



Texas A&M University
Request for a Change in Curriculum
Undergraduate ♦ Graduate ♦ Professional

1. Program request type: Undergraduate Graduate First Professional (ex., DVM, JD, MD, etc.)
2. Request change for: Degree Program Minor Certificate
3. Request submitted by (Department or Program Name): Institute for Scientific Computation (ISC)
4. Program Designation and Name (e.g., B.A. in History, Minor in History, Certificate in European Union): Computational Sciences Certificate Program
5. Brief description of change: The ISC proposes changing the Computational Sciences Certificate Program by introducing clarity into the catalog description, changing the curriculum from requiring two core and two elective courses to one core and three elective courses, and adding additional elective course options.
6. Rationale for change: Program changes will provide clarity in certificate requirements and facilitate increased student participation.

Use the checkboxes below to make sure that all information is included.

7. a. Proposed curriculum attached. Yes No
- b. Current catalog curriculum with handwritten edits attached. Yes No
- c. Current Howdy degree evaluation with handwritten edits attached. Yes No
- Please make sure the attached proposed curriculum, catalog and Howdy degree evaluation match.*
8. a. Will degree program hours change (increase/decrease) due to the proposed curriculum changes? Yes No
- b. If yes, degree program hours will change from: _____ to: _____
- c. If yes, is the Texas Higher Education Coordinating Board form attached? Yes No
- <http://www.thecb.state.tx.us/index.cfm?objectid=A0F9F7FA-9A92-4F11-2756AD3BBFF01D60>
9. If proposed changes affect other unit(s), are letters of support attached? Yes No

IMPORTANT NOTE: Curriculum changes submitted through the approval process and fully approved by February (December-UCC/GC, January-Faculty Senate, February-President) will be effective in the next academic year. Changes requiring approval beyond the University should complete the internal approval process early in the fall semester whenever possible in order to ensure timely implementation.

Approval recommended by:

<u>Yalchin Efeudiev</u> Department Head or Program Chair (Type Name & Sign)	<u>10/16/2015</u> Date	<u>[Signature]</u> Dean of College	<u>10-21-15</u> Date
<u>[Signature]</u> Chair, College Review Committee	<u>10-20-15</u> Date	<u>[Signature]</u> Chair, GC or UCC	<u>11-5-15</u> Date

Proposed Catalog Description for the Computational Sciences Certificate Program:

The Institute for Scientific Computation developed the Computational Sciences Certificate Program to meet the increased need for computational techniques that help solve complex science and engineering problems. This program targets science and engineering students enrolled in graduate studies, providing them with a broad-based multidisciplinary enhancement to their degree program and preparing them with the intellectual infrastructure necessary as a leader in computational science, engineering, and technology. By completing this certification program, a graduate will receive an official certified transcript that will add value and marketability to their advanced degree. The Computational Sciences Certificate Program provides formal documentation on a student's transcript that they successfully completed courses focused on computational aspects that supplement their degree in science or engineering. To fulfill the certification requirements, a student must complete four total courses (one core and three electives), as described by the program curriculum, and a capstone project within their home department. For more information, visit <http://isc.tamu.edu>.

Proposed Curriculum for the Computational Sciences Certificate Program:

Core Courses

Select one of the following		3
MATH 609	Numerical Analysis	
STAT 604	Topics in Statistical Computations	
CSCE 659/ ECEN 659	Parallel/Distributed Numerical Algorithms and Applications ¹	

Elective Courses

Select three of the following, one of which must be exclusive of the student's home department ²		9
AERO 615	Numerical Methods for Internal Flow	
CSCE 603	Database Systems and Applications	
CSCE 605	Compiler Design	
CSCE 626	Parallel Algorithm Design and Analysis	
CSCE 654	Supercomputing	
CVEN 680	Advanced Computation Methods for Fluid Flow	
CVEN 688	Computational Fluid Dynamics	
GEOG 620	Geophysical Inverse Theory	
MATH 610	Numerical Methods in Partial Differential Equations	
MATH 648	Computational Algebraic Geometry	
MATH 661	Mathematical Theory of Finite Element Methods	
MATH 676	Finite Element Methods in Scientific Computing	
MEEN 672	Introduction to Finite Element Method	
NUEN 618	Multiphysics Computations in Nuclear Science and Engineering	
OCNG 615	Numerical Modeling of Ocean Circulation I	
PETE 656	Advanced Numerical Methods for Reservoir Simulation	
STAT 605	Advanced Statistical Computations	
STAT 608	Regression Analysis	
STAT 626	Methods in Time Series Analysis	
STAT 636	Applied Multivariate Analysis	
CSCE 620/ VIZA 670	Computational Geometry	
MATH 660/ CSCE 660	Computational Linear Algebra	

Other

Capstone Project³

Total Semester Credit Hours	12
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- ¹ MATH 609 will also satisfy the CSCE 653 prerequisite.
- ² With approval by the director of the Institute for Scientific Computation (ISC), students may substitute a course outside those listed as elective options. In such situations, the student must justify the substitution to and seek approval from the ISC's director *prior to* enrolling in the course. The director will include their support for the substitution in a memorandum to the Office of Graduate Studies (OGS) after the student files their degree plan with OGS and copies of these documents with the ISC.
- ³ The capstone project's goal is to provide students with experience in the computational sciences. The capstone project may be fulfilled by:
 1. an independent study graduate course within the student's home department, or
 2. an independent study graduate course outside the student's home department, or
 3. as part of a MS thesis or project required by the student's home department, or
 4. as part of a PhD dissertation.

To fulfill this requirement, the ISC's associate director or director must approve the capstone project, certify its computational component, and document its completion.

Computational Sciences - Certificate

The Computational Sciences Certificate was developed to meet the increased need for computational techniques to help solve complex science and engineering programs. This program is targeted to science and engineering students enrolled in graduate studies. The goal of this certificate program is to provide formal documentation upon a student's transcript that they have taken additional courses focused on the computational aspects that supplement a given degree in science and engineering. To fulfill the certification requirements, a student must complete four courses, as described by the program outline, and a capstone project in their home department.

This certification will provide a graduate student with a broad-based multidisciplinary enhancement to his/her degree program as well as prepare him/her with the intellectual infrastructure to be a new leader in computational science, engineering, and technology. By joining this certification program, a graduate will receive an official certified transcript that will add value and marketability to his/her advanced degree. For more information, visit <http://isc.tamu.edu/research-education/CSCPI> or send an email message to cscpi@isc.tamu.edu. <http://isc.tamu.edu>

Program Requirements

Course Options

Select two courses from two different departments, and exclusive of one's home department	3	Core Courses
Select two courses from the given list, as long as they are not from the student's home department	6	
Capstone Project	3	Elective Courses
Capstone Project	3	
Total Semester Credit Hours	12	

Outside courses listed on the student's degree plan can be used to satisfy the four course requirements.

The goal of the capstone project is to provide students with experience in the area of computational science. The intended length of the project is one semester. This project may be fulfilled by:

- an independent study graduate course in the home department, or
- an independent study graduate course outside the home department, or
- as part of a MS thesis or project required by the home department, or
- as part of a PhD dissertation.

To fulfill this requirement, the faculty member supervising the capstone project must write a memo describing the project and carrying the project's computational component; this memo must be placed in the student's file in the home department.

Course Options

Mathematics

Core	MATH 609	Numerical Analysis	4
Elective	MATH 610	Numerical Methods in Partial Differential Equations	4
Elective	MATH 660/ CSCE 660	Computational Linear Algebra	3
Statistics	STAT 604	Topics in Statistical Computations	3
Elective	STAT 605	Advanced Statistical Computations	3
Elective	STAT 608	Regression Analysis	3

Elective	STAT 626	Methods in Time Series Analysis	3
Elective	STAT 636	Applied Multivariate Analysis	3
Computer Science	CSCE 603	Database Systems and Applications	3
Elective	CSCE 654	Supercomputing	3
Elective	CSCE 659/ ECEN 659	Parallel/Distributed Numerical Algorithms and Applications	3
Elective	CSCE 660/ MATH 660	Computational Linear Algebra	3

Each of the following courses will be offered once a year.

Each of the following courses will be offered once every two years.

MATH 609 will satisfy the CSCE 653 prerequisite.

CORE COURSES 3

- Select one of the following, exclusive of the student's home department
 - MATH 609
 - STAT 604
 - CSCE/ELEN 659

ELECTIVE COURSES 9

- Select three of the following, one of which must be exclusive of the student's home department
 - MATH 610
 - MATH 660 / CSCE 660
 - STAT 605
 - STAT 608
 - STAT 626
 - STAT 636
 - CSCE 603
 - CSCE 654
 - CSCE 660 / MATH 660

+ additional new courses as listed on proposed curriculum document.

1 - ...
 2 - With approval by the director of the Institute for Scientific Computation (ISC) students may substitute a course outside those listed as elective options. In such situations, the student must justify the substitution... (see proposed curriculum document).
 3 - ...

Dwight Look
College of Engineering



AEROSPACE ENGINEERING

Rodney D. W. Bowersox
Professor and Head
Holder of Ford Professorship I

DATE: October 12, 2015

TO: Dr. Bradley Shumbera
Assistant Director, Institute for Scientific Computation

FROM Rodney Bowersox *R Bowersox*
Professor and Head of Aerospace Engineering

SUBJECT: Computational Sciences Certificate Program

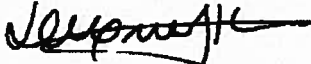
I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by Including AERO 615, Numerical Methods for Internal Flow, from the Department of Aerospace Engineering in its curriculum.

701 H. R. Bright Building
3141 TAMU
College Station, TX 77843-3141

Tel. 979.845.7178 Fax 979.845.6051
bowersox@tamu.edu
<http://engineering.tamu.edu/aerospace>

MEMORANDUM:

TO: R. Bradley Shumbera
Assistant Director, Institute for Scientific Computation

FROM: Dilma Da Silva 
Department Head, Professor and Holder of the Ford Motor Company Design Professorship II

DATE: October 9, 2015

SUBJECT: Computational Science Certificate Program Changes

I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including the following courses from the Department of Computer Science and Engineering in its curriculum:

- CPSC 603, Database Systems and Applications
- CPSC 605, Compiler Design
- CPSC 620/VIZA 671, Computational Geometry
- CPSC 626, Parallel Algorithm Design and Analysis – CPSC 654, Supercomputing
- CPSC 659/ECEN/659, Parallel/Distributed Numerical Algorithms and Applications
- CPSC 660/MATH 660, Computational Linear Algebra

Should you have any questions or concerns, please feel free to contact me.

Shumbera, R. Bradley

From: Autenrieth, Robin
Sent: Thursday, October 15, 2015 10:03 AM
To: Shumbera, R. Bradley
Cc: Girimaji, Sharath S
Subject: Re: Computational Sciences Certificate Program Changes

Hello,
Yes it is acceptable to list these classes. I had to check with the new DH in OCEN and he agrees.
Thanks
Robin

Sent from my iPad

On Oct 15, 2015, at 8:26 AM, Shumbera, R. Bradley <shumbera@tamu.edu> wrote:

Dr. Autenrieth,

Could you please update regarding my request from 10/7 (included below)?

R. Bradley Shumbera, Ph.D. | Assistant Director
Institute for Scientific Computation | Texas A&M University
3404 TAMU | College Station, TX 7743-3404

ph: 979.458.0448 | mobile: 979.224.4415 | fax: 979.862.3983
shumbera@tamu.edu | <http://isc.tamu.edu/>

Developing Computational Technology to Advance Science & Engineering

From: Shumbera, R. Bradley
Sent: Wednesday, October 7, 2015 1:51 PM
To: Autenrieth, Robin <rautenrieth@civil.tamu.edu>
Subject: Computational Sciences Certificate Program Changes

Dr. Autenrieth,

The Institute for Scientific Computation is currently working to update its Computational Sciences Certificate program. This program targets science and engineering graduate students, providing them with formal documentation on their transcript that they successfully completed courses targeted at the computational sciences to supplement their degree. To promote increased student participation, we are updating the program's curriculum by adding additional elective choices that will satisfy program requirements. Based on the recommendation of Dr. Chen, we are interested in adding the following courses from your department:

- CVEN 680, Advanced Computation Methods for Fluid Flow
- CVEN 688, Computational Fluid Dynamics

Would you kindly provide a short statement indicating your support for this move on departmental letterhead? Below you can find suggested wording you can use.

"I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including the following courses from the Department of Civil Engineering in its curriculum:

- CVEN 680, Advanced Computation Methods for Fluid Flow
- CVEN 688, Computational Fluid Dynamics"

If you have any questions or concerns, please feel free to contact me.

Best Regards,

R. Bradley Shumbera, Ph.D. | Assistant Director
Institute for Scientific Computation | Texas A&M University
3404 TAMU | College Station, TX 7743-3404

ph: 979.458.0448 | mobile: 979.224.4415 | fax: 979.862.3983
shumbera@tamu.edu | <http://isc.tamu.edu/>

Developing Computational Technology to Advance Science & Engineering

THE COLLEGE OF GEOSCIENCES

DEPARTMENT OF GEOLOGY & GEOPHYSICS



Dr. Michael Pope
Professor and Head

Inclusion of GEOP 620, Geophysical Inverse Theory in Computational Sciences Certification

October 7, 2015

To Whom it May Concern:

I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including GEOP 620, Geophysical Inverse Theory from the Department of Geology and Geophysics in its curriculum.

Sincerely,

A handwritten signature in cursive script that reads 'Michael C. Pope'.

Dr. Michael C. Pope
Professor and Head
Department of Geology and Geophysics

108AA Halbouty Hall
3115 TAMU
College Station, TX 77843-3115
Ph: 979.845.4376 FAX: 979.845.6162
mcpope@tamu.edu

October 7, 2015

To Whom It May Concern:

I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including the following courses from the Department of Mathematics in its curriculum:

- MATH 609, Numerical Analysis
- MATH 610, Numerical Methods in Partial Differential Equations
- Math648, Computational Algebraic Geometry
- MATH 660/CSCE 660, Computational Linear Algebra
- MATH 661, Mathematical Theory of Finite Element Methods
- MATH 676, Finite Element Methods in Scientific Computing

Sincerely,



Emil J. Straube
Professor and Head

Shumbera, R. Bradley

From: Andreas Polycarpou
Sent: Thursday, October 15, 2015 8:42 AM
To: Shumbera, R. Bradley; Kate Goodman
Subject: Re: Computational Sciences Certificate Program Changes

Dear Dr. Schumbera

"I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including MEEN 672, Introduction to Finite Element Method, from the Department of Mechanical Engineering in its curriculum."

Thanks, Andreas

Andreas A. Polycarpou, Ph.D.
Department Head & Meinhard H. Kotzebue '14 Professor
Texas A&M University
Department of Mechanical Engineering
100 Mechanical Engineering Building, 3123 TAMU
College Station, TX 77843-3123
Tel (979) 458 - 4061; Fax (979) 845 - 3081
E-mail: tamu-me-head@mengr-tamu.org
Dept Web Site: <http://www.mengr.tamu.edu>

Shumbera, R. Bradley

From: Hassan, Yassin A
Sent: Thursday, October 15, 2015 11:58 AM
To: Shumbera, R. Bradley; Burks, Andrea L
Cc: Ragusa, Jean C
Subject: RE: Computational Sciences Certificate Program Changes

Importance: High

Dear Dr. Shumbera,

This this to inform you the Department of Nuclear Engineering supports the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including NUEN 618, Multiphysics Computations in Nuclear Science and Engineering, from the Department of Nuclear Engineering in its curriculum."

Should you need more information, please contact me.
Thanks,
Yassin

Yassin A. Hassan
Department Head, Nuclear Engineering
Sallie and Don Davis '61 Professor of Engineering
Editor-in-Chief of Nuclear Engineering and Design Journal
Texas A&M University
MS 3133
College Station, Texas 77843-3133
Phone: 979 845 7090
Cell : 979 218 4417
Email: y-hassan@tamu.edu

COLLEGE OF GEOSCIENCES

DEPARTMENT OF OCEANOGRAPHY

Deborah Thomas
Department Head and Professor
dthomas@ocean.tamu.edu
Phone: (979) 845-7211
Fax: (979) 845-6331



October 14, 2015

To Whom It May Concern

I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including OCNG 615, Numerical Modeling of Ocean Circulation I, from the Department of Oceanography in its curriculum.

Please let me know if I may be of any assistance in enhancing this transformative educational program.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Debbie Thomas'.

Debbie Thomas



Harold Vance Department of
PETROLEUM ENGINEERING
TEXAS A & M UNIVERSITY

A. Daniel Hill
Noble Endowed Chair
Department Head
(979) 845-2244
danhill@tamu.edu

October 7, 2015

R. Bradley Shumbera, Ph.D.
Assistant Director
Institute for Scientific Computation
Texas A&M University
3404 TAMU
College Station, TX 7743-3404

Dear Dr. Shumbera:

I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including PETE 656, Advanced Numerical Methods for Reservoir Simulation from the Harold Vance Department of Petroleum Engineering in its curriculum.

If you have any questions or concerns, please feel free to contact me.

Sincerely,

A. Daniel Hill
Department Head
Noble Endowed Chair

Mailing Address:
3116 TAMU
College Station, TX 77843-3116
Web - <http://engineering.tamu.edu/petroleum>

Department Head Office:
507 Richardson Building
College Station, TX 77843-3116
Tel. 979.845.1450 Fax 979.862.6579

October 7, 2015

R. Bradley Shumbera, Assistant Director
Institute for Scientific Computation
Texas A&M University
3404 TAMU
College Station, TX 7743-3404

Dear Dr. Shumbera,

I support the Institute for Scientific Computation's efforts to revitalize the Computational Sciences Certificate Program by including the following courses from the Department of Statistics in its curriculum:

- STAT 604, Topics in Statistical Computations
- STAT 605, Advanced Statistical Computations
- STAT 608, Regression Analysis
- STAT 626, Methods in Time Series Analysis
- STAT 636, Applied Multivariate Analysis

Sincerely,

A handwritten signature in cursive script that reads "Valen" followed by a long horizontal flourish.

Valen Johnson
Professor and Head
Department of Statistics
Texas A&M University