Program Assessment Report (PAR)

Computer Engineering (CEG) Baccalaureate Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2021-2022

I. PROGRAM LEARNING OUTCOMES

The Bachelor of Science in Computer Engineering (BSCE) was established in 1981. It has been continuously accredited by the ABET Engineering Accreditation Commission(EAC) since 1987. ABET Criterion 3 Student Outcomes used for assessment data collection. (a) an ability to apply knowledge of mathematics, science, and engineering (b) an ability to design and conduct experiments, as well as to analyze and interpret data (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (d) an ability to function on multidisciplinary teams (e) an ability to identify, formulate, and solve engineering problems (f) an understanding of professional and ethical responsibility (g) an ability to communicate effectively (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (i) a recognition of the need for, and an ability to engage in life-long learning (j) a knowledge of contemporary issues (k) an ability to use the the techniques, skills, and modern engineering tools necessary for engineering practice 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 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors 3. an ability to communicate effectively with a range of audiences 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet

objectives 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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 CE (EAC) learning objectives assessed abcek • Current CE (EAC) learning objectives assessed 1, 2, 6 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. Senior Design. Summative data is collected in the senior design experience (CEG 4890/4891 Team Projects I and II). These courses, generally taken in the senior year, are the most convenient place to assess overall student learning achievement. Team Projects I assesses all learning objectives, except for the outcomes that are difficult to assess individually in a team-based course and are already well assessed elsewhere in the program. • Team Projects I, Prior CE (EAC) learning objectives assessed All except (b) • Team Projects I, Current CE (CAC) learning objectives assessed All except 6 See the three attached files - Fall 2019 data for Overview of Team Projects - Spring 2020 data for Overview of Team Projects - Overview of Team Projects (senior design)

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 Quizzes, see attached file, PrerequisiteDataSumaryReport F19.pdf Team Projects Capstone, see attached file,

See graphs in PreequisiteDataSumaryReport 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.