

**Marquette University
Learning Assessment Plan**

Physics

Program: Physics

Degree: BS

Submitted: April 24, 2006

Program Learning Outcomes Students will be able to:	Performance Indicators	Measures	Use of the Information
1. Physics graduates demonstrate command of theoretical, experimental and computational physics in preparation for their chosen career path after graduation.	<ol style="list-style-type: none"> 1. Use a variety of physical principles and techniques to solve problems. 2. Demonstrate mathematical sophistication sufficient to attack difficult problems in physics 3. Use common symbolic software to construct solutions to complex problems. 	The data will be collected in two challenging upper division courses: PHYS131 and PHYS112 where students must use sophisticated problem solving skills. Because these are upper division courses, this will present an opportunity to assess how effective our lower division courses have been in promoting skills. There is only one section of these courses offered each year but all of the skills must be used in it.	The data will be collected by the faculty member teaching these courses and presented as a report to the entire faculty every year. During each year, we will rely on the judgment of the faculty member teaching the courses that year. The faculty will adjust the program as appropriate.
2. Physics graduates apply the tools of physics including mathematics, experimental design with apparatus, and computers to explore independently new problems of practical or theoretical importance.	<ol style="list-style-type: none"> 1. Analyze a new problem presented in everyday language in terms of physics concepts 2. Devise an experimental or computational test that will provide data to solve or illuminate the problem 3. Analyze data from experiment or computation in terms of the original problem presented. 	Students may either: <ol style="list-style-type: none"> 1. Participate in an independent undergraduate research project or 2. Perform an extended experimental project in Physics 157 or 3. Participate in student teaching (an option for teaching majors only). 	The student's research advisor or the instructor of the advanced lab course will report to the faculty on how well the student fulfills this learning objective and will present illustrative examples of each students' written reports on their work as well as examples of papers or posters they have presented at professional meetings. Criteria for these projects will be those for creative excellence in the discipline.
3. Physics graduates exhibit growth as members of a scientific community and in awareness of professional responsibilities.	<ol style="list-style-type: none"> 1. Observe scientific ethics in their work 2. Use science in the service of the community 3. Participate in organizations at 	Students: <ol style="list-style-type: none"> 1. Help one another in solving problems and help beginning students 2. Participate in service learning, act as TAs or participate in SPS outreach 	Because we have small numbers of students and know them personally, faculty members will be able to discuss the growth of each senior before graduation and determine how

	Marquette, nationally and regionally	activities 3. Attend a professional meeting either at Marquette or elsewhere.	to alter the program to encourage greater participation in the scientific community. The activities of our students both at Marquette and in the scientific community as a whole form part of the departmental annual reports so records are maintained.
4. Physics graduates demonstrate the ability to construct, articulate, and defend a valid scientific argument and to critique others' arguments and techniques.	<ol style="list-style-type: none"> 1. Presents well-structured written and oral scientific arguments 2. Critiques colleagues' papers and presentations using valid scientific arguments 	<ol style="list-style-type: none"> 1. In Physics 104, sophomores are asked to make an oral presentation and write a paper on a topic in physics. Other students in the class ask questions and critique the presentation. The students discuss their presentations with the instructor and their peers. 2. In senior level courses or as part of their research experiences, students make an oral presentation to the faculty and their peers. These presentations are evaluated by the standards used in physics for judging work presented in professional settings. 	<ol style="list-style-type: none"> 1. The instructor of Physics 104 and other faculty members acting as observers. This is intended as a formative evaluation and there are few formal guidelines but a good deal of one-on-one discussion. 2. The faculty will discuss each senior's ability to meet this learning objective and consider areas in the program where improvements should be made.