Institutional Effectiveness Report
Academic Year 2011-2012
Physics and Engineering Technology

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Mission and Goals

Physics

The Department of Physics and Astronomy offers a baccalaureate degree in Physics with a concentration in Computational Physics or Health Physics. Students completing the majors offered by the department will be prepared for careers in industry and scientific research or for graduate school.

Engineering Technology

The Francis Marion University B.S. degree programs in Civil Engineering Technology (CET) and Electronics Engineering Technology (EET) allow students with an associate's degree in Engineering Technology or those in pursuit of such a degree to earn their bachelor's degree after approximately two years of additional coursework. FMU's Engineering Technology programs provide a unique cooperative educational opportunity to students and workers of the Pee Dee region and South Carolina by offering a liberal arts education to Engineering Technology students from the state's Technical Colleges in addition to their chosen technical and scientific training. The Engineering Technology degree programs enable graduates to compete more effectively for technical positions within local and regional industry.

Assessment Activities

Student learning and development	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**
All laboratory courses will require mandatory written lab reports. Benchmark: 70% of the physics and engineering technology majors who complete the 300 and 400 level physics laboratory courses will submit a complete set of laboratory reports for each course.	30/35 (86%)	38/44 (86%)	39/48 (81%)	22/28 (79%)	26/33 (78%)	29/39 (75%)
Physics majors will complete one or more senior projects in PHYS 419 and420 and will submit a written report. Benchmark: The written reports will be graded by two physics faculty members, assessed for accurate and clear scientific information reporting, and 70% of the students will score 4 or more on a 1-7 point scale.	8/8 (100%)	8/8 (100%)	8/8 (100%)	7/7 (100%)	9/10 (90%)	8/8 (100%)
Physics majors will be required to make at least one oral scientific report. An oral presentation based on a student's senior projects will be required as part of PHYS 420. Benchmark: Students will make an oral presentation at a special Society of Physics Students meeting, which will be evaluated by the physics faculty and at least one faculty member from another discipline for oral presentation quality. The mean score for these presentations should be at least 70 on a 100-point scale.	2/3 (67%)	6/6 (100%)	2/2 (100%)	0/0	3/3 (100%)	6/6 (100%)
Instructional Technology	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**
Students will be required to demonstrate the ability to use computers to solve physics problems Physics 301 or Physics 302 or Physics 401. Benchmark: one computer project will be completed in either physics 301, 302, or 401 and 70% of the	3/3 (100%)	9/12 (75%)	6/7 (86%)	7/8 (87)	13/18 (72%)	15/20 (75%)

students will score 4 or better on a 1-7 point scale of computer use, as assessed by two faculty members.						

Reviews Of Student Graduate School Admission And Fellowship Or Assistantship Acquisition	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**
Within any four-year period, 80% of FMU physics graduates who apply to graduate school in a related discipline will be accepted.	6/6 (100%)	4/4 (100%)	3/3 (100%)	3/3 (100%)	1/2 (50%)	2/2 (100%)
One in eight of FMU physics graduates who are accepted to graduate school in a related field will receive a fellowship or assistantship.	5/6 (83%)	4/4 (100%)	3/3 (100%)	3/3 (100%)	1/1 (100%)	1/2 (50%)
Faculty Service To The University And To The Community	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**
The level of involvement of the physics faculty in University committees will be evaluated through an examination of the faculty's annual reports. The benchmark for this activity is for the department's faculty, on average, to serve on at least two campus committees.	18/7 (2.6)	22/7 (3.1)	23/7 (3.3)	24/7 (3.4)	22/7 (3.1)	26/7 (3.7)
The extent of the physics faculty's participation in activities of the community at large is assessed through an examination of the faculty's annual reports. Value listed is the number of documented activities.	35	18	27	20	26	28

Issues and Actions

Issues of Concern 2006-2010	***Actions Taken***
Improvements to the Computational Physics major: Program requirements, course content, and facilities	• The computational physics courses (220,306,406) have been altered to include several new projects, some of which have been published in the physics collection of the National Science Digital Library. • Dr. Smith has done a complete revision of the Lasers and Optics course, PHYS 312, to include updated topics and experiments. • The Electronics course, PHYS 310, has been updated to include the use of electronic sensors which interface with microprocessors. The students write programs to display output information to the user.
Improvements to the Health Physics major: Program requirements, course content, and facilities	• The nuclear physics laboratory is currently undergoing a complete remodeling and upgrade, thanks to a $100,000 grant from Progress Energy. This will benefit the both the traditional physics major and the health physics program. • Undergraduate scholarship funding from the Nuclear Regulatory Commission has been renewed in the amount of approximately $168,000 over two years. • Health Physics faculty continue efforts to renew and expand the summer internship offerings for the Health Physics majors.
General improvements	• New laboratory experiments are planned for the Physical Science 101 labs, some of which will make greater use of the expanded capabilities of the recently acquired laptop computers. • The department's introductory courses are seeing an increased use of multimedia presentations, including electronic textbooks (e-books) with online tutorials and electronic homework submission. It remains to be seen whether these changes result in measurable improvements in student performance, but they certainly help to lower financial cost to the students. • A new major in Industrial Engineering is planned. Research, development, and planning have begun under the direction of the department chair, Dr. Peterson.

	• A set of Personal Response Devices (aka "clickers") was purchased for use in the planetarium shows. This allows the presentations to be more interactive with students and/or general public.
Recruiting of students	• The department's major recruiting effort SCPSI continues to be modified and improved. The addition of two new faculty with astrophysics backgrounds will offer new experiences that may serve to attract students. • The department's Open House presentation has been slightly modified to place greater emphasis on the Health Physics program, since most prospective students are unfamiliar with the discipline. Scholarships and excellent employment opportunities are highlighted.

Assessment of General Education Courses

The Department of Physics and Astronomy has chosen to assess its General Education offerings by having students complete a survey concerning the results of an experiment they have just designed and completed. The techniques of data acquisition, experiment design, and analysis required in this experiment are considered representative of the students' mastery of the laboratory course material.

The experimental problem given to the students concerns a simple pendulum. The students must identify variables that may effect the time period of a pendulum (length, mass, amplitude) and investigate to see which one(s) actually have an influence. By analyzing the results, the students attempt to develop an empirical equation that correctly predicts the time period for any simple pendulum.

A copy of the survey questions and a reporting of the results follow.

SURVEY FOR PSCI 101 FINAL EXAM
SIMPLE PENDULUM EXPERIMENT

Directions: In response to the following questions, circle the answers that best characterize your results from the Simple Pendulum Experiment.

1. Did variations in the amplitude of the oscillating pendulum affect its time period?
   a) The amplitude had no effect on the time period.
   b) The amplitude seemed to have a slight effect on the time period.
   c) The amplitude had a major effect on the time period.

2. Did variations in the length of the oscillating pendulum affect its time period?
   a) The length had no effect on the time period.
   b) The length seemed to have a slight effect on the time period.
   c) The length had a major effect on the time period.

3. Did variations in the mass of the oscillating pendulum affect its time period?
   a) The mass had no effect on the time period.
   b) The mass seemed to have a slight effect on the time period.
   c) The mass had a major effect on the time period.

4. Which of the following expressions best characterizes the relationship between the time period (T) of a simple pendulum and its length (l)?
   a) $T = kl$
   b) $T = k\sqrt{l}$
   c) $T = kl^2$
   d) $T = \frac{k}{l}$
   e) none of the above

Survey Results
(last four years)

Question #/Response characterizations	**2008-2009 (205 students)**	**2009-2010 (210 students)**	**2010-2011 (250 students)**	**2011-2012 (211 students)**
1.Correct	92 (45%)	96 (45%)	72 (29%)	76 (36%)
Incorrect/reasonable	99 (48%)	103(48%)	133(53%)	119(56%)
Incorrect	14 (7%)	37 (7%)	45 (18%)	16 (8%)
2.Correct	144(70%)	149(70%)	157(63%)	182(86%)
Incorrect/reasonable	43 (21%)	44 (21%)	53 (21%)	17 (8%)
Incorrect	18 (9%)	8 (9%)	15 (6%)	12 (6%)
3.Correct	89 (43%)	91 (43%)	103(41%)	104(49%)
Incorrect/reasonable	79 (39%)	82 (38%)	120(48%)	97(46%)
Incorrect	36 (18%)	37 (17%)	27 (11%)	10 (5%)
4.Correct	9 (4%)	9 (4%)	25 (10%)	66 (31%)
Incorrect/reasonable	137(67%)	143(67%)	120(48%)	93(44%)
Incorrect	57 (28%)	16 (8%)	90 (36%)	54 (25%)

Commentary: This year's results show some modest gains in students' performance. In all questions the percentage of students giving correct answers increased and the percentage of clearly incorrect answers decreased. Question #4 can be considered the "capstone" question and is also the most difficult of the four. This group showed a significant improvement over last year's group, an outcome we find particularly encouraging. Plans are underway to include two new experiments in the coming academic year, which should be helpful to the students in performing this type of analysis. We hope to see subsequent improvements in these results.