Certificate Title: **Graduate Certificate in Computer Science**

New: X  
Revision: ☐

Classification of Instructional Programs (CIP) Discipline # (6 digits): **11.0701**  
*Please ensure that you select the appropriate CIP code for your certificate program. Please consult this website for more information about CIP codes: [https://nces.ed.gov/ipeds/cipcode/default.aspx?y=55](https://nces.ed.gov/ipeds/cipcode/default.aspx?y=55)

Certificate Type:  
On-Campus: ☐  
Distance: ☐  
On-Campus & Distance: X

Proposed Effective Date: **Spring 2019**

Director of the Certificate Program: **George Rouskas**
Program Coordinator (if different from Director): **N/A**
Graduate Services Coordinator: **Kathy Luca**
College: **College of Engineering**
Department/Program: **Computer Science**

Catalog Description:

The Graduate Certificate in Computer Science provides students with advanced academic credentials in Computer Science. The program is intended for professional development and may be tailored to individual requirements.

<table>
<thead>
<tr>
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<th>Distance</th>
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<tbody>
<tr>
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<td>Yr. 2-5</td>
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<td></td>
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<tr>
<td>New</td>
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<td>Yr. 3-8</td>
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<tr>
<td></td>
<td>Yr. 4-12</td>
<td>Yr. 4-10</td>
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</tbody>
</table>

Attachments:

☐ Proposal Document  
☐ Statement of other departments likely to be affected and summary of consultation with those departments  
☐ Program-level assessment  
☐ Campus Routing Form  
☐ Signature Page
Graduate Certificate in Computer Science
North Carolina State University

This request has been reviewed and approved by the appropriate campus committees and authorities.

Endorsed By:

Laurie Williams, Interim Department Head
Head, Department/Director of Graduate Program (Printed Name and Signature) 4/27/2018 Date

Recommended By:

[Signature]
Chair, College/Graduate Studies Committee (Printed Name and Signature) 4/27/18 Date

Endorsed By:

[Signature]
College Dean (Printed Name and Signature) 4/27/18 Date

Recommended By:

[Signature] Thomas E. Miller, Jr. 5/9/18
Vice Provost, DELTA (if DE degree) (Printed Name and Signature) Date

Approved By:

[Signature] Peter J. Harrick 8/30/18
Dean of the Graduate School (Printed Name and Signature) Date

Recommended By:

[Signature] Dean's Council (Printed Name and Signature) 4/25/19

Approved By:

[Signature] Executive Vice Chancellor and Provost (Printed Name and Signature) 4/2/19 Date

Approved By:

[Signature] Chancellor (Printed Name and Signature) 6/12/19 Date

(revised August 2015)
Graduate Certificate in Computer Science

Program Justification
The Computer Science (CSC) department proposes to offer a Graduate Certificate Program (GCP) in Computer Science (CSC). This program is primarily intended for individuals who wish to increase their knowledge and skills in Computer Science either for future career opportunities or in preparation for graduate studies. Students who complete the certificate will gain in-depth knowledge in Computer Science concepts, methods and tools. We anticipate that professionals interested in the CSC GCP will enroll as distance education students through Engineering Online (EOL). Many Computer Science courses are already being offered through EOL as part of the existing Master of Computer Science distance education degree program.

Program Objectives
1. In this certificate program, students will learn advanced concepts, methods and tools of Computer Science and apply them to a variety of computational problems and tasks.
2. The certificate program will provide an educational experience that satisfies the expectations of its graduates.

Program of Study
The CSC GCP requires a total of 12 credit hours of graduate-level Computer Science courses taken for a grade. There is no prescribed list of courses for the certificate; students may take a combination of courses tailored to their interests and needs, subject to course prerequisites. The following courses are regularly offered online and would be available to both on-campus and distance students; all other Computer Science graduate courses are available to on-campus students.

CSC 501 – Operating Systems Principles
CSC 505 – Design and Analysis of Algorithms
CSC 506 – Architecture of Parallel Computers
CSC 510 – Software Engineering
CSC 517 – Object-Oriented Design and Development
CSC 520 – Artificial Intelligence
CSC 522 – Automated Learning and Data Analysis
CSC 540 – Database Management Concepts and Systems
CSC 555 – Social Computing
CSC 570 – Computer Networks
CSC 573 – Internet Protocols
CSC 574 – Computer and Network Security
CSC 575 – Introduction to Wireless Networking
CSC 579 – Introduction to Computer Performance Modeling
CSC 591 – Special Topics in Computer Science (multiple courses)
CSC 750 – Service-Oriented Computing
Admission Requirements
Students must meet **ONE** of the following requirements for admission into the CSC Graduate Certificate Program:

- Have a BS degree in Computer Science from a regionally accredited four-year college or university, and have an overall GPA of at least 3.0 on a 4-point scale.
- Have a BS degree in the sciences or engineering from a regionally accredited four-year college or university with an overall GPA of at least 3.0 on a 4-point scale.

Application and Completion Process
An application for acceptance into the GCP is required for all new students. Students must complete the Graduate School application, found at [https://grad.ncsu.edu/apply/](https://grad.ncsu.edu/apply/).

New applications will be reviewed at the department/program level.

Registration procedures, registration dates and course availability for each semester can be found on the NCSU Registration and Records webpage at [http://www.ncsu.edu/registrar/](http://www.ncsu.edu/registrar/). Additional information regarding the CSC GCP can be found on the Computer Science ([http://www.csc.ncsu.edu](http://www.csc.ncsu.edu)) website. Questions regarding the CSC GCP can be directed to the certificate coordinator. Information regarding Engineering Online can be found at [http://engineeringonline.ncsu.edu](http://engineeringonline.ncsu.edu).

Every semester that a student is enrolled in the CSC GCP, all credit hours for which the student is registered will be subject to the Computer Science tuition premium¹. It is the responsibility of the student to apply for, and receive, the certificate once they have completed the requirements in order for this premium to be removed in subsequent semesters, if the student will be continuing in a degree program that is not subject to tuition premium.

Admission to Other Graduate Programs
Academic success in the CSC GCP might have a strong bearing on admission to a graduate degree program. However, completion of a graduate certificate program **in no way** guarantees entry into a graduate degree program, which must be done through a separate application process.

Academic Performance Requirements
- The CSC GCP requires a total of 12 credit hours.

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¹ Premium tuition is charged based on a student’s program of study, not individual courses the student takes, and this policy is outside the department’s control. For instance, CSC Masters students pay the CSC premium even if in a given semester they take one, two, or three courses outside the CSC department. Similarly, once a student is admitted to the CSC GCP and the certificate is added to their program of study, they will be charged the premium. Therefore, students are advised to only register for courses that apply towards the completion of the CSC GCP. We plan to include this information on the certificate website so that students make an informed decision.
• To receive a Graduate Certificate, a student must maintain a minimum 3.00 grade point average (GPA) on Graduate Certificate coursework taken at NCSU. All grades on courses taken towards the GCP in courses numbered 500 and above are included in the GPA. Any courses taken at the 400 level and below are not eligible for certificate credit.

• All courses taken for certificate credit must be completed with a grade of “B-” or better.

• All courses at the 500- or 700-level taken for certificate credit must be letter-graded. Credit-only courses cannot be used for certificate credit.

• Transfer credit from other institutions is not allowed for the GCP. All coursework must be registered through NC State University.

• Up to three (3) credit hours of PBS coursework, if not already used in another graduate program, may be transferred into the GCP. All transfer credit must carry a grade of B or better.

• All GCP requirements must be completed within four (4) calendar years, beginning with the date the student commences courses applicable to the GCP. In addition, students must maintain continuous enrollment every semester until all coursework is completed. A one-semester leave of absence may be granted if the student is unable to enroll in a course due to extenuating circumstances. The leave of absence must be approved in writing by the CSC DGP before the start of the semester.

Program Administration
The CSC GCP will be administered by the Director of Graduate Programs in the Department of Computer Science, in cooperation with the NCSU Engineering Online program for distance-education students.

All certificate courses are existing courses in Computer Science. The implementation and presentation of the certificate is not expected to require effort outside the normal academic activities of the course instructors. No additional staff or resources are required to support the administration of this program.

At the completion of the certificate, students will complete an exit survey for the purpose of evaluating the quality of the certificate program and its impact on students. The exit interviews will be conducted by the CSC DGP. The results will be used to inform curricular improvement.

Enrollment Projection

<table>
<thead>
<tr>
<th></th>
<th>Yr 1</th>
<th>Yr 2</th>
<th>Yr 3</th>
<th>Yr 4</th>
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</thead>
<tbody>
<tr>
<td>On campus</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
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<tr>
<td>Distance Education</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

These projections are based on (1) discussions with industry members of the Computer Science Strategic Advisory Board and (2) repeated unsolicited requests and questions received by our program, and take into account the different pace of on-campus vs. online students.
Tuition and Fees
The department will seek approval for a tuition structure that is identical to that of the Computer Science Masters program, i.e., that includes the tuition premium. Tuition premium is charged based on the student’s program.

Faculty Participants
All faculty who teach graduate-level Computer Science courses will participate in the CSC GCP.

Departments likely to be affected
No other departments are likely to be affected by the proposed graduate certificate.

Outcomes Assessment Plan

Objectives

1. The certificate program will provide a graduate level working knowledge of current Computer Science concepts and methods.
2. The certificate program will provide an educational experience that satisfies the expectations of its graduates.

Outcomes

1. By the time they complete this certificate program, graduates should be able to:
   • Identify and describe the major principles, methods, and tools of one field of Computer Science
   • Apply the methods and tools learned during the certificate studies to tackle computational problems and tasks
   • Use relevant software packages and tools in their own professional activities

2. At the time they complete this certificate program, graduates are expected to:
   • Be satisfied with the usefulness of the certificate program in enabling them to achieve their professional goals
   • Be sufficiently satisfied with the certificate program to recommend it to others with the same professional goals
   • Be satisfied with the appropriateness of the courses in providing the knowledge or training they anticipate needing for their professional goals
   • Be satisfied with the frequency and timeliness of courses offered for the certificate
   • Be satisfied with the quality of teaching in certificate courses
   • Be satisfied with the overall educational experience of the certificate program
Objective 1. Students will learn advanced concepts, methods and tools of Computer Science and apply them to a variety of computational problems tasks.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Evidence to be Collected</th>
<th>Source of Evidence</th>
<th>Frequency of Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify and describe the major principles, methods, and tools of one field of Computer Science</td>
<td>Final exams in corresponding courses</td>
<td>Students</td>
<td>Annually</td>
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<tr>
<td>Apply the concepts and methods learned during the certificate studies to tackle computational problems and tasks</td>
<td>Projects in corresponding courses</td>
<td>Students</td>
<td>Annually</td>
</tr>
<tr>
<td>Use relevant software packages and tools in their own professional activities</td>
<td>Projects in corresponding courses</td>
<td>Students</td>
<td>Annually</td>
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</tbody>
</table>

Objective 2. The certificate program will provide an educational experience that satisfies the expectations of its graduates

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Evidence to be Collected</th>
<th>Source of Evidence</th>
<th>Frequency of Collection</th>
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<td>To be satisfied with the usefulness of the certificate program in enabling them to achieve their professional goals</td>
<td>Exit survey administered by Graduate School</td>
<td>Graduate School</td>
<td>Annually</td>
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<td>To be sufficiently satisfied with the certificate program to recommend it to others with the same professional goals</td>
<td>Exit survey administered by Graduate School</td>
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<td>To be satisfied with the appropriateness of the courses in providing the knowledge or training they anticipate needing for their professional goals</td>
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<td>professional goals</td>
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<td>To be satisfied with the frequency and timeliness of courses offered for the certificate</td>
<td>Exit survey administered by Graduate School</td>
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<td>To be satisfied with the quality of teaching in certificate courses</td>
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<tr>
<td>To be satisfied with the overall educational experience of the certificate program</td>
<td>Exit survey administered by Graduate School</td>
<td>Graduate School</td>
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