

## Physics and Engineering PLO 4: Communication

**Program Learning Outcome:** Students will effectively communicate complicated technical information.

**Measure:** PHY475: Senior Lab final written project and technical talk. Juried as a department; Secondary Measure Oral Examination in Electricity and Magnetism.

**Criteria for success:** At least 75% of students will achieve an average score of 2.5 or higher on criteria on the Oral and Written Presentation rubrics; At least 75% of students will achieve an average score of no less than one grade lower on their PHY361 final oral exam than their written exam.

Second Measure:

**Aligned with DQP Learning Areas:**

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skill/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

**Longitudinal Data:**

Data from Senior Project Talks:

	2012-13	2013-14	2014-15
N of Students	8	7	8
% above 2.5	88%	100%	100%
average score	-	3.2	3.4
met criteria	yes	yes	yes

Data from papers written on senior projects. Note that seniors did not create a write-up in the 2013-14 academic year.

	2012-13	2013-14	2014-15
N of Students	8	7	8
% above 2.5	75%	-	100
met criteria	yes	no	yes

**Additional Data:**

Data from E&M oral exams showing the number of students that scored no more than a grade lower (9 percent less) on their oral portion of their final compared to the written final.

	2009-10	2011-12	2013-14
N of Students	11	22	18
met requirement	82%	95%	83%
met criteria	yes	yes	yes

In a 2015 survey of graduating seniors, students all (8/8) rated themselves as either high satisfactory or outstanding in having achieved this learning outcome. (This may be more a measure of self-confidence.)

**Conclusions Drawn from Data:** Students have often demonstrated stronger speaking skills than writing skills. Though students are frequently meeting our criteria, their overall scores are closer to the 2.5 range.

**Changes to be Made Based on Data:** Both writing and speaking have been incorporated into more courses. Increased opportunities to develop these skills is important. In 2015 the writing rubric was applied to students starting in their sophomore year. This led to more rigorous attention to the presentation of data and communication. It would be helpful to build in some additional practice with speaking about technical concepts earlier in their academic career.

Additional small and medium sized writing assignments would be helpful to incorporate in upper division courses.

**Rubric Used:**

## Physics and Engineering Oral Presentation Rubric

	Outstanding	High satisfactory	Low Satisfactory	Unsatisfactory
Command of Material	<input type="checkbox"/> clearly knows material <input type="checkbox"/> expands on PPT slides <input type="checkbox"/> content appropriate for audience	<input type="checkbox"/> knows most key facts <input type="checkbox"/> some expansion on slides <input type="checkbox"/> partial adaption for audience	<input type="checkbox"/> reads some, knows some <input type="checkbox"/> no expansion on slides <input type="checkbox"/> little adaption of content for audience	<input type="checkbox"/> reads many sentences from slides <input type="checkbox"/> dependent on notes <input type="checkbox"/> lacks adaption of content to audience
Organization	<input type="checkbox"/> clear and concise outline <input type="checkbox"/> relevant graphics and key text on slides <input type="checkbox"/> $\pm 30$ s of time limit	<input type="checkbox"/> clear outline <input type="checkbox"/> too much information on slides <input type="checkbox"/> $\pm 60$ s of time limit	<input type="checkbox"/> some sense of outline <input type="checkbox"/> too much information and detail <input type="checkbox"/> $\pm 1.5$ m of time limit	<input type="checkbox"/> no clear sense of outline <input type="checkbox"/> slides are paragraphed; too much detail on one slide <input type="checkbox"/> $\pm 2$ m of time limit
Presentation Skills	<input type="checkbox"/> clearly practice several times; smooth transitions <input type="checkbox"/> free of umms and the like <input type="checkbox"/> clearly heard and used inflection for emphasis <input type="checkbox"/> engages audience with eye contact <input type="checkbox"/> engages audience with gestures	<input type="checkbox"/> Practiced, but transitions not smooth <input type="checkbox"/> few umms <input type="checkbox"/> understood much of the time and some inflection <input type="checkbox"/> some engagement with eye contact <input type="checkbox"/> some engagement with gestures	<input type="checkbox"/> practiced, but no transitions between slides <input type="checkbox"/> many umms <input type="checkbox"/> some difficulty hearing and little inflection <input type="checkbox"/> infrequent eye contact <input type="checkbox"/> some distracting gestures	<input type="checkbox"/> not practiced, doesn't anticipate content of next slide <input type="checkbox"/> umms and the like detract from the presentation <input type="checkbox"/> cannot be heard and/or speaks in a monotone <input type="checkbox"/> no eye contact <input type="checkbox"/> frequent distracting gestures
Presentation Tools	<input type="checkbox"/> PPT background matched to content, legible font, graphics, seamless transitions <input type="checkbox"/> Appropriate graphics used.	<input type="checkbox"/> appropriate background, font, transitions <input type="checkbox"/> Some graphics used to enhance presentation.	<input type="checkbox"/> distracting backgrounds, transitions, fonts hard to read <input type="checkbox"/> graphics do not enhance presentation	<input type="checkbox"/> no attention to backgrounds, transitions, fonts very hard to read <input type="checkbox"/> distracting use of graphics

## Physics and Engineering Write-up Rubric

	Outstanding	High satisfactory	Low Satisfactory	Unsatisfactory
Structural pieces	<ul style="list-style-type: none"> <li><input type="checkbox"/> abstract is a clear and concise summary of all relevant results and descriptions in the order emphasized in the paper.</li> <li><input type="checkbox"/> introduction indicates precise subject, scope, and purpose</li> <li><input type="checkbox"/> main body is a well organized, logical and contains all necessary information without extra information.</li> <li><input type="checkbox"/> conclusion appropriately sums up, gives conclusions, and recommendations</li> <li><input type="checkbox"/> multiple references from reputable sources.</li> <li><input type="checkbox"/> references cited in the body of the document</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> abstract could be made clear and/or concise with minor changes.</li> <li><input type="checkbox"/> introduction is missing one of the following: precise subject, scope, and purpose.</li> <li><input type="checkbox"/> main body lacks some organization</li> <li><input type="checkbox"/> conclusion does two of the following: sums up, gives conclusions, and recommendations</li> <li><input type="checkbox"/> most references from distinct reputable sources</li> <li><input type="checkbox"/> some citation of reference in body</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> abstract is missing some information and/or contains unnecessary information.</li> <li><input type="checkbox"/> introduction is missing two of the following: precise subject, scope, and purpose.</li> <li><input type="checkbox"/> main body is missing some important pieces and/or is not well organized</li> <li><input type="checkbox"/> conclusion does one of the following: sums up, gives conclusions, and recommendations</li> <li><input type="checkbox"/> some references from reputable sources</li> <li><input type="checkbox"/> limited citation of references</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> abstract does not contain necessary information</li> <li><input type="checkbox"/> introduction does not give precise subject, scope and purpose.</li> <li><input type="checkbox"/> main body is not well organized, lacks logical arguments and relevant data</li> <li><input type="checkbox"/> conclusion does provide any summation, conclusions, or recommendations</li> <li><input type="checkbox"/> no bibliography, or all references from untrusted sources</li> <li><input type="checkbox"/> no citation of references</li> </ul>
Data	<ul style="list-style-type: none"> <li><input type="checkbox"/> data is clearly presented in properly formatted tables, figures and graphs where appropriate.</li> <li><input type="checkbox"/> all uncertainties are shown and error propagation are carried out where appropriate.</li> <li><input type="checkbox"/> no grammatical or spelling errors</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> some data could be presented more clearly</li> <li><input type="checkbox"/> most uncertainties are shown and propagation of error carried out.</li> <li><input type="checkbox"/> few grammatical and spelling errors</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> data is poorly presented and some key data is missing.</li> <li><input type="checkbox"/> many uncertainties are missing and/or propagation or error not carried out correctly</li> <li><input type="checkbox"/> some grammatical and spelling errors</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> several pieces of key data are missing</li> <li><input type="checkbox"/> no uncertainties of measurements are show</li> </ul>
Grammar, Spelling, and Style	<ul style="list-style-type: none"> <li><input type="checkbox"/> equations well formatted, and variables introduced as needed.</li> <li><input type="checkbox"/> appropriate style (no first person, past tense when reporting what was done)</li> <li><input type="checkbox"/> clear sentences and ideas are presented in a way that won't be misunderstood</li> <li><input type="checkbox"/> concise and quantitative as subject matter permits</li> <li><input type="checkbox"/> arguments are complete and logical</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> a few errors in formatting equations</li> <li><input type="checkbox"/> a few informal statements and/or tense</li> <li><input type="checkbox"/> a few unclear sentences</li> <li><input type="checkbox"/> a few unnecessary words and ideas</li> <li><input type="checkbox"/> most arguments are complete</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> poorly formatted equations</li> <li><input type="checkbox"/> several areas with are too informal and tense errors</li> <li><input type="checkbox"/> many complex and unclear sentences</li> <li><input type="checkbox"/> frequent extra and inexact words</li> <li><input type="checkbox"/> several arguments are difficult to follow</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> incorrect equations</li> <li><input type="checkbox"/> very informal and/or use of future tense where not appropriate</li> <li><input type="checkbox"/> many sentences are unclear and have overly complex construction</li> <li><input type="checkbox"/> many vague, inexact, many idle words</li> <li><input type="checkbox"/> arguments are incomplete, illogical, and may contain unnecessary information and specialized jargon</li> </ul>