

**Department of Physics
2006-2007 Annual Report**

I. Mission Statement

The primary mission of the Physics Department is to provide a full academic program for students pursuing a B. S. Major in Physics or Minor in Applied Physics; College Physics for students fulfilling the requirements of the college's core curriculum in laboratory science; University Physics for students in technical majors or in military programs requiring a calculus based introduction to physics; and technical, general, and special electives to meet the needs of students in certain majors, the honors program, and the professional programs including graduate courses in physics pedagogy. In service to its faculty, the college, and the scientific community, a secondary mission is to provide conditions conducive to faculty research and scholarly development, faculty participation in scholarly societies and organizations, and an exposure to our developing discipline through professional seminars. In service to the community and local school systems a tertiary mission is to provide Department sponsored events that popularize science and promote interest in the study of physics.

II. Expected Results

A. Primary Mission

Physics is the study of the fundamental laws of nature and how they explain the phenomena of the observable universe. The Department fulfills its primary mission by helping students develop critical reasoning skills. The students are shown how the same fundamental laws govern all physical phenomena and serve as the foundation of all branches of science and engineering. This requires that they not only understand the laws of physics, but also acquire sufficient empirical facts and laboratory experience to logically apply the scientific method to interpret empirical data.

Philosophically, the measures of success in teaching and learning are similar for all core physics lecture and laboratory courses. They include assessment of learning, critical thinking, and problem solving skills. However, the criteria applied to the assessment of physics majors, other science majors, and engineering majors reflect that these students are expected to adopt the principles of physics as tools of their future profession.

Physics majors graduating with good grades should be adequately prepared for graduate study in physics or any closely related discipline. Applied physics minors with good grades should find that their physics experience augments their preparation for graduate studies, professional certification, or the workplace. The curriculum will be broad enough to prepare all physics majors for careers in fields such as education at the secondary level, research and industrial scientific laboratories, high-technology branches of

the Armed Forces, and other careers that require analytical thinking with a mathematical and scientific background.

The College and University Physics core courses introduce each student whether technical or liberal arts to the scientific method. Students learn to use mathematics to calculate and compare theoretical predictions with physics observations. Students achieving good grades should be prepared to take the physics portion of qualifying examinations such as the EIT and MCAT.

B. Secondary Mission

All Physics faculty should be active in scholarly development and keeping up in their discipline. Ideally they should be active in some research at least on a level that warrants reasonable competitiveness for CF research and/or development grants. Publication in respected journals is a continuing goal, although this may not be possible for all members at all periods of their career, especially in the area of experimental physics where access to equipment is a serious impediment.

The Physics faculty should maintain membership in professional societies and share their knowledge with their department and college colleagues.

C. Tertiary Mission

The Department will share its expertise and aid student recruitment by sponsoring events useful to the local schools and area colleges and their instructors. As often as possible these activities will be conducted with the active participation of cadets.

III. Assessment Tools

A. Primary Mission

The Department maintains information pertaining to the career goals and achievements of its physics graduates. Graduating seniors are polled and graduates are contacted to monitor their careers and educational advancement. Particular attention is paid to those physics majors that apply to graduate school or seek commissions in the Armed Forces.

The final examinations in Modern Physics, Classical Mechanics, Electronics, Optics, Electromagnetism, and Quantum Mechanics include at least one problem taken from the Graduate Record Examination database. Records are kept correlating the performance on these problems, the students performance in the course, the GPR in the student's major courses and when available the student's performance on the GRE. These data are intended to

be a measure of the performance of the Department as a whole over an extended period of time. These data will take time to collect and will not be identified with any particular student or faculty member.

The Department will periodically review the breadth and depth of the curriculum in the physics major and applied physics minor through discussion and surveys with other respected physics programs.

The Department assesses the degree of student understanding of physical concepts by means of monitoring the performance of students on the end of term exams in the core curriculum courses. Surveys are frequently given to assess the preparation in mathematical skill and knowledge of physics of incoming students.

Observational, experimental, and data analysis skills, physical common sense, ability to follow directions, and attention to detail are products of a successful laboratory experience. These skills are assessed by instructor observation, laboratory reports, and laboratory exams. The computer interfaced laboratory experiments are being introduced to help develop these skills and to respond to deficiencies observed in earlier laboratory experiences.

B. Secondary Mission

Faculty participation in scholarly activity and research are assessed by refereed publications, books and laboratory manuals, presentations (external and internal), written non-refereed reports, acknowledgements by other scholars, successful support from external and internal grants, equipment acquisition, new course development, and professional development funding.

C. Tertiary Mission

The determining criterion of the quality of professional service is the response of colleagues and the participating community.

IV. Assessment Results

A. Primary Mission

Five students graduated with B. S. degrees in physics (four in May and one after first session of summer school). Two sought commissions in the Armed Forces. One received a commission in the Navy and one received a commission in the Air Force. The three others sought entry into graduate

school. One was accepted to a PhD program in physics at Virginia Tech, one was accepted to a PhD program in physics at the University of South Carolina, and one was accepted into a Master program in physics at Howard University. Each student major was successful in attaining his individual goal.

The three students who entered graduate school took the GRE in physics. All three, even though they were admitted to graduate school, did below average on this test. The department has instituted a plan to aid rising juniors and seniors in the preparation for the GRE. This will include general instruction in how to take an exam, subject preparation for the exam, and taking practice exams. Our goal is to have all majors with good grades who desire to go to graduate school in physics be able to get above the 70th percentile.

This past year a change was made in the numbering of courses taken by our majors. PHYS 323/333/373 were changed to PHYS 223/233/273 to reflect the year in which these courses are normally taken by our majors, namely the sophomore year. A solid state course was offered under our advance topics course.

Physics Majors

Preknob visits 15
Incoming freshmen 10
Rising sophomores 7
Rising juniors 6
Rising seniors 4
Graduating seniors 5

Applied Physics Minors
4 over various classes

Number in core curriculum courses

PHYS-203 starting sequence – 142 (Fall 2006)
PHYS-221 starting sequence – 102 (Fall 2006/Spring 2007)

All department course final exams are on file. Course performance is reflected in student final grades.

The physics introductory laboratories 271 and 272 have been converted over to computer-interfaced-to-equipment experiments. Data is gathered through transducers and analog to digital converters and transferred to spreadsheets. Students can table, graph, histogram, compute, and error analyze their measured data using the power and flexibility of Excel. Report writing is done using Word and is submitted electronically.

The new experiments generate more and better data. Students, using spreadsheets, can perform the calculations in lab on more realistic data. Since mistaken or miscalculated data can be spotted before leaving the lab student frustration is lower and laboratory report writing is much improved.

B. Secondary Mission

Published Papers, Books, and Manuals Academic Year 2006-2007

Joel C. Berlinghieri, "Physics Laboratory Manual for Scientists and Engineers Part I", Tavenor Press, SC, 2007 ISBN 978-1-886855-42-7

Joel C. Berlinghieri, "Physics Laboratory Manual for Scientists and Engineers Part II", Tavenor Press, SC, 2007 ISBN 978-1-886855-43-4

FCAPT BVRI Photometry of NZ Gem, HD 73017, HD 77247, RT Vir, and 104 Her (2006, Baltic Astronomy, 15, 363, S. J. Adelman and W. L. Harrell)

The ASTRA Spectrophotometer: Design and Overview (2007, The Future of Photometric, Spectrophotometric, and Polarization Standardization, ed. C. Sterken, ASP Conference Series, 364, 255, S. J. Adelman, A. F. Gulliver, B. Smalley, J. S. Pazder, P. F. Younger, L. J. Boyd, D. Epan, and T. Younger)

The ASTRA Spectrophotometer: Reductions and Calibration (2007, The Future of Photometric, Spectrophotometric, and Polarization Standardization, ed. C. Sterken, ASP Conference Series, 364, 265, with B. Smalley, S. J. Adelman, and A. F. Gulliver)

The HgMn Binary Star ϕ Herculis: Detection and Properties of the Secondary and Revision of the Elemental Abundances of the Primary (2007, ApJ, 655, 1046, with R. T. Zavala, S. J. Adelman, C. A. Hummel, A. F. Gulliver, H. Caliskan, J. T. Armstrong, D. J. Hutter, K. J. Johnston, and T. A. Pauls)

On the Abundances of the Am and normal A Stars (2007, Baltic Astronomy, 17, in press, S. J. Adelman and N. Unsee)

Stromgren Photometry of the Supergiants HD 4841 (B5 Ia) and HD 194279 (B1.5 Ia)(2007, Baltic Astronomy, 17, in press, S. J. Adelman and K. Yuce)

Weather in stellar atmosphere revealed by the dynamics of mercury clouds in α Andromedae (2007, Nature Physics, letter released June

2007 , O. Kochukhov, S. J. Adelman, A. F. Gulliver, and N. Piskunov)

FCAPT uvby Photometry of the mCP stars BN Cam, EP Vir, FF Vir, and HD 184905 (2007. PASP, 119, in press, July, with J. Sutton)

Patrick R. Briggs, “The Properties of Materials”, South Carolina Governor’s School for Science & Mathematics in Hartsville. A Summer Science Program for rising ninth graders.

C. Tertiary Mission

**September – Annual Physics Student and Faculty Beach Picnic –
The Citadel Beach House, Isle of Palms**

**September – Society of Physics Students (SPS) –
Student speaker, Senior Cadet William L. Harrell –
Summer Research experiences at Lockheed Martin in Florida**

**Election of SPS Student Officers
President – Eric Graham
Senior Vice President – Jason Chuma
Junior Vice President – Joe Miller
Secretary/Treasurer – Brennin Colegrove**

**October – Presentation sponsored by the Department of Mathematics &
Computer Science and the Department Physics –
Dr. Charles Groetsch, Dean of Mathematics and Science.
Topic: Tartaglia**

**October – Society of Physics Students (SPS) – alumni speaker,
Capt. Reginald H. Rice, Class of 2001, - physics and experiences in the
U.S. Army. Fort Jackson, South Carolina.**

**November – Society of Physics Students (SPS) – student speaker:
Senior Cadet Miguel Benitez – Summer Research experiences at
Howard University in Washington, DC. His topic was “Weather”.**

December – 18th annual Physics Department Holiday Open House –

**December 2006 to May 2007 – graduate student visitor Istanbul, Turkey
Miss Aysegul Teker, Research Associate
Istanbul Kultur University**

January 2007 – Speaker, Eric Zink – alumni speaker, Class of 2000

(Computer Science major/Minor in Applied Physics)
Title of talk: “Software-based Information Consolidation & Display in Air Traffic Control Systems”

February 2007 – Science Fair Judges to Academic Magnet High School
Group included: LTC Russell Hilleke, Dr. Rene Hurka, and student physics majors

February 13, 2007 – In recognition of Darwin Week, Dr. John McMasters of The Boeing Company, gave a lecture in Copeland Auditorium. Dr. McMaster is a visiting Sigma Xi Lecture speaker. His topic was about airplane design in the future.

February 2007 – alumni visitor, Charles Long, Class of 1980
COL Joel Berlinghieri (then Major) had been his advisor

February 2007 – Society of Physics Students (SPS) meeting
COL Joel Berlinghieri – Discussion of GRE exam and the need for preparation

March 2007 – Society of Physics Students (SPS) meeting
Speaker – Col. Saul Adelman - the delivery and installation of the Astro-Spectrophotometer to Fairborn Observatory near Nogales, Arizona.

March 20, 2007 - Astrophysics Seminar
The Citadel Physics Department and The Harlow Shapley Visiting Lectureship Program of the American Astronomical Society.
Dr. Rocky Kolb, Professor of Physics, University of Chicago,
“Dark Matter and dark energy: new physics or epicycles?”

April 2007 – Annual Physics Department Astronomy Night –
Telescopes and BBQ
The Fish Farm, Hollywood, South Carolina. Hosts: Barbara & Rick Eager

April 2007 – Senior Research Presentations
Miguel Benitez – “Heliostat”
Jason Chuma – General relativity computer program
Eric Graham – Building a scintillation particle detector
Will Harrell – Building a radio telescope
Nawapong Unsuree – Building an electron-tunneling particle detector

April 2007 – Society of Physics Students (SPS) lunch meeting
Sigma Pi Sigma, Physics Honor Society Induction –
Dr. Rene Hurka and Cadet Jason Chuma

Highest GPA Senior – Nawapong Unsuree
Highest GPA Junior – Brennin Colegrove
Highest GPA Sophomore – Tom Gade
Highest GPA Freshman – Jacob Atcher

April 2007 – Physics Department Seminars

Dr. Richard Olenick, University of Dallas, Physics Dept.

Title of talk: “Computational Modeling of Baseball, Avalanches, Electron Scattering, and All Sorts in Between”

Dr. Gary Blanpied, University of South Carolina, Physics Dept.

Title of talk: “Characterization of Cosmic Ray Showers”

V. Goals and Objectives for 2007-2008

The expansion of the computer interfaced laboratories to additional courses and laboratory rooms as well as the addition of other experiments and more statistical analysis in existing experiments will be of the first priority.

Computers, interface equipment, and experiment equipment will be sought through increases in the department budget and through targeted grants.

Based on student difficulty in comprehending certain laboratory concepts, assessed by means of experiment reports, laboratory quizzes and end of semester exams, some laboratory experiments will be pedagogically strengthened and the laboratory manual revised.

In the coming year a review of the textbook used in the University Physics core course will be reviewed for possible replacement. The inclusion of Web-based homework software will also be addressed.

A review of the Major and Applied Minor in Physics will also be conducted in the coming school year. The needs of these programs and the core course obligations of the department are needed in determining the staffing needs of the department for the next decade.

A strengthening of the data collected for the assessment process will also be addressed.