**Dordt College Engineering Department**

**Faculty Course Assessment Report**

**Course:** EGR 304

**Instructor:** De Boer

**Semester:** Spring 2020

**Assessment of Department Student Learning Outcomes**

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| Student  Learning  Outcome  (SLO) | | Does this course have goals related to this SLO? (Y/N) | Score (1/2/3) only if course goals are related to this SLO | Scale | | |
| 1 | 2 | 3 |
| One or more course goals are related to this outcome, but very few activities and/or assignments are included to accomplish it. | Activities and/or assignments are conducted related to this outcome, but student participation levels, performance, and self-report, along with faculty observation and reflection indicate that these activities need to be modified or implemented differently. | Activities and/or assignments that are related to this outcome are working well and achieving the intended results, based on student participation levels, performance, and self-report along with faculty observation and reflection. |
| Course goals, activities, and assignments… | | |
| 1 | Educational Breadth and Worldview | N |  | … challenge students to make connections to the broader curriculum beyond engineering fundamentals. | | |
| 2 | Faithfulness and Responsibility | N |  | … engage students in the spectrum of modal aspects that contribute to normative technology. | | |
| 3 | Societal and Historical Context | N |  | … develop student appreciation of the importance of the broader context of historical, cultural, and societal development. | | |
| 4 | Life-Long Learning | N |  | … challenge students to commit to life-long learning and develop the skills necessary to do so. | | |
| 5 | Problem Solving and Critical Thinking | Y | 3 | … develop problem solving and critical thinking skills. | | |
| 6 | Engineering, Math, and Science Fundamentals | Y | 3 | … develop engineering, math, or science fundamentals. | | |
| 7 | Experimental Design and Analysis | Y | 3 | … pertain to experimental design and analysis. | | |
| 8 | Engineering Design | Y | 3 | … challenge students to develop technological designs and solutions for open-ended problems. | | |
| 9 | Engineering Skills and Tools | Y | 3 | … develop skills necessary for professional engineering practice. | | |
| 10 | Teamwork | N |  | … develop or utilize teamwork skills. | | |
| 11 | Communication | N |  | … develop or utilize communication in oral, written, or graphical forms. | | |

What went well? (assignments, tests, labs, in-class activities, etc.)

The textbook by Lee and Seshia, Introduction to Embedded Systesm: A Cyber-Physical Systems Approach, 2nd edition, was adopted. The textbook was the basis for about a quarter to a third of the course content. This worked well. A modules on security and message brokering were added to the course. That also worked well.   
In the previous offering (Spring 2017), the programming language used was changed from C to Python. The hardware platform used in the lab was changed from the Arduino to the Raspberry Pi. Additionally the course was changed from a junior-level course offered every spring to a sophomore-junior level course offered in the spring of odd calendar years only. These changes were recommended by the computer science department and the engineering department but were not initiated by the instructor. These changes did not work out very well in the opinion of the course instructor. For the Spring of 2020 the course was reverted back to the Arduino Uno hardware platform with most of the programming in C. Some attention and lab time was given to the Raspberry Pi platform and the Python language to cater to cater partially to the recommendations from the Computer Science department. This hybrid approach worked much better than trying to swing the whole course over to Python. (Teaching real-time systems via Raspberry Pi and Python is not a good match but does work well for some “Internet-of-Things” concepts.)

Due to the alternate-year scheduling of this course nominally half of the class is now a year younger (especially in terms of prior courses taken) than the other half. In this semester’s offering of the course and it turned out that there were two seniors and ten juniors and no sophomores. This is a much better level of maturity to work with than the sophomores and juniors that populated the course in the last offering, Spring 2017. This contributed greatly to the success of this semester’s offering of the course.

What are your proposed actions for identified weaknesses? (i.e. outcomes with 1 or 2 ratings)  
  
The previous deficiencies experienced in the Spring of 2017 have been addressed. This semester’s offering of the course went very well and was a pleasurable and rewarding course for the instructor to teach.

Additional thoughts/comments:  
The gains made in terms reverting back to the C language and the Arduino platform (or an equivalent platform offering real-time control of the hardware), the junior/senior mix of students instead of the sophomore/junior mix should be retained for future offerings of this course.

This course was taught during the Covid-19 pandemic of 2020. After spring break the course was taught online in a synchronous manner. The normal class meetings at Noon to 12:50 PM CDT were continued and mediated by Zoom.com. The labs on Wednesday afternoons were also continued in a synchronous manner. The instructor found three students who were still on campus at the end of Spring Break an had them raid the electronics lab for equipment and take the equipment home with them. Then the instructor re-organized the lab from six teams of two people each to three teams of four people each so that each team had one member who had taken equipment home. The instructor maintained synchronous meetings of the lab sessions an put the students in Zoom breakout rooms according to their teams. The student with the equipment was able to follow guidance from his team members, share video of the apparatus performing (or more frequently, miss-performing, requiring the team to diagnose possible problems and propose improvements), others on the team were able screen-share code and edit code as a group, etc. The instructor circulated among the breakout rooms to observe and guide their progress. All three teams had successful projects of about the same scope and difficulty as would have happened in a face-to-face lab.

This FCAR was prepared on May 6, 2020 without insight from any of the student evaluations of instruction.