**State University College at Oswego**
**Department of Physics**

## Implementation of Writing Requirements in New General Education Program

The Department of Physics plan for meeting the Writing Across the Curriculum component of General Education requires all five courses to be provided by the Physics Department. Nine such courses are being offered to meet this requirement. These physics courses themselves are hierarchical in scope (each one building upon knowledge required in a previous course), so the writing requirement progresses from freshman-level lab reports to comprehensive and intensive research papers based upon original work.

**Goals:** Graduates with a BA or BS in Physics should be able to:

1. Maintain a well-documented laboratory notebook.
2. Generate and assemble the appropriate components of a written and/or oral report. These components include:
    a. background on concepts being explored
    b. description of previous work
    c. graphs
    d. simulations
    e. statistical analysis
    f. diagrams
    g. bibliography
3. Develop a written or oral report. This task involves:
    a. identification of the audience
    b. establishing the level of the presentation
    c. establishing the depth of the exposition
4. Write an outline of the exposition
5. Write a detailed report. The report will include the following sections:
    a. abstract
    b. introduction
    c. data
    d. results
    e. analysis of results
    f. conclusions

**Objectives:** The BA and BS degree programs will provide writing skills development experiences each year of the four year program. The development of these skills will proceed in three steps, commensurate with the level of course taken.

1. Students begin to develop the necessary skills with their first course in physics, Physics 111/112. Both the course and the laboratory meet the purposes stated above. For example, problem solving required for the homework assignments and the hour exams involve elements of analysis, synthesis, and communication which are all central to expository writing. In the associated laboratory, weekly formal reports are required. These reports are critiqued by the instructor and returned; an opportunity exists to resubmit the lab report for re-evaluation.

2. Students continue to develop expository writing skills in the remaining three years in numerous 300 and 400 level laboratory courses. These courses are listed below. More extensive reports are required in these upper-division laboratories with emphasis on presenting an informed background on the material in the students' own words. These reports are also critiqued by the instructor.

3. Students in the BS program are required to take an Advanced Laboratory course (Physics 430, 431, or 432); most BA students elect this course as well. This is a capstone experience where students work with faculty members on an original research project and present their work in the form of a senior thesis. They are required to write a thesis of 10 or more pages. This project requires a review of the scientific literature on the subject as well as a description of procedures used, a detailed analysis of the data, a discussion of results, and conclusions.

**Courses:** The following 9 courses satisfy the expository writing requirement of the new General Education program:

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| Phy 111/112 and 111L | College/University Physics I and Lab (4 sh) |
| Phy 212/213 and 212L | College/University Physics II and Lab (4 sh) |

In this two semester sequence (where the lab is required), students submit weekly lab reports whose format is outlined in point 5 above. These reports constitute about 20% of the final grade in Physics 111/212. Each report is evaluated by the instructor based upon both writing and experimental results. At the beginning of the semester, a discussion is held in class of expectations for such a report, based upon the above goals.

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| Phy 321L | Electronics Laboratory (1 sh) |
| Phy 322L | Optics Laboratory (1 sh) |
| Phy 323L | Quantum Physics Laboratory (2 sh) |
| Phy 352L | Electrical Measurements Laboratory (2 sh) |

These 4 courses are intermediate level labs. Much more thinking and analysis goes into completing these labs. Consequently, the reports are much longer than those in the Phy 111/212 sequence. More effort must be put into writing about the background and the concepts being explored, as well as the discussion of results. Skills in maintaining a well-documented lab notebook are emphasized. Sample papers from the literature provide the students with a written model for the reports. These reports constitute about 40% of the final grade in these labs.

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| Phy 430 | Advanced laboratory in Low Temperature Physics (3 sh) |
| Phy 431 | Advanced Laboratory in Nuclear Physics (3 sh) |
| Phy 432 | Advanced Laboratory in Optics (3 sh) |

The Advanced Labs provide a capstone experience for our students. They are involved in original work in one of these three fields. The final report is an important part (50%) of the final grade. They are to meet all the goals as outlined above. In parallel with the development of this report, which summarizes their accomplishments, the students must prepare a "review" paper on previous work in this area. Such a paper draws heavily upon library research. This review paper is evaluated by the instructor, about the middle of the semester, and becomes part of the final report.

**Implementation:**

These 9 courses are already in place in our department and emphasis is placed upon the various facets of a good written scientific report. Some changes or modifications are being made in our writing requirements for Phy 111/212 for this next academic year. Because we have many lab sections of these two courses, with different instructors, the requirements for a lab report will be introduced in the lecture, and not the lab. This provides more time to emphasize the components of a good written report and good writing techniques.