SPECIAL REPORT

OF THE

GRADUATE AND PROGRAM AND BUDGET COUNCILS

concerning a

COMPUTER SCIENCE MASTER’S CONCENTRATION IN SECURITY
WITHIN THE
COLLEGE OF INFORMATION AND COMPUTER SCIENCES (CICS)

Presented at the
768th Regular Meeting of the Faculty Senate
April 27, 2017

COUNCIL MEMBERSHIP

GRADUATE COUNCIL


PROGRAM AND BUDGET COUNCIL

The Academic Standards and Curriculum Committee (ASCC) of the Graduate Council met on February 1, 2017 and reviewed the proposal for the Computer Science Master’s Concentration in Security within the College of Information and Computer Sciences (CICS). The ASCC recommended this proposal for approval.

On Wednesday, February 8, 2017, the Graduate Council unanimously approved the Computer Science Master’s Concentration in Security within the College of Information and Computer Sciences (CICS), Proposal #3365 in the Course and Curriculum Management System.

This proposal creates a new Computer Science Master’s Concentration within the College of Information and Computer Sciences (CICS). It does not overlap the Certificate currently in place. The proposed concentration allows CICS to respond more effectively to the demand for students with training in security, privacy and related topics. It also takes advantage of the recently established Cybersecurity Institute. There are no new resources required as it relies on currently-taught or –scheduled courses and admission controls will be put in place to ensure ability to accommodate new students will not be exceeded.

At its meeting on March 22, 2017, the Program and Budget Council unanimously approved the Computer Science Master’s Concentration in Security within the College of Information and Computer Sciences (CICS). It was submitted as Proposal #3365 in the Course and Curriculum Management System.

MOTION: That the Faculty Senate approve the Computer Science Master’s Concentration in Security within the College of Information and Computer Sciences (CICS), as presented in Sen. Doc. No. 17-058.
Briefly describe the Proposal

This proposal will create a new Computer Science Master's concentration in Security within the College of Information and Computer Sciences (CICS). Expanding opportunities for security education and training is increasingly important to students that wish to pursue jobs in any industry or government position. The proposed concentration in security will allow CICS to respond more effectively to the demand for students with training in security, privacy, and related topics, while leveraging existing CICS resources, and resources committed to the recently established Cybersecurity Institute. Students completing the concentration will satisfy the requirements of our existing Master's program through a mixture of new courses tailored specifically to security, as well as existing computer science courses.

Provide a brief overview of the process for developing the proposal.

This proposal was developed both to respond to a clear need for enhanced training in the area of security, and to take advantage of the opportunity provided by the recent establishment of the Cybersecurity Institute. To develop the curriculum for the proposed concentration, a review of the offerings at top universities with existing security concentrations and degree programs was conducted, with a particular focus on the Master of Science in Security program. A review of existing security-related courses offered at UMass Amherst was then conducted, and faculty from CICS and the College of Engineering were contacted for input.

Based on these reviews, a group of faculty was consulted, including Profs. James Allan (Chair of the Faculty), Andrew McGregor (Curriculum Chair), Mark Corner (MS program director), Prof. Brian Levine (Cybersecurity Institute director), as well as Leeanne Leclerc (Graduate Program Manager) and faculty teaching security courses (Amir Houmansadr, Phillipa Gill, Marc Liberatore, and Gerome Miklau). This group contributed to creating the proposed curriculum for the concentration based on a combination of existing and newly-approved courses. The proposed concentration was then presented to the CICS faculty, who voted to approve the proposal.

Describe the proposal’s purpose and the particular knowledge and skills to be acquired.

As noted above, the need to provide expanded and enhanced training in the area of security has been widely recognized. The goal of this proposal is to help meet this need by creating a new concentration that will provide students with a masters-level computer science curriculum focused specifically on security. This proposal has also driven the creation of several new courses that have expanded our curricular offerings to cover more facets of security.

This proposal is intended to be similar to our existing Master’s program and the recently approved Computer Science Master’s concentration in Data Science, so that students have some flexibility to switch between all three plans.

Students in the security concentration will be required to take four “core” courses (12 credits), including one each from the Systems, Theory, and AI areas. One of the four must be COMPSCI 660 Advanced Information Assurance, which is a systems core. Courses from COMPSCI in a set Security menu may count as a second systems core for this concentration only. A grade of “B” or better is required in each course.

Students must take four additional courses as free electives (12 credits). Students must take two additional courses as security electives (6 credits) from the same set Security menu. Unlike requirement (a), the two may be offered outside COMPSCI. A grade of “B” or better must be achieved in these two security electives.
The concentration includes an optional 6-credit project to count towards the electives requirement. A project will provide students with practical hands-on experience in one or more areas of security (privacy, forensics, network security, etc.). The project will also give students a chance to enhance their project management, and oral and written communication skills. The project counts towards the electives requirement, as do any independent studies. Satisfying all four electives with two independent studies and then a 6-credit project is strongly discouraged.

If this proposal requires no additional resources, say so and briefly explain why. If this proposal requires additional resources, explain how they will be paid for. For proposals involving instruction, indicate how many new enrollments are expected and whether the courses have room to accommodate them.

This concentration leverages existing faculty in CICS and courses that are already being taught in Fall 2016 or scheduled for Spring 2017, with plans for continued offerings in subsequent academic years. (For example, this academic year, COMPSCI 590B/690B: Detecting Interference in Networks, COMPSCI 590F Digital Forensics, and COMPSCI 591L Computer Crime Law have been introduced to our curriculum.) The courses that are critical to sustaining the Concentration in Security are being taught by existing CICS faculty members and will be part of their regular teaching duties.

We expect the creation of this concentration to increase applications to our master's program, but admission controls will be used to ensure that we will not exceed our ability to accommodate these students in new and existing courses. In addition, the new security courses that we will create will be capped to provide sufficient seats for all admitted students. We again expect the cost of any additional teaching assistants required for these courses to be covered by available tuition from the additional students.

Finally, since students in the concentration will be able to use a few other graduate-level computer science courses and courses from other departments as electives, we do not expect undue pressure on other existing courses.

Provide a curriculum outline showing degree program requirements, requirements of any existing concentrations, requirements of proposed concentration, and how they relate. You may include this outline and any additional documents as attachments below.

See the table in the attached document for a comparison of requirements between the primary Computer Science MS degree, the proposed concentration in Security, and the existing concentration in Data Science.

The document includes a sample schedule as well.
<table>
<thead>
<tr>
<th>Existing Computer Science Master’s Requirements</th>
<th>Security Master’s Concentration Requirements</th>
<th>Existing Data Science Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Total 30 course credits</strong></td>
<td><strong>2. Students must take four core courses (12 credits) including one each from the areas of Theory, Systems, and Artificial Intelligence, and one additional course from any area. A grade of B or better must be achieved in all cores.</strong></td>
<td><strong>2. Students must take four core courses (12 credits) including one each from the areas of Theory for Data Science, Systems for Data Science, and Data Analysis, and one additional core course from any area. A grade of B or better must be achieved in all Data Science cores.</strong></td>
</tr>
</tbody>
</table>
| 2. Students must take four Computer Science core courses (12 credits) including one each from the areas of Theory, Systems and Artificial Intelligence, and one additional course from any area. A grade of B or better must be achieved in all cores. | 2. Students must take four core courses (12 credits), including one each from the Systems, Theory, and AI areas.  
  - COMPSCI 660 must be taken as a systems core.  
  - Courses from COMPSCI in the Security menu may count as a second Systems core for this concentration only.  
  A grade of “B” or better must be achieved in all four cores. | 3. Students must take six additional courses as electives (18 credits). |
| 3. Students must take six additional courses as electives (18 credits). | 3a. Students must take four additional courses as free electives (12 credits);  
  3b. And students must take two additional courses (6 credits) as security electives from a Security menu.  
  - Unlike Item 2, they may be offered outside CICS.  
  - A grade of “B” or better must be achieved in these two security electives. | 3a. Two courses (6 credits) taken from among a set of courses designated as satisfying the Data Science Elective requirement;  
  3b. And one course (3 credits) taken from among a set of courses satisfying the Data Science Statistics requirement;  
  3c. And three additional courses as free electives (9 credits). |
| 4. No more than 9 credits total may come from courses outside of CICS. Credit for graduate courses from other departments and colleges must be approved by the GPD. | 5. No more than 18 credits may come from courses at the 500 level. 500-level classes taken to satisfy menu requirements fall into this group. | **6. At least 12 of those 18 credits must come from courses at the 600-900 level that are not independent studies. 600-level classes taken to satisfy menu requirements fall into this group.** |
| 6. At least 12 of those 18 credits must come from courses at the 600-900 level that are not independent studies. 600-level classes taken to satisfy menu requirements fall into this group. | **7. No more than 6 credits may be taken pass/fail.** | **7. No more than 6 credits may be taken pass/fail.** |
| 7. No more than 6 credits may be taken pass/fail. | **8. At most 12 credits from independent studies and/or a Master’s project (COMPSCI 701).** | **8. At most 12 credits from independent studies and/or a Master’s project (COMPSCI 701).** |
| **9. Classes with a grade below a “C” may not be counted toward the MS degree.** | **10. No more than 12 credits may be transferred from other programs or institutions.** | **10. No more than 12 credits may be transferred from other programs or institutions.** |
| 11. Overall grade point average for 30 MS credits must be 3.0 or higher. | **11. Overall grade point average for 30 MS credits must be 3.0 or higher.** | **11. Overall grade point average for 30 MS credits must be 3.0 or higher.** |
### Sample Schedule

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall I</strong></td>
<td>COMPSCI 590B; COMPSCI 590D</td>
<td>First systems core (via security menu); Theory core</td>
</tr>
<tr>
<td><strong>Spring I</strong></td>
<td>COMPSCI 660; 600-level elective; 500/600-level elective</td>
<td>Second systems core; First elective; Second elective</td>
</tr>
<tr>
<td><strong>Fall II</strong></td>
<td>COMPSCI 591L, COMPSCI 589, 600-level elective</td>
<td>First security elective; AI core; Third elective</td>
</tr>
<tr>
<td><strong>Spring II</strong></td>
<td>COMPSCI 591S, 500/600-level elective (Or instead COMPSCI 701 MS project for 6 credits)</td>
<td>Second security elective; Fourth elective</td>
</tr>
</tbody>
</table>