# UNIVERSITY FACULTY SENATE FORMS

## Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

**Submitted by:** _____Richard Braun_____phone number____x1869_____

**Department:** ____Mathematical Sciences_____email address__braun@math.udel.edu__

**Action:** ____Revision of Certificate in Computational Science and Engineering_____
       (Example: add major/minor/concentration, delete major/minor/concentration, revise
major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

**Effective term_____11F_____**
                (use format 04F, 05W)

**Current degree____not applicable_____**
                (Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

**Proposed change leads to the degree of: ___leads to a certificate_____**
                                (Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

**Proposed name:_____ Certificate in Computational Science and Engineering_____**
                Proposed new name for revised or new major / minor / concentration / academic unit
                                (if applicable)

## Revising or Deleting:

**Undergraduate major / Concentration:_____not applicable _____**
                        (Example: Applied Music – Instrumental  degree BMAS)

**Undergraduate minor:_____not applicable_____**
                (Example: African Studies,  Business Administration,  English, Leadership, etc.)

**Graduate Program Policy statement change:____yes, attached_____**
                        (Must attach  your Graduate Program Policy Statement)

**Graduate Program of Study:_Certificate in Computational Science and Engineering**
                (Example: Animal Science: MS  Animal Science:  PHD  Economics: MA Economics: PHD)

**Graduate minor / concentration:_____not applicable_____**

Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, highlighting the changes made to the original policy document.

**List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?**
 (Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter "None")

No new courses are being created for this Certificate program. Courses relevant to the Certificate that had already been approved, modified or deleted by the participating departments have been incorporated into the program policy statement and the catalog entry. No changes to the courses were made specifically for this Certificate; the changes are solely from previous changes by the departments. The course descriptions in the program policy statement are being updated to reflect the following changes. Courses deleted: MATH 694, CISC 603, MEEG 867; Courses modified: MATH 611, MATH 612, MATH 838, GIEG 605; Courses created: MATH 817, CISC 614, MEEG 667 and MEEG 833.

**Explain, when appropriate, how this new/revised curriculum supports the 10 goals of undergraduate education: http://www.ugs.udel.edu/gened/**

This is a post-baccalaureate certificate program, but it could be taken by simultaneous BS-MS students. The certificate would benefit such students by providing an interdisciplinary study opportunity involving 7 departments and two colleges. The revisions don't change this.

**Identify other units affected by the proposed changes:**
(Attach permission from the affected units. If no other unit is affected, enter "None")

The following departments are involved from Arts and Sciences: Mathematical Sciences, and Physics and Astronomy. The following departments are involved from Engineering: Chemical Engineering, Civil and Environmental Engineering, , and Computer and Information Sciences, Electrical and Computer Engineering, and Mechanical Engineering. Mathematical Sciences's Graduate Studies Committee approved the changes; the department discussed the changes and felt no vote was needed. Representatives from all of the participating departments suggested and approved the changes from outside of Mathematical Sciences.

**Describe the rationale for the proposed program change(s):**
(Explain your reasons for creating, revising, or deleting the curriculum or program.)

Course changes made by the participating departments in the intervening time since the Certificate has been approved have now been entered into the Certificate documents. Minor language changes were made as well; for example, "We propose that... " appeared numerous places; those phrases are replaced with language appropriate for a program that is already underway.

**Program Requirements:**
(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and **include a side-by-side comparison** of the credit distribution before and after the proposed change.)

The revised catalog entry is below after the revised program policy statement; please see that document. No credit or course requirements have changed.


**ROUTING AND AUTHORIZATION:**   (Please do not remove supporting documentation.)

Department Chairperson _____  Date _10/25/10_____

Dean of College_____  Date_____

Chairperson, College Curriculum Committee_____  Date_____

Chairperson, Senate Com. on UG or GR Studies_____  Date_____

Chairperson, Senate Coordinating Com._____  Date_____

Secretary, Faculty Senate_____  Date_____

Date of Senate Resolution_____  Date to be Effective_____

Registrar _____ Program Code_____  Date_____

Vice Provost for Academic Affairs & International Programs_____Date_____

Provost _____Date_____

Board of Trustee Notification_____Date_____

Revised 10/23/2007  /khs

# Certificate in Computational Science and Engineering

## Admission to the Program

Application to the Certificate in Computational Science and Engineering program is submitted using the on-line graduate admission application that includes a statement of purpose, two letters of recommendation and transcripts from all previous college or university study.

Students currently matriculated in a graduate degree program should complete a "Change of Classification Form" to seek approval to add the Certificate in Computational Science and Engineering Program.

## Requirements

Students are required to have a Bachelor degree in the sciences or engineering and should have background in the following areas: (i) fluency in a programming language such as C, C++ or Fortran, etc.; (ii) linear algebra; (ii) differential equations; (iv) multidimensional calculus; (v) undergraduate-level data structures. Non-mathematics students may be able to make up one of these areas via the background courses in mathematics; these are the 500 level courses listed in Table 1.

Students are required to choose an appropriate advisor associated with the certificate program, or have an appropriate advisor appointed by the Director of the Certificate Program, who will be the primary contact for questions. The student will develop a plan for the certificate with the advisor before the beginning of the second course. The Director of the Certificate Program will verify that the student has completed the requirements for the certificate and will approve the application for the certificate upon successful completion of the requirements.

A total of 15 credits required for this post-baccalaureate certificate. The student is required take CISC 621 and *one* of the following: MATH 607, PHYS 660 or CHEG 827. The student must complete courses in three different departments from the list in Table 1. At least one course from the 800 level must be taken from department area list; CHEG 827 does not satisfy this requirement.

A student with sufficient background may waive up to three credits of the 15 credit requirement. Credits from another University may not be transferred toward this certificate.

Students may earn up to three credits as XXX 866 Special Problems if approved by the advisor in place of one course in the department area options. If the 866 course is a project connected to the student's employment, the advisor will grade the 866 course.

Credits satisfying the Certificate requirements may also count toward the degree requirements in the student's home department. Note: MATH 607 may not be taken for credit toward a graduate degree in the Department of Mathematical Sciences.

## Satisfactory progress

Students in the Certificate in Computational Science and Engineering program must achieve a grade of B- or better to obtain credit for a course toward the certificate. Students must obtain at least a 3.0 cumulative grade point average in the courses from the list to obtain the certificate.

## Course Requirements for the Certificate (15 credits):

- 3 credits required: CISC 621
- 3 credits required from MATH 607, PHYS 660 or CHEG 827
- 9 credits required from area courses.
- Students must complete one course from at least three different areas (departments) listed in Table 1.

## Area Courses for the Certificate

Area courses are shown in Table 1; the courses are current as of the 2011-12 academic year. Updates of the courses (based on which courses are offered that particular year and decided by the certificate program committee) are listed on the certificate program web pages to which the students are directed in order to make course selections.

| Department | Courses | | |
| --- | --- | --- | --- |
| | 500 level* | 600 level | 800 level |
| Chemical Engineering (CHEG) | | | 831, 841, 866° |
| Civil and Environmental Engineering (CIEG) | | 601, 605 | 801, 866° |
| Computer and Information Sciences (CISC) | | 601, 604, 614, 636, 637, 649, 675, 681, 683 | 841, 849, 879 886, 887, 889, 866° |
| Electrical and Computer Engineering (ELEG/CPEG) | | CPEG 655 | ELEG 841, 866° |
| Mathematical Sciences (MATH) | 503, 529, 535 | 611, 612 | 817, 838, 866° |
| Mechanical Engineering (MEEG) | | 6xx° | 833, 866° |
| Physics and Astronomy (PHYS) | | 650, 660 | 866° |

Table 1: The area courses for the Certificate in Computational Science and Engineering program by department. *Credit for one of these 500 level background courses can be applied to the certificate requirements for students not in a degree program in the

Department of Mathematical Sciences. °Topic courses may have multiple descriptions and subjects and may change over time; check the department course availability and with the Certificate Director for approval.