Deactivation Proposal
Bachelor of Science in Computer Science
CONCENTRATION(S) IN COMPUTER SCIENCE

Institution: Georgia State University
School/Division: College of Arts and Sciences
Department: Computer Science
Contact: Anu Bourgeois
Date of Submission: September 15, 2017
Name of Program to be Deactivated: Concentration(s) in Computer Software Systems, Databases and Knowledge-based Systems, Graphics and Human-Computer Interaction, Hardware Systems, Networks and Parallel and Distributed Computing, Theoretical Computer Science
Starting Date / Implementation term: Fall 2018

Rationale for change:

In an effort to assist the university with RPG, the CS Department believes that concentrations are no longer the effective option for CS majors. Our goal is to provide our students with as many course options available each semester as possible, without the reliance on when, and if, certain specific courses will be offered that count towards one of the current six concentrations. Additionally, the CS faculty are growing exponentially and the research specializations within the department is also changing rapidly. This means that, going forward, faculty members who could teach courses contained within a concentration are no longer in the department (this is true for the Graphics & Human-Computer Interaction concentration), while brand new faculty are interested in teaching courses that are not contained within one of the current six concentrations.

Certain concentrations have traditionally had low demand, resulting in a lower offering of the classes contained within, such as Hardware Systems (HWS) and Theoretical Computer Science (RSC). With a lower offering of these classes, it impedes the progress for the few students that do select these concentrations.

For the reasons described above, the CS department believes that is it far better to simply require a CS major to take five senior-level computer science elective courses – in addition to their foundational CS courses – to fulfill their degree requirements.

The CS Department is also submitting proposals to add two new undergraduate certificates in Cybersecurity and Data Science and we believe our concentrations will duplicate the certificate coursework. Other certificates may be proposed in the future. The certificates will be optional for students, and will thus not restrict their progress towards fulfilling the degree if there are
scheduling issues, or other concerns. Students will also be able to complete multiple certificates and enhance their marketability upon graduation.

With the proposed changes, the CS department does not believe that there will be an impact on current CS majors. The department plans to continue offering the elective classes as before. Our goal is to notify all undergraduate students of the decision to remove concentrations as soon as possible so that they can make appropriate plans. And most importantly, students who have not completed their programs will be advised by faculty, departmental staff, and university academic advisors regarding suitable options.

**Anticipated impact on other programs within the offering department, the college, or the university:** The CS Department does not believe that the formal deactivation/termination of concentrations will have any negative financial or administrative impact on the other departments, colleges, or the university at large.

**Additional resource requirements, if any, and budget implications (e.g., personnel costs, library acquisitions, computing/equipment costs, facilities and other operating costs, graduate student support). Intended method of funding additional costs if any:** No additional resources are required or requested.

**Offices, departments, committees, and individuals consulted during the development of the proposal:** College of Arts & Sciences Dean’s Office and CS Departmental Undergraduate Committee

**Approval path for program proposal, noting all formal department- or college-level votes:**

Department of Computer Science: Fall 2017

A&S Undergraduate Council: Fall 2017

Committee on Academic Programs:
3210 Computer Science

Programs Offered:

- Bachelor of Science in Computer Science
- Dual Degree Programs
  - Bachelor of Science and Master of Science in Computer Science
  - Bachelor of Science in Computer Science with the Master of Science in Health Administration (Health Informatics specialization)
  - Bachelor of Science in Computer Science with the Master of Science in Information Systems
- Minor in Computer Science
- Certificate of Cybersecurity
- Certificate of Data Science

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Computer science is the systematic exploration of all aspects of computation. Computer science as a discipline seeks to build a scientific foundation for topics such as computer design, computer programming and software, information processing, algorithmic solutions to problems, and the algorithmic process itself. Computer science provides underpinnings for today’s applications in industry, science, government, and business and prepares the foundation for tomorrow’s applications in ubiquitous computing, medical cures for diseases, and instant access to information by everyone.

The B.S. degree program in computer science provides preparation in the fundamental principles and processes of computation and training in applying these principles in application areas in industry, science, government, and business. The student completes a basic group of required courses in the early stages and chooses courses from several concentrations in the later stages to provide for appropriate breadth and depth of knowledge in the discipline.

A B.S. degree in computer science provides a good foundation for advanced studies at the M.S. or Ph.D. level as well as for careers in industry, science, government, and business. To plan the major according to particular goals, students are encouraged to consult with an adviser in the department. Majors who are interested in having a paid work experience related to their area of study should contact the university’s Office of Cooperative Education, which coordinates the university’s cooperative education programs.

The courses are structured, and the department enforces the prerequisites for its courses. Students are urged to check and take the prerequisites for computer science courses and any computer science requirement as listed by their major department/school/institute. Refer any questions to that major department/school/institute or to the Department of Computer Science.

Academic Advisement for Undergraduate Students

Academic advisement for undergraduate students is provided through the University Advisement Center (freshman through junior status/fewer than 90 hours) and the college’s Office of Academic Assistance (senior status/90 or more hours). See section 3040 for additional information.

Program Academic Regulations
A minimum grade of C is required in all mathematics, physics, and computer science courses and all 3000-level or above courses that are used to fulfill the undergraduate programs of this department.

As part of the core curriculum, students must receive credit for the two calculus courses: Math 2211 and Math 2212. (When counting the number of semester hours in Areas A, D, and F, only 3 of the 4 credit hours of each calculus course will be counted in Area A and/or D. The fourth hour, or the “rollover hour,” will be counted in Area F.)

Prerequisites and co-requisites are strictly enforced in all computer science courses.

**Program Degree Requirements**

In addition to the Program Degree Requirements, students must fulfill the College of Arts and Sciences Degree Requirements (see section 3030) and the University Degree Requirements (see section 1400).

**Major Eligibility Requirements**

Effective fall semester 2017, to be eligible for the Bachelor of Science in Computer Science and to enroll in major-level CSC courses (CSC 2720 Data Structures and all 3000- and 4000-level CSC courses), students must fulfill the following requirements:

- Complete the following courses with a grade of C or higher:
  - a. **CSC 1301** Principles of Computer Science I;
  - b. Either **CSC 2510** Theoretical Foundations of Computer Science or **MATH 2420** Discrete Mathematics; and
  - c. Either **MATH 1113**, **MATH 2211**, **MATH 2212**, or **MATH 2215**.

- Students must earn an average of 2.5 grade points across the three courses areas (a, b, and c). The GPA will be calculated based on the first attempt at the courses designated above at Georgia State University.

- Where more than one course may be taken toward fulfilling the requirement (items a and b above), the first attempt at the first course taken from the list will be used to calculate the major eligibility grade-point average. For example, in item c, if a student takes **MATH 1113** before taking **MATH 2211**, then the first attempt at **MATH 1113** will be used for the major eligibility GPA.

- WF s counts as an attempt. Ws do not count as an attempt. Courses retaken using the university Repeat to Replace policy are not counted as first attempts.

- If a student has AP credit for any course designated above, the course will not be used in this GPA calculation, even if the student chooses to take the course.

- Transfer students who transfer these course(s) into Georgia State, may use the grades in the transferred course(s) to calculate the GPA or they may attempt them once at Georgia State. Course taken at Georgia State’s Perimeter College count as first-attempts.

Once students are eligible to take major-level Computer Science courses (CSC 2720 and 3000- and 4000-level CSC courses), they remain eligible to take them as long as they are eligible to enroll at Georgia State University, and they satisfy other Computer Science program requirements. Students must meet any prerequisites for the specific 3000- or 4000-level course.

This requirement applies to students entering or re-entering the university in fall 2017 or thereafter, or to students who choose to follow the Computer Science program requirements in the undergraduate catalog for 2017-18 or thereafter. Students who have selected the Computer Science B.S. major but have not yet fulfilled the major eligibility requirement will be designated as Pre-Computer Science majors.

Students in majors other than Computer Science including those minoring in Computer Science, may enroll in major-level CSC courses as long as they meet any pre-requisites for the specific course.
B.S. in Computer Science

Core Curriculum Areas A-E Requirements and Recommendations

Area A:

- Required course: MATH 1113, or higher level MATH must be taken in Area A. A section of MATH 1113 Precalculus that is designated specifically for this major is recommended (see GoSolar listing to identify appropriate sections).

Area D:

- Required course: MATH 2211 Calculus I (4) (or a higher level mathematics course) (One credit hour counts in Area F or as an elective.)
- Recommended course: PHYS 2211 Principles of Physics I (4) and PHYS 2212 Principles of Physics II (4)

Area F: Courses Appropriate to the Major (18)

1. Carry over from Areas A and/or D (1-2):
   - Students will carry one additional credit hour over to Area F for each 4-credit-hour mathematics course taken in Area A and/or Area D.
2. MATH 2212 Calculus II (4) (unless taken in either Area A or D) (0-4)
3. Required courses: (11)
   - CSC 1301 Principles of Computer Science I (4)
   - CSC 1302 Principles of Computer Science II (4)
   - CSC 2510 Theoretical Foundations of Computer Science or MATH 2420 (3)
4. Select additional elective courses from the following to complete 18 hours in Area F:

   - All courses above ending in K are commonly offered as separate lecture and lab (L) courses by GSU’s Perimeter College. The combined (K) courses and separate lecture and lab (L) courses cover the same subject matter and are considered equivalent courses.
   - Any credit hours exceeding 18 earned to complete the Area F requirements will count toward elective hours.

Area G: Major Requirements (48)

1. Courses to fulfill CTW requirement (4):
   - CSC 4350 Software Engineering (4)
2. MATH 3030 Mathematical Models for Computer Science (3)
3. PHYS 2212K Principles of Physics II (4) (Unless already taken in Area D)
4. Computer Science Requirements (21):
   - CSC 2720 Data Structures (3)
5. For a total of twenty (20) hours, select at least five courses from the CSc elective courses at the 3000- or 4000-level. Note: No courses at or above CSc 4870 can count towards the Area G section without departmental approval.

Area H: Minor and/or Additional Courses (12)

1. Twelve hours of additional courses taken at the 2000-4000 level (12)
2. Students earning a B.S. in the Department of Computer Science are not required to complete a minor.
3. Additional courses must be taken as electives to complete a minimum of 120 semester hours.

Minor in Computer Science

Students choosing to minor in computer science should complete CSc 1302 and CSc 2720 and nine hours of additional computer science courses at the 3000 level or above. Consultation with an adviser in computer science is recommended. Students majoring in mathematics may not include CSc 4610 or CSc 4620 in the minor.

Certificate of Cybersecurity

Along with the emerging technologies such as Internet of Things, Cloud Computing, Internet etc. are the emerging cyber threats. There is a growing need for professionals who are skilled at keeping digital information and infrastructure safe. The certificate would develop expertise in network security, information security and cyber-crime in order to prevent and respond to large scale cyber threats and attacks. The certificate of cybersecurity is designed for students to offer tangible proof of their technical and strategic knowledge in cybersecurity.

The certificate consists of 16 credit hours at the 4000-level from a restricted set of courses listed below with an earned grade of B or higher in the first attempt at each course. All corresponding prerequisites will need to be met for the certificate courses. Courses retaken using the university Repeat to Replace policy are not counted as first attempts. Students must be declared as CSc majors.

1. Required courses (4):
   - CSc 4222 Intro to Cybersecurity
2. Select 3 of the following courses (12):
   - CSc 4220 Computer Networks
   - CSc 4221 Wireless Networks and Mobile Computing
   - CSc 4224 Ethical Hacking
   - CSc 4225 Internetwork Programming
   - CSc 4360 Mobile App Development

Certificate of Data Science
With the proliferation of social networks and mobile computing and emerging areas of Internet of Things (IoT), cyber sensing and networking technologies, generating and collecting data has become ubiquitous. The computation and analysis of such large amounts of data have become increasingly important for today’s global and competitive economy. Businesses and industries are striving to use data analytics, data mining, machine learning and statistical models to make better data-driven decisions. As a result, a significant growing demand exists for scientists trained in managing large data sets, developing and utilizing computer systems/software to process data, extracting knowledge or insights from data in various forms and modeling predictive analytics.

The certificate consists of 16 credit hours at the 4000-level from a restricted set of courses listed below with an earned grade of B or higher in the first attempt at each course. All corresponding prerequisites will need to be met for the certificate courses. Courses retaken using the university Repeat to Replace policy are not counted as first attempts. Students must be declared as CSc majors.

1. Required courses (4):
   - CSc 4780 Predictive Data Analytics
2. Select 3 of the following courses (12):
   - CSc 4710 Database Systems
   - CSc 4730 Data Visualization
   - CSc 4740 Data Mining
   - CSc 4760 Big Data Programming
   - CSc 4850 Intro to Machine Learning

Cooperative Education and Internship Programs

The department participates in the University’s Cooperative Education program, in which students rotate between being a full-time student and working in paid, full-time professional positions. Details are available on the department’s website.

The department also encourages students to seek out relevant internships to enhance their preparation for careers related to Computer Science. We offer elective credit, to count towards Area H requirements, subject to department approval.

Critical Thinking Through Writing Requirement

As of summer 2015, all students are required to complete one Critical Thinking Through Writing (CTW) course as part of the major. The university formerly required two CTW courses. Students following previous catalog requirements who have passed one CTW course in the major should consult with their senior academic adviser to determine which courses may be used as a substitution for the other formerly required CTW course. Information on senior advisement in the Office of Academic Assistance is available at cas.gsu.edu/undergraduate/senior-advisement-90-credit-hours/.

Dual Bachelor’s/Master’s Degree Programs

The department offers the following dual degree programs, the last two in partnership with the J. Mack Robinson College of Business:

- Bachelor of Science and Master of Science in Computer Science
- Bachelor of Science in Computer Science with the Master of Science in Health Administration (Health Informatics specialization)
- Bachelor of Science in Computer Science with the Master of Science in Information Systems

Students must be formally accepted into the dual degree program by the participating departments and colleges to be able to take graduate courses as an undergraduate. Additionally, acceptance into the dual program does not
constitute admission to the master's program. Students must fulfill regular graduate admissions requirements and apply for the master’s program following college processes.

Information about the dual program, including application instructions and program requirements, can be found at cas.gsu.edu/dual-degrees/.

**Graduation with Distinction in the Major**

This unit offers undergraduate students with the opportunity to earn the designation of graduation with distinction in the major. Please contact the undergraduate director for the specific criteria for this honor.