

Course Outcomes Guide

Course Title: Fundamentals of Electricity ELE 110

Date: May 2018

Course Team: Juan C Luna

Expected Learning Outcomes:

- Identify hazards of electrical circuits and be able to work safely.
- Explain the concepts of current flow, AC/Dc Circuits and Ohm's Law.
- Troubleshoot basic electrical circuits using schematic diagrams.
- Explain the operation and application of common components such as AC and DC motors, relays, switches, power supplies.
- Perform basic industrial wiring and troubleshooting.

Assessment:

At the end of the Spring 2018 semester, the instructor administered an ELE110 assessment exam. The assessment exam covers all course outcomes. Data from the most recent assessment is analyzed, and compared to previous semesters.

Validation:

The course outcomes and assessment tool for Fundamentals of Electricity (ELE 110) are consistent and aligned with recommendations from the following IEEE publications:

- Merging Pedagogical Approaches: University of Glasgow-UESTC Joint Education Program in Electronics and Electrical Engineering. K. Meehan et al. Frontiers in Education Conference (FIE), 2014 IEEE. 978-1-4799-3922-0
- Intelligent Performance Assessment of Students' Laboratory Work in a Virtual Electronic Laboratory Environment. Achumba et al. IEEE TRANSACTIONS ON LEARNING TECHNOLOGIES, VOL. 6, NO. 2, APRIL-JUNE 2013
- Assessment of undergraduate electrical engineering laboratory studies. G. Carter et al. IEEE PROC, Vol. 127, Pt. A, No. 7, SEPTEMBER 1980

The final grade comprises a combination of homework, lab activities, with several exams in between. A final assessment exam can determine the overall comprehension of the subject, although it will not measure other components typical of lab activities, like team player skills, hands-on expertise. The final assessment exam cannot measure homework effort and time management skills. Nevertheless, the final assessment exam can be an expected consequence of the effort put into the lab and homework activities.

Results:

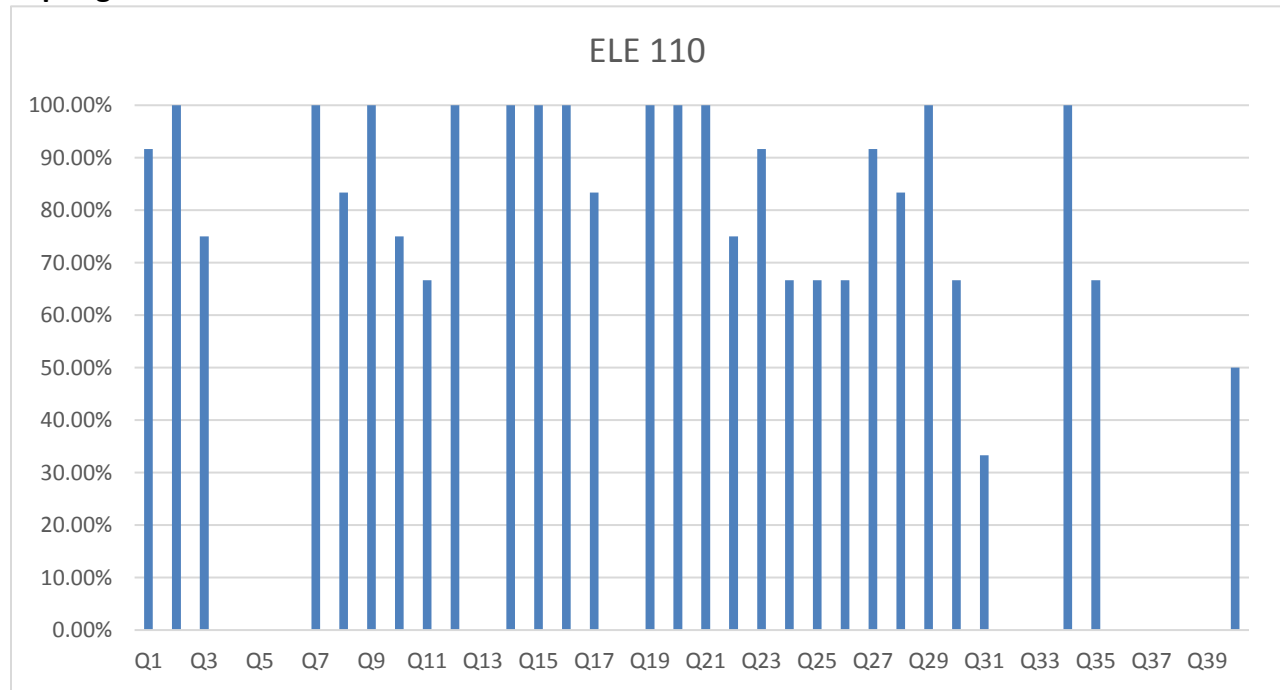
Assessment Final Exam Results: Spring 2018

The overall average score for the exam was 79.1%, the median was 77.50%, and the highest score was 92.50%. The sample size was 12 for the Spring 2018 semester.

Out of 40 questions, 29 questions were the most relevant to measure course outcomes.

The breakdown by relevant course outcome question is shown in the chart below.

Spring 2018. N=12



Average Relevant Course Outcome Question: 83.9%

Strengths & Weaknesses:

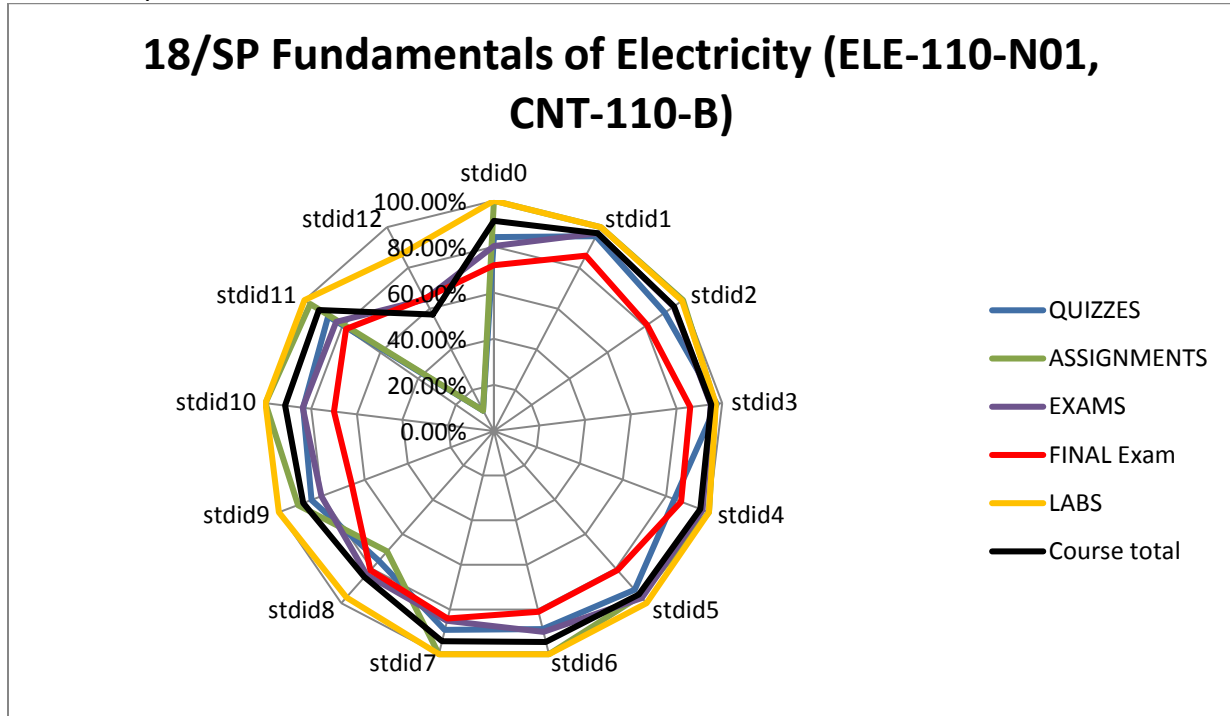
Based in the data, most students perform extremely well in questions pertaining to

- Identify hazards of electrical circuits and be able to work safely.
- Explain the concepts of current flow, DC Circuits and Ohm's Law.
- Troubleshoot basic electrical circuits using schematic diagrams.
- Explain the operation and application of common components such as AC and DC motors, relays, switches, power supplies.
- Perform basic industrial wiring and troubleshooting.

AC circuits and complex circuit calculations are questions that most students are performing on or below average level as it is expected from freshman electrical engineering students.

Assessment Final Grade Results: Spring 2018

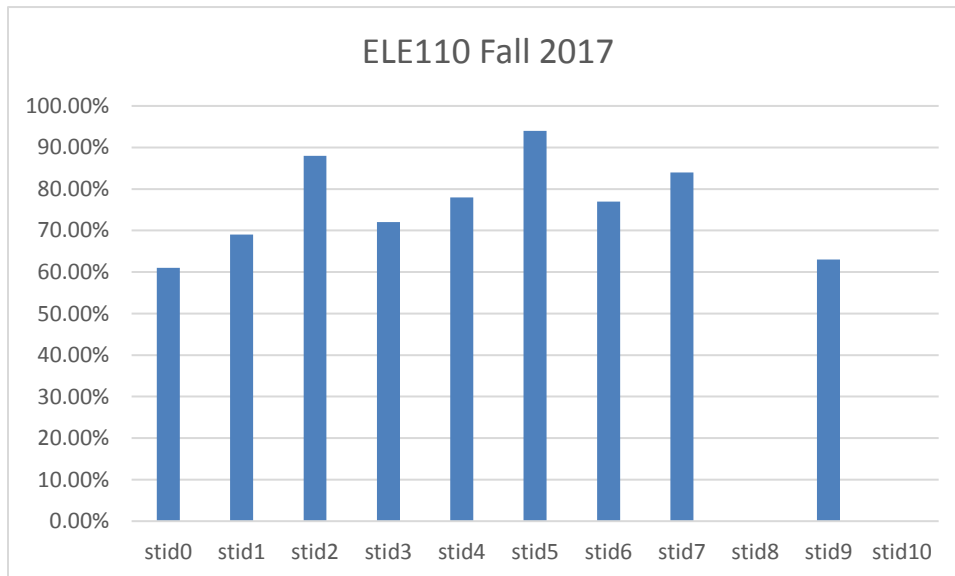
As it was expected the final grade is highly correlated with completion of assignments, lab activities, quizzes and exams.



From the above graph, it can be shown that the student (stdid12) that did not complete assignments, and had less lab activity eventually ended up performing poorly in exams, quizzes, and final exam. The final course result for the student was a failing grade. This data shows how important are all the core assessment components.

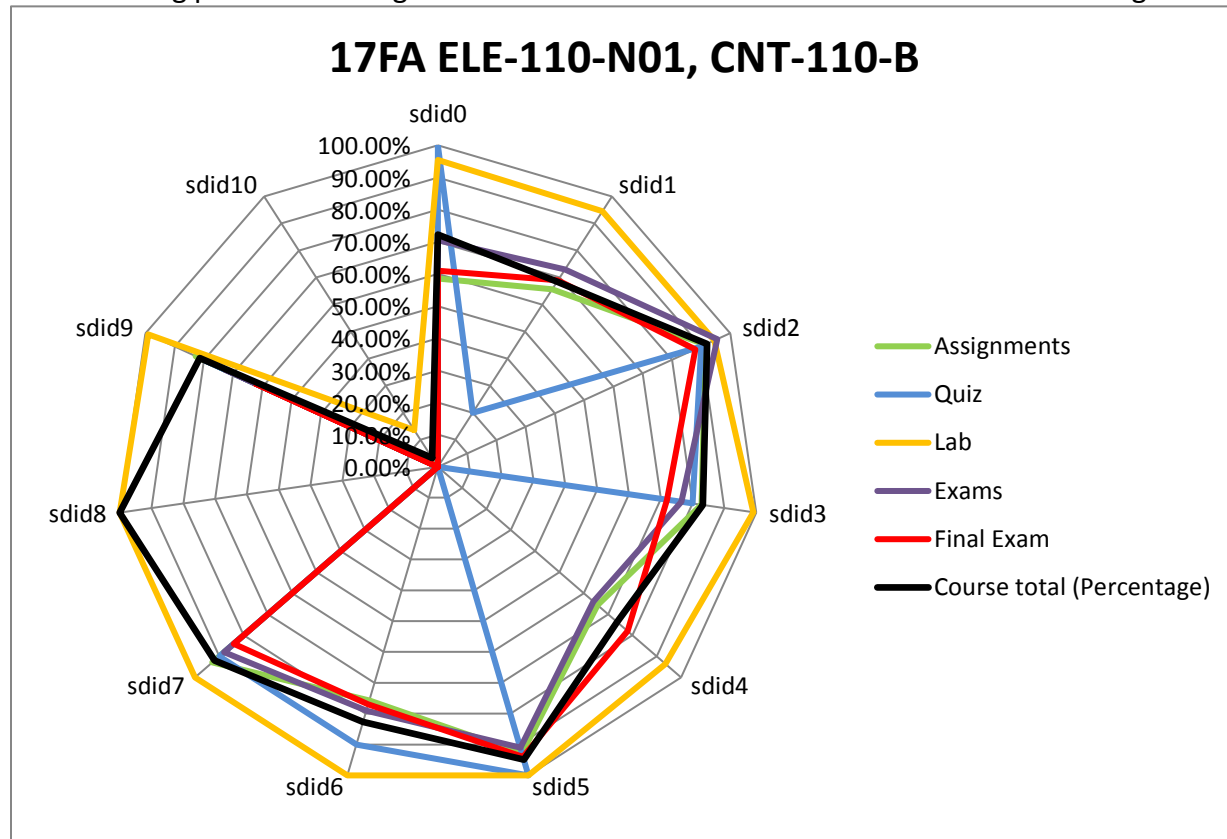
COMPARISONS TO PREVIOUS SEMESTERS:

Fall 2017: N=10



ELE 110- Fall 2017 assessment scores do not have a breakdown of most relevant questions to course outcomes in the final exam. Breakdown of course outcome questions in the exams was not performed on Fall 2017. The bar chart shown above (ELE 110- Fall 2017) plots the final grade as a whole.

The following plot shows the grade correlation between the different assessment categories.



ELE110-Fall2017 shows the same tendencies as ELE110-Spring2018. There are only two data points worthy of explanation: stdid8 is a continuing education student, and stdid10 is a drop.

Completion of all core categories was assuring completing course outcomes with success.

There was also a change in the textbook for this course. The new textbook (Electricity for the Trades-Petruzella) had the advantage to provide virtual labs with Multisim, allowing the students to perform simulations at home while presenting their assignments.

Follow-up

- The data will be evaluated to improve teaching techniques
- The results will be used to alter the course content to focus on areas were students had the most issues

Budget Justification

No additional resources needed.