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## 2020 BSEE Electrical Engineering

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# Major-AP-ELEG-Electrical Engineering (BSEE)

2020

Completed

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## Institutional Mission

Arkansas Tech University is dedicated to student success, access, and excellence as a responsive campus community providing opportunities for progressive intellectual development and civic engagement. Embracing and expanding upon its technological traditions, Tech inspires and empowers members of the community to achieve their goals while striving for the betterment of Arkansas, the nation, and the world.

## Program Mission

The mission of the Department of Electrical Engineering at Arkansas Tech University is to develop and educate students to become electrical or computer engineers exhibiting professional competency and ethics, with a desire for life-long learning.



Program Learning Outcomes		Expectations/Target for this Outcome	Findings/Results
<p><b>1 Calendar Year Assessment Information</b>                      2020 Calendar Year</p> <p>Persons contributing to this year's assessment: 1) Carl Greco 2) Matthew Young</p> <p>APPROVALS_____ Department Head Approval:                      _____ Date: _____ Dean Approval: _____ Date: _____ Office of                      Assessment Approval: _C. Austin. Date: _8.27.21 _____</p> <p>(**NOTE**. This block provides a brief description of actions taking place (or planned to take place) during the academic year. If there are more (or less) outcomes assessed, please alter as necessary. Additional comments are also welcome.) Program Level Context: (ex. Second year using Weave Assessment Management System, or ADHE Program Review conducted on 3/15/20) Student Learning Outcomes Assessed during AY2020-21 (Add more as necessary): Outcome 1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics Curriculum Committee Proposals or Changes (erase choice not used): Y / N Assessment Data Used as Support for Change: (give Outcome #) Is Status of Project Noted in Title Bar Current? (erase choice not used): Y / N Change status in title bar above Are All Attachments Noted in Assessment Plan Added Below? (erase choice not used): Y / N From Dean review (7/15/21): It is unclear how the program measures the</p>			

Program Learning Outcomes		Expectations/Target for this Outcome	Findings/Results
<p>specified outcomes. They do not appear to have specific performance measures tied to the outcomes. These performance measures should be consistently measured over time to track student performance. Rather than reporting aggregate data, the results from each assessment instrument should be recorded. Aggregation of data makes it difficult to determine where students are successfully meeting outcomes and where changes are needed to foster student achievement. In addition, the program should specify how the students are to successfully meet an outcome.</p>			
<p style="text-align: center;">Outcome has action plan</p> <p>1.1 Complex Engineering Problems (ABET Student Outcome 1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics Complete list of ABET Student Outcomes: 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.</p> <p><b>ACTION PLAN</b></p>	<p>1.1.1 Academic Performance in Selected Courses  Performance on selected tests and quiz problems and projects.</p>	<p>1.1.1.1 <b>Met</b>  At the Introductory level, student must be able to identify complex engineering problems  Seventy percent of the students are expected to meet this outcome.</p>	<p>Assessment was performed in ELEG 2103: Electric Circuits I. Student achieved a 82% success at the Introduce level. The cumulative median pass rate for all the required electrical engineering courses was 91.3% in Spring and 86.9% in the Fall. See the  <b>REFLECTION ON FINDINGS AND RECOMMENDATIONS FOR NEXT STEPS</b>  Students met the expectation. No action is recommended.</p>

Program Learning Outcomes		Expectations/Target for this Outcome	Findings/Results
<p>Students were successful at the Introduce and Master level but unsuccessful at the Reinforce level. Modify the course delivery in ELEG 3103 used to assess the Reinforce level. The following remedial actions will be taken in ELEG 3103: • Devote more lecture classes to diodes, mosfets, and bjt theory and application. (This will be accomplished by taking a device-first approach to teaching electronics). • Devise a scheme to require students to complete more problem-solving with diodes, BJTs, and transistors. • Implement more hands-on activities with the Analog Discovery II platform involving diodes, BJTs, and MOSFETs.</p> <p>DUE no due date set</p>		<p>1.1.1.2 <b>Not Met</b></p> <p>At the Reinforce level students must be able to formulate complex engineering problems</p> <p>Seventy percent of the students are expected to meet this outcome.</p>	<p>Assessment was performed in ELEG 3103: Electronics I. At the Reinforce level students achieved a 58% success.</p> <p><b>REFLECTION ON FINDINGS AND RECOMMENDATIONS FOR NEXT STEPS</b></p> <p>The following remedial actions will be taken:</p> <ul style="list-style-type: none"> <li>• Devote more lecture classes to diodes, mosfets, and bjt theory and application. (This will be accomplished by taking a device-first approach to teaching electronics).</li> <li>• Devise a scheme to require students to complete more problem-solving with diodes, BJTs, and transistors.</li> </ul>

Program Learning Outcomes		Expectations/Target for this Outcome	Findings/Results
			<ul style="list-style-type: none"> <li>Implement more hands-on activities with the Analog Discovery II platform involving diodes, BJTs, and MOSFETs.</li> </ul>
		<p>1.1.1.3 <span style="background-color: #92d050; padding: 2px;">Met</span></p> <p>At the Master level they must be able to solve complex engineering problems. Assessment was performed in ELEG 4113: Digital Signal Processing.</p> <p>Seventy percent of the students are expected to meet this outcome.</p>	<p>Student achieve 97% success at the Master level.</p> <p><b>REFLECTION ON FINDINGS AND RECOMMENDATIONS FOR NEXT STEPS</b></p> <p>Students met the expectation. No action is recommended.</p>

### Project Attachments (3)

Attachments	File Size
 Assessment_Report_ELEG_2020_2021.docx	22KB
 Weave_2020_SO1.pdf	80KB

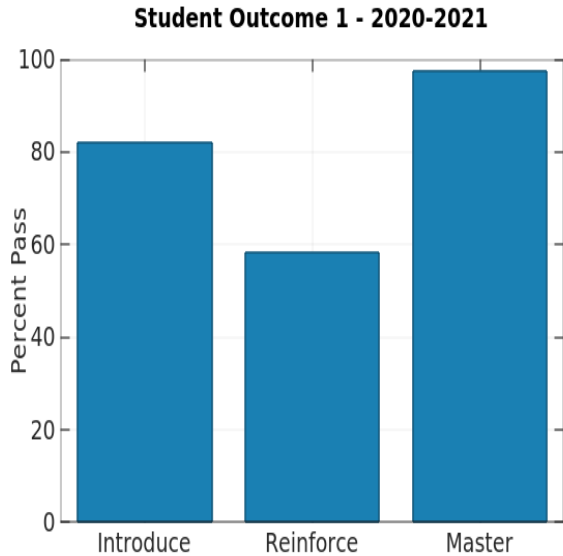
## **Bachelor of Science in Electrical Engineering Assessment Report for 2020-2021**

### **Outcomes**

The Electrical Engineering program and the Electrical Engineering with the Biomedical Option are accredited based on the following seven student outcomes [The 2021-2022 *Criteria for Accrediting Engineering Programs*]:

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.

The 2020-2021 assessment report will address student outcome 1.



*Figure 1: Student Outcome 1 in the Electrical Engineering degree program for 2020-2021.*

Data for the Introduced results were taken from ELEG 2103: Electric Circuits I in the Spring 2021 semester. The Reinforce data came from ELEG 3103: Electronics I in the Fall 2020 semester, and the Master data was obtained from ELEG 4113: Digital Signal Processing in the Fall 2020 semester.

**Action Plan:**

The following remedial actions will be taken to address the deficiencies in ELEG 3103.

- Devote more lecture classes to diodes, mosfets, and bjt theory and application. (This will be accomplished by taking a device-first approach to teaching electronics).
- Devise a scheme to require students to complete more problem-solving with diodes, BJTs, and transistors.
- Implement more hands-on activities with the Analog Discovery II platform involving diodes, BJTs, and MOSFETs.

# Electrical Engineering

## Student Outcome 1

The summary of student outcomes for the time period Spring 2015 (201520) through Spring 2021 (202120) are presented as box plots for each Fall and Spring semesters. Box plots display non-parametric (non-Gaussian distributed) skewed data where the top of the box is the upper quartile (Q3 or 75<sup>th</sup> percentile), the lower edge is the lower quartile (Q1 or 25<sup>th</sup> percentile), and the middle (red) line is the median (Q2 or 50<sup>th</sup> percentile). The whiskers are defined as following: the upper whisker is the highest datum below  $1.5 \cdot \text{IQR} + Q3$ , and the lower whisker is the lowest datum above  $Q1 - 1.5 \cdot \text{IQR}$  where the Interquartile (IQR) range is defined as  $Q3 - Q1$ . Data points outside the range defined by the upper and lower whiskers are outliers and represented by open circles in the graphs.

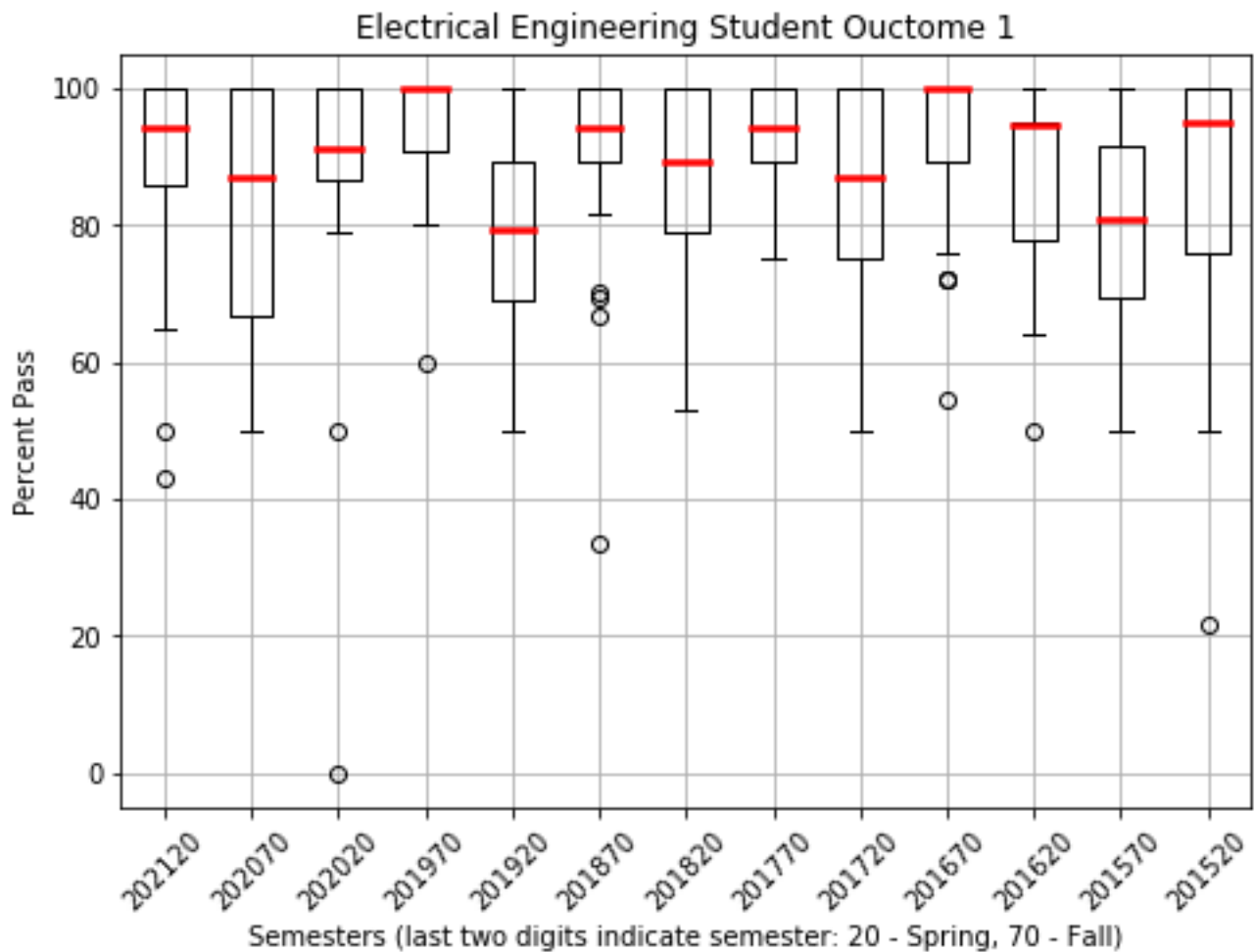


Figure 1: Percent Pass for Student Outcome 1.



Table 1: Student Outcome 1: Number of measures (n), and median percent pass

semester	202120	<b>202070</b>	<b>202020</b>	201970	201920	201870	201820	201770	201720	201670	201620	201570	201520
n	33	<b>27</b>	<b>30</b>	30	19	30	32	22	25	27	11	17	27
median	94.1	<b>86.9</b>	<b>91.3</b>	100.0	79.3	94.1	89.2	94.3	87.0	100.0	94.4	80.8	95.0

Outliers (Data Outside box plot range) for the last three semesters

Student Outcome 1:

Semester 202120:

- ELEG 2103: Electric Circuits I, Solve simple 1<sup>st</sup> and 2<sup>nd</sup> order circuits, 42.9% pass
- ELEG 3143: Electromagnetics. Solve problems involving transmission line concepts, 50% pass.

Semester 202070:

- ELEG 2103: Electric Circuits I, Solve simple 1<sup>st</sup> and 2<sup>nd</sup> order circuits, 52.2% pass. (displayed as the bottom whisker on the graph)

Semester 202020:

- ELEG 2113: Electric Circuits II, AC Steady-state circuit analysis and power calculations, 50% pass.
- ELEG 3143: Electromagnetics, Solve problems involving plane waves, 0% pass.