures; and 3) Add COE 332 (Software Design)—this course will offer three hours of design in software engineering.

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 would you do so?

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:

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? No
Note: THECB Semester Credit Hour Change Form required, download from URL:
http://www.thecb.state.tx.us/reports/DocFetch.cfm?DocID=2419&format=doc
If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date:	May 12, 2017	Approved by whom:	Dr. Noel Clemens, Chair
	May 11, 2017		ASE/EM Faculty
	April 27, 2017		COE Undergraduate Curriculum

COMPUTATIONAL ENGINEERING DEGREE PROGRAM

		Committee
College approval date:	May 24, 2017	Approved by whom: CSE Degrees & Courses Committee
Dean approval date:	Sept. 18, 2017	Approved by whom: CSE Faculty; Sharon L. Wood, Dean

PROPOSED NEW CATALOG TEXT:[4]

BACHELOR OF SCIENCE IN COMPUTATIONAL ENGINEERING

Computational engineering is a relatively new field in engineering that recognizes the increasing demand for advanced computational methods in engineering practice. Computational engineering in this context refers to the study and development of computer algorithms that translate mathematical and physical descriptions of engineering problems into languages that computers can process. This emphasis distinguishes computational engineering from computer science and computer engineering. Computational engineers must have basic knowledge of fundamental engineering and science, with more advanced knowledge of mathematics, algorithms and computer languages. Because of their extensive education in these disciplines, computational engineers can work in a variety of areas.

The objectives of the computational engineering degree program are to prepare students for professional practice in engineering; to prepare students for such post-baccalaureate 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 and the humanities, integrates classroom and laboratory experiences in engineering, with advanced instruction in mathematics, statistics and computational science. The curriculum requires students to use modern engineering tools and computer technology, to work individually, and to practice teamwork.

The first two years of the computational engineering curriculum emphasize fundamental material along with engineering sciences, while the third and fourth years provides further depth in mathematics, algorithms, computer languages, and experimentation. The major offers technical electives in the third and fourth years where students may choose an industrial track or a post-baccalaureate track. The industrial track focuses on the applications of computer methods in industry, while the post-baccalaureate track prepares students for graduate study and research.

Program Outcomes

Computational engineering graduates should demonstrate:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as 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 techniques, skills, and modern engineering tools necessary for engineering practice

Program Educational Objectives

Within a few years of graduation, computational engineering graduates should:

- Contribute to the economic development of Texas and beyond through the ethical practice of computational engineering in industry and public service

- Exhibit leadership in technical or business activity through engineering ability, communication skills, and knowledge of contemporary and global issues
- Continue to educate themselves through professional study and personal research
- Be prepared for admission to, and to excel in, the best graduate programs in the world
- ~~Design systems to collect, encode, store, transmit, and process energy and information, and to evaluate system performance, either individually or in teams~~
- Use their engineering ability and creative potential to create technology that will improve the quality of life in society

Portable Computing Devices

Students entering computational engineering are required to have access to a portable computing device capable of running the software tools required for undergraduate engineering analyses (~~MatLab~~ MATLAB, SOLIDWORKS, Word, Excel, etc) and access to the remote server for the department. 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.~~ Minimum and recommended specifications may be found on the department website.

Curriculum

Course requirements include courses within the Cockrell School of Engineering 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.

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*.

Courses used to fulfill technical elective requirements must be approved by the computational 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**
Computational Engineering Courses		
~~COE 111L~~	~~Engineering Computation Laboratory~~	~~1~~
COE ~~211K~~ 311K	Engineering Computation	3~~2~~
COE 301	Introduction to Computer Programming	3
COE 321K	Computational Methods for Structural Analysis	3
COE 322	Intro to Scientific Computation	3
COE 332	Software Engineering	3
COE 347	Introduction to Computational Fluid Dynamics	3
COE 352	Advanced Scientific Computation	3
COE 371	Applied Mathematics I	3

COE 372	Applied Mathematics II	3
~~COE 373~~	~~Systems Engineering Design~~	~~3~~
COE 374	Senior Design Project (writing flag and independent inquiry flag)	3
Aerospace Engineering		
ASE 320	Low-Speed Aerodynamics	3
~~ASE 321K~~	~~Computational Methods for Structural Analysis~~	~~3~~
ASE 330M	Linear System Analysis	3
ASE 333T	Engineering Communication (writing flag and ethics and leadership flag)	3
~~ASE 347~~	~~Introduction to Computational Fluid Dynamics~~	~~3~~
ASE 375	Electromechanical Systems	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	Differential Equations with Linear Algebra (quantitative reasoning flag)	4
or M 427K	Advanced Calculus for Applications I	
M 427L	Advanced Calculus for Applications II	4
M 362K	Probability I	3
Mechanical Engineering Courses		
M E 210	Engineering Design Graphics	2
M E ~~320~~ 310T	Applied Thermodynamics	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
Other required courses		
Approved technical electives		9~~6~~
~~SDS 322~~	~~Introduction to Scientific Programming~~	~~3~~
~~SDS 329C~~	~~Practical Linear Algebra I~~	~~3~~

Rhetoric and Writing		
RHE 306	Rhetoric and Writing (English composition)	3
Remaining Core Curriculum Courses		
E 316L	British Literature (humanities; in E 316L, 316M, 316N, and 316P some sections carry a global cultures or cultural diversity flag)	3
or E 316M	American Literature	
or E 316N	World Literature	
or E 316P	Masterworks of Literature	
American and Texas government (some sections carry a 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 (in UGS 302 all sections carry writing flag; in UGS 303 some sections carry a writing flag)	3
or UGS 303	First-Year Signature Course	
Total Hours		122

COMPUTATIONAL ENGINEERING DEGREE PROGRAM

SUGGESTED ARRANGEMENT OF COURSES

First Year

First Term	Hours	**Second Term**	Hours
UGS 302 or 303	3	COE 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~~ ME 210	2~~3~~
		American history	3
	16		16~~17~~

Second Year

First Term	Hours	**Second Term**	Hours
E M 306	3	COE ~~211K~~ 311K	3~~2~~
M 427J or 427K	4	~~COE 111L~~	~~1~~
PHY 303L	3	E M 311M	3
PHY 103N	1	~~E M 319~~ COE 332	3
~~M E 210~~ COE 322	3~~2~~	M 427L	4
M E 310T	3	~~ASE 333T~~ American and Texas government	3
	17~~16~~		16

Third Year

First Term	Hours	**Second Term**	Hours
ASE 320	3	~~ASE~~ COE 321K	3
~~ASE 330M~~ COE 352	3	~~ASE~~ COE 347	3
M 362K	3	~~SDS 322~~ ASE 330M	3
~~SDS 329C~~ E M 319	3	~~American and Texas government~~ E 316L, 316M, 316N, or 316P	3
~~E 316L, 316M, 316N, or 316P~~ ASE 333T	3	~~Social and behavioral sciences or visual and performing arts~~ Technical elective	3
	15		15

Fourth Year

First Term	Hours	**Second Term**	Hours
ASE 375	3	COE 372	3
~~COE 352~~ Social and behavioral sciences or visual and performing arts	3	COE 374	3

COE 371	3	American history	3
~~COE 373~~ American and Texas government	3	Technical elective	3
Technical elective	3		
	15		12

Total credit hours: 122

[1] See https://facultycouncil.utexas.edu/degree-program-changes for detailed explanations.
[2] Submit required Texas Higher Education Coordinating Board forms to the provost's office (lydia.cornell@austin.utexas.edu); downloadable from URL https://facultycouncil.utexas.edu/thecb-forms
[3] **EXCLUSIVE**: of *exclusive* application and of primary interest only to a single college or school ("no protest" period is *seven calendar days*); **GENERAL**: of *general* interest to more than one college or school (but not for submission to the General Faculty) ("no protest" period is *fourteen calendar days); major* legislation must be submitted to the General Faculty for adoption ("no protest" period is *fourteen calendar days)*.
[4] The proposed text should be based on the text of the current catalog available at: http://catalog.utexas.edu/undergraduate/
Strike through and replace (with underlines) only the specific language to be changed. Do NOT use track changes, and do not include hyperlinks in the catalog copy. Submit form electronically to the Office of the General Faculty and Faculty Council at fc@austin.utexas.edu. For questions on completing this section, please contact Victoria Cervantes, fc@austin.utexas.edu, 471-5934 or Brenda Schumann, brenda.schumann@austin.utexas.edu, 475-7654.