

Physics Assessment 2007-2008 Report, College of Science
Date: November 30, 2008
From: Huong Nguyen, Physics Assessment committee

Marshall University
Program Review
December 2008

Program: _____ **BS in Physics** _____

College: _____ **Science** _____

Date of Last Review: _____ **December 2007** _____

I. Goals of Physics Program

The mission of the Department of Physics and Physical Science is to provide to our majors grounding in the core subfields of our discipline and to prepare them for graduate study. The completion of the B.S. in physics prepares the graduate for graduate school in physics or engineering, medical school, or other professional programs; or for direct employment in government or industrial laboratories, and other technically related fields. The Physics curriculum consists of background core and the advanced physics courses. The background courses of classical mechanics, quantum mechanics, electricity and magnetism, is still viewed as an essential foundation to the understanding of specialized topics within physics. New areas of research are addressed as special applications of material taught in intermediate and advanced courses.

The curriculum in physics provides a natural structure for the B.S. physics major:

- 1) A broad exposure to many topics General Physics in (PHY 211/213) in the first year, General Modern Physics and Modern Physics Laboratory (PHY 320 and PHY421), Mathematical Methods in Physics (PHY 445) in the second year,
- 2) Core courses in Electricity and Magnetism (PHY 300-302), advanced classical mechanics (PHY 330), statistical and thermal physics (PHY308), and quantum mechanics (PHY 442) in the junior and senior years.
- 3) For upper-level electives we offer courses as Optics (PHY 304), Electronics (PHY 314), Biomedical Physics (PHY 350), Nuclear Physics (PHY 462), Quantum Mechanics II, Solid State Physics (PHY 425), Labview, and other special topic courses.

II. Assessment Outcomes and Related Curriculum Activities

We continue to implement an exit exam required for all graduating seniors. The national benchmark we have selected to use is the Educational Testing Service "Major Field Test in Physics II", which is used by schools and departments at more than 600 colleges and universities globally to measure undergraduate student academic achievement, level of comprehension and problem-solving skills in all of the core subfields in physics. The content of the Major Field

Tests reflect the basic knowledge and understanding gained in the core undergraduate curriculum. The tests are two-hour, multiple-choice examinations designed to assess mastery of concepts and principles as well as knowledge expected of students at the conclusion of a major in specific subject areas. This year we have four graduates. For the category of "Introductory Physics" (see charts), our student scored a mean of 38.3 (compared to the 2005-2006 average of 30 and 2006-2007 average of 47) below the national mean of 48. For the category "Advanced Physics", our student scored a mean of 40 (the 2005-2006 average was 42 and the 2006-2007 average was 37), below to the national mean of 49. For the Total Score, this year's student scored 139 (the 2005-2006 average was 135, the 2006-2007 average was 142) below the national mean of average of 148.4. Although there were some improvements in comparison with the last two years, the scores of our students are still below the national average. One reason for poor results in exit field exams this year was that this year we had one long time student who had taken absence for many years and come back for graduation. His score was in the bottom 1%, and certainly it affected the average score of the whole team. Another reason is since the test result does not affect the graduation and the GPA, our students did not review for the test or take it seriously. These two years we have been making some changes to help motivate our students to study for the tests. Also, one important reason is several subfields in these exams belong to the courses that have been offered in our program as the "electives" for year due to the lack of faculty members. Last year we have made a change to our curriculum to add the two new courses to our required core for physics majors: Statistical and Thermal Physics (PHY 308) and Mathematical Methods in Physics (PHY 445). These two courses provide basics knowledge for our majors and are in core courses of many Physics program in the country. For the benefit of our students, the two courses will be a part of our required core from 2009. We believe that when this addition is in effect, it will help to improve the result of the exit field exam of our program.

This year we also begin to offer several new courses as elective courses: Solid State Physics, Medical Physics, Introduction to Labview, Quantum Mechanics II. The courses went well and we believe students found them very useful for their future career,. In the near future, we are going to make more changes to improve our program.

III. Faculty

In the last year, our faculty especially active in research with large numbers of refereed journal publications, presentations at professional meetings, submitted proposals and awarded grants. During the last year, our faculty have 12 papers published in refereed physics journals, have presented 10 papers at national and international conferences. Our faculty also are very active in writing and submitting research proposals to external research funding agency as NSF, DOE, DOD...In the last year, our faculty received grants from NASA West Virginia Space Grant Consortium, EPSCoR Proposal Preparation Mini-Grant, NASA research Seed Grant, Hedrick Program Grant for Teaching Innovation. With the changes over the last three years in our faculty body (during the last three years, we have two new tenure-track faculty -Dr. Babiuc and Dr. Nguyen- and two full-time temporary faculty -Dr. Fan and Dr. Richards) who hold impressive publication records and very active in research) the faculty research component in our department is enhanced greatly, the numbers of refereed journal publications, conference presentations as well as the number of external and internal grant proposals submitted and awarded have been increasing noticeably. These changes are bringing benefits to students as we

involve more students in our research. In the last year we provided different professional opportunities to our students:

+April 2008, Dr. Oberly led a group of physics majors to visit the Physics Department at the Kentucky University.

+ Professor Thomas Wilson and undergraduate physics majors Daniel Velazquez, Daniel Crowder, Jon Linville presented a co-authored paper entitled “Anisotropic Capillary Wave Propagation in a Ripple Tank” at the 2007 Fall Meeting of the Ohio Section of the American Physical Society held October 19-20 at Miami University, Oxford, OH

+ Dr. Huong Nguyen supervised undergraduate student Michael Price to do research on phonoritons. The works resulted in a presentation by Michael Price at the APS Ohio Regional Meeting April 2007, a Michael’s Yeager scholar’s representation and a Sigma Xi Day Presentation.

+Dr. Maria Babiuc-Hamilton supervised undergraduate student Paul Stokes to do research on “Testing Numerical Relativity with a Standard Black Hole Tested” and a presentation on Sigma Xi Day was given.

Appendix: Assessment Student Outcomes

| Component / Course / Program Level | | | | | |
|--|------------------------------|--|---|--|--|
| Student Outcome | Person or Office Responsible | Assessment Tool or Approach | Standards/Benchmark | Results/Analysis | Action Taken |
| (1) Demonstrate Knowledge of Introductory Physics | Department | Educational Testing Service “Major Field Test Physics II” (Reporting Date: January 2004). Topics include: (I) Classical Mechanics; (II) Electricity and Magnetism; (III) Thermodynamics, Optics, and Waves. | Possible Score: 20-100; 35 questions selected from Topics: (I), (II), (III) | 4 students, mean=38.3, national mean=48 | Add new courses to physics core |
| (2) Demonstrate Knowledge of Advanced Physics | Department | (IV) Fundamental Concepts of Quantum Mechanics, (V) Special Topics | Possible score: 20-100; 32 advanced questions. | 4 students, mean=40, national mean=49 - | Add new courses to physics major core, add new electives |
| (3) Total Test Score | Department | | Possible Score: 120-200; Topics: (I- V) | 4 students, mean=139, national mean=148 | |

| Component / Course / Program Level | | | | | |
|---|-------------------------------------|------------------------------------|----------------------------|---|---------------------|
| Student Outcome | Person or Office Responsible | Assessment Tool or Approach | Standards/Benchmark | Results/Analysis | Action Taken |
| (4) Assessment Indicator for Topic (I) | Department | “ | 13 questions | NA. Minimum of 5 scores required for processing | |
| (5) Assessment Indicator for Topic (II) | Department | “ | 12 questions | NA. Minimum of 5 scores required for processing | |
| (6) Assessment Indicator for Topic (III) | “ | “ | 13 questions | NA. Minimum of 5 scores required for processing | |
| (7) Assessment Indicator for Topic (IV) | “ | “ | 16 questions | NA. Minimum of 5 scores required for processing | |
| 8) Assessment Indicator for Topic (V) | | “ | 12 questions | NA. Minimum of 5 scores required for processing | |