Physics and Engineering

Core Competencies

2025-26

Physics and Engineering

Learning Outcome: ABET #1: Students will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (CC: CT)

Outcome Measures and Criteria for Success:

Course	Outcome Assessed	Assessment Method	Threshold	Frequency
EGR2014 EGR2014L	Students will be able to set up a problem with the appropriate variables and solve the problem. (ME and EE)	Exam Question	At least 80% of the students will score 2.5 or higher on the associated rubric	Odd Fall
EGR2024 EGR2024L (New Assessment beginning 2026-27)	Students will be able to set up a problem with the appropriate variables and solve the problem. (all)	Exam Question	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR3034 EGR3034L (New Assessment beginning 2026-27)	Students will be able to apply a theoretical model to calculate a solution to a problem using appropriate computational techniques/software. (ME)	Exam Question	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR4063 (New Assessment beginning 2026-27)	Students will be able to set up a problem with the appropriate variables and solve the problem (ME and EE)	Exam Question	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR4103 (replaced EGR4013) (New Assessment beginning 2026-27)	Students will be able to apply a theoretical model to calculate a solution to a problem using appropriate computational techniques/software. (EE and CSE)	Exam Question	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR4082 (phasing out starting 2025-26)	Students will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (all)	Faculty/Review Team Assessment of Final Project	At least 80% of the teams will score 2.5 or higher on the associated rubric	Annually

EGR4082 (phasing out starting 2025-26)	Student reflection on preparation to solve problems using engineering, science and mathematics. (all)	Senior Survey (Indirect Method)	80% of the respondents will say that they are satisfied or higher	Annually
PHY2044	Students will be able to set up a problem with the appropriate variables and solve the problem (all)	Exam Question	At least 80% of the students will score 2.5 or higher on the associated rubric	Odd Fall

Longitudinal Data:
Note that the PHE department changed assessment processes to align with ABET expectations for engineering curriculum. The data shown is all that we are expected to collect for ABET, both formative and summative data. The italicized data is from our previous assessment systems.

EGR2014 (Formative)	Percent of Students Above 2.5					
	2025-26					
1.2 Students will be able to apply appropriate scientific and engineering principles	96%					
1.3 Students will be able to formulate the appropriate assumptions, equations, and/or relationships applicable to facilitate mathematical expression and solution	88%					
1.4 Students will be able to solve a complex engineering problem	88%					

EGR2014 (Formative)	*Percent of Students Above 2.5*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Identify necessary information given in the problem to arrive at a solution.	*100%*	*67%*	*77%*	*67%*	*73%*	*79%*
Formulate appropriate equations with corresponding variables.	*100%*	*67%*	*100%*	*67%*	*64%*	*79%*
Solve the problem by applying the principles identified.	*100%*	*67%*	*100%*	*67%*	*64%*	*79%*

EGR2024 (Formative)	*Percent of Students Above 2.5*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Identify necessary information given in the problem to arrive at a solution.	*100%*	*82%*	*90%*	*100%*	*57%*	*77%*
Formulate appropriate equations with corresponding variables.	*100%*	*73%*	*90%*	*100%*	*71%*	*77%*
Solve the problem by applying the principles identified.	*100%*	*73%*	*90%*	*88%*	*64%*	*38%*

PHY2044 (Formative)	Percent of Students Above 2.5					
	2025-26					
1.2 Students will be able to apply appropriate scientific and engineering principles	64%					
1.3 Students will be able to formulate the appropriate assumptions, equations, and/or relationships applicable to facilitate mathematical expression and solution	64%					
1.4 Students will be able to solve a complex engineering problem	54%					

EGR3034 (Summative)	*Percent of Students Above 2.5*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Identify necessary information given in the problem to arrive at a solution.		*81%*		*100%*		*100%*
Formulate appropriate equations with corresponding variables.		*81%*		*100%*		*82%*
Solve the problem by applying the principles identified.		*94%*		*100%*		*64%*

EGR4013 - Old System (Summative)	Percent of Students Above 2.5			
	2019-20	2020-21	2021-22	2022-23
Identify necessary information given in the problem to arrive at a solution.	63%		87%	
Formulate appropriate equations with corresponding variables.	56%		87%	
Solve the problem by applying the principles identified.	63%		73%	

EGR4103 - New System (Summative)	Percent of Students Above 2.5						
	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25*	2025-26
Can identify a theoretical model to calculate a solution to a problem (EE and CSE)				100%			
Can apply appropriate computational techniques/software (EE and CSE)				100%			
Identify necessary information given in the problem to arrive at a solution.						100%	
Formulate appropriate equations with corresponding variables.						82%	
Solve the problem by applying the principles identified.						6%	

* Used different rubric for 2024-25.

EGR4082 (Summative)	Percent of Students Above 2.5					
	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Students will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (all).	64%	40%	67%	100%	100%	100%

EGR4082 (Student Survey)	Percentage of Students Indicating Satisfied or Higher		
	2022-23	2023-24	2024-25
How well do you feel that you have been prepared to: [Apply the principles of knowledge of engineering, science, and mathematics to solve problems?]	100%	90%	71%

Previous Learning Outcome: Students will apply physical principles, mathematical reasoning, and computational techniques to solve real-world problems.

Previous Outcome Measure: Embedded final exam questions given in upper division mastery class on a rotating basis (EGR/PHY3063, EGR/PHY3043 and PHY4053).

Previous Criteria for Success (how do you judge if the students have met your standards): At least 75% of students will achieve an average score of 2.5 or higher on criteria described in application rubric.

Previous Data:

	Percentage Over 2.5									
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
	PHY431	PHY361	PHY431	PHY361	PHY431	PHY361	PHY431	PHY3063	PHY/EGR3043	PHY/EGR3063
Application Rubric	84%	88%	82%	80%	71%	96%	81%	92%	100%	53%

****** Note the courses were renumbered in the 2019-20 academic year. PHY361 became PHY3063. PHY431 became PHY4053. At that time some courses were cross listed as both engineering and physics.*

Conclusions Drawn from Data:

Significant underperformance in freshman class PHY 2044, however we see an improvement on all levels for the sophomore class EGR2014. This is somewhat expected since this is the first college level physics class taken by the students.

Changes to be Made Based on Data:

Introduce study techniques for STEM courses in their first semester Intro Engineering and PHY 2044 class.

Rubric:
EGR2014 – Attached
EGR2024 – Attached
EGR3034 – Attached
EGR4013 – Attached
EGR4103 – Attached
EGR4082 – There is no rubric since it comes from the review sheet of the faculty and external professional review committee.
Senior Survey – No rubric for this since they are survey results.
PHY2044 – Attached

Engineering and Physics Rubric

PLO1: Student will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (CC: CT)

Courses evaluated: EGR 2014/2014L, EGR 2024/2024L, EGR 3034/3034L, EGR 4013

Criteria	**4 – Excellent**	**3 – Good**	**2 – Fair**	**1 – Poor**
Identify necessary information given in the problem to arrive at a solution	No mistakes	Few mistakes, mostly correct	Some mistakes, some understanding	Many mistakes, not interpreting information
Formulate appropriate equations with corresponding variables	No mistakes	Few mistakes, mostly correct	Some mistakes, some understanding	Many mistakes, not interpreting information
Solve the problem by applying the principles identified	No mistakes	Few mistakes, mostly correct	Some mistakes, some understanding	Many mistakes, not interpreting information

EGR4103 Rubric

PLO1: Students will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (CC: CT)

Outcome Assessed	Excellent (4)	Good (3)	Satisfactory (2)	Unsatisfactory (1)	Excellent (4)
Can identify a theoretical model to calculate a solution to a problem. (EE and CSE)	No mistakes	Few mistakes, mostly correct	Some mistakes, some understanding	Many mistakes, not interpreting information	No mistakes
Can apply appropriate computational techniques/software. (EE and CSE)	No mistakes	Few mistakes, mostly correct	Some mistakes, some understanding	Many mistakes, not interpreting information	No mistakes

PHY 2044 Assessment Method: Exam Question

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Outcome Assessed	Exemplary (4)	Satisfactory (3)	Developing (2)	Unsatisfactory (1)
1.2 Students will be able to apply appropriate scientific and engineering principles	Principles are appropriately and accurately applied to the physical problem considered.	Principles are appropriately (though not always accurately) applied to the physical problem considered.	Identifies some information and assumptions relevant to the analysis.	Incorrect principles applied or few scientific or engineering principles demonstrated and applied.
1.3 Students will be able to formulate the appropriate assumptions, equations, and/or relationships applicable to facilitate mathematical expression and solution	Clearly and comprehensively identifies relevant known properties, equations, and appropriate assumptions. Gathers information in a concise and organized form.	Identifies most of the relevant information, equations, and assumptions. Focuses the analysis on the desired result. Gathers information in an appropriate form.	Approach appears somewhat unfocused. Information gathering is somewhat unorganized.	Demonstrates little or no understanding of what information and assumptions are needed to perform the analysis. Approach is not directed to the objective of the analysis. Unable to organize the analysis.
1.4 Students will be able to solve a complex engineering problem	In addition to being complete and correct and addressing the identified problem, solution is elegant and/or optimized.	For the most part, solution is complete, correct, and addresses the identified problem.	Solution is only partially correct or only partially addresses the identified problem. Some key parts may be missing.	Solution is incorrect, does not address the identified problem, or is missing most or all key parts (schematics, drawings, code, procedures, etc.).

EGR 2014 Assessment Method: Exam Question

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Outcome Assessed	Exemplary (4)	Satisfactory (3)	Developing (2)	Unsatisfactory (1)
1.2 Students will be able to apply appropriate scientific and engineering principles	Principles are appropriately and accurately applied to the physical problem considered.	Principles are appropriately (though not always accurately) applied to the physical problem considered.	Identifies some information and assumptions relevant to the analysis.	Incorrect principles applied or few scientific or engineering principles demonstrated and applied.
1.3 Students will be able to formulate the appropriate assumptions, equations, and/or relationships applicable to facilitate mathematical expression and solution	Clearly and comprehensively identifies relevant known properties, equations, and appropriate assumptions. Gathers information in a concise and organized form.	Identifies most of the relevant information, equations, and assumptions. Focuses the analysis on the desired result. Gathers information in an appropriate form.	Approach appears somewhat unfocused. Information gathering is somewhat unorganized.	Demonstrates little or no understanding of what information and assumptions are needed to perform the analysis. Approach is not directed to the objective of the analysis. Unable to organize the analysis.
1.4 Students will be able to solve a complex engineering problem	In addition to being complete and correct and addressing the identified problem, solution is elegant and/or optimized.	For the most part, solution is complete, correct, and addresses the identified problem.	Solution is only partially correct or only partially addresses the identified problem. Some key parts may be missing.	Solution is incorrect, does not address the identified problem, or is missing most or all key parts (schematics, drawings, code, procedures, etc.).

Physics and Engineering

Learning Outcome: ABET #3: Students will demonstrate an ability to communicate effectively with a range of audiences.

- Students will be able to speak about their work with precision, clarity and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

Outcome Measures and Criteria for Success:

Course	Outcome Assessed	Assessment Method	Threshold	Frequency
EGR2014L	(WC) Students will be able to write a lab report that accurately summarizes the experiment and the results (ME and EE)	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Odd Fall
EGR2024L (New Assessment beginning 2026-27)	Students will be able to write a lab report that accurately summarizes the experiment and the results.	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR3034L (New Assessment beginning 2026-27)	(WC) Students will be able to write a lab report that accurately summarizes the experiment and the results (ME)	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR3053L	(WC) Students will be able to write a lab report that accurately summarizes the experiment and the results (EE and CE)	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Odd Fall
EGR3093L (phasing out starting 2025-26)	Students will be able to write a lab report that accurately summarizes the experiment and the results.	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Alternating Year
EGR3113L (New Assessment beginning 2026-27)	(OC) Students will be able to speak about their work to a wide range of audiences that emphasizes design choices and constraints (ME and EE)	Faculty Team Assessment Final Project (Open House Demo)	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall
EGR4082	(OC) Students will be able to speak about their work with precision, clarity and	Faculty Team Assessment of Final Project Presentation	At least 80% of the teams will score 2.5 or higher on the associated rubric	Annually

	organization. (all)			
EGR4082	(WC) Students will be able to write about their work with precision, clarity and organization. (all)	Faculty Team Assessment of Final Project Report	At least 80% of the teams will score 2.5 or higher on the associated rubric	Annually
EGR4082	(IL) Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (all)	Faculty Team Assessment of Final Project Report	At least 80% of the teams will score 2.5 or higher on the associated rubric	Annually
EGR4082	Student reflection on preparation to communicate effectively (all)	Senior Survey (Indirect Method)	80% of the respondents will say that they are satisfied or higher	Annually
EGR4103L (New Assessment beginning 2026-27)	(WC) Students will be able to clearly document the design process for the final project (EE and CE)	Final Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Even Fall

Longitudinal Data:
Note that the PHE department changed assessment processes to align with ABET expectations for engineering curriculum. The data shown is all that we are expected to collect for ABET, both formative and summative data, so some formative data has been added as well as some additional data gathered from laboratory reports.

EGR2014 (Formative)	Percent of Students Above 2.5					
	2025-26					
3.6 Produce clear and effective written content	58%					
3.7 Use appropriate technical language and terminology	77%					
3.8 Create professional quality figures, tables, and graphics	46%					
3.9 Follow appropriate documentation and citation standard	12%					

EGR2024 (Formative)	*Percent of Students Above 2.5*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25**
Students will be able to write a lab report that accurately summarizes the experiment and the results	*0%*	*33%*	*56%*			*100%*
Writing is precise, clear, and organized				*100%*	*100%*	
Writing accurately summarizes the experiment				*100%*	*100%*	
Writing accurately summarizes the main results of the experiment				*100%*	*100%*	

** The wrong rubric was used in 2024-25.*

EGR3053 (Summative)	Percent of Students Above 2.5					
	2025-26					
3.6 Produce clear and effective written content	100%					
3.7 Use appropriate technical language and terminology	100%					
3.8 Create professional quality figures, tables, and graphics	100%					
3.9 Follow appropriate documentation and citation standard	100%					

EGR3093 (Summative)	*Percent of Students Above 2.5*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students will be able to write a lab report that accurately summarizes the experiment and the results	*100%*	*N/A*	*100%*	*N/A*	*60%*	*N/A*

EGR4082 (Summative)	Percent of Students Above 2.5					
	2025-26					
3.3 Displays appropriate structure and organization in their oral communication	100%					
3.4 Creates professional quality visual aids	100%					
3.6 Produce clear and effective written content	100%					
3.7 Use appropriate technical language and terminology	100%					
3.8 Create professional quality figures, tables, and graphics	100%					
3.10 Identify and evaluate information sources	100%					
3.11 Use information ethically and legally	100%					

EGR4082 - Speaking (Summative)	*Percentage of Students at 2.5 or Higher*						
	2018-19	*2019-20**	*2020-21**	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students will be able to speak about their work with precision, clarity and organization. (CC: OC)	*75%*	*100%*	*88%*	*100%*	*100%*	*100%*	*100%*

EGR4082 - Writing (Summative)	*Percentage of Students at 2.5 or Higher*						
	2018-19	*2019-20**	*2020-21**	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students will be able to write about their work with precision, clarity and organization. (CC: WC)	*100%*	*No Data*	*80%*	*67%*	*100%*	*100%*	*0%*

EGR4082 - Information Literacy (Summative)	*Percentage of Students at 2.5 or Higher*						
	2018-19	*2019-20**	*2020-21**	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)	*44%*	*No Data*	*80%*	*100%*	*83%*	*0%*	*0%*

* Indicates a COVID year

EGR4082 (Student Survey)	Percentage of Students Indicating Satisfied or Higher			
	2022-23	2023-24	2024-25	2025-26
How well do you feel that you have been prepared to: [Communicate truthfully and effectively?]	100%	90%	71%	63%
How well do you feel that you have been prepared to: [Communicate orally?]	83%	100%	71%	88%
How well do you feel that you have been prepared to: [Communicate in writing?]	100%	100%	71%	100%

Conclusions Drawn from Data:

EGR2014 underperformed on written communication. This class was taught in a way that did not emphasize the writing portion of communication. This was the result of miscommunication between the previous and current instructor.
EGR4082 saw an improvement in oral and written communication from the previous year, however, there appears to be a lack of preparation to communicate truthfully and effectively. This may be due to the vague nature of the question.

Changes to be Made Based on Data:

Adjust EGR2014 curriculum such that there is intentional writing standards carried over from EGR 2024, which students would see the previous semester.
In EGR4082 consider rewording the survey questions to avoid ambiguity.

Rubrics:
EGR2014 - Attached
EGR2024 - Attached
EGR3053 - Attached
EGR3093 - Attached
EGR4082 Report Rubric – Attached
EGR4082 Presentation Rubric – Attached
Oral Presentation - attached
Writing - attached
Information Literacy – This is a subset of the writing rubric.
The senior data comes from a survey and thus has no rubric.

EGR 2014 and 2014L Assessment Method: Lab Report

3. **Students will demonstrate an ability to communicate effectively with a range of audiences (CC: OC, WC, IL)**

Criteria	4 – Excellent	3 – Good	2 – Fair	1 – Poor
3.6 Produce clear and effective written content	Writing is exceptionally clear, fluent, and concise. Main points are well-developed with excellent support. Organization is logical and enhances understanding.	Writing is clear and well-organized. Main points are adequately developed with appropriate support.	Writing is sometimes unclear or disorganized. Main points lack sufficient development or support.	Writing is unclear, disorganized, and difficult to follow. Main points are undeveloped or unsupported.
3.7 Use appropriate technical language and terminology	Consistently uses precise technical terminology appropriate to the audience. Technical concepts are clearly explained when necessary.	Generally uses appropriate technical terminology with adequate explanations when needed.	Sometimes uses inappropriate technical terminology or fails to explain technical concepts adequately.	Consistently misuses technical terminology or uses overly technical language without necessary explanation.
3.8 Create professional quality figures, tables, and graphics	Figures, tables, and graphics are expertly designed, properly labeled, and effectively support the document's purpose.	Figures, tables, and graphics are well-designed, labeled appropriately, and support the document's purpose.	Figures, tables, or graphics have minor design flaws, labeling issues, or only partially support the document's purpose.	Figures, tables, or graphics are poorly designed, inadequately labeled, or fail to support the document's purpose.
3.9 Follow appropriate documentation and citation standard	Documentation and citations follow required formatting standards perfectly. Sources are thoroughly and accurately documented.	Documentation and citations generally follow required formatting standards with minor errors. Most sources are properly documented.	Documentation and citations contain several formatting errors. Some sources are improperly documented or missing.	Documentation and citations contain major formatting errors or are largely missing.

EGR 2024 Assessment Method: Lab Report (Current)

PLO3: Students will demonstrate an ability to communicate effectively with a range of audiences.

- Students will be able to speak about their work with precision, clarity, and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

Criteria	**4 – Excellent**	**3 – Good**	**2 – Fair**	**1 – Poor**
Writing is precise, clear, and organized	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
Writing accurately summarizes the experiment	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
Writing accurately summarizes the main results of the experiment	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized

EGR 2024L Assessment Method: Lab Report (Past)

PLO3: Students will demonstrate an ability to communicate effectively with a range of audiences.

- Students will be able to speak about their work with precision, clarity, and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	4 – Excellent	3 – Good	2 – Fair	1 – Poor
3. Students will be able to write a lab report that accurately summarizes the experiment and the results.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
6. Students will be able to carry out an experiment based on instructions and accurately record data.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
6. Students will be able to analyze experimental data and draw conclusions.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized

EGR 3053 and 3053L Assessment Method: Lab Report

3. Students will demonstrate an ability to communicate effectively with a range of audiences (CC: OC, WC, IL)

Outcome Assessed	Exemplary (4)	Satisfactory (3)	Developing (2)	Unsatisfactory (1)
3.6 Produce clear and effective written content	Writing is exceptionally clear, fluent, and concise. Main points are well-developed with excellent support. Organization is logical and enhances understanding.	Writing is clear and well-organized. Main points are adequately developed with appropriate support.	Writing is sometimes unclear or disorganized. Main points lack sufficient development or support.	Writing is unclear, disorganized, and difficult to follow. Main points are undeveloped or unsupported.
3.7 Use appropriate technical language and terminology	Consistently uses precise technical terminology appropriate to the audience. Technical concepts are clearly explained when necessary.	Generally uses appropriate technical terminology with adequate explanations when needed.	Sometimes uses inappropriate technical terminology or fails to explain technical concepts adequately.	Consistently misuses technical terminology or uses overly technical language without necessary explanation.
3.8 Create professional quality figures, tables, and graphics	Figures, tables, and graphics are expertly designed, properly labeled, and effectively support the document's purpose.	Figures, tables, and graphics are well-designed, labeled appropriately, and support the document's purpose.	Figures, tables, or graphics have minor design flaws, labeling issues, or only partially support the document's purpose.	Figures, tables, or graphics are poorly designed, inadequately labeled, or fail to support the document's purpose.
3.9 Follow appropriate documentation and citation standard	Documentation and citations follow required formatting standards perfectly. Sources are thoroughly and accurately documented.	Documentation and citations generally follow required formatting standards with minor errors. Most sources are properly documented.	Documentation and citations contain several formatting errors. Some sources are improperly documented or missing.	Documentation and citations contain major formatting errors or are largely missing.

EGR 3093L Assessment Method: Lab Report

PLO3: Students will demonstrate an ability to communicate effectively with a range of audiences.

- Students will be able to speak about their work with precision, clarity, and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	4 – Excellent	3 – Good	2 – Fair	1 – Poor
3. Students will be able to write a lab report that accurately summarizes the experiment and the results.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
6. Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources of error.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized

EGR 4082 Assessment Method: Final Report

Outcome Assessed	Excellent (4)	Good (3)	Fair (2)	Poor (1)
3.6 Produce clear and effective written content	Writing is exceptionally clear, fluent, and concise. Main points are well-developed with excellent support. Organization is logical and enhances understanding.	Writing is clear and well-organized. Main points are adequately developed with appropriate support.	Writing is sometimes unclear or disorganized. Main points lack sufficient development or support.	Writing is unclear, disorganized, and difficult to follow. Main points are undeveloped or unsupported.
3.7 Use appropriate technical language and terminology	Consistently uses precise technical terminology appropriate to the audience. Technical concepts are clearly explained when necessary.	Generally uses appropriate technical terminology with adequate explanations when needed.	Sometimes uses inappropriate technical terminology or fails to explain technical concepts adequately.	Consistently misuses technical terminology or uses overly technical language without necessary explanation.
3.8 Create professional quality figures, tables, and graphics	Figures, tables, and graphics are expertly designed, properly labeled, and effectively support the document's purpose.	Figures, tables, and graphics are well-designed, labeled appropriately, and support the document's purpose.	Figures, tables, or graphics have minor design flaws, labeling issues, or only partially support the document's purpose.	Figures, tables, or graphics are poorly designed, inadequately labeled, or fail to support the document's purpose.
3.10 Identify and evaluate information sources	Consistently identifies and evaluates highly relevant, authoritative information sources. Demonstrates excellent critical assessment of source quality.	Identifies and evaluates appropriate information sources with reasonable critical assessment.	Sometimes selects information sources with limited relevance or authority. Critical assessment of sources is inconsistent.	Frequently selects inappropriate sources or fails to evaluate sources critically.
3.11 Use information ethically and legally	Consistently demonstrates full understanding of ethical and legal use of information. All sources are properly acknowledged and cited.	Demonstrates good understanding of ethical and legal use of information. Sources are generally acknowledged and cited appropriately.	Demonstrates limited understanding of ethical and legal use of information. Some sources may not be properly acknowledged or cited.	Shows poor understanding of ethical and legal use of information. Sources are frequently unacknowledged or improperly cited.

EGR 4082 Assessment Method: Faculty/Review Team assessment of Final Project

Outcome Assessed	Excellent (4)	Good (3)	Fair (2)	Poor (1)
3.3 Displays appropriate structure and organization in their oral communication	The entire presentation is understandable, logical, and easy to follow; smooth flow and good transitions among team members.	Most of the presentation is understandable, logical, and easy to follow; some hesitancy to flow.	Parts of the presentation are difficult to understand, not always logical, and difficult to follow; interrupted flow.	Most or all of the presentation is difficult to understand and follow; no flow.
3.4 Creates professional quality visual aids	Makes very effective use of visual aids, which are always clear, meaningful, and easy to interpret.	Makes good use of visual aids, which are usually clear and easy to interpret.	Makes some use of visual aids, but they are confusing or do not enhance the presentation.	Marginal or poor use of visual aids; needs more practice using visual aids.
4.3 Evaluates global impacts of engineering solutions	Comprehensively evaluates global impacts of engineering solutions across multiple dimensions. Demonstrates sophisticated understanding of international contexts.	Evaluates major global impacts of engineering solutions. Shows adequate understanding of international contexts.	Limited evaluation of global impacts. Basic understanding of international contexts.	Fails to consider global impacts of engineering solutions.
4.4 Assesses economic considerations in engineering decisions	Thoroughly assesses economic implications across short and long-term horizons. Demonstrates advanced understanding of economic factors.	Assesses major economic implications of engineering decisions. Shows good understanding of economic factors.	Limited assessment of economic implications. Basic understanding of economic factors.	Fails to consider significant economic implications of engineering decisions.
4.6 Considers societal implications of engineering work	Thoroughly examines societal implications across diverse communities. Demonstrates sophisticated understanding of social equity considerations.	Examines major societal implications of engineering work. Shows good understanding of social impacts.	Limited examination of societal implications. Basic understanding of social impacts.	Fails to consider significant societal implications of engineering work.

PHY-ENG Oral Presentation Rubric Update

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Command of material	☐ Clearly knows material	☐ Knows most key facts	☐ Reads some, knows some	☐ Reads many sentences from slides
	☐ Expands on PowerPoint slides	☐ Some expansion on slides	☐ No expansion on slides	☐ Dependent on notes
	☐ Content appropriate for audience	☐ Partial adaptation for audience	☐ Little adaptation of content for audience	☐ Lacks adaptation of content to audience
Organization	☐ Clear and concise outline	☐ Clear outline	☐ Some sense of outline	☐ No clear sense of outline
	☐ Relevant graphics and key text items on slides	☐ Too much information on slides (not concise)	☐ Too much information and detail	☐ Slides are in paragraphs; too much detailed information on one slide
	☐ Plus/minus 30 seconds of time limit	☐ Plus/minus 60 seconds of time limit	☐ Plus/minus 1.5 minutes of time limit	☐ Plus/minus 2 minutes of time limit
Presentation skills	☐ Clearly has practiced several times; smooth transitions	☐ Practiced, but transitions are not smooth	☐ Practiced, but no transitions between slides	☐ Not practiced, doesn't anticipate content of next slide
	☐ Free of uhms and the like	☐ Few uhms and the like	☐ Many uhms and the like	☐ Uhms and the like detract from the presentation
	☐ Clearly heard and used inflection for emphasis	☐ Understood much of the time and some inflection	☐ Some difficulty hearing and little inflection	☐ Cannot be heard and/or speaks in a monotone
	☐ Engages audience with eye contact	☐ Some engagement with eye contact	☐ Infrequent eye contact	☐ No eye contact
	☐ Engages audience with gestures	☐ Some engagement with gestures	☐ Some distracting gestures	☐ Frequent distracting gestures
Presentation tools	☐ PPT background is matched to content, legible font, graphics, seamless transitions	☐ Appropriate background, font, transitions	☐ Distracting backgrounds, transitions, fonts hard to read	☐ No attention to backgrounds, transitions, fonts very hard to read
	☐ Appropriate graphics used	☐ Some graphics used to enhance presentation	☐ Graphics do not enhance presentation	☐ Distracting use of graphics

PHY-ENG Written Presentation Rubric

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Structural pieces	☐ Abstract is a clear and concise summary of all relevant results and descriptions in the order emphasized in the paper	☐ Abstract could be made clear and/or concise with minor changes	☐ Abstract is missing some information and/or contains unnecessary information	☐ Abstract does not contain necessary information
	☐ Introduction indicates precise subject, scope, and purpose	☐ Introduction is missing one of the following: precise subject, scope or purpose	☐ Introduction is missing two of the following: precise subject, scope or purpose	☐ Introduction does not give precise subject, scope and purpose
	☐ Main body is well organized, logical and contains all necessary information without extra information	☐ Main body lacks some organization	☐ Main body is missing some important pieces and/or is not well organized	☐ Main body is not well organized, lacks logical arguments and relevant data
	☐ Conclusion appropriately sums up, gives conclusions, and recommendations	☐ Conclusion does two of the following: sums up, gives conclusions, and recommendations	☐ Conclusion does one of the following: sums up, gives conclusions, and recommendations	☐ Conclusion does not provide any summation, conclusions, or recommendations
	☐ Multiple references from reputable sources	☐ Most references from distinct reputable sources	☐ Some references from reputable sources	☐ No bibliography or all references from untrusted sources
	☐ References cited in the body of the document	☐ Some citations of reference in the body	☐ Limited citation references	☐ No citation of references
Data	☐ Data is clearly presented in properly formatted tables, figures and graphs where appropriate	☐ Some data could be presented more clearly	☐ Data is poorly presented and some key data is missing	☐ Several pieces of key data are missing
	☐ All uncertainties are shown and error propagation is carried out where appropriate	☐ Most uncertainties are shown and propagation of error carried out	☐ Many uncertainties are missing and/or propagation or error not carried out correctly	☐ No uncertainties of measurements are shown
Grammar, spelling and style	☐ No grammatical or spelling errors	☐ Few grammatical and spelling errors	☐ Some grammatical and spelling errors	☐ Many grammatical and spelling errors
	☐ Equations well formatted and variables introduced as needed	☐ A few errors in formatting equations	☐ Poorly formatted equations	☐ Incorrect equations
	☐ Appropriate style (no first-person, past tense when reporting was done)	☐ A few informal statements and/or tense	☐ Several areas which are too informal and tense errors	☐ Very informal and/or use of future tense where not appropriate
	☐ Clear sentences and ideas are presented in a way that won't be misunderstood	☐ A few unclear sentences	☐ Many complex and unclear sentences	☐ Many sentences are unclear and have overly complex construction
	☐ Concise and quantitative as subject matter permits	☐ A few unnecessary words and ideas	☐ Frequent extra and inexact words	☐ Many vague, inexact, and/or idle words
	☐ Arguments are complete and logical	☐ Most arguments are complete	☐ Several arguments are difficult to follow	☐ Arguments are incomplete, illogical, and may contain unnecessary information and specialized jargon

Physics and Engineering

Learning Outcome: ABET #6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Outcome Measures and Criteria for Success:

Course	Outcome Assessed	Assessment Method	Threshold	Frequency
EGR2014	Students will be able to carry out an experiment based on instructions and accurately record data (ME and EE)	Procedures in Lab Document	80% of the respondents will say that they are satisfied or higher	Odd Fall
EGR2024 EGR2024L (phasing out starting 2025-26)	Students will be able to carry out an experiment based on instructions and accurately record data.	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Annually
EGR2024 EGR2024L (phasing out starting 2025-26)	Students will be able to analyze experimental data and draw conclusions.	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Annually
PHY3004 PHY3004L (phasing out starting 2025-26)	Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources or error.	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Annually
EGR3053# EGR3053L (2023 and beyond) EGR3093 EGR3093L (old) (phasing out starting 2025-26)	Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources or error.	Lab Report	At least 80% of the students will score 2.5 or higher on the associated rubric	Alternating Year
EGR2014	Students will be able to analyze experimental data and draw conclusions (ME and EE)	Lab Report	80% of the respondents will say that they are satisfied or higher	Odd Fall
EGR3113 (New Assessment beginning 2026-27)	Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources or error (ME and EE)	Lab Report	80% of the respondents will say that they are satisfied or higher	Even Fall

EGR3123	Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources or error (ME)	Lab Report	80% of the respondents will say that they are satisfied or higher	Odd Fall
EGR4082	Student reflection on preparation to conduct experiments and interpret data.	Senior Survey (Indirect Method)	80% of the respondents will say that they are satisfied or higher	Annually

Longitudinal Data:
Note that the PHE department changed assessment processes to align with ABET expectations for engineering curriculum. This includes both formative and summative data. As can be seen in the data, the measurement/rubric has changed over time.

EGR2014 (Formative)	Percent of Students at 2.5 or Higher					
	2025-26					
6.2 Develop an experiment plan	62%					
6.3 Acquire data according to the experiment plan	88%					
6.4 Analyze and interpret data	46%					

EGR2024 (Formative)	*Percent of Students at 2.5 or Higher*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students will be able to carry out an experiment based on instructions and accurately record data	*0%*	*27%*	*100%*			
Students are able to carry out the experiment from instructions				*100%*	*100%*	*100%*
Students will be able to analyze experimental data and draw conclusions	*0%*	*45%*	*60%*	*100%*	*79%*	*100%*

PHY3004 (Summative)	*Percent of Students at 2.5 or Higher*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources of error	*40%*	*100%*	*63%*	*100%*	*50%*	*75%*

EGR3053 (Summative)	*Percent of Students at 2.5 or Higher*					
	2019-20	*2020-21*	*2021-22*	*2022-23*	*2023-24*	*2024-25*
Students are able to follow instructions					*100%*	*N/A*
Students are able to carry out the experiment from instructions					*100%*	*N/A*
Data is accurately recorded					*100%*	*N/A*
Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources of error	*100%*		*100%*			

EGR3123 (Summative)	Percent of Students at 2.5 or Higher					
	2025-26					
6.2 Develop an experiment plan	100%					
6.3 Acquire data according to the experiment plan	100%					
6.4 Analyze and interpret data	100%					
6.5 Use engineering judgement to draw conclusions	100%					

EGR4082 (Student Survey)	Percentage of Students Indicating Satisfied or Higher			
	2022-23	2023-24	2024-25	2025-26
How well do you feel that you have been prepared to: [Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions?]	83%	100%	57%	88%

Conclusions Drawn from Data:

The students generally meet our benchmarks at the summative level. EGR2014 is underperforming on experimental planning and data analysis. However, they do well on acquiring the data.

Changes to be Made Based on Data:

EGR2014 can emphasize analysis techniques that are expected to be seen in the report. The ability to develop an experimental plan requires improvements in written communication. Continue to emphasize writing standards in this class.

Rubrics:
EGR2014 – Attached
EGR2024 – Attached
PHY3004: Rubric is attached.
EGR3053: Rubric is attached.
EGR3123 – Attached
EGR4082: This is data from a survey given to seniors.

EGR 2014 Assessment Method: Lab Report

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CC: QR)

Outcome Assessed	Exemplary (4)	Satisfactory (3)	Developing (2)	Unsatisfactory (1)
6.2 Develop an experiment plan	All relevant variables and externalities are identified. A data collection procedure is formulated and explained in detail without being unnecessarily complicated.	Almost all variables are identified. Data collection procedures are formulated adequately, but do not account for all externalities.	Some variables are identified, but some key variables are missing. A data collection procedure is described, but details required to accurately reproduce the experiment are missing.	The majority of key variables are not identified. A data collection procedure is incomplete, unclear, or not documented.
6.3 Acquire data according to the experiment plan	Procedures were followed and any procedural changes required are justified and explained.	Procedures were mostly followed and any procedural changes required are noted.	Procedures were mostly followed, but changes made are not clearly described and explained.	Procedures were not followed.
6.4 Analyze and interpret data	Analysis is thorough and there are no errors. Analysis goes above and beyond the experiment plan.	Analysis is mostly complete and follows experiment plan. Many methods for analysis are used with only a few errors.	Analysis is incomplete. A few methods for analysis are used, but there are many errors.	Analysis is poorly performed or missing.

EGR 2024 and 2024L Assessment Method: Lab Report (Past)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	4 – Excellent	3 – Good	2 – Fair	1 – Poor
Students are able to follow instructions	No mistakes	Few mistakes, mostly follows instructions	Some mistakes, some confusion following instructions	Many mistakes, clearly does not follow instructions
Students are able to carry out the experiment from instructions	No mistakes	Few mistakes, mostly correct experimental setup	Some mistakes, some confusion with experimental setup	Many mistakes, wrong experimental setup
Data is accurately recorded	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some confusion with data	Many mistakes, data is not organized or labeled properly

EGR 2024 and 2024L Assessment Method: Lab Report (Past)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	4 – Excellent	3 – Good	2 – Fair	1 – Poor
Analyze experimental data	Arrives at significant results of the experiment from data and identifies key features in data	Arrives at significant results of the experiment from data	Arrives at some of the significant results of the experiment from data	Does not analyze data or incorrectly analyzes data
Draw conclusions from data	Significant conclusions of the experiment are stated and further inferences are made from data	Significant conclusions of the experiment are stated	Some Significant conclusions of the experiment are stated	No conclusions stated or inaccurate conclusions from data

EGR 2024L Assessment Method: Lab Report (Past)

PLO3: Students will demonstrate an ability to communicate effectively with a range of audiences.

- Students will be able to speak about their work with precision, clarity, and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	4 – Excellent	3 – Good	2 – Fair	1 – Poor
3. Students will be able to write a lab report that accurately summarizes the experiment and the results.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
6. Students will be able to carry out an experiment based on instructions and accurately record data.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
6. Students will be able to analyze experimental data and draw conclusions.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized

PHY 3004L Assessment Method: Lab Report

PLO3: Students will demonstrate an ability to communicate effectively with a range of audiences.

- Students will be able to speak about their work with precision, clarity, and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	**4 – Excellent**	**3 – Good**	**2 – Fair**	**1 – Poor**
3. Students will be able to write a lab report that accurately summarizes the experiment and the results.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized
6. Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources of error.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized

EGR 3053L Assessment Method: Lab Report

PLO3: Students will demonstrate an ability to communicate effectively with a range of audiences

- Students will be able to speak about their work with precision, clarity, and organization. (CC: OC)
- Students will be able to write about their work with precision, clarity and organization. (CC: WC)
- Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand. (CC: IL)

PLO6: Students will demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (CC: QR)

Criteria	**4 – Excellent**	**3 – Good**	**2 – Fair**	**1 – Poor**
6. Students will be able to compare experimental results to appropriate theoretical models and explain differences, including quantifying sources of error.	No mistakes	Few mistakes, mostly clear and organized	Some mistakes, some ambiguity	Many mistakes, writing is ambiguous and not organized

EGR 3123 Assessment Method: Lab Report

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CC: QR)

Outcome Assessed	Exemplary (4)	Satisfactory (3)	Developing (2)	Unsatisfactory (1)
6.2 Develop an experiment plan	All relevant variables and externalities are identified. A data collection procedure is formulated and explained in detail without being unnecessarily complicated.	Almost all variables are identified. Data collection procedures are formulated adequately, but do not account for all externalities.	Some variables are identified, but some key variables are missing. A data collection procedure is described, but details required to accurately reproduce the experiment are missing.	The majority of key variables are not identified. A data collection procedure is incomplete, unclear, or not documented.
6.3 Acquire data according to the experiment plan	Procedures were followed and any procedural changes required are justified and explained.	Procedures were mostly followed and any procedural changes required are noted.	Procedures were mostly followed, but changes made are not clearly described and explained.	Procedures were not followed.
6.4 Analyze and interpret data	Analysis is thorough and there are no errors. Analysis goes above and beyond the experiment plan.	Analysis is mostly complete and follows experiment plan. Many methods for analysis are used with only a few errors.	Analysis is incomplete. A few methods for analysis are used, but there are many errors.	Analysis is poorly performed or missing.
6.5 Use engineering judgement to draw conclusions	Thorough consideration given from an engineering perspective to draw the most probable outcome and conclusion	Reasonable conclusion provided	Incomplete conclusions; not well thought out.	No conclusion or probable outcome provided