Program Assessment Report (PAR)

Computer Science, BA (CS) Baccalaureate Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2021-2022

I. PROGRAM LEARNING OUTCOMES

The Bachelor of Arts in Computer Science program shares most of its outstanding features with the department's externally accredited Computer Science BS and Computer Engineering BS programs. The distinguishing feature of the CS BA program is a focus on the application of computing to a diverse range of domains. The CS BA program requires less mandatory course work towards developing mathematically rigorous scientific-method based skills. Instead, the CS BA program provides opportunity for students to develop knowledge in other domains in which computing is applied. These potential domains of interest include not only the sciences, but also business, the arts, health care, or any other area of university study. Recognitions of quality of the program This program is supported by the same faculty, core course sequence, and assessment infrastructure as the department's externally accredited (ABET) Bachelors of Science programs in Computer Science and in Computer Engineering. As such, there is no doubt that the graduates of this program receive a high quality experience similar in outcome to our BS programs. Student Learning Outcomes used for Assessment Data Collection Students who complete the BA in computer science will have (a)an ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline (b) an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution (c) an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs (d) an ability to function effectively on teams to accomplish a common goal (e) an understanding of professional, ethical, legal, security and social issues and responsibilities (f) an ability to communicate effectively with a range of audiences (g) an ability to analyze the local and global impact of computing on individuals, organizations, and society (h) recognition of the need for and an ability to engage in continuing professional development (i) an ability to use current techniques, skills, and tools necessary for computing practice (j) an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way

that demonstrates comprehension of the tradeoffs involved in design choices (k) an ability to apply design and development principles in the construction of software systems of varying complexity ABET released new Student Learning Outcomes that will be used for the next accreditation visit in 2022. They are being reviewed by faculty. Graduates of the program will have an ability to 1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. 2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. 3. Communicate effectively in a variety of professional contexts. 4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. 5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline. 6. Apply computer science theory and software development fundamentals to produce computing-based solutions. [CS] PROGRAM EDUCATIONAL OBJECTIVES Program educational objectives describe what graduates are expected to attain within a few years after graduation. Three to five years after matriculation, graduates of our Bachelor of Arts in Computer Science program will be Expert Graduates of the Computer Science program are employable as computing professionals and will be recognized by their employers as well-prepared for their career in computing. Adaptive Graduates understand that education is a lifelong process and are well prepared for continuing studies. Engaged Graduates demonstrate an appreciation for the professional, social, ethical, and leadership roles of computing professionals. Applied Graduates can apply computing and software development principles to a diverse range of domains, such as analytics, data science, informatics, management, etc.

II. PROCEDURES USED FOR ASSESSMENT

A. Direct Assessment

Assessment of retained relevant knowledge. Formative data is collected in online multiple-choice prerequisite quizzes to assess retained prerequisite knowledge required for courses in the mandatory program introductory core. This data is used both by the UGSC to monitor program quality as well as by individual instructors to help identify students that are struggling with the required knowledge/skills so that they can receive appropriate support or advice. The formative assessments focus on discipline-specific knowledge and skills that are expected to be retained as students progress along the prerequisite introductory core course sequence. As such, these assessments focus on • Prior CS (CAC) learning objectives assessed abcijk • Current CS (CAC) learning objectives assessed 1, 2, 6 Assessments of retained relevant knowledge (Prerequisite quizzes) This assessment strategy utilizes GRE-style multiple choice quiz questions to directly assess formative learning objectives. These assessment instruments are not delivered in the courses where the topics are taught. Instead, the program instruments achievement of student outcomes by assessing the ability of students to demonstrate mastery of prerequisite knowledge engendered in precursor courses. The direct assessment questions are delivered to students in the form of an on-line "assessment of prerequisite knowledge" in each of their core program courses. At a minimum, the program expects each

outcome to be measured in at least two places over the course of every three-year period. In practice, however, the ease of delivery of the on-line assessment allows us to target the significantly higher goal of directly assessing every student, every term, in every core course. The pre-course assessment tools attempt to formatively assess learning objectives dealing with knowledge of computer science principles and relevant concepts from other disciplines, the ability to analyze data, design/construct computational solutions to problems, recognition of design/algorithmic trade-offs, and knowledge of contemporary tools. Course Topic areas for prerequisite questions CAC SOs CS1181 Computer Science II Fundamental Programming Concepts, Mathematical Preparedness 1, 2, 6 CEG2350 OS Concepts & Usage First-year programming concepts 1, 2, 6 CS3100 Data structures and algorithms First-year programming concepts, computer organization, fundamental operating systems concepts, discrete structures, 1, 2, 6 CEG3310 Computer Organization First-year programming concepts, 1, 2, 6 CEG4110 Software Engineering Data structures 1, 2, 6 No less often than once every three years the UGSC considers summaries of this data, collected each term. In practice, this data is automatically summarized and examined every term and any flagged concerns can be brought forward as soon as they are detected. The Prerequisite Data Summary Report for Fall 2019 is attached. We are having difficulty with the tool used to summarize the data for Spring 2020. We are working on a solution to the problem. The UGSC is working on adding CEG 4110- Introduction to Software Engineering to the assessment reporting instrument. The course is pinned so advisors can conduct senior year checks for students in this program.

B. Scoring of Student Work

Formative data is collected in online multiple-choice prerequisite quizzes to assess retained prerequisite knowledge required for courses in the mandatory program introductory core. These assessment instruments are not delivered in the courses where the topics are taught. Instead, the program instruments achievement of student outcomes by assessing the ability of students to demonstrate mastery of prerequisite knowledge engendered in precursor courses. The direct assessment questions are delivered to students in the form of an on-line "assessment of prerequisite knowledge" in each of their core program courses. At a minimum, the program expects each outcome to be measured in at least two places over the course of every three-year period. In practice, however, the ease of delivery of the on-line assessment allows us to target the significantly higher goal of directly assessing every student, every term, in every core course. Questions are taken from professionally-developed assessment instruments, such as the GRE subject test in computer science, and scored according to the provided answer keys associated with these instruments.

C. Indirect Assessment

Exit surveys are used to collect graduating student assessment of self-efficacy for each of the learning outcomes. For each outcome students are asked to rate their own level of ability/achievement. For FA19 and SP20, student responses generally indicated a high self-assessment of abilities related to program outcomes. These self-efficacy ratings did not exhibit any concerning trends relative to previous years. See attached documents, ExitSurveyF19.pdf and ExitSurveyS20.pdf, for full details including descriptive statistics and distribution plots.

III. ASSESSMENT RESULTS/INFORMATION:

Prerequisiste Quzzes, see attached file, PrerequisiteDataSumaryReport F19.pdf

see graphs in PrerequisiteDataSumaryReport F19.pdf

Student learning outcome j was flagged as a concern. The UGSC is reviewing the data. No other actions are indicated.

IV. ACTIONS TO IMPROVE STUDENT LEARNING

This data is used both by the UGSC to monitor program quality as well as by individual instructors to help identify students that are struggling with the required knowledge/skills so that they can receive appropriate support or advice. The UGSC faculty and student advisors review all program courses every three years to ensure that course pre-requisites are relevant, student learning objectives are accurate and sequential courses are aligned. Technical electives are reviewed and new courses created as needed to ensure coverage of emerging technologies. Student grades are analyzed to flag courses where students are having difficulties so course coordinators can identify any problems and adjust the course content or learning strategies. A student advisory board that consists of a cross-section of students from all CSE majors and levels meet with the undergraduate program director at least once a year. Plans are shard and students give input on what is working and suggestions for improvements. Similarly, an external advisory board comprised of business leaders and alumni meet with the department chair and program faculty to give program suggestions and feedback. CSE was the first department to build active learning classrooms. We have found that students, especially in introductory level courses, embrace this learning style. This is reflected in the course comments as well as student advisory board meetings. We continue to convert classrooms to support the active learning pedagogy. Most recently with the transition to remote learning, many faculty use the breakout rooms to continue to incorporate active learning in distance mode. New faculty members and adjuncts are assigned to faculty mentors. The department system administration team periodically meets with the UGSC and department chair to discuss the state of the labs to offer courses in modern,

up-to-date laboratories that meet the needs of the ever changing technological requirements. Our systems team stood up a Discord server to foster communication between students, faculty and advisors during the quarantine. We have received high praise as students use the site for study groups, help room assistance and to connect with their peers.

V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.