DOCUMENTS OF THE GENERAL FACULTY

PROPOSAL TO CHANGE THE TRANSCRIPT-RECOGNIZED CERTIFICATE IN COMPUTATIONAL SCIENCE AND ENGINEERING IN THE ACADEMIC POLICIES AND PROCEDURES SECTION OF 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* application and of primary interest only to a single college or school.

The Committee on Undergraduate Degree Program Review recommended approval of the certificate on February 10, 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 the Texas Higher Education Coordinating Board.

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 February 17, 2016.

Hillary Hart, Secretary
General Faculty and Faculty Council

Posted on the Faculty Council website (http://www.utexas.edu/faculty/council/) on February 11, 2016.

PROPOSAL TO CHANGE THE TRANSCRIPT-RECOGNIZED CERTIFICATE IN COMPUTATIONAL SCIENCE AND ENGINEERING IN THE ACADEMIC POLICIES AND PROCEDURES SECTION OF THE COCKRELL SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG, 2016-2018*

1. Type of Proposal
- ☐ New Certificate Program (requiring THECB notification only)
- ☒ Change an Existing Certificate Program
- ☐ Delete a Program

Proposed classification ☒ Exclusive ☐ General ☐ Major

2. 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)	

3. 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 3 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:
Date of communication:
Response:

4. Official Certificate Name: Undergraduate Certificate in Computational Science and Engineering

5. Proposed Implementation Date: Fall 2016

6. CIP Code (administrative unit awarding the certificate)**:** N/A

7. Statement of Objective: N/A

8. Number of Students Expected to Receive the Certificate Each Semester: Five

9. Number of Hours Required for Completion: Eighteen

10. List Faculty on the Certificate Program Faculty Committee.

Name of Faculty Member	College/Department	Title at UT Austin	Highest Degree and Awarding Institution
Todd Arbogast (Chair)*	CNS/Mathematics	Professor	PhD, Univ of Chicago
Luis Caffarelli*	CNS/Mathemtics	Professor	PhD, Univ of Buenos Aries
Clint Dawson*	CSE/ASE & EM	Professor	PhD, Rice
Leszek Demkowicz*	CSE/ASE & EM	Professor	PhD, Cracow Univ
Bjorn Engquist*	CNS/Mathematics	Professor	PhD, Uppsla Univ
Omar Ghattas*	JSG/Geosciences	Professor	PhD, Duke
J. Tinsley Oden*	CSE/ASE & EM; CNS/Mathematics & CS	Professor	PhD, Oklahoma State
Robert van de Geijn*	CNS/Computer Science	Professor	PhD, Univ of Maryland College Park

11. Academic Course Requirements:

Course Abbreviation and Number	Course Title	SCH
M 427J	Differential Equations with Linear Algebra	CNS
M 427K	Advanced Calculus for Applications I	CNS
M 427L	Advanced Calculus for Applications II	CNS
M 340L	Matrices and Matrix Calculations	CNS
M 341	Linear Algebra and Matrix Theory	CNS
SDS 329C	Practical Linear Algebra	CNS
ASE 301	Introduction to Computer Programming	CSE
BME 303	Introduction to Computing	CSE
CHE 210	Introduction to Computing	CSE
C E 311K	Introduction to Computer Methods	CSE
C S 303E	Elements of Computers and Programming	CNS
C S 105	Computer Programming	CNS
C S 313E	Elements of Software Design	CNS
E E 312	Software Design and Implementation I	CSE
GEO 325J	Programming in FORTRAN and MATLAB	JSG
MIS 304	Introduction to Problem Solving and Programming	MSB
M E 205	Introduction to Computers and Programming	CSE
SDS 322	Introduction to Scientific Programming	CNS
ARE 372	Modeling of Air and Pollutant Flows in Buildings	CSE
ASE 211K	Engineering Computation	CSE
ASE 311	Engineering Computation	CSE
ASE 321K	Computational Methods for Structural Analysis	CSE
ASE 347	Introduction to Computational Fluid Dynamics	CSE

ASE 372N	Satellite-Based Navigation	CSE
BIO 321G	Principles of Computational Biology	CNS
BIO 337J	Computational Biology Laboratory	CNS
BME 313	Numerical Methods and Modeling in Biomedical Engineering	CSE
BME 113L	Introduction to Numerical Methods in Biomedical Engineering	CSE
BME 342	Biomechanics of Human Movement	CSE
BME 345	Graphics and Visualization Laboratory	CSE
BME 346	Computational Biomolecular Engineering	CSE
BME 377T	Topic: Computational Methods for Biomedical Engineers	CSE
CHE 348	Numerical Methods in Chemical Engineering and Problem Solving	CSE
ECO 363C	Computational Economics	CLA
E E 313	Linear Systems and Signals	CSE
E M 360	Topic 13 – Applications of Finite Element Methods	CSE
E M 394F	Finite Element Methods	CSE
GEO 325K	Computational Methods	JSG
GEO 347G	Climate System Modeling	JSG
M 374M	Mathematical Modeling in Science and Engineering	CNS
M E 218	Engineering Computational Methods	CSE
M E 318M	Programming and Engineering Computational Methods	CSE
M E 365K	Finite Element Method	CSE
M E 369L	Introduction to Computational Fluid Dynamics	CSE
PGE 310	Formulation & Solution of Geosystems Engr Problems	CSE
PGE 323M	Reservoir Engineering III	CSE
PHY 329	Introduction to Computational Physics	CNS
SDS 339	Applied Computational Science	CNS
STA 372	Topic 7 – Computational Finance	MSB
ASE 321K	Computational Methods for Structural Analysis	CSE
C S 323E	Elements of Scientific Computing	CNS
C S 323H	Elements of Scientific Computing: Honors	CNS
C S 367	Numerical Methods	CNS
C S 377	Principles and Applications of Parallel Programming	CNS
E E 360F	Introduction to Software Engineering	CSE
E E 360P	Concurrent and Distributed Systems	CSE
E E 379K	Engineering Programming Languages	CSE
E E 380L	Topic 5 - Engineering Programming Languages	CSE
M 348	Scientific Computation in Numerical Analysis	CNS
M 368K	Numerical Methods for Applications	CNS
M E 369P	Application Programming for Engineers	CSE
SDS 335	Scientific & Technical Computing	CNS
SDS 374C	Parallel Computing for Science and Engineering	CNS

SDS 374D	Distributed and Grid Computing for Science and Engineering	CNS
SDS 374E	Visualization and Data Analysis for Science and Engineering	CNS
SDS 375	Special Topics in Scientific Computation	CNS
ASE 330M	Linear System Analysis	CSE
CSE 380	Tools and Techniques of Computational Science	ICES
CSE 383C	Numerical Analysis: Linear Algebra	ICES
CSE 383K	Numerical Analysis: Algebra and Approximation	ICES
CSE 386C	Methods of Applied Mathematics	ICES
CSE 386M	Functional Analysis in Theoretical Mechanics	ICES
CSE 393F	Finite Element Methods	ICES
CSE 393N	Numerical Methods for Flow and Transport Problems	ICES
C S 329E	Topic: Elements of Data Visualization	CNS
C S 337	Theory in Programming Practice	CNS
C S 337H	Theory in Programming Practice: Honors	CNS
C S 363D	Introduction to Data Mining	CNS
C S 373	Software Engineering	CNS
E E 360C	Algorithms	CSE
E E 380L	Topic 10: Data Mining	CSE
E E 461L	Software Engineering and Design Laboratory	CSE
GEO 366M	Mathematical Methods in Geophysics	JSG
M 346	Applied Linear Algebra	CNS
M 372K	Partial Differential Equations and Applications	CNS
M 376C	Methods of Applied Mathematics	CNS
NEU 366M	Quantitative Methods in Neuroscience	CNS
SDS 348	Computational Biology and Bioinformatics	CNS
SDS 394	Scientific & Technical Computing	CNS
SDS 394C	Parallel Computing for Scientists and Engineers	CNS
SDS 394D	Distributed and Grid Computing for Scientists and Engineers	CNS
CSE 370	Individual Reading and Research	ICES

12. **Other Certificate Requirements:** None

13. **Give a Detailed Rationale for Change(s):** In Fall 2012, program requirements were updated after review of initial three years of program's existence. Intention of changes was to make certificate more accessible and to increase number of approved courses. As an interdisciplinary program, we wanted to provide a wider selection of coursework that would be available to students in different colleges/majors. Course areas were more clearly defined and the mathematics prerequisites were moved to a new certificate requirement area: Upper Division Mathematics.

14. **College/School Approval Process:**
    Approver: Gerald E. Speitel Date: May January 22, 2016
    Title: Director, Associate Dean, CSE

    Approver: J. Tinsely Oden Date: May January 27, 2016
    Title: Director, ICES

PROPOSED NEW CATALOG TEXT:

ACADEMIC POLICES AND PROCEDURES

{No changes to this point}

Certificates

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Certificate in Computational Science and Engineering

The foundations of science and engineering are under rapid, dramatic, and irreversible change brought on by the advent of the computer. Steady growth in computer capabilities, and enormous expansion in the scope and sophistication of computational modeling and simulation, have added computation as the third pillar of scientific discovery and have revolutionized engineering practice. Computational science and engineering can affect virtually every aspect of human existence, including the health, security, productivity, and competitiveness of nations.

The Computational Science and Engineering Certificate program is sponsored by the Cockrell School of Engineering, the Jackson School of Geosciences, the College of Liberal Arts, and the College of Natural Sciences; it is administered by the Institute for Computational Engineering and Sciences (ICES). The program offers highly qualified upper-division students an opportunity for in-depth study and research in computational science and engineering, including computational and applied mathematics, numerical simulation, scientific computation, and visualization. A student who completes the general requirements listed on Transcript-Recognized Programs and the specific requirements below receives recognition on his or her University transcript and a letter from the director of ICES that describes the program and the work completed. Along with supporting letters from supervising faculty and graduate mentors, these are valuable assets for students applying to graduate school and pursuing competitive job opportunities.

To apply for admission, students must have completed sixty semester hours of coursework, ~~and~~ must have a grade point average of at least 3.00 and must have taken coursework in Calculus. ~~Students are expected to have broad training in quantitative methods, comparable to that provided by Mathematics 408D or 408M, Computer Science 303E or Statistics and Data Sciences 222, Mathematics 427K, and Mathematics 340L.~~

Students must complete ~~the following~~ eighteen semester hours of approved coursework with a grade of at least ~~*B*~~ *C-* in each course. A student's overall GPA in certificate courses must be 3.00 or greater. Students must take at least one course in each of the following areas:

1. Upper Division Mathematics ~~Three semester hours in numerical computing chosen from the following: Computer Science 323E, 323H, 367, Mathematics 348.~~
2. Basic Programming ~~Three semester hours in numerical applications chosen from the following: Aerospace Engineering 347, Biology 337J, 346, Biomedical Engineering 342, Chemical Engineering 348, Economics 363C, Geological Sciences 325K, Mathematics 374M, Mechanical Engineering 369L, Physics 329, Statistics and Data Sciences 339~~.
3. Numerical Applications ~~Nine semester hours chosen from the following: Computer Science 377, Engineering Mechanics 360,Mathematics 346, Mathematics 368K, Mathematics 372K, Mathematics 376C, Statistics and Data Sciences 374C, 374E.~~
4. Advanced Computing
5. Electives
6. Scientific Computing Project – ~~A scientific computing project~~ to be supervised by a member of the computational science, engineering, and mathematics (CSEM) graduate program faculty. The research project is completed in a three-semester-hour research methods or individual instruction course, which the student should take during the senior year. The research project may include mentoring by ICES postdoctoral fellows and CSEM graduate students as part of a vertical instructional research team.

With the approval of the certificate program's faculty adviser, course substitutions may be made within the broad area of computational science and engineering.

Some courses on the approved course list may be restricted by the department offering the course. Please note that the CSE Certificate Program cannot ask the department to waive prerequisites or force the department to lift restrictions on their courses.

A list of approved courses ~~More information about the certificate~~ is available at http://www.ices.utexas.edu/programs/cse-certificate/ and in the Institute for Computational Engineering and Sciences, ACE 4.110.