Institutional Effectiveness Report

Name of Program/Department:	**Programs: Physics, Industrial Engineering** **Department: Physics and Engineering**
Year:	**2019-2020**
Name of Preparer:	**Larry Engelhardt**

Mission Statement

The Department of Physics and Engineering seeks to offer courses in astronomy, engineering, physical science, and physics that are taught by full-time faculty members with appropriate advanced degrees dedicated to science education at the University level. The faculty strive for excellence in instruction, research, and discipline-related service to the community. The courses offered in the department range in level from introductory courses that expose non-science majors to scientific thought to advanced courses that cover contemporary topics in physics and engineering. The laboratory experience is required in appropriate courses to illustrate the importance of experimentation to the scientific endeavor and engineering profession. For the majors in the department, the opportunity to undertake undergraduate research is offered and professional internships are encouraged. Majors graduating from programs in the department are expected to be proficient in oral and written communication, familiar with the scientific and engineering literature, and aware of the importance and usage of technology in science and engineering. Students completing the majors offered by the department will be prepared for careers in industry and scientific research or for graduate school.

Computational Physics and Health Physics

Program Learning Outcomes

The department seeks to produce Computational (CP) and Health Physics (HP) graduates who:

1. possess a thorough understanding of the physical principles on which the universe operates.
2. can apply physical principles in solving problems related to the physical world, which includes using computers to model physical systems and processes (CP).
3. are experienced in research activities, including the interpretation and communication of results.
4. possess a thorough understanding of the types, sources, detection, and measurement of ionization radiation, the biological effects of such radiation, and of the methods of reducing human exposure (HP).
5. recognize the importance of intellectual honesty, professional ethics, and personal integrity in the pursuit of knowledge and personal goals alike.

Executive Summary

Understanding of introductory physics concepts was assessed in PHYS 201 and PHYS 202. In PHYS 201, this assessment was challenged by the COVID19 pandemic. In one of the sections of PHYS 201, the assessment was not able to be completed as planned due to the sudden change to online courses; and in the other section of PHYS 201, the assessment benchmarks were not reached, which was likely due to the sudden change to online instruction and assessment. In PHYS 202, students continued to struggle with the assessment questions. Based on last year's results, we modified the questions to try to make the questions less confusing, but students still struggled. We are in the process of developing specific activities to help students to better understand these difficult concepts, as discussed in the "Action Items" on page 6.

Upper-level physics students demonstrated – in both direct and indirect assessments – that they were both competent and confident in their technical skills and in their preparation for future endeavors. The Health Physics (HP) majors completed a direct assessment of their HP-specific knowledge; whereas the Computational Physics (CP) students were not able to complete their direct assessment due to the pandemic.

Concerning the Industrial Engineering program, assessment activities follow the ABET guidelines. The program has received ABET accreditation and will continue to be evaluated by ABET. Of the 7 Program Learning Outcomes (PLOs), student performance met all 7 of the PLOs.

The Mechanical Engineering (ME) program just began in Spring 2020 and will seek ABET accreditation after it becomes eligible. (ABET requires a program to have graduated students prior to review.) Current ME students were assessed in several courses, and most of the PLOs were met. Some of the PLOs were not able to be assessed due to the sudden (pandemic-induced) change to online instruction; and one of the PLOs was not met, which is likely due to this change to online instruction.

For the General Education courses, the students' experimental skills and their interpretation of experimental results was assessed. In each category, the students did reach the benchmark of 70%, but had the most difficulty in "developing an empirical equation that describes a particular relationship". The faculty who teach Physical Science labs will discuss ways to emphasize this relationship between experimental data and mathematical equations.

Student Learning Outcomes (Physics)

SLO#1.0: Students will demonstrate knowledge of introductory physics concepts.
Benchmark performance: Students in Physics 201 will, on average, answer 70% of the post-test questions correctly in each category.

SLO#2.0: Students will demonstrate knowledge in upper-level physics concepts.
Benchmark performance: 90% of students will demonstrate gains in post-test scores given at the end of PHYS 418 and PHYS 406 compared to pre-tests administered at the start of PHYS 316 and PHYS 306.

SLO#3.0: Students will be able to use modern laboratory techniques to measure and analyze experimental data.
Benchmark performance: 90% of our graduates will indicate on an exit survey that they feel very competent or fairly competent with regard to their laboratory skills.

SLO#4.0 Students will be able to competently present technical information via both oral and written communication.
Benchmark performance: 90% of the students in Physics 419, and will receive a score greater than 80/100 based on a faculty assessment of their oral presentations.

SLO#5.0 Students will demonstrate competency in physics-relevant computer skills.
Benchmark performance: 90% of our graduates will indicate on an exit survey that they feel very competent or fairly competent with regard to their computational skills.

SLO#6.0: Students will have an appreciation for physics including its significance and practical relevance.
Benchmark performance: Greater than 70% of the responses given by our graduates on the Colorado Learning Attitudes About Science Survey will be “expert-like”.

SLO#7.0: Students will be prepared for a career or further study upon completion of the program.
Benchmark performance: 90% of our students will indicate on an exit survey that they feel very competent or fairly competent as to how well they think the program has prepared them for a career or further education after college.

SLO#1 Students will demonstrate knowledge of introductory physics concepts.

In PHYS 202, a 6-question pre/post instruction survey was administered. (The survey is included in Appendix A.) The pre-instruction results are on papers that are not currently accessible but will be included later this summer, and we will include a comparison between these pre/post instruction results at that time. N = 34 students took the post-test, and this group was short of the 70% benchmark on 5 of the 6 questions (post-test averages: 65%, 18%, 26%, 38%, 15%, 94%). See "Action Items" on page 6 for additional details.

In PHYS 201, a 3-question pre/post instruction survey was administered. (The survey is included in Appendix B.) N = 24 students took the pre-test, and N = 20 students took the post-test. On all three questions, students showed significant gains. For Question 1 (understanding acceleration), the number of students with the misconception that "acceleration" only refers to "speeding up" decreased from 46% (pre) to 5% (post); and the number of students who correctly indicated that acceleration includes both speeding up *and* slowing down increased from 33% (pre) to 70% (post). For Question 2 (understanding Newton's 1st Law), the number of correct responses increased from 4% (pre) to 25% (post), but was still well short of the 70% benchmark. For Question 3, the number of students who were able to correctly apply Newton's 3rd Law increased from 13% (pre) to 50% (post), showing a large gain, but not quite reaching the 70% benchmark.

SLO#2 Students will demonstrate knowledge in upper-level physics concepts.

Students choosing to major in Physics choose a concentration in either Health Physics (HP) or Computational Physics (CP), so we separately assess HP and CP students for their upper-level physics knowledge. For HP, an assessment (Appendix C) was administered at the beginning of PHYS 316 as a pre-test and at the end of PHYS 418 as a post-test. Four students took the post test, and two students took the pre-test. We just started this assessment last year, so the students who took the post-test did not take this corresponding pre-test, so we are not able to state pre/post gains for this cohort of students. For the students who took the post-test, 3 out of the 4 students scored at least 70% on the assessment, with an average score of 68% for the 4 students. For the two students who took the pre-test, their average score was 50% and neither student exceeded this 70% threshold. Due to COVID19 changes, the CP assessment was not administered.

SLO#3 Students will be able to use modern laboratory techniques to measure and analyze experimental data.

An exit survey (Appendix D) was administered to the graduating physics majors which was completed by N = 5 out of the six physics graduates. All 5 respondents indicated that they felt either very competent (80%) or fairly competent (20%) in their acquired laboratory skills, which did meet the benchmark for this SLO.

As a direct measurement of experimental skills, the ability of students to connect an electric circuit containing resistors in parallel was measured in the PHYS 202 Laboratory. For several years, we have used an assessment activity that involves the insertion and proper use of a meter to measure the electric current delivered to a specified resistor, and students have consistently struggled with this assessment. This year, we revised this assessment (Appendix E), and broke the activity into two parts: Part 1) constructing the parallel circuit without a meter, and Part 2) constructing the same circuit but with a meter properly inserted. N=32 students did the assessment, and 31 students (97%) completed Part 1 correctly, but only 7 students (22%) completed Part 2 correctly. Knowing this result will help us to better emphasize instruction on how to insert the meters as described on page 6.

SLO#4.0 Students will be able to competently present technical information via both oral and written communication.

In PHYS 419, students completed a scientific literature review and presented their findings as both a written report and an oral presentation. (Appendix F includes the rubrics used for assessing both the written reports and the oral presentations.) There were N = 11 students who received an average score of 82% on their written reports and an average score of 88% on their oral presentations. The oral presentations were assessed by multiple faculty using a common rubric (Appendix F), and 91% of the students (10 out of 11) scored better than 80% on their oral presentations. This did meet our benchmark that 90% of the students will receive a score greater than 80% based on a faculty assessment of their oral presentations.

In an exit survey (Appendix D) that was completed by N = 5 out of six of the physics graduates, 100% of the respondents indicated that they felt either very competent (60%) or fairly competent (40%) in giving presentations of scientific/technical work; and 100% of the respondents indicated that they felt either very competent (60%) or fairly competent (40%) in technical writing. This did meet our benchmark of 90% of graduates feeling at least fairly competent in these skills.

SLO#5.0 Students will demonstrate competency in physics-relevant computer skills.

In an exit survey (Appendix D), that was completed by N = 5 out of six of the physics graduates, 4 of the respondents (80%) indicated that they felt either very competent (20%) or fairly competent (60%) with regard to their computational skills. This fell short of our benchmark of 90% of graduates feeling at least fairly competent in these skills, although this was only one student that indicated not feeling competent. In past years we have also delivered a direct assessment of computational skills to the Physics majors who graduate with a concentration in Computational Physics; but due to the pandemic, we did not deliver this direct assessment to the two students who graduated with a concentration in Computational Physics.

SLO#6.0: Students will have an appreciation for physics including its significance and practical relevance.

The Colorado Learning Attitudes About Science Survey (CLASS) was completed by five of the six graduating physics majors. (www.colorado.edu/sei/class) The percentage of 'expert-like' responses for these graduating seniors was 78%. The benchmark for this assessment is 70%, and for reference, this assessment was also administered in Physics 200 (to N=29 underclass students) who had 51% 'expert-like' responses.

SLO#7 Students will be prepared for a career or further study upon completion of the program.

In an exit survey (Appendix D), that was completed by N = 5 out of six of the physics graduates, 4 of the respondents (80%) indicated that they felt very well prepared for future studies or for future employment, and 1 respondent (20%) felt not very well prepared. (Benchmark: 90%)

Action Items (Physics)

SLO#1.0: Students will demonstrate knowledge of introductory physics concepts

This was assessed in both PHYS 201 and PHYS 202. In PHYS 201, the assessment difficulties were likely due to the pandemic, so we are not specifying any action to be taken. In PHYS 202, students have struggled to meet the benchmark on this assessment for several years. Last year, we suspected that the students' difficulty was due to the assessment questions being unnecessarily confusing, so we attempted to clarify the questions, but this did not help. Several of the questions on the assessment (Questions 1, 2, and 4 of Appendix A) deal with the dynamics of charged particles, so we will include activities in both the lecture and lab portions of PHYS 202 to attempt to clarify these concepts. There are many opportunities for student confusion here (e.g., confusing electric & magnetic fields, confusing "right hand rules", and not having a sufficiently strong grasp of vector concepts) which will be addressed in lecture through additional think-pair-share activities; and in lab, activities will be added that will allow students to observed (and interact with) charged particle dynamics using computer simulations.

SLO#3.0: Students will be able to use modern laboratory techniques to measure and analyze experimental data.

On an exit survey, all of the graduating physics majors indicated that they felt competent in their laboratory skills; but at the introductory level, most students are not able to pass our assessment of experimental skills (Appendix E). Almost all of the students were able to construct a parallel circuit without much difficulty, but only 22% of the students were able to insert a meter to measure current. We will address this in PHYS 202 lab by adding multiple new activities where the student will add a meter to a circuit in order to measure current in different locations. Due to the pandemic, this coming fall every student will purchase their own lab kit which will include a multimeter, so this might provide a good opportunity to make sure that every student becomes competent at using their multimeter. (In the past, a student could have relied on a lab partner.)

Industrial Engineering Program

Program Learning Outcomes (PLOs)

The Program Learning Outcomes for the Industrial Engineering (IE) program at FMU have been developed as a representation of acknowledged and anticipated needs of the program's constituents. Internally, they are referred to as Program Educational Objectives (PEOs), as to follow the Accreditation Board for Engineering and Technology (ABET). These learning outcomes also represent and support the educational mission of Francis Marion University, the Department of Physics and Engineering, and the IE Program. These objectives are statements of expected accomplishments of Industrial Engineering graduates within 3-5 years of graduation:

a) Obtain an advanced degree (e.g., MS, MBA, PhD) at an accredited institution.

b) Spearhead/lead a corporate project or research initiative (e.g., Six Sigma, facility acquisition/location).

c) Organize or significantly support structured community outreach/education efforts and activities.

d) Acquire skills/knowledge through certification in areas not on the IE degree plan.

With an emphasis on development and retention of local talent (e.g., Pee Dee Region), the PEOs emphasize career responsibility and advancement, dedication to life-long learning, and a desire to support and develop the social and community structures where program graduates reside. Repeatedly, these three areas (pursuit of career opportunities, life-long learning, and community service) became the focal point of conversation with program constituents when discussing their ideal FMU IE graduates.

Student Learning Outcomes (SLOs)

The Industrial Engineering program follows the expected outcomes from the Accreditation Board for Engineering and Technology (ABET) for student assessment. These seven outcomes are a modification of previous ABET outcomes and were implemented in the Industrial Engineering curriculum in the Fall of 2019. In addition, the outcomes support the program educational objectives and represent expected student capabilities upon graduation.

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 Student Outcomes are intended to enable students to achieve the program's PEOs within 3-5 years of completion of the BSIE degree. As illustrated in Table 1, each student outcome supports at least three PEOs.

Table 1. Mapping of Relationship Between Student Outcomes and Program Educational Objectives

			Student Outcomes							
			1	2	3	4	5	6	7	Total
Program Educational Objectives (PEOs)	Obtain Advanced Degree from Accredited Institution	a	X					X	X	**3**
	Lead Industrial Project/ Research	b	X	X	X	X	X	X		**6**
	Organize or Engage in Community Outreach Efforts	c		X	X	X	X			**4**
	Acquire skills/knowledge through certification in areas not in the ME curriculum	d			X	X		X	X	**4**

When interpreting the importance of student outcomes in achieving PEOs, it is helpful to consider how the absence of a given, mapped, outcome may influence attainment of the corresponding PEO. As an example, students unable to demonstrate proficiency in student outcome a) 'an ability to apply knowledge of mathematics, science, and engineering' would almost certainly be unable to obtain an advanced degree (Masters, PhD, MBA) and would likely be deemed unfit to spearhead/lead a major corporate initiative (these two PEOs require proficiency and skill in math, science and engineering). This same student, however, would certainly be able to organize community activities and acquire certifications (many non-technical certification opportunities exist for motivated individuals to pursue). In this way, the PEOs are intrinsically supported by those indicated student outcomes, which are deemed essential to PEO attainment.

Assessment Methods

The industrial engineering program evaluates student performance using the eleven outcomes required by the Accreditation Board for Engineering and Technology (ABET). These outcomes are measured at least twice throughout the academic year in more than one course. In addition, all specific outcomes for each course are measured twice during the same semester (Start of Semester and End of Semester). Table 2 illustrates the framework used for evaluating student performance, including the mapping of all Student Outcomes to engineering courses (ENGR) and the illustration of measurement through the four-year curriculum of the program.

Table 2. Map of Student Outcomes Assessment for Industrial Engineering Curriculum

			ABET Student Outcomes							
Semester/year	Course	Title	**1**	**2**	**3**	**4**	**5**	**6**	**7**	***Total***
Sp1	101	Intro to Engineering			×	×	×			3
Sp1	201	Engineering Graphics		×					×	2
Sp2	220	Materials		×						1
Fa2	301	Mechanics	×			×				2
Sp2	355	Production/Operations Mgmt						×		1
Fa3	310	Electronics								0
Fa3	320	Statistics			×			×		2
Sp3	330	Engineering Economy				×				1
Fa3	350	Manufacturing Processes					×	×	×	3
Sp4	356	Quality Control						×		1
Sp3	373	Operations Research	×		×					2
Fa4	420	Human Factors		×		×	×			3
Fa4	467	Supply Chain	×							1
Fa4	468	Production Planning								0
Sp4	470	Facility Design		×						1
Sp4	480	Senior Design	×	×	×	×	×	×	×	7
Varies	397	Research in IE								0
Varies	497	Special Topics								0
		Total	4	5	4	5	4	5	3	

Instructors can evaluate students by either assigning specific work that assesses these outcomes or by selecting work or portions of work that are required for course credit(s). Each work evaluation is graded using a qualitative scale of: *excellent, acceptable, or unacceptable.* The measure used to evaluate student performance is the *percentage of students who perform equal or better than "acceptable" by the end of each course*. The target for this measure is **70%**.

Assessment Results

The summary of the data gathered for the academic year 2019-2020 is shown in Figure 1. As the figure depicts, none of the outcomes reflected to be below the target measure of 70%. This is consistent with the outcomes obtained for the academic year 2018-2019.

Based on these results, no immediate action will be taken to improve instruction in the courses where the outcomes were measured. However, as a continuous improvement method, the faculty of the program will evaluate the student outcomes and where they are currently being measured and make changes as needed to the map previously shown in Table 2.

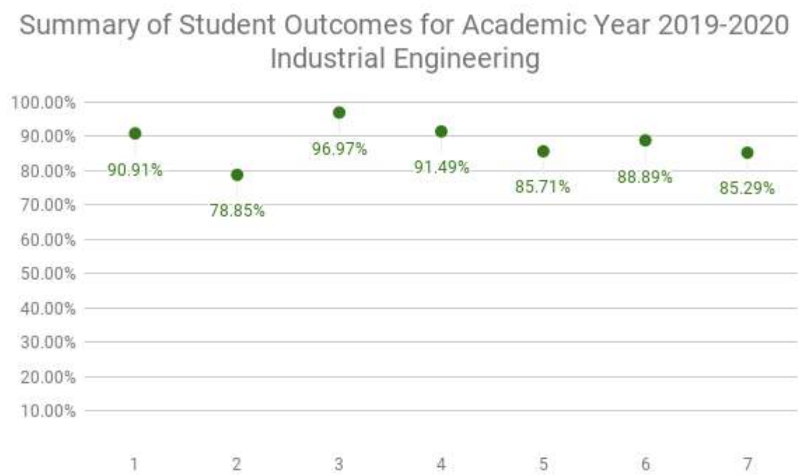


Figure 1. Summary of Student Outcomes Assessments

Table 3 provides a detailed view of the results by outcome, specifying the courses in which they were measured. This table allows faculty to act on those courses in which the number of students performing at the "unacceptable" level seems to be significant. In addition, it reflects some of the negative effects from the COVID-19 pandemic.

For example, in the course ENGR 101, Introduction to Industrial Engineering, the student outcomes were not measured at the end of the semester, as they tackle abilities that students develop while being in a classroom and collaborating with others. This was a direct effect of the pandemic.

Mechanical Engineering Program

Program Learning Outcomes (PLOs)

FMU's Mechanical Engineering (ME) program, which began in Spring 2020, has PLOs that have been developed as Program Educational Objectives (PEOs). These were developed as a representation of acknowledged and anticipated constituency needs and also serve to support the educational mission of Francis Marion University and the ME Program. These objectives are statements of expected accomplishments of Mechanical Engineering graduates within 3-5 years of graduation.

1. **Apply engineering skills to solve complex technical problems and make decisions based on objective analyses.**
2. **Employ technical communication, leadership, and teamwork skills to lead projects.**
3. **Pursue further education and/or training (graduate studies, licensures, certification etc.)**
4. **Serve the community by engaging in outreach activities.**

With an emphasis on development and retention of local talent (e.g., Pee Dee Region), the PEOs emphasize career responsibility and advancement, dedication to life-long learning, and a desire to support and develop the social and community structures where program graduates reside. Repeatedly, these three areas (pursuit of career opportunities, life-long learning, and community service) became the focal point of conversation with program constituents when discussing their ideal FMU ME graduates.

Student Learning Outcomes (SLOs)

The Mechanical Engineering program assesses students on the following seven outcomes, following the expected outcomes from the Accreditation Board for Engineering and Technology (ABET). These outcomes represent expected student capabilities upon graduation.

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.**

Assessment Methods

The ME program evaluates student performance using the seven outcomes from the Accreditation Board for Engineering and Technology (ABET). These outcomes are measured at the end of each semester, at least. Data from these assessments are used to identify opportunities to improve the curriculum as well as individual course content. **Table 3** (on the next page) illustrates the mapping of all Student Outcomes to mechanical engineering courses.

Table 3: ABET Student Outcome Platform for FMU Mechanical Engineering

			ABET Student Outcomes							
Semester/Year	**Course**	**Title**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Sp1	101	Intro to Engineering			x	x	x			3
Sp1	201	Engineering Graphics		x					x	2
Sp2	220	Materials Eng.		x						1
Fa2	301	Engineering Mechanics	x			x				2
Sp2	250	Mechanics of Materials	x	x					x	3
Fa3	310	Electronics								0
Fa3	320	Statistics			x			x		2
Sp3	330	Engineering Economy				x				1
Fa3	350	Manufacturing Processes					x	x	x	3
Sp3	370	Fluid Mechanics	x			x				2
Sp4	402	Sys. Dynamics and Controls		x						1
Fa4	400	Thermo and HMT			x		x	x		3
Fa4	401	Design of Mechanisms	x	x					x	3
Fa4	468	Production Planning								0
Sp4	411	Design for Manf. & Assembly		x		x			x	3
Sp4	480	ME Senior Design	x	x	x	x	x	x	x	7
Varies	397	Research in IE								0
Varies	497	Special Topics								0
		Total	5	7	4	6	4	4	6	

Instructors can evaluate students by either assigning specific work for accreditation or by selecting work or portions of work that are required for course credit(s). Each work evaluation is graded using a qualitative scale of: excellent, acceptable, or unacceptable. The measure used to evaluate student performance is the percentage of students who perform equal or better than "acceptable" by the end of each course. The target for this measure is 70%.

Assessment Results and Action Items

FMU's Mechanical Engineering curriculum shares the following courses with its Industrial Engineering curriculum: ENGR101 (Introduction to Engineering), ENGR201 (Engineering Graphics), ENGR220 (Materials Engineering), ENGR301 (Engineering Mechanics), ENGR310 (Electronics), ENGR320 (Statistics for Engineers), ENGR330 (Engineering Economy), ENGR350 (Manufacturing Processes), and ENGR468 (Production Planning).

While assessing Student Outcomes in the above-mentioned shared courses, data was gathered that would help instructors differentiate ME students' responses from those of IE students. The assessment results presented below are based on the responses from ME students alone, and therefore represent assessment results of the ME program only.

Table 4: Summary of End of Semester Student Outcomes for Academic Year 2019-2020 (by Course) – Mechanical Engineering

Semester	Course	Outcomes Measured	Excellent	Acceptable	Unacceptable	% >= Acceptable
Spring 2020	ENGR101	3	0	0	0	n/a
		4	0	0	0	n/a
		5	0	0	0	n/a
	ENGR201	2	4	9	5	72.22%
		7	6	6	6	66.67%
	ENGR220	2	6	10	0	100%
	ENGR250	1	3	4	0	100%
		2	3	3	1	85.71%
		7	3	2	2	71.43%

Table 5: Summary of Student Outcomes for Academic Year 2019-2020 (by Outcomes) – Mechanical Engineering

Outcomes Measured	Excellent	Acceptable	Unacceptable	% >= Acceptable
1	3	4	0	100.00%
2	13	22	6	85.37%

Outcomes Measured	Excellent	Acceptable	Unacceptable	% >= Acceptable
3	n/a	n/a	n/a	n/a
4	n/a	n/a	n/a	n/a
5	n/a	n/a	n/a	n/a
7	9	8	8	68.00%

Table 4 shows assessment results for the ME program by course, and **Table 5** shows assessment results from the ME program by outcome. Outcome 7 for ENGR201 was below the predetermined 70% threshold. The results for Outcome 7 in **Table 5** are also below 70%. The sudden transition to online instruction (due to COVID19) caused was hypothesized to be the cause for subpar performance. Based on this, the engineering faculty conclude that there is no need to make changes. ENGR101 Student Outcomes were not assessed at the end of the Spring 2020 due to COVID19 limitations. However, data was collected at the beginning of the semester, and this is presented in **Table 6**.

Table 6: ENGR 101 Student Outcomes Assessment - Spring 2020

Outcome	Excellent	Acceptable	Unacceptable
3	4	13	2
4	4	12	3
5	8	9	2

In addition to the results and conclusions above, the faculty also determined that program-specific inferences may be difficult to make from outcome data from early engineering courses (first three semesters), where students still have opportunity to change program declaration. Many students in first three semesters are still determining which program is best suited to them.

Table 7. Summary of Student Outcomes Assessment by Course for Academic Year 2019-2020

Semester	Course	Outcomes Measured	Excellent	Acceptable	Unacceptable	% >= Acceptable
Fall	*ENGR301*	1	6	6	1	**92.31%**
		4	6	4	3	**76.92%**
	ENGR320	3	3	8	0	**100.00%**
		6	8	2	1	**90.91%**
	ENGR350	5	8	2	1	**90.91%**
		6	6	5	0	**100.00%**
		7	5	6	0	**100.00%**
	ENGR420	2	6	7	0	**100.00%**
		4	5	8	0	**100.00%**
		5	10	2	1	**92.31%**
	ENGR467	1	6	3	0	**100.00%**
Spring	*ENGR101*	3	0	0	0	**n/a**
		4	0	0	0	**n/a**
		5	0	0	0	**n/a**
	ENGR201	2	2	5	5	**58.33%**
		7	2	5	5	**58.33%**
	ENGR220	2	1	2	3	**50.00%**
	ENGR330	4	6	3	1	**90.00%**
	ENGR355	6	3	2	1	**83.33%**
	ENGR356	6	7	7	1	**93.33%**
	ENGR373	1	8	3	0	**100.00%**
		3	7	3	1	**90.91%**
	ENGR470	2	5	5	0	**100.00%**
	ENGR480	1	5	3	3	**72.73%**
		2	6	2	3	**72.73%**
		3	5	6	0	**100.00%**
		4	3	8	0	**100.00%**
		5	8	0	3	**72.73%**
		6	3	5	3	**72.73%**
		7	8	3	0	**100.00%**

Action Items

Actions from 2018-2019 assessments:

From last year's assessment, the IE faculty found opportunities with outcome i of the previous ABET outcomes. As a reminder, outcome *i* targeted student "*recognition of the need for, and an ability to engage in life-long learning"*. With the implementation of the new ABET outcomes (1-7), this opportunity was not pursued further.

Opportunities from 2019-2020 assessments:

The student outcomes assessment by course reflected that outcomes 2 and 7 were under the target level in the courses ENGR 201 and 220. After discussion, faculty believes that the sudden transition to online instruction affected these student outcomes. No changes will be implemented to course instruction, as this is believed to be a direct effect of the COVID-19 pandemic.

General Education

The department assesses its general education offerings in the PSCI 101 (Physical Science I) course, specifically its laboratory component. Relevant goals of the university's general education program are identified and assessed, such as the abilities to test scientific principles and draw conclusions supported by experimental data.

Applicable General Education program goals include:

#3: The ability to use technology to locate, organize, document, present, and analyze information and ideas.

#5: The ability to use fundamental mathematical skills and principles in various applications.

#6: the ability to demonstrate an understanding of the natural world and apply scientific principles to reach conclusions.

Measureable Outcome	Pre-Test Results (N=75)	Post-Test Results (N=68)
1. Identify all testable variables that might affect desired property (cart's acceleration, pendulum's time period) **Gen Ed goals: #3, #6**	7.1	8.4
2. Design experimental tests to eliminate (rule out) variables that do not affect the desired property. **Gen Ed goals: #5, #6**	6.2	7.2
3. From experimental results, identify trends in the data related to variables that do have a significant effect on the desired property, such as direct or inverse relationships. **Gen Ed goals: #5, #6**	5.0	7.2
4. Demonstrate proficiency in the data collection and analysis process; accurate measurements and computations. **Gen Ed goals: #3, #5, #6**	7.0	8.2
5. Identification and minimization of sources of experimental errors, both random and systematic; computation of *percent difference* or *percent error* where appropriate. **Gen Ed goals: #3, #5, #6**	5.3	8.8
6. Demonstrate ability to draw valid conclusions based on experimental results; recognize strengths and limitations of experimental process. **Gen Ed goals: #3, #6**	5.3	7.3
7. Where appropriate, develop an empirical equation that describes a particular relationship (such as that between the pendulum's length l and its time period T). **Gen Ed goals: #3, #6**	N/A	7.0

Scoring follows a 1-10 scale, 10 being the highest score. Benchmark: 7/10 (70%).

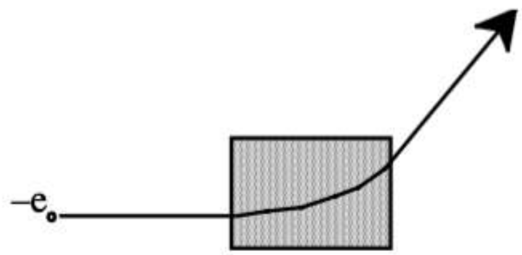
Benchmark: Students will score at least 7/10 (70%) on each of the seven measurable outcomes being assessed.

Commentary/Actions

Students demonstrated measurable growth and improvement on each of the tested items, and the benchmarks were met for all seven of the items. Moreover, for most of the items (#1, 4, 5, 6), the results improved from last year to this year. For Item #7, the benchmark was barely met, which was a slight decrease from 76% last year to 70% this year. The faculty who teach Physical Science labs will discuss ways to emphasize this relationship between experimental data and mathematical equations.

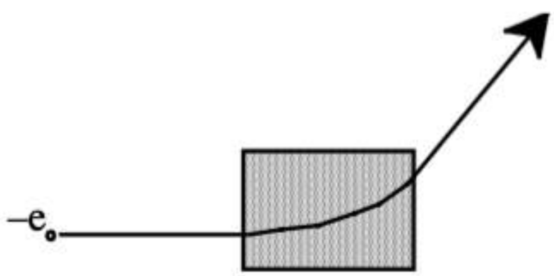
Appendix A: Physics 202 Pre/Post Instruction Survey

Question 1:
A moving electron travels along the path shown. It passes through a region of electric field (shown as the gray rectangle). There are no other charges and no other electric fields. In what direction is the electric field in the gray region?



a) To the right
b) To the top of the page
c) To the left
d) To the bottom of the page
e) Out of the page
f) Into the page
g) None of the above

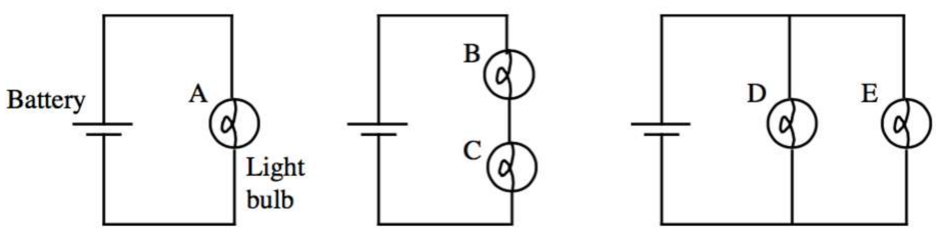
Question 2:
A moving electron travels along the path shown. It passes through a region of magnetic field (shown as the gray rectangle). There are no other charges and no other electric fields. In what direction is the magnetic field in the gray region?



a) To the right
b) To the top of the page
c) To the left
d) To the bottom of the page
e) Out of the page
f) Into the page
g) None of the above

Question 3:

In these three circuits, all the batteries are identical and have negligible internal resistance, and all the light bulbs are identical.

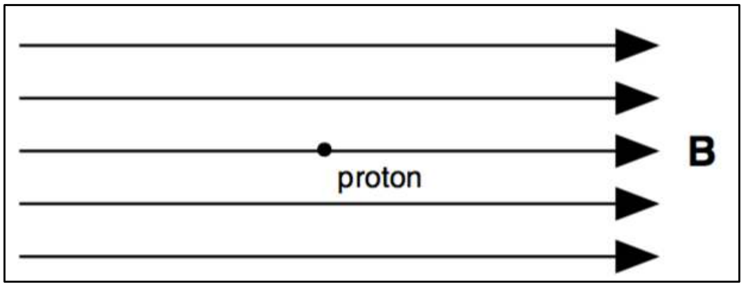


Q11 Rank all 5 light bulbs (A, B, C, D, E) in order of brightness from brightest to dimmest.

(a) A = B = C > D = E
(b) A > B = C = D = E
(c) A > B = C > D = E
(d) A > B > C > D = E
(e) A = D = E > B = C
(f) A = D = E > B > C
(g) A > D = E > B = C
(h) D = E > A > B = C
(i) None of the above

Question 4:

A proton sits in a region of constant magnetic field (shown below with arrows). There are no other charges present. What is the direction of the initial magnetic force on the proton?



a) To the right
b) To the top of the page
c) To the left
d) To the bottom of the page
e) Out of the page
f) Into the page
g) None of the above

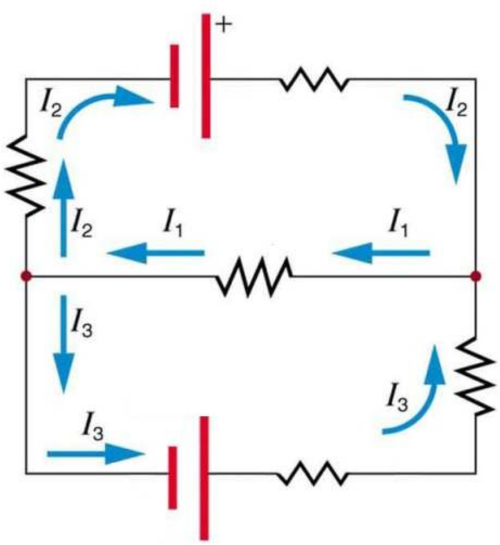
Question 5:

Two identical conducting spheres are initially separated. The left sphere has a -3 coulomb charge and the right sphere has a +2 coulomb charge. The spheres are allowed to touch each other briefly, and then they are separated. Determine the charge on the left sphere.

a) - 1 C b) $-\frac{1}{2}$ C c) 0 C d) $+\frac{1}{2}$ C e) + 1 C

Question 6:

Given the circuit below with currents (I_1, I_2, & I_3) and directions labelled below, which is a true statement?



a) $I_1 + I_2 = I_3$
b) $I_1 + I_3 = I_2$
c) $I_2 + I_3 = I_1$
d) $I_1 = I_2 = I_3$
e) None of the above

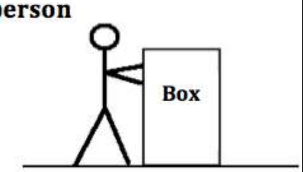
Appendix B: Physics 201 Pre/Post Instruction Survey

The three questions below were given as both pre and post tests in Physics 201. These questions test the students' understanding of three concepts that are both fundamental to the study of physics and very conceptually difficult. N = 24 students took the pretest, and N = 20 students took the posttest. Results are provided below each question.

1. Which of the following runners is/are accelerating? (Circle each runner that has non-zero acceleration.)
   A. A runner that starts from rest and speeds up to 15 miles per hour (mph).
   B. A runner that slows down from 15 mph to a stop.
   C. A runner that runs along a straight track at a constant speed of 15 mph.
   D. A runner that runs around a circular track at a constant speed of 15 mph.

Selecting both A & B demonstrates an understanding that the term "acceleration" includes both speeding up and slowing down. On the pretest, 8 out of 24 students (33%) answered both A & B; on the posttest 14 out of 20 students (70%) answered both A & B. Selecting A, B, *and* D, demonstrates an understanding of the vector nature of acceleration. On the pretest, 4 out of 24 students (17%) answered A, B, *and* D; on the posttest, 5 out of 20 students (25%) answered A, B, *and* D.

Problems 4 – 7 all refer to the figure on the right, which shows a person pushing a large box to the right with a constant velocity.



4. The net force that is being exerted on the box will be…
   A. To the right
   B. To the left
   C. Up
   D. Down
   E. None of the above

The correct answer is E, which demonstrates an understanding of Newton's first law of motion. On the pretest, 1 out of 24 students (4%) answered E; on the posttest, 5 out of 20 students (25%) correctly answered E. (The students explained their answer in problem #5 of the final exam.)

14. Someone left a shopping cart sitting on some railroad tracks, and it got hit by a freight train. When the train hit the cart, was the force exerted on the shopping cart bigger, smaller, or the same as the force exerted on the freight train? Briefly explain/justify why your answer is correct and why your answer makes sense.

The correct answer is that the forces were the same, which demonstrates an understanding of Newton's 3rd law. On the pretest, 3 out of 24 students (13%) answered this question correctly; on the posttest, 10 out of 20 students (50%) answered correctly.

Appendix C: Upper-Level Health Physics Assessment (Page 1 of 6)

B-3 For a radionuclide with a decay constant of 0.1 per min, all the following relationships are correct <u>except</u>:

a. the half-life is 6.93 minutes.
b. the mean-life is 10 minutes.
c. the tenth-life is 23 minutes
d. in one hour, the activity will be reduced to 0.025 of its initial activity.
e. the activity will decay to 0.1 of its initial activity every minute.

B-4 The Q-value of a reaction is defined as the:

a. energy equivalence of the decrease in rest mass.
b. excess kinetic and radiant energy of reactants over products.
c. excess binding energy of reactants over products.
d. minimum energy that can be exhibited by radiation emitted from the product.
e. energy required to "make the reaction go".

B-5 All of the following are sometimes emitted from the product nucleus or product atom following the disintegration of a parent nucleus except:

a. gamma rays of discrete energy by the product nucleus.
b. conversion electrons of discrete energy by the product atom.
c. a continuous spectrum of x-rays by the product atom.
d. Auger electrons of discrete energy by the product atom.
e. beta particles of varying energy by the product nucleus.

B-8 In simple radioactive decay, the number of radioactive atoms at any time, t, is given by $N_t = N_0$ e-λt. All of the following are correct <u>except</u>:

a. the factor $e^{-\lambda t}$ is the fraction of the original atoms remaining at time t and is termed the decay factor.
b. the quantity $(1 - e^{-\lambda t})$ equals the fraction of the original number of atoms decaying in time t.
c. the decay constant, λ, is the instantaneous fraction of atoms decaying per unit time.
d. the activity at any time is given by the product λN_t
e. the equation always predicts the actual number of atoms remaining.

B-14 For a radioactive nuclide with a disintegration constant of 0.693 min-1, the fraction of atoms that decays in one minute is expected to be:

a. 0.24.
b. 0.37.
c. 0.50.
d. 0.63.
e. 0.76.

B-16 A researcher desires to have 10 mCi of I-131 which has an 8-day half-life. If it takes 16 days for the shipment to reach its destination then the activity which must be shipped is:

a. 14 mCi.
b. 20 mCi.
c. 40 mCi.
d. 60 mCi.
e. 74 mCi.

C-3 For water in the photon energy region from 0.1 to 2.5 MeV the total energy mass absorption coefficient is accounted for almost entirely by:

a. photoelectric interactions.
b. Compton interactions.
c. pair production interactions.
d. Raleigh scattering.
e. Thompson scattering.

C-7 The linear stopping power for charged particles , (dE/dx):

a. includes both collision and radiation losses by the particle.
b. only includes ionization energy losses.
c. always equals LET.
d. is independent of the charge and velocity of the particle.
e. is independent of the atomic number of the medium.

C-17 The highest to lowest relative penetration of 1 MeV alpha, beta and gamma rays is:

a. alpha, beta, gamma.
b. beta, gamma, alpha.
c. gamma, alpha, beta.
d. gamma, beta, alpha.
e. beta, alpha, gamma.

C-24 An interaction of neutrons with an energy of 1 Mev important because of its contribution to the total absorbed dose and because of its importance in many neutron shields is the:

a. (n,p) reaction on nitrogen.
b. (n,d) reaction on boron.
c. elastic scattering reaction with hydrogen.
d. inelastic scattering reaction with hydrogen.
e. (n,γ) reaction with sodium.

C-32 The threshold for pair production in the coulomb field of a target nucleus is about:

a. 0.51 MeV.
b. 1.02 MeV.
c. 1.53 MeV.
d. 2.04 MeV.
e. 2.56 MeV.

C-69 Annihilation radiation originates in which of the following sources?

a. electron atomic transitions.
b. positron-electron pairs.
c. nucleus of an atom.
d. radar transmissions.
e. radiant energy lost by charged particles.

J-3 If a person has been exposed to 450 roentgens of radiation:

a. his chances for survival are approximately 50-50.
b. no valid conclusions can be drawn, since the duration of exposure and the extent to which the body has been irradiated are not known.
c. he will be violently ill and will have many undesirable after-effects.
d. he has received LD-50.
e. he has received a lethal exposure.

Appendix C: Upper-Level Health Physics Assessment (Page 4 of 6)

J-12 If the brain (mass 1500 g) and the kidney (mass 350 g) both receive an acute dose of 500 rad from a high energy x-ray machine, the observed physiological effect on the brain would be less than on the kidney because...

a. it has greater mass.
b. the brain does not process bodily fluids.
c. the brain has a higher cell mitotic rate.
d. the brain has a lower cell mitotic rate.
e. the skull is very thick and dense.

J-19 At what level of acute whole body radiation would you expect to begin to see some significant physiological effects in a population?

a. 0.17 rem.
b. 0.5 rem.
c. 170 rem.
d. 500 rem.
e. 1,700 rem.

J-20 The effect on an individual being exposed to a gamma source continuously 100 rad/hr for 7 hours relative to another exposed to 100 mrad/hr for 7000 hours would be:

a. less.
b. greater.
c. same.
d. dependent on the type of radiation.
e. dependent on the weights of the persons exposed.

J-23 Chronic radiation exposures are those:

a. involving continuous or repeated exposures over a relatively long time interval.
b. involving a definite increased risk of cancer.
c. involving no significant or somatic injury.
d. that are acceptable to the exposed individual.
e. that may have some small risk to the exposed individual.

J-24 Acute radiation exposures are those:

a. occurring under critical conditions.
b. occurring as a result of an accident.
c. involving relatively large doses in a relatively short time.
d. requiring medical attention.
e. requiring notification of the NRC.

D-1 The quality factor, Q, ranked from highest to lowest for alpha, beta, and recoil atom is:

a. alpha, beta, recoil atom.
b. beta, alpha, recoil atom.
c. beta, recoil atom, alpha.
d. recoil atom, beta, alpha.
e. recoil atom and alpha, beta.

D-8 The absorbed dose...

a. has the unit 1 rad = 1 joule/g.
b. is the energy imparted by radiation divided by the mass of the interacting volume.
c. is a function of directly ionizing radiation only.
d. applies to the ionization produced by X or gamma radiation only.
e. is defined as being measured in tissue.

D-12 The dose equivalent is the:

a. activity in curies in the organ of reference.
b. dose in rads.
c. energy deposited per gram times the quality factor and other appropriate modifying factors.
d. dose in rads times the quality factor times the distribution factor or other modifying factors.
e. amount of X or gamma radiation interaction in air.

K-12 Which of the following radiations presents the most severe external radiation hazard ?

a. alpha particles.
b. gamma photons.
c. fast neutrons.
d. beta particles.
e. conversion electrons

P-1 The basic physical methods applied to protection against internal radiation hazards are:

a. film badges, dosimeters, ion chambers, survey meters.
b. respirators, ventilation, air cleaning equipment, decontamination, time limitation, protective clothing, glove boxes.
c. time, distance, shielding.
d. bio-assay, whole body counting, nose wipes.
e. standards, regulations, procedures.

Appendix C: Upper-Level Health Physics Assessment (Page 6 of 6)

P-19 Which of the following is <u>not</u> a major objective of a radiological protection program.

a. Minimize external exposure to individuals.
b. Minimize internal exposure to individuals.
c. Minimize collective exposure.
d. Ensure economical operation while meeting the basic requirements.
e. Minimize contamination of areas, personnel, and equipment.

P-32 A technician is allowed 100 mrem to complete a job. He spends 15 minutes in a 100 mrem/hr field, 30 minutes in a 40 mrem/hr field, and 4 minutes in a 300 mrem/hr field. How many more minutes can he remain in the 300 mrem/hr field?

a. 0.1 minute.
b. 7 minutes.
c. 11 minutes.
d. 12 minutes.
e. 15 minutes.

Q-16 For radiation protection purposes, which of the following organs has been selected as the critical organ in children for exposure to environmental iodine?

a. Gonads.
b. Thyroid.
c. Lungs.
d. Whole Body.
e. Bone marrow.

G-2 The ALI or Annual Limit on Intake as used in ICRP Publication 30 for a radionuclide for occupational exposure is:

a. determined from the maximum permissible uptake rate by Reference Man for an occupational exposure of 50 years.
b. the quantity which if taken into the body alone during a year will cause one of the ICRP dose limits to be exceeded.
c. the annual amount in an organ of reference which will cause one of the ICRP dose limits to be exceeded
d. that quantity in the total body such that the critical organ is irradiated at the maximum permissible dose equivalent rate.
e. determined by first establishing the derived air concentration based on metabolic models for intakes over a 50 year period.

Appendix D: Exit Survey Administered to Graduating Physics Majors

Provide an email address that you will continue to check after graduation. *
What is your major? *
When did you select this major? *
Why did you choose this major? *
Are you graduating with any minors? If so, what are they? *
Did you take any astronomy classes? If so, which ones?
How many semesters did you spend enrolled as a student at FMU? *
What is your current overall FMU GPA? *
How many summer internships did you complete? *
How many summer research experiences did you complete? *
If you completed a summer internship, please list your employer.
If you completed a summer research experience, please list where you performed this research.

Assess your level of content knowledge in your major. *
- Very knowledgeable
- Fairly knowledgeable
- Not very knowledgeable
- Not at all knowledgeable

Assess your level of competence with regard to laboratory skills. *
- Very competent
- Fairly competent
- Not very competent
- Not at all competent

Assess your level of competence with regard to computational skills. *
- Very competent
- Fairly competent
- Not very competent
- Not at all competent

Assess your level of competence with regard to technical writing. *
- Very competent
- Fairly competent
- Not very competent
- Not at all competent

Assess your level of competence with regard to giving a technical presentation. *
- Very competent
- Fairly competent
- Not very competent
- Not at all competent

Assess to what extent these skills and this content knowledge have improved as a result of the courses you have taken in your major. *
- Very large improvement
- Large improvement
- Some improvement
- No improvement

Assess the sense of community that you experienced within your major at FMU. *
Did you feel like the faculty/department cared about your academic and future success? Did you feel connected with fellow classmates in the department?
- Very good sense of community
- Fairly good sense of community
- Some small sense of community
- No sense of community

Discuss what things you think contributed (either positively or negatively) to your sense of community.
What do you plan to do after graduation? *
How well do you think that the courses in your major have prepared you for the next steps (life, career, further education) that you will be taking after college? *
- Very well
- Fairly well
- Not very well
- Very poorly

Is there anything that you think could have been done to improve your experience (within your major) at FMU?
If you have any other comments that you would like to share about your experience (within your major) at FMU, please write them below.

Appendix E: Physics 202 Lab Assessment of Experimental Skills (Page 1 of 2)

Logistics:

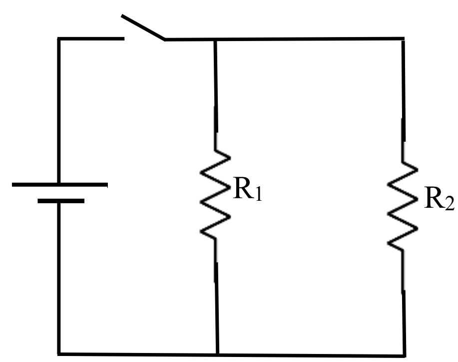
The students were given this individual assessment of their experimental skills. Two identical setups were provided, each in a different part of the room, and the lab groups cycled through the assessment. When it was their turn, each group of two students split up, with each student working independently on one of the setups. Each student was provided a maximum of 7 minutes to complete the assessment. The students were asked not to talk with their classmates about the assessment.

Equipment:

- 1 Battery
- 1 tap switch
- 1 DMM with two leads (banana to U-shaped)
- Resistor board with 2 resistors labeled "R_1" and "R_2")
    - Resistor R_1 = 220 Ohm
    - Resistor R_2 = 100 Ohm
- At least 4 wires (U-shaped to U-shaped) – I provided 6

Task:

Construct the following circuit, including a DMM to measure the current flowing through resistor R_2:



Additional Details:

- The students are provided with a picture showing how the equipment appears before they begin the assessment.
- The student is instructed to tell the instructor when they have completed the task (if completed within 7 minutes). The instructor will check their work.
- After being checked, the student is asked to return the equipment to its original state, as shown in the picture.

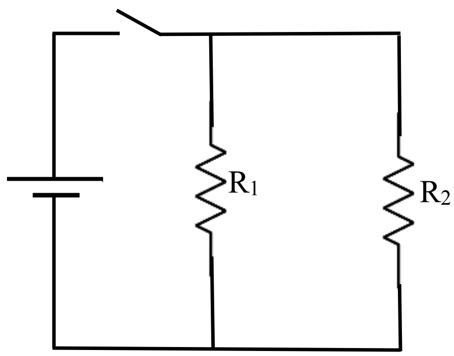
The next page is what was given to the students.

Physics 202 - Assessment of Experimental Skills (Page 2 of Appendix E)

You will have up to 7 minutes to complete the two parts below. Please start the timer now.

Part 1:

Construct the circuit shown in the circuit diagram using the equipment shown in the picture. On the table in front of you, the equipment to be used is labeled “Part 1”.



Part 1

Equipment for Part 1

Leave your circuit from Part 1 set up (do not take it apart). Continue to Part 2 below.

Part 2:

For this part, you will use the equipment on the table in front of you that is labeled “Part 2”. The equipment is the same, except that now you will also use a multimeter. Construct the same circuit that you constructed in Part 1, but this time also include the multimeter to measure the current that flows through resistor R_2 (when the switch is closed).

Equipment for Part 2

When you have completed your circuit, let your instructor know that you are done.

After your instructor has checked your circuit, please disassemble both of your circuits and leave the equipment as shown in the pictures.

Please do not talk with your classmates about this assessment.

Appendix F: Physics 419 (Senior Seminar) Rubrics for Assessing both Written & Oral Communication of Technical Material (Page 1 of 2)

Assessment rubric for written literature review:

PHYS 419 - Fall 2019

Criteria	Outstanding (12 – 15 pts)	Good (8 - 11 pts)	Fair (4 – 7 pts)	Unacceptable (0 – 3 pts)	Points Earned
Content (max of 15 Points)	• Information provided is pertinent to the topic • Information provided is logical & supported by evidence	• Information provided is pertinent to the topic • Information provided is fairly logical & reasonably supported	• Information provided is consistently pertinent • Information provided is logical or supported by evidence	• Information provided is not pertinent • Information provided is rarely logical & supported by evidence	
Mechanics (max of 15 Points)	• Proper citations are used • Grammar and Spelling have been checked • Hook statement is clearly provided in the opening of the Introduction	• Proper citations are used • Grammar and Spelling issues are minimal • Hook statement is provided in the opening of the Introduction	• Citations are used properly in most cases • Grammar and Spelling issues are apparent • Hook statement is not very clear in the Introduction	• Citations are not properly used • Grammar and Spelling has not been checked • Hook statement is missing from the Introduction	
				Total Points for the Scientific Literature Review Article: (maximum 75 Points)	

SLR Format: Throughout the semester the student has been building their SLR to include the sections listed below. Students researching a topic that did not have a scientific theory were asked to write a Methodology section instead that described how data for a particular population was collected. Some papers will also provide a Models section – especially if the topic involved numerical simulations. The SLR is written in the voice of a reporter. The only section where the author's voice may appear is in the Discussion section. This author voice can address shortcomings of the research work. Each student was asked to visit the Writing Center once they had a full draft of the paper.

Sections that are to be included in the final paper:

Abstract; Introduction; Theory (or Methodology); Experiments (or Models); Results; Discussion; Conclusion, References

Citations: The PHYS 419 class was directed to use APA parenthetical citations instead of ordered numbers. The reference section is therefore to be in alphabetical order by last name of authors.

Assessment Rubric for Presentation

Student Name: ____

The Presentation is 100 points toward the final grade.

100 - 90 points = Demonstrates excellent understanding of the topic and presented a clear and easy to follow summary of their research.

89 - 75 points = Demonstrates good understanding of the topic and presented a somewhat clear and easy to follow summary of their research.

75 - 0 points = Demonstrates incorrect or insufficient understanding of the topic and presented a hard to follow summary of their research.

Criteria	Points Earned
Organization (15 Points) • Speaker provided outline of presentation • Speaker provided content in a logical sequence	
Content (45 Points) • Technical terms are defined for the audience • Material presented is relevant to the topic • Sufficient material is presented • Obvious conclusion summarizing the presentation is made • Graphs and Figures were relevant to the presentation	
Presentation (40 Points) • Speaker used a clear, audible voice • Speaker maintained eye contact with audience • Presentation completed in the allotted time period • Information was well communicated • Speaker was dressed appropriately for the presentation	
Total Points for the Conclusion and Abstract Sections: (maximum 100 Points)	

Evaluator Comments:

Assignment developed based on the Workshops from "Lessons for a Scientific Literature Review." By R. Schmidt, M. Smyth, & V. Kowalski (2008) Libraries Unlimited.