Program Review

B.S. Program in Physics

College of Science

November 2011

MARSHALL UNIVERSITY
Program Review
Marshall University

Date: __10/1/2011________________

Program: ______B. S. in Physics_____

Degree and Title

Date of Last Review: __11/2006_______________________________

Recommendation
Marshall University is obligated to recommend continuance or discontinuance of a program and to provide a brief rationale for the recommendation.

Recommendation
Code (#):
1. Continuation of the program at the current level of activity; or
2. Continuation of the program at a reduced level of activity or with corrective action: Corrective action will apply to programs that have deficiencies that the program itself can address and correct. Progress report due by November 1 next academic year; or
3. Continuation of the program with identification of the program for resource development: Resource development will apply to already viable programs that require additional resources from the Administration to help achieve their full potential. This designation is considered an investment in a viable program as opposed to addressing issues of a weak program. Progress report due by November 1 next academic year; or
4. Development of a cooperative program with another institution, or sharing of courses, facilities, faculty, and the like; or
5. Discontinuation of the program

Rationale for Recommendation: (Deans, please submit the rationale as a separate document. Beyond the College level, any office that disagrees with the previous recommendation must submit a separate rationale and append it to this document with appropriate signature.)

3 Dr. Nicola Orsini___________________________10-15-2011
Recommendation: Signature of person preparing the report:
Date:

3 Dr. Nicola Orsini___________________________10-15-2011
Recommendation: Signature of Program Chair:
Date:

3 Dr. Charles C. Somerville________________________10-15-2011
Recommendation: Signature of Academic Dean:
Date:

3 Dr. Dallas Brozik___________________________11-9-2011
Recommendation: Signature of Chair, Academic Planning Committee: (Baccalaureate pgms only)
Date:

Recommendation: Signature of President, Faculty Senate/Chair, Graduate Council:
Date:

Recommendation: Signature of the Provost and Senior Vice President for Academic Affairs:
Date:

Recommendation: Signature of the President:
Date:

Recommendation: Signature of Chair, Board of Governors:
Date:
College/School Dean’s Recommendation

Recommendation: Continuation of the program with identification of the program for resource development (Recommendation code #3)

Rationale: The Department of Physics and Physical Science is undergoing a transition from a department with a predominant focus on service teaching to one in which there is a growing expectation for research activity. This transition is evidenced by the recent success that Physics faculty members have had in garnering external funding, most notably the funding of three prestigious National Science Foundation (NSF) awards to three different Physics faculty members during the reporting period. This is among a full-time faculty of seven tenured or tenure-track appointments and three term appointments. Furthermore, Physics has not received significant investment from the Research Infrastructure Improvement (RII) funds that have been awarded to the university in recent years. This means that the department has hired very capable faculty members who have been self-motivated and very efficient in their professional development. It will be important to nurture those faculty members and the growing research culture that they have established in order to make their achievements sustainable.

During the review period, ten full time faculty along with four adjuncts offered 46 different lecture, laboratory, or research courses (a total of 247 course offerings, some with multiple sections). Thirteen of those courses were designated as service courses and accounted for a total of 131 course offerings with an average enrollment of 56.5 students per offering. There were a total of 8,133 enrollments in Physics and Physical Science classes during the review period, 7,400 of which were in service courses. The remaining courses (33) were required or elective courses for Physics majors. They accounted for 116 course offerings and 733 enrollments, for an average enrollment of 6.3 students per offering. The required and elective courses include independent study and capstone courses in which low enrollments are both expected and desirable, but they also include more traditional lecture and lab courses that must be offered to allow majors to fulfill graduation requirements. During this review period the department’s major teaching role has been to provide service courses for other majors both within the College of Science and across the university. The demand for service courses will certainly rise due to rapid enrollment growth, and the concomitant demand for physics courses, in both the College of Health Professions and the College of Information Technology & Engineering. The department will also be impacted by increased enrollment of students who are attracted to Marshall by the new School of Pharmacy.

Both the heavy, and increasing, service load and the significant progress in funded research are straining at college and departmental resources. Research active faculty must have reassigned time in order to complete their obligations to funding agencies. Quite simply, there is less available faculty time to meet an increasing teaching demand. In his review, Professor Orsini states the need for additional faculty lines, additional space, and increased investment in departmental operations and equipment.
I support the department’s request for additional faculty, and have already submitted a request for an additional tenure-track line. In the short run we project spending of a minimum of $11,000 per semester for adjunct instructor stipends – if we can find qualified instructors who are willing and available to teach. Although employing adjuncts is a necessary and cost-effective way to temporarily bridge instructional gaps, it is not a strategy that will provide the type of quality education to which we aspire. Our annual faculty assessments (data not shown) clearly indicate that adjuncts, temporary, and term employees provide less value to the university than do traditional tenure-track faculty. To continue to provide needed service courses, to sustain the notable improvement in research activity, and to grow the size and improve the quality of the undergraduate major, an additional tenure-track faculty line is needed.

Regarding space allocations, the college is undergoing a detailed space-utilization study, and space will be reassigned or new space will be requested as warranted. The college has dedicated a classroom (S 166) to be a 24-seat computer laboratory that will be available to Physics students and faculty. Network cable has already been run into the room and authorization to purchase the computer equipment from CoS lab fees has been approved. The lab is anticipated to be operational by the end of the current semester (Fall 2011).

The need for increased operation and equipment budgets is common to all departments in the College of Science. This semester, department Chairs will be asked to submit detailed operating and professional development budgets for consideration by the University Budget Office. In the meantime, the college budget will continue to offset much of the costs associated with new faculty hires, and professional development for existing faculty. In recent years, net revenue from summer school offerings has been used to fund faculty professional development. This use of funds will continue as long as net revenues are returned to the colleges. Loss of those funds would essentially halt college-level funding of professional development activities. Regarding the purchase of equipment for teaching laboratories, the college office now returns a greater percentage of lab fee revenues than was done under the previous dean (60% minimum versus 40%). The college also returns 50% of CoS Indirect Cost Recovery (ICR) funds to the department of a faculty member who has obtained external funding. Under the previous dean, none of the ICR funds were allocated to department chairs. The college also routinely makes funding available to the departments for “greatest needs” investment, and continues to use college ICR funds for equipment calibration and maintenance.

In summary, the college recognizes the dramatic increase in research activity and the high demand for service teaching in the Department of Physics and Physical Science. On this basis, I support Professor Orsini’s request for an additional tenure-track faculty line in his department. The college will also continue to work to make needed space available, and to increase equipment purchasing and maintenance budgets.

Charles C. Somerville
Signature of the Dean

15 October 2011
Date

Program Review
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Marshall University
Program Review

For purposes of program review, the academic year will begin in summer and end in spring.

Program: ______ B.S. in Physics
College: ______ College of Science
Date of Last Review: ____________ 11/2006

I CONSISTENCY WITH UNIVERSITY MISSION

Provide your program’s mission statement. Explain how your mission supports the mission of your college and the mission of Marshall University.

The mission of the Department of Physics and Physical Science at Marshall University is to endow our majors with a solid foundation in the core subfields of our discipline and to prepare them to become successful professionals. The overarching goal of our Physics degree is to provide students with a liberal education consisting of a broad array of knowledge in physics, but also in the broader areas of physical and natural sciences, such as chemistry, biology, astronomy, mathematics, engineering, etc. Many professionals in these fields began with a degree in physics. Half of our students who obtain a bachelor degree in physics go directly into employment; the other half continue on to graduate school at the best universities in the country in physics, astronomy, engineering, medicine, law, education, etc. Therefore, our mission supports the mission of the College of Science (COS): to graduate students who appreciate the art of scholarship by having an excellent grasp of the fundamental concepts in their principal areas of study. The department also supports the mission of Marshall University of providing innovative undergraduate and graduate education that contributes to the development of society and the individual.

II ACCREDITATION INFORMATION

Physics programs are not accredited. The feeling of physics professional societies is that physics curricula need to be adaptable to the local setting, and should not be rigidly prescribed.

III PROGRAM STATEMENT on Adequacy, Viability, Necessity and Consistency with University/College Mission

A. ADEQUACY
1. Curriculum:
   The B.S. curriculum is designed for students who want a complete program in physics. The completion of our B.S. in Physics enables students to continue with
graduate schools in physics or engineering, medical school, or other specialized programs. This degree also prepares students for direct employment in government and industrial workplaces or other related fields.

Additional related programs within the department lead to a B.A. degree in physics with a specialization in physics and/or general science for physics teachers, a minor in physics, and an M.S. degree in physical science.

Starting this year (Fall 2011), we extended our traditional B.S. in physics to include three different areas of emphasis in medical physics, bio-physics, and applied physics. This addition was necessary in order to accommodate the development of research as well as job market growth in varied subfields of the physical sciences. Students who follow these flexible tracks (emphases) toward a B.S. in Physics will have a sound physics background as well as a broad knowledge in additional areas of science, such as chemistry, biology, or engineering.

The core physics courses require a strong background in calculus and differential equations; therefore our students must complete 17 credit hours of math requirements (specific to our degree, in the first two years) comprised of calculus (MTH 229, 230 and 231), and differential equations (MTH 335). Our majors must also acquire fundamental skills in utilizing computers, which include using software packages for data analysis and word processing, interfacing experiments for data collection, and computer modeling. We offer our students independent study coursework towards developing those skills.

The minimum number of required physics courses towards our major is 44 credit hours; of these credits, our majors must complete 34 credit hours of required courses covering all the main areas of physics: modern physics, electricity and magnetism, thermodynamics, classical mechanics and quantum mechanics. This core curriculum builds the essential foundation necessary to the understanding of more specialized topics within physics.

The core coursework of applied physics courses emphasizes applications of Modern Physics (PHY320); Thermodynamics (PHY308); Optics (PHY 440); and Electronics (PHY 430). These courses are also open to other science majors who often attain a minor in physics.

New areas of research are taught as special topics in intermediate and advanced seminar-style courses. At least 6 credit hours of elective upper-level courses provide our majors with an introduction to some of the most current topics in physics: electronics, optics, solid state physics, biophysics, computational physics, astrophysics and astronomy, etc. In addition, our majors are required to earn 4 credit hours of experimental work in well-equipped advanced physics labs and at least 2 credit hours of independent research with a faculty member towards the capstone project in physics. Together with the math requirements and the capstone project, our majors will have to complete a minimum of 63 credit hours beyond their general education requirements.

In addition, students will have to obtain at least 58 credit hours of the general university and college requirements. A 2.00 overall GPA and a 2.00 Major GPA are required to graduate. Please see Appendix I, for the list required of courses, elective courses, and total hours required.
2. **Faculty:**

We have 14 faculty engaged in teaching the courses within the major, of which 10 are full time (71%) and 4 are adjuncts (29%). Within the full time faculty, four faculty members have obtained tenure (40%), three are on a tenure track (30%), and three are on term contracts (30%). All full time faculty members have earned a Ph.D. in physics (100%). Among the adjunct faculty, two have a Ph.D. in physics, one has an M.S. in physics education, and one has a B.S. in physics. The experience of our full time faculty in higher education reaches an impressive shared total of 216 years of teaching at college level, including 132 years of teaching at Marshall University.

Five of our full time faculty members are averaging teaching loads of 12 contact hours. Note: Some courses in our department are labs. For every lab credit hour faculty interact with students twice that number. Therefore contact hours are more appropriate to use to determine the faculty teaching load. Three faculty members have retired or left in the past five years; those faculty members taught full loads as well, leaving little time for research. The chairman of our department felt that a more balanced situation between teaching and research had to be achieved. To that end, five faculty were hired, three in tenure-track lines and two on term contracts. The additional faculty allows the chairman to give more reassigned time for our tenure track faculty, thus providing a greater opportunity for grant writing to secure research grants.

We have been extremely successful in obtaining grants and have made our department one of the most active in research in the COS. Within the last five years, three faculty members (Maria Babiuc, Howard Richards and Thomas Wilson) were awarded a total of $700,000 through NSF grants. Five other grants were awarded through the NASA-EPSCoR, (for a total of $100,000). Our faculty members were also awarded a number of internal grants. Our three female faculty members were awarded the MU-Advance faculty development fellowships in the total amount of $50,000. Our faculty members also regularly obtain INCO and Quinlan travel awards, as well as summer research awards.

The professional activity of our faculty is indeed very competitive. During the period of review, our tenured and tenure-track faculty published twenty (20) papers in peer-reviewed international journals and wrote five (5) book chapters. Our research is being presented at many international conferences and our faculty members commonly receive invitations to speak about their research in a variety of venues. We presented papers at 45 international conferences, gave talks at 20 national and regional conferences, and participated in 50 meetings, workshops or seminars. Our faculty members are recognized nationally, as demonstrated by the 15 invited lectures, and by invitations to sit on 10 review panels.

Undergraduate physics majors are also benefiting from this research activity. It is now much easier for students to get involved in research projects with a faculty member early on in their undergraduate careers. This research many times leads to “capstone” projects that sometimes are presented at major conferences. In several cases students have coauthored research articles published in peer-reviewed journals. Some examples are cited below.

**Professor Thomas Wilson** and undergraduate physics majors Daniel Velazquez, Daniel Crowder, and Jon Linville presented a co-authored paper entitled “Anisotropic Capillary Wave Propagation in a Ripple Tank” at the Fall Meeting of the Ohio Section of
the American Physical Society held October 19-20, 2007, at Miami University, Oxford, OH. Daniel Velazquez also presented his research at the Physics Diversity Summit 2009, Nashville, TN. Dr. Wilson supported physics major Nathan Crowe in research on the “Development of Bilayer Photolithographic Lift-off Process for Thick Sputtered Films”.

During the period of this review, Dr. Nguyen supervised undergraduate physics majors Justin Angus, Michael Price, Daniel Velazquez, Sarah Hall and David Facemyer to do research on phonoritons and quantum dots. Their work resulted in a presentation at the 2007 APS March meeting, a presentation at the 2008 Regional Ohio APS March Meeting, a Yeager Scholar presentation, a presentation at Undergraduate Day at the Capitol, and two presentations at the Marshall University Sigma Xi Day.

Dr. Fan supervised physics majors Jon Linville and Mathew Seitz who performed research on the “Development of flexible dye-sensitized solar cells”. They presented their work at the West Virginia STAR Symposium in Huntington, WV, 2010.

Dr. Oberly mentored physics major Charles Clements in research on “Measuring the Quality of Small Screen Displays to Create a Standard of Accessibility for the Visually Impaired”. He also mentored physics major Anthony Hernandez in research on “Thermal Stress on a Rigid Body Measured Using Interferography” in 2010.


Dr. Thomas Wilson has used personal response question and answer systems (also known as “clickers”) in the classroom for several years. He uploads student scores to blackboard, and students discuss why the incorrect answers are incorrect. He has also developed many unique demonstrations that can be seen at the Marshall YouTube website. Dr. Wilson has also used MASTERING PHYSICS since 2001 and more recently WEB ASSIGN since 2009 for online homework. These online services provide tutoring and hints to students during the problem-solving process, and teach students how to back out of intellectual “blind alleys”.

Dr. John Winfrey has found over the span of his career that students are increasingly poorly prepared in mathematics and in problem-solving skills required to perform well in physics. Therefore, Dr. Winfrey has engaged in a teaching mode based upon the results of research-driven, problem-solving tactics. He always assumes students have not seen a new mathematics procedure (at least in the form required in physics), and provides a mini-review of that mathematical technique. Dr. Winfrey also provides early instruction on optimizing learning based on the results of brain-science research.
Also based on that research, Dr. Winfrey transfers responsibility for learning by making students aware that "learning" is what the student does; learning is not a passive download from the instructor. The “teacher” is really the “coach” in learning a major skill and craft: Physics. Based on the general observation that we remember 10% of what we read, 30% of what we hear, and 90% of what we say, the general experience of look and “listen/don’t talk” is reversed. Therefore, students are required to pre-read chapters at home before they begin in class, lecturing is brief, and problem solving is the major activity that occurs during class time.

For each type of problem that could occur on a test, Dr. Winfrey works one example in full – live. Then a “paired” problem is given to groups to solve together. Students teaching each other expand the understanding of the student being instructed by a peer, as well as the peer speaker. It also exposes group members to alternative problem-solving approaches. The motto that goes with this research-proven technique in Physics is that the instructor is, “the guide by the side, rather than the sage on the stage”. The students then go home and do drill-work on multiple problems, honing and expanding their skill. The above in-class procedure insures that each student has a basic understanding of each problem type before they begin progressing further up the learning curve.

Dr. Howard Richards has developed a problem-solving procedure for students, which guides them systematically through multi-concept problems. Students just out of high school come to us with the impression that problem solving is finding a single equation, and then jamming all the given information into that equation, regardless of the frequent mismatch. Many concepts in Physics require organized, multi-step procedures.

The problem-solving sheet developed by Dr. Richards requires students to attempt specific parts of the solution within the assigned spaces. Based on experience, students can be expected to solve four unrelated, truncated problems in a one-hour test. The procedure is everything; the numerical answer is not the bottom line. If a problem can be broken into simple, related parts, it might be possible for students to solve it much easier.

Dr. Maria Babiuc-Hamilton has also focused on innovative teaching methods. She made use of the RealTime Physics experimental method in General Physics Lab I (PHY 202), implemented an interactive teaching component in the general Physics Lab II (PHY 204), implemented cooperative group problem solving in the Modern Physics Lecture (PHY 320) and renovated the Modern Physics Lab (PHY 421) by adding three new lab experiments. Dr. Babiuc-Hamilton also made significant modifications to the Biomedical Physics course (PHY 350) and involved students in exciting field trips to the MU Molecular and Biological Imaging Center, MU Exercise Physiology Lab, and the Cabell-Huntington Hospital Radiology Center.

Dr. Maria Babiuc-Hamilton also engaged in educational research in physics, analyzing the effect on student performance and retention of three physics teaching methods, with emphasis on the gender gap. Her findings (presented at the 2009 APS March Meeting, Pittsburgh, PA, the 2009 AAPT Summer Meeting, Ann Arbor, MI, and the SoTL Commons Conference Learning, 2009) revealed that in non-physics major courses, female students tend to outperform male students. However, in physics the situation is reversed, and the most important factors that influence our students'
performance are their current math skills and their previous background in physics. This prompted her to organize “Saturday Experiments in Modern Physics”, an outreach program to High School students (Winter 2010, Marshall University, Huntington, WV). The goal of the program was to make modern physics a more approachable, exciting, and rewarding experience for high-school students and to inspire them to become future scientists. **Dr. Babiuc-Hamilton** also participated in the “Expand Your Horizon” statewide science outreach program targeted towards middle school students (Spring 2010, at Marshall University, Huntington, WV and Spring 2011 at Mountain State University, Berkley, WV), presenting the workshop: ESTEEM PHYSICS: Engaging Students Through Exciting Experiments in Modern Physics.

**Dr. Maria Babiuc-Hamilton** and **John Winfrey** organized “Open-ended Discussion with the Faculty” on campus outreach meetings (Spring 2010, Marshall University, Huntington, WV), targeted towards physics and science majors.

**Dr. Nicola Orsini** carries on a very active outreach program, by acting as liaison for local high school teachers, and a science resource for local TV stations. He promotes teaching physics in all the state’s high schools as a required science by communicating and providing information to state senators, state representatives, and high school teachers and acts as consultant to set up a program to certify middle and high school teachers to teach physics. He also gave workshops on electrostatics for Elementary Schools and lectures for Boy Scout Merit Badge Masters on topic of “Astronomy” required for the merit badge.

**Dr. Thomas Wilson** arranged for Dr. Wolfgang Grill and Dr. Ronald Walsworth to present public lectures at Marshall University.

**Dr. Ralph Oberly** organized a Yeager Scholars field trip to the Green Bank Radio Astronomy Observatory. Our chapter of the Society of Physics Students, under **Dr. Oberly’s** supervision, made annual trips to Ohio State University in Columbus, OH, to visit the Physics Department and learn about the graduate degrees offered there. They are also doing physics demonstrations at Chesapeake Middle School, OH, each year.

In general, the Physics faculty carries on an energetic outreach program, being routinely involved in judging physics SCORES competitions, serving as judges in science fairs, participating in the Marshall University Open Houses, Green and White days, Majors, Minors & More fairs, giving demonstrations at a middle-school science and engineering days, etc.

Please see **Appendix II Faculty Data Sheet** for details on the activity of each full-time faculty member.

3. **Students:**
   a. **Entrance Standards:**

Admission to the Physics BS program depends upon admission into the College of Science. This requires an ACT Mathematics score of at least 21, and an ACT Composite score of at least 21. An alternate route is to pass ENG 101 and MTH 127/130 with grades of “C” or higher.
b. Entrance Abilities:
Physics majors during the current 5-year period averaged more than 3 points (14%) higher than the COS average; a typical Physics major is gifted with academic ability and enters college with a strong background and interest in many subjects. Most rise to the challenge of our rigorous physics program, cultivating a work ethic to succeed in mathematics and other sciences as well. **Physics majors’ ACT Math scores ranged from 19 to 35, with an average of 27.5 and a standard deviation of 4.4.** The average for the College of Science was 23.4, and the average for all MU majors was 21. The average ACT Math scores of those who graduate with the BS in physics was 2.2 points higher than the entire cohort with which they entered. The average high school GPA for physics majors was 3.48, compared to the COS GPA average of 3.56 and the MU average GPA of 3.33.

c. Exit Abilities:
The average final GPA of our physics major students is 3.27, comparable to the COS GPA average of 3.32. The Major Field Test in Physics is a national benchmark, used by schools and departments at more than 600 colleges and universities globally, to measure undergraduate student academic achievement, and the level of comprehension and problem-solving skills in all the core subfields in physics. The multi-year average for Marshall University graduating physics majors was a score of 144. This score is consistent with the National Average for the same period of 148, considering that the standard deviation was 30%, larger than the difference between our mean and the national mean. In addition to this, the small number of Marshall students tested cannot lead to statistically significant conclusions about performance.

4. Resources:

a. Financial:
The table below shows total allocations in three key budget funds: operating, personnel, and lab fees. Notable changes in the department’s operating funds occurred in fiscal year (FY) 2009 and 2010. The increase in 2009 was made in response to a request by the department to increase the funds available for faculty development. The notable decrease in FY 2010 reflects a mid-year budget reduction taken by the university due to reductions in the State of West Virginia allocation to the university. In general, operating fund allocations have increased during the reporting period, but only two years of the five reported here approach full operational funding.

Allocations to the department’s personnel fund varied in FY 2007 through 2010, mostly due to variations in summer school course offerings and the attendant variability in salaries paid to summer school faculty. The notable drop in allocation to the personnel fund in FY 2011 reflects a new budgeting process for summer school salaries. Summer School salary funds are no longer distributed to the department, but are paid from a central fund. Core funding in personnel has not changed markedly during the reporting period.
<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Operating (119001)</th>
<th>Personnel (119004)</th>
<th>Lab Fees (119005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2007</td>
<td>$7,500.00</td>
<td>$21,955.77</td>
<td>$24,069.00</td>
</tr>
<tr>
<td>FY 2008</td>
<td>$7,770.00</td>
<td>$29,596.38</td>
<td>$84,004.22</td>
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<tr>
<td>FY 2009</td>
<td>$27,694.00</td>
<td>$39,742.72</td>
<td>$50,276.00</td>
</tr>
<tr>
<td>FY 2010</td>
<td>$17,170.00</td>
<td>$28,408.49</td>
<td>$69,808.00</td>
</tr>
<tr>
<td>FY 2011</td>
<td>$25,916.50</td>
<td>$13,186.00</td>
<td>$67,083.45</td>
</tr>
</tbody>
</table>

1 includes personnel funds for graduate assistants, student assistants, part-time faculty, annual employment increments, and fringe benefits
2 Lab fees are collected centrally in COS and a portion of the fees are then allocated to departments
3 Does not include salary for PHY lab coordinator
4 Includes salary and fringe benefits for PHY lab coordinator
5 Does not include faculty summer school salaries, budgeted separately in this year and afterward

The COS collects lab fees from students taking any of our department labs. A portion of this money is then returned to our department by our Dean. Fund allocations have varied significantly during the reporting period. In FY 2008 the COS created the College of Science Office of Student Services. The office is staffed by two professional advisors who help in the recruitment and retention of COS students. The creation of that office came at the expense of two staff lines taken from within the college (one from Physics and one from Chemistry). The funds to maintain those positions come from lab fees. In addition, to pay for the salary and fringe benefits of the Department lab manager, the administration decided that lab fees have to be used. It is also important to note that not all lab fee allocations are made at the start of the year, and that the numbers included here are full-year allocations. The variability from year to year is due to supplementary allocations made on the basis of greatest need as determined by consensus of the department chairs. Years of higher lab fee allocations are those years in which Physics was found to have the greatest need for additional supplements.

The funding levels do not allow for any discretionary spending power. Considering that this department has a very large service course function, and devotes more than 90% of its financial resources to the lower division service courses, there are very few funds left for supporting the major.

Eliminating the BS in Physics would save, at best, modest funds for the university and more likely none at all. As pointed out above, the Department of Physics and Physical Sciences faculty teach a substantial number of service courses. During the period under review, 90% of the enrollment in physics courses (7,400 of 8,133) was in service courses. These service courses serve a number of major programs as well as the core curriculum. Hence, the faculty and the resources needed to support this massive service responsibility have to be sustained whether there is a major or not. Further, students seeking the physics major would enroll elsewhere and that would represent a loss of tuition revenue for Marshall.
Moreover, the research dollars the faculty generate are dependent on having a physics major. Undergraduate research is an essential component of the research this faculty is engaged in and eliminating the major would have a negative impact on funded research. In fact, the institution would stand to lose funding because the indirect costs that flow back to the institution would be sacrificed if the research were not conducted.

There are no similar programs within a 50-mile radius of the campus. The program at Marshall University is one of only five B.S. Physics degree programs in West Virginia. Our program serves primarily students from southern West Virginia. The B.S. in Physics program, the Physics 9-12 Teaching Specialization, and the M.S. in Physical Science degree are three parallel programs that use the same space, equipment, and faculty. Elimination of any one of the three would negatively affect the other programs. Two of the three provide teacher training in an area of critical shortage for the state of West Virginia as well as the nearby areas in Kentucky and Ohio.

b. Facilities:
The upper division labs are equipped with adequate storage facilities and are well illuminated. Teaching laboratory equipment is not adequate at the upper division level. The astronomy and nuclear physics courses need additional equipment and storage area. The department needs more lab space in order to expand its research capability.
The department also needs two more rooms: a) one room to be used as a student lounge, open discussion and study room, exclusive to our majors, and b) one room equipped with computers. This second room would be used by the lower division students as an interactive recitation room, and supervised by student-tutors recruited from our upper division.

5. Assessment Information
a. Student learning outcomes:
1. Broad Knowledge of Major Areas in Physics
   Our majors acquire the broad exposure to the major topics in physics the first year, by obtaining at least a C in Principles of Physics (PHY 211/213) and in the second year, by passing Modern Physics (PHY 320).
2. Deep Understanding of Core Subjects in Physics
   Core courses in Mechanics, Electricity and Magnetism, Thermal Physics and Quantum Physics provide our students with deep understanding of core subjects in physics.
3. Fundamental Physics Laboratory and Computational Skills
   Our students are introduced to laboratory and computational practices in the General Physics Laboratory courses (PHY 202/204), and develop these skills more seriously in Modern Physics (PHY 421) and Optics (PHY 405) or Electronics Laboratory (PHY 415).
4. Use of logical reasoning in problem solving
   Our students develop and demonstrate problem-solving skills all across the curriculum in logical step-by-step processes by identifying and analyzing physics word problems and arriving at correct solutions.
5. Appreciation and pursuit of new discoveries in physics
The comprehensive kaleidoscope of upper level electives, special topics and independent studies and interdisciplinary physics courses, offers our students flexible choices in tailoring courses after their interest and ignites their passion for physics.

6. Experience of Undergraduate Physics Research
Ongoing research by our faculty gives our majors the opportunity to get involved in research early in their college careers, with some starting their first year. All of our majors are required to complete a Capstone research project; these require a great deal of student effort, and are supervised by faculty members.

7. Ability to Succeed in Graduate School and/or Workplace
Our physics majors are directly involved in the Marshall University Chapter of the Sigma Pi Sigma Society of Physics Students, a nationally recognized society, and have the chance to visit graduate institutions and workplaces that employ physics graduates every year. Almost all of our Physics majors have been successful in Graduate School or employment. See III C sections 2 and 3 below.

b. Assessment tools/measures:
Assessments of our majors’ learning outcomes are conducted at the conclusion of the program, and consist of two globally recognized assessment tools: the ETS Major Field Test for Physics and the Undergraduate Capstone Research Program.

I. During their senior year all physics majors will take the Major Fields Test in Physics.
This exam is effective in assessing learning outcomes 1, and 2. Students’ scores are broken down into subgroups: Introductory Physics (Classical Mechanics, Electromagnetism, Optics, and Thermodynamics) and Advanced Physics (Quantum Mechanics, Atomic Physics and Special Topics). The Major Fields Test in Physics is taken in December and in April. Results are typically returned several months later. The previous two test results are reported to the department faculty at the first department meeting held during convocation week in the fall. The minutes of this meeting along with the supporting documentation (summary score results and comparisons) are archived and supplied to the assessment committee when requested.

II. Student learning outcomes 3 and 4 are intrinsic to the discipline of physics and are evaluated using assessment tools integrated in the curriculum.
Students develop and write reports for experiments conducted during the physics labs, use computer-based technology in conducting computer-based physics experiments. Physics is by definition the science that is based on the students’ ability to solve problems. All physics courses, without exception, contain, teach and assess problem-solving techniques. Our quizzes and exams consist of physics word problems and test students’ ability to use acquired knowledge, logic and critical thinking in order to find the correct solution.

III. During their senior year all physics majors must take the Physics Capstone Research Course (PHY 491/PHY 492).
In this course students work individually under the supervision of a physics faculty member and perform research in an area selected by mutual agreement. At the conclusion of the course, students present their research in a lecture attended by the departmental faculty. They also submit a written research report. This tool is effective in assessing students’ mastery of learning outcomes 5 and 6. A panel of faculty members attends the students’ final lectures, and reviews the students’ final written reports. These results are reported to the department faculty at the first department meeting held during convocation week in the fall. The minutes of this meeting along with the supporting documentation are archived and supplied to the assessment committee when requested.

IV. The 7th outcome is assessed indirectly and is measured during matriculation by the willingness of our majors to initiate and participate in enrichment programs, and after the graduation, in their integration into the workforce.

c. Standards/benchmarks:
The ETS Major Field Test for Physics consists of 70 multiple-choice questions, some of which are grouped in sets and based on materials such as diagrams, graphs, experimental data and descriptions of physical situations. The emphasis of the test is on the students’ firm grasp of fundamental principles and their ability to apply an understanding of them in the solution of problems. Most of the test questions can be answered on the basis of a mastery of the first three years of undergraduate physics.

Data are compared with national data and presented as part of the yearly assessment of the program. Results are broken down into the topics listed above in the assessment tools section. The overall results inform the department of any possible changes to the programs’ curricula and methods of delivery. Criterion: overall and in the two breakdown areas of the MFT, ninety percent of MU physics majors will score at or above the 50th percentile on the standardized exam.

The Physics Capstone Research Course (PHY 491/PHY 492) has been a featured course in the physics major for some time; however the results have not been used systematically for program assessment. Evaluation of student work for assessment purposes is in the developmental phase. During the Fall 2011 semester, physics faculty will create a rubric for evaluating the students’ presentations and final written reports for the purpose of program assessment. A summary of the panel’s review will be used to assess student-learning outcomes 4 and 5. Criterion: Ninety percent of MU physics majors will score at least satisfactorily according to the rubrics for evaluating student independent research, oral presentations and written reports.

The introductory and advanced physics labs are very important because this is where we train our students to apply the theoretical knowledge acquired in physics courses and to develop important skills like following a procedure, gathering data, testing and interpreting a physics theory, etc. We assess this skill in the lower division labs by using a standardized template lab report that students fill in, and for the upper division labs, by testing their ability to write lab reports for the experiments in the form of an experimental article in physics. We are in the process of gathering the data.
Our majors are assessed during their tenure for their ability to use logical reasoning in problem solving by means of quizzes and exams. We specify that those measures integrated in the curriculum are used by the entire faculty, and consist of evaluating the steps the students take in order to solve a physics problem. The very nature of the discipline of physics revolves around this ability, and our examinations are traditionally designed to test if our students are developing this essential skill. We are in the process of standardizing this procedure and gathering data that will be analyzed.

Our majors’ ability to succeed in graduate school and/or workplace is assessed in tracking the path of our alumni and keeping in touch with them. The criterion is for a high percentage of our graduates to be in the workplace or in graduate school with stipend and/or fellowship one year after graduation.

d. Results/analysis:
We present the results from the Major Field Test in Physics that are relevant for the period of review. The MFT percentile scores (both individual and in group) are relative to nationwide averages.

- In 2006-2007 we had two graduates and only one of them took the test. For the category of Introductory Physics, our student scored a mean of 47, equal to the national mean of 47. For the category Advanced Physics, our student scored a mean of 37, below the national mean of 48. For the Total Score, the student scored 142, below the average mean of 148.
- In 2007-2008 we had four graduates, and three of them took the test. For the category of Introductory Physics, our students scored a mean of 38.3, below the national mean of 48. For the category Advanced Physics, our students scored a mean of 42, below the national mean of 49. For the Total Score, the students scored 139, below the average mean of 148.
- In 2008-2009 we had four graduates, and all of them took the test. For the category of Introductory Physics, our students scored a mean of 45.5, very close to the national mean of 46.8. For the category Advanced Physics, our students scored a mean of 58, above the national mean of 48. For the Total Score, the students scored 152, above the average mean of 148.
- In 2009-2010, we had five graduates, two of which participated in the tests. For the category of Introductory Physics, our students scored a mean of 42.5, very close to the national mean of 47.4, with the standard deviation of 8.2. For the category Advanced Physics, our students scored a mean of 43, in comparison with the national mean of 48, with a standard deviation of 7.8. For the Total Score, the students scored 143, below the average mean of 148, with a standard deviation of 8.5.

e. Action taken:
The results of the Major Field Tests are consistent with the national average considering that the standard deviation is in general larger than the difference between our mean and the national mean. In addition to this, the small number of students tested cannot lead to statistically significant conclusions about the performance of our majors. We identified a problem in improving the results of the test due to the fact that
the students lack the motivation in preparing for the test. (This test does not affect their graduation GPA.)

An important reason for lower scores was that several subfields in these exams belong to the courses that have been offered in our program as electives. These electives are not regularly scheduled due to the lack of faculty members.

We also addressed this issue by introducing several new courses as electives, which were well received by the students and enhanced their motivation. In 2007, we made changes to our curriculum to add two new courses to our required core for physics majors: Statistical and Thermal Physics (PHY 308), and Mathematical Methods in Physics (PHY 445), which became part of our required core in 2008.

The Field Test results in 2009 were much improved. This prompted us to improve our curriculum further by adding two more new courses: Optics (PHY 304), and Quantum Mechanics II (PHY 443).

We believe that all these changes to the curriculum increase the quality of our program; we expect that the MFT scores of our students will improve. We are making a continuing effort to bring the quality level of our program up to the national standards to the benefit of our students.

Concerning the other assessment tools, they are fully implemented, but we are in the process of gathering data in the form required by the assessment committee.

f. **Other Learning and Service Activities**
As we write this report, we decided, beginning in the Fall 2011 term, to begin routinely testing our Physics students with Concept Inventories, which are nationally normed on 12,000 students. This assessment is a pre- and post-test measure of gain in core physics knowledge. These results will assess how well we are instructing our students within the discipline, and allow us to continuously improve our pedagogy.

g. **Plans for Program Improvement**
The Department of Physics aspires to the highest standards of excellence in all aspects of teaching, research and service. We aim to provide teaching of physics courses to science and non-science majors at the highest quality. We will also pursue our research with the intention to receive national and international recognition. And, we will continue to render service to the University, surrounding community, the state, and the nation.
<table>
<thead>
<tr>
<th>Year/Plan</th>
<th>Increase the total number of majors and minors</th>
<th>Improve undergraduate teaching and learning</th>
<th>Improve research productivity</th>
<th>Enhance departmental resources and infrastructure</th>
<th>Engagement and outreach</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>Introduce Areas of Emphasis in the physics program. Improve, maintain and update the department website</td>
<td>Develop evaluation instruments to measure crucial concept mastery Implement the national Physics Proficiency Program</td>
<td>Provide release time to pursue innovative research</td>
<td>Time the retirements with the new faculty positions</td>
<td>Increase interaction with area schools and programs for middle and high school teachers</td>
</tr>
<tr>
<td>2012-2013</td>
<td>Improve program visibility through ads. Mentor incoming students to improve retention rates</td>
<td>Use the pre-imposed test analysis to assess the number of students who master crucial concepts in key courses</td>
<td>Mentor new faculty Encourage faculty to sponsor undergraduate research and senior projects</td>
<td>Secure related start-up funds</td>
<td>Bring Science Olympiad at Marshall University</td>
</tr>
<tr>
<td>2013-2014</td>
<td>Improve contacts with high school physics teachers Track under-represented groups of students</td>
<td>Increase fraction of students who master crucial concepts in key courses Introduce interactive tutorials software</td>
<td>Develop new opportunities for undergraduate research Make undergraduate research visible</td>
<td>Properly equip the advanced teaching labs for majors</td>
<td>Obtain fast track certification for physics teachers</td>
</tr>
<tr>
<td>2014-2015</td>
<td>Use student surveys on course and program effectively Improve students satisfaction with the program</td>
<td>Develop, implement and use criteria for assessment of capstone reports and presentations</td>
<td>Obtain support for conference travel and visits to granting agencies</td>
<td>Obtain increased funding for scholarship and assistantship</td>
<td>Strengthen alumni relations and generate support for physics</td>
</tr>
<tr>
<td>2015-2016</td>
<td>Modify practices consistent with survey results and departmental priorities</td>
<td>Treat innovation in physics/science education as research equivalent</td>
<td>Continue emphasis on proposal writing and pursuing of external awards</td>
<td>Provide appropriate research infrastructure and support services</td>
<td>Cultivate formal interactions with local and regional school districts</td>
</tr>
</tbody>
</table>

h. Graduate and Employer Satisfaction:
We are trying to build a formal database of our alumni. We contacted them through emails and Facebook. Although the response is not sufficient to carry on a formal survey, we do know that our graduates have achieved acceptance into graduate programs at major universities, including the Illinois Institute of Technology at Chicago, University of California at San Diego, and Columbia University in New York. Besides going into PhD programs, our alumni are also entering Master Program, Medical Programs, the US Navy Nuclear Program, and becoming high school college physics and math teachers. Our chairman has been contacted by several institutions praising us for the preparation we have provided our students. He has also been contacted by
recruiters from WVU that are looking for good students to recruit into their graduate program.

i. **Annual assessment reports**

Please see the assessment letters appended at the end of this document.

6. **Previous Reviews:**

   At its meeting in April 2007, the Marshall University Board of Governors recommended that the BS in Physics continue at its current level of activity.

   The general comments of the last five year program review evaluation were very positive, especially because we implemented the Major Field Test in Physics to enhance our program effectiveness. However, the committee suggested that we should include how the instructor evaluates student work, and how student progress is assessed during the student tenure within the program. The committee also recommended the addition of at least an indirect assessment measure to the process, like student satisfaction survey. The biggest criticism of the committee was the fact that our report did not include, specifically, assessment methods that suggest higher levels learning, with the outcome more specifically stated.

   We feel that the committee comments reflect more on the way our assessments were presented than on our performance in teaching and assessing higher level thinking. In this report we try to be more specific. Please refer to Point 5 concerning the Assessment Information and Appendix V.

7. **Strengths/Weaknesses:**

   The main strength of our program is our faculty, which is well-trained, all with earned doctorates and very experienced. Our faculty members have made impressive strides to become more research active and we are producing BS graduates at a rate higher than in the previous reporting period. The small size of the faculty and the program has allowed students to interact regularly with the faculty, which the students view as a very positive feature. The friendly nature of the department and close relationship between faculty and students make students feel comfortable and motivated to study. We are always eager to assist students, and once they graduate, to help them get into their desired graduate school or job of choice.

   We are offering our students the opportunity to engage in research early on in their major and the possibility to choose from a diversity of interesting research activities. We are able to support our student research program with grant money awarded to our faculty. We have given $4000 per year to physics majors from scholarships that were endowed by A. Dixon Callihan, Donald C. Martin, Ralph P. Hron, and Dr. Thomas J. and Mary A. Manakkil.

   The faculty is also strongly committed to excellence in physics education. Our faculty receives some of the best student evaluations in the COS. In addition, our faculty members always welcome students’ constructive comments to improve their teaching. Our classroom demonstrations enrich our lectures by making topics more relevant. Some of our faculty use the latest technology available to make our discussions vibrant and exciting.

   Our most highly used classroom, S277 has been renovated and transformed into a high technology teaching center.
Finally we are involved in a vibrant outreach and student enrichment program. The main weakness of our program is that we are understaffed and we are lacking space. To address these initial needs we are asking for more faculty positions and space to allow our program to grow and to facilitate further research activity.

B. VIABILITY

1. Articulation Agreements:
There are no program specific articulation agreements with other institutions for delivery of this program.

2. Off-Campus Classes:
The department has occasionally taught off-campus classes primarily to serve the need to certify in-service high school teachers in physics. Last summer Dr. Orsini taught Astronomy 500/500L to in-service teachers through RESA II to help them with the physics certification. The major difficulty is the offering of laboratory-based survey courses because there are no acceptable labs off-campus. The problem can be solved by finding money to bring these teachers to Marshall University.

3. Online Courses:
With regards to offering web-based instructional courses, we make some observations. Various faculty members within our department certainly are conversant with web-based instruction, with substantial expertise in HTML, Java, LaTeX to HTML conversion, MathML, etc., and our faculty have also been early and strong users of WebCT at Marshall, as a vehicle for providing supplemental course delivery information. We feel, however, that it is neither advisable nor prudent to offer standalone physics courses on the web for the simple reason that any professor/student web conversations will necessarily require the transfer of mathematical expressions and relevant sketches to distance learners, and such information transfer is currently prohibitively time-consuming and problematic. Instead, we recommend the use of MIT’s OpenCourseWare initiative (http://ocw.mit.edu/index.html) providing freely-available undergraduate and graduate courseware in physics and engineering to our students who are interested.

4. Service Courses:
The department has an exceedingly large service course function, devoting more than 90% of its funds and 60% of its time, to the low-level service courses, including those taught outside the department. The Conceptual Physics Course (PHY 101/101L) had a total number of 620 students enrolled for the period of this 5 years review, and in the General Physical Science Course (PHY 109/109L, PHY 110/110L) we had 2283 students enrolled. In the General Physics Course (PHY 201/202, PHY 203/204) we had 4393 students enrolled. In the Principles of Physics Course, that includes both physics majors and other majors, we had 264 students. See Appendix VI.

5. Program Course Enrollment:
About 40% of the Student Credit Hour production at the undergraduate level is for upper division courses. Occasionally one-half of the total enrollments in upper-division classes are non-majors. This has been especially true in PHY 350, which is taken mostly by pre-medicine majors to prepare for the MCAT exam. Upper division courses are also taken by in-service teachers to improve their physics content understanding. See Appendix VI.

6. Program Enrollment:
The number of principal majors enrolled in our program has been small, but stable. Over the past five years, we have had on average 19 students per year with physics as the principal major, 3 students with physics as second major, 2 students with physics as minor and have graduated 3 students per year. Over the past five years, Marshall has averaged 3.8 BS degrees per year (Appendix VII). The trend data for the total enrollment and program graduates is included in Appendix VIII.

7. Enrollment Projections:
The next five years will be even more exciting. Marshall’s student enrollment is steadily increasing, and the number of sections of undergraduate courses has been increased to meet the demand. The department has three additional concentrations: Applied Physics, Bio Physics and Medical Physics. We plan on recruiting vigorously to make these programs successful.

“The basic story line of the STEM (Science, Technology, Engineering and Mathematics) crisis is, at this point, well known. In an increasingly interdependent and technology-driven economy, America is falling behind. A substantial number of students cannot perform basic math. U.S. students lag behind peers in international comparisons of science and math knowledge and skills. Fewer American students than ever are graduating from college with math and science degrees, and there is a shortage of K-12 teachers in STEM fields.” (The National Council on Teacher Quality).

The following is a summary of information provided by the American Institute of Physics (AIP). See: http://www.aip.org/statistics/trends/undergrad_degree.html. AIP promotes the profession of physics, but also keeps careful records of long term trends in physics education pedagogy, enrollments, and changes in national and industrial needs.

Until 9/11/2001, the United States was importing degreed individuals from overseas, but now security concerns have greatly reduced that flow. As a result, the United States has had to step up home-grown STEM graduates, and in particular, physics graduates. In physics, there has been a decade of growth in the number of BS Physics graduates.
The value of the Marshall University program is that small departments have been the backbone of that maintenance and growth. The vast majority of BA Physics graduates have come from small departments.

Small Physics Departments have also prepared high quality BS students for graduate school and public sector jobs.
Their opportunities and career paths have been identical.

Thus, we expect our enrollment in the BS physics degree to be crucial to our national needs, and that our enrollments can only increase over time due to that need.
C. NECESSITY:

1. Advisory Committee:
   We do not currently have a program Advisory Committee. However, any possible
changes in the B.S. program are discussed at length in department faculty meetings.
When changes have been agreed to be necessary, they are made by considering
national and local trends and needs.
   It is desirable to give our students the opportunity to graduate in four years. To
that aim we streamlined our program such that this could be achieved without any loss
of rigor.
   The state of West Virginia needs certified physics teachers. The College of
Education offers a B.A. in physics. With the approval of the College of Education, We
have continued to work on the content courses required for teacher certification to make
that curriculum more streamlined.
   We also introduced three additional concentrations, applied, bio and medical
physics. We feel that these concentrations will increase our program’s flexibility thus
making it more attractive to incoming students interested in cross disciplinary studies.

2. Graduates:
   We successfully tracked and kept in touch with 10 of our 13 graduates during the 5
years of the present review, which represents 77% of our alumni. Out of those, 3 went
on to major universities, including the Illinois Institute of Technology at Chicago,
University of California at San Diego, and Columbia University in New York to complete
a PhD program, one went to the Medical School and one is in the US Navy Nuclear
program. To this we are adding two alumni who are following a master graduate
program here at Marshall University. This represents a percentage of 54% of our
majors who were accepted into graduate schools. Two of our majors are employed as
high school teachers, and one as faculty at Marshall University. The start-up salary for
graduate school is about $20K and for teachers is about $40K per year. See Appendix
VIII.

3. Job Placement:
   As a department, we do not interact with employers except when we are asked by
our graduates to write letters of recommendations. In such cases we have also
followed up with phone calls describing our graduates’ abilities suited for these jobs.
   We do receive inquiries from other states needing graduates to fill their physics
teaching needs even if these graduates are not from the College of Education. This
information is then shared among our seniors and provides them with contacts with
these schools.
   To make our graduates even more employable, we have added Applied Physics,
BioPhysics and Medical Physics concentrations.
   As an institution, Marshall University has a great program that helps all of our
graduates. The Career Services Center is well staffed with quality people that provide
crucial services for our graduating seniors. One of the many services they provide is to
put our graduates in contact with many employers. At times, our department eagerly
provides additional information to help our graduates attain employment.
IV. RESOURCE DEVELOPMENT (If applicable)

1. Vision

The Department of Physics and Physical Science at Marshall University will be recognized for the distinction of its faculty, the pioneering research they and their students perform, and the excellence of the education provided to all of our students. Discoveries in pure science will expand our knowledge and enable us to have a deeper understanding of the physical universe. We will also provide the expertise and understanding of physical and related systems that are required, and essential, for interdisciplinary partnerships. We will integrate the process of discovery, and the discoveries, into the education of our students. We will engage our colleagues in the Colleges of Science, Engineering, Education, and others at Marshall University and elsewhere to jointly advance our understanding and application of science to provide the benefits of science to society. We will engage diverse populations of learners and develop innovative education initiatives and services, aiming for a student body of undergraduate majors of superior intellect and accomplishment. We will give high priority to the education of students from other disciplines by creating innovative curricula to match their requirements and, we will educate them to the full extent of their abilities. The students we serve will have the best professors, the finest educational technology available, and a stimulating physical environment for their classes. Our department will welcome women, minorities, and individuals from all cultures to form an enriching and diverse community of physicists. We will produce physics research at the forefront of science, physics degree students of the highest rank, and, through education and outreach, a more science-literate society.

2. Mission

The mission of the Department of Physics and Physical Science at Marshall University is to endow our majors with a solid foundation in the core subfields of our discipline and to prepare them to be successful professionals. We aspire to build and provide an environment where research and creativity in physics can flourish. The overarching goal of our Physics degree is to provide students with a liberal education, in an excellent learning environment, consisting on a broad array of knowledge in physics, but also in the physical and natural sciences, such as chemistry, biology, astronomy, mathematics, engineering, etc. The purpose of this education will be of serving the citizens of West Virginia, the United States, and the world through scholarship in the field of physics and closely related sciences.

3. Strategic Plan

Our strategic plan contains a set of objectives essential in meeting our goals:

- **Faculty and staff excellence.** A faculty and staff of the highest quality are essential ingredients of a first rate department.

- **Excellence in education.** We are committed to giving all of our students the highest quality education, with emphasis on critical thinking and analysis, conceptual understanding, problem solving and ethical issues related to science in general and physics in particular.
Integration of research and education. The department will develop and maintain leadership in research and discovery, and will strive for the continual integration of research and discovery into the educational experience.

State-of-the-art facilities. Forefront and cutting edge physical facilities and an excellent support staff are essential to meeting our research and educational objectives.

Engagement. Our faculty, staff and students will enthusiastically share their knowledge of physics with the greater community, including K-12 students and teachers of West Virginia, our alumni, and the general public.

4. Resources

The implementation of our vision, in which Physics will play a central role in the University and College of Science Strategic plans, will require a significant increase in resources, as well as reallocation of existing resources, to provide the personnel and physical facilities necessary to achieve our goals. We envisage funding from a partnership involving the College, University, the State, the Federal Government and private fund raising. We expect to compete for such funding by matching our needs and vision with appropriate funding sources. We expect support from the College and University that will result in increased Federal funding. Additionally, we will ask alumni and friends who share our vision for the future to take an active role in making it reality. We will give high priority to the funding of chaired professorships, undergraduate research, graduate fellowships, and the creation and support of research and educational labs, essential for carrying out successfully our mission.

Our budget needs to be increased. When we compare the program review filed five years ago with this one, we find a decrease in the yearly budget of about $2800. Over the same period we show an average increase in the number of students of about 20 per year. When we take into account an inflation rate of about 24% over the five years period, we need a 25% budgetary increase just to keep pace.

We are currently improving the research component of our faculty. We have replaced retiring faculty with new tenure-track faculty and 3 new term faculty. We still lack expertise in some other areas of physics. As we move to the future we will be looking to hire new faculty with diverse specialties. As opportunities arise, faculty will be hired to perform competitive research as well as teach. We are poised to become one of the most research productive departments in the COS and at the same time continue being one of the best-practice teaching departments. We have asked for an additional tenure-track or term faculty for the academic year 2012-2013 in order to continue with our mission. Retiring faculty have taught an average of 12 contact hours, whereas new faculty are coming in with reduced teaching loads. Therefore we require two additional faculty for every retiring member. The new faculty will be selected carefully to complement and fill gaps in the existing expertise.

If we really wish to bring ourselves up to the next level of excellence – one in which more modern and relevant required courses are added to the B.S. core – major changes are in order. For instance, a) offering an enhanced curriculum more in line with high quality physics programs elsewhere in the United State, b) including the electives and other modern courses of interest as required core courses, and c) having the resources to offer core courses each year instead of only as every two
years as is the historical model at Marshall. The increased instructional demands are estimated to be 12-18 contact hours per semester. In order to meet the increased demands for research, for supervising student research and Capstone projects, and for offering additional core courses in the major, we project a need for an additional three full-time, research-active tenure-track faculty in order to attract and retain the brightest students.

In proportion to the number of new research-active tenure-track faculty lines created, both office space and faculty laboratory research space would be required. The COS is currently undertaking a detailed study of space allocation. It is our hope that the result of this study will be the allocation of more space to our department. We have requested the old physics department space now occupied by the radiation lab in the basement of the COS. It is our hope that money can be found to decommission the space to be returned for routine use. We would also hope that space could be made available in the new R.C. Byrd Biotechnology building if necessary.

The development of advanced experimental physics laboratory is an absolutely essential component of a quality undergraduate curriculum. To address this important need for resource development, we request funding to purchase the necessary equipment for the following advanced experiments:

<table>
<thead>
<tr>
<th>Item</th>
<th>Laboratory</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Sensitivity Gamma Spectrometer</td>
<td>Modern Lab/Demo</td>
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<tr>
<td>Alpha/Beta Detector</td>
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<td>Freebody software</td>
<td>PHY 202</td>
<td>$500.00</td>
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</table>
Dr. Nicola Orsini, Chair
Physics
COS

Dear Nico:

The University Assessment Committee and I have completed our evaluation of the BS in Physics’ assessment of student learning. This letter will provide general comments and suggestions for improvement. Although the scoring rubric we used to evaluate assessment reports was sent to you in April, I will not include numerical ratings in this letter. The reason for this is that the rubric is still relatively new and is continuing to be revised. At this time, I ask that you use it for formative purposes to help improve your assessment plan. We also would appreciate your comments concerning this rubric.

I appreciate the work you have done to improve the physics program. I applaud you for using the ETS Major Field test. Although you have a small number of students and so must view trends over time, this is useful in that it allows you to compare your students’ performance against a national benchmark. It also allows you to assess national standards and use this information to revise your curriculum, as you have done. Although you have a small number of students, it might be useful to analyze your data according to the test’s topical categories, e.g. classical mechanics, electricity, etc. Result, analyzed over time, might point to specific curricular areas that need strengthening. Your rate of student presentations and publications also is impressive.

To improve assessment, I recommend that you reword your outcomes using measurable terms. For example, instead of, “Students will possess knowledge,” try “Students will demonstrate knowledge.” Instead of, “Students will possess deep understanding,” try “Students will analyze, synthesize, evaluate, compare and contrast, etc.” Ask yourselves what you want your students to be able to do with their knowledge and what your assignments and assessments are asking them to do.

Also, although I agree that acceptance of research for presentation and publishing such research in peer-reviewed journals demonstrates the quality of the work, it would be helpful for faculty to assess this work using rubrics. This would allow you to evaluate student strengths and weaknesses within this process, helping to inform changes in learning activities. Also, you’re still using the old assessment report template. The new one is located at http://www.marshall.edu/assessment/assessment_forms.htm. Please see the rubric sent earlier for additional reviewer comments.

Thanks to your faculty for attending the Program Assessment Workshop on Assessment Day. During the academic year 2011 – 2012, I plan to meet with all programs to assist with further development of assessment plans and look forward to meeting with and discussing your assessment
plan with you. I will be in touch at the end of the summer about scheduling. If you have questions or concerns, please let me know.

Sincerely,

Mary E. Reynolds

Mary E. Reynolds
Director of Academic Assessment

C: Dr. Charles Somerville, Dean, COS
Dr. Nicola Orsini, Chair  
Physics  
COS

Dear Nico:

The University Assessment Committee and I have completed our evaluation of the BS in Physics’ assessment of student learning. This letter will provide my general comments and suggestions for improvement. Although the scoring rubric we used to evaluate assessment reports is attached, I will not include numerical ratings in this letter. The reason for this is that we used the attached rubric is still relatively new and, as you will see, it raises the bar for what is considered excellent assessment. However, I ask that you use it for formative purposes to help improve your assessment plan. We also would appreciate your comments regarding this rubric.

I commend you for using the ETS Major Field Test in Physics. This is a good tool that allows you to both compare your students with national benchmarks and to evaluate strengths and weaknesses in your curriculum. Do the test results break down performance into anything other than basic and advanced physics? Also, do the questions require students to do anything besides “demonstrate knowledge?” The reason I ask is that knowledge is the lowest cognitive level according to Bloom’s taxonomy. If the questions require students to analyze, compare and contrast, evaluate, synthesize, etc. this might inform how outcomes are written.

How is students’ lab work evaluated? Is a rubric used to evaluate capstone work? I would agree, though, that acceptance of this work at national conferences and in peer-reviewed journals is a testament to its quality. I would like to meet with you after Assessment Day to discuss ways to write more measurable outcomes and to develop rubrics.

Please see the attached rubric. If you have questions or concerns, please let me know.

Sincerely,

Mary E. Reynolds

Mary E. Reynolds  
Director of Academic Assessment

C: Dr. Charles Somerville, Dean, COS
Office of Assessment & Program Review

April 7, 2009

Dr. Nicola Orsini, Chair
Physics
COS

Dear Nico:

The University Assessment Committee and I have completed our evaluation of the BS in Physics' assessment of student learning. This letter will provide my general comments and suggestions for improvement. Although the scoring rubric we used to evaluate assessment reports is attached, I will not include numerical ratings in this letter. The reason for this is that we used the attached rubric for the first time this year and, as you will see, it has changed considerably from the ones used in previous years. It raises the bar for what is considered excellent assessment considerably and, since it was not shared with programs before this assessment cycle, I'm not comfortable using it to give programs a formal rating this year. However, I ask that you use it for formative purposes to help improve your assessment plan. We also would appreciate your comments concerning this new rubric.

Your report shows that you are making strides in assessing student learning within the Physics program. However, while using the Physics Major Fields test is a wonderful thing to do, I strongly encourage you to supplement this assessment with authentic assessments throughout your curriculum. I'm sure your students engage in research, presentations, and other types of projects that would allow them to demonstrate mastery of the student learning outcomes you identify for your program. I would recommend that, as a first step, you develop student learning outcomes. Then, I recommend that you identify where (and in how many places) within the curriculum each outcome is assessed. Then, after you have identified your assessment instruments, you should develop detailed scoring rubrics for each. Finally, you should determine an assessment schedule that allows you to conduct an in-depth assessment of only a portion (about ¼) of your outcomes each year. I would be glad to meet with you to work on this plan.

Regarding your program's student learning outcomes, I only saw two on your report and they were both stated at the lowest level of learning, knowledge, i.e. "Students will demonstrate knowledge of introductory physics and advanced physics." I know that students in your program have many opportunities to analyze and evaluate concepts, etc. and would be happy to help you develop student learning outcome statements that reflect what they do in your curriculum.

Please see the attached rubric and letter to Deans, Chairs, and Faculty detailing general suggestions for an effective assessment program. If you have questions or concerns, please let me know.
Sincerely,

Mary E. Reynolds

Mary E. Reynolds
Director of Academic Assessment

C: Dr. Wayne Elmore, Interim Dean, COS
Office of Assessment & Program Review

April 1, 2008

Dr. Nicola Orsini, Chair
Physics
COS

Dear Nico,

The University Assessment Committee and I have completed our evaluation of the annual program assessment report for the BS in Physics. This letter will provide feedback in the following manner. First, I will comment generally on each section of your report. Second, I will rate the following areas of the report on a four point scale (0 – 3, with 3 being the highest rating): student learning outcomes, assessment measures, and the feedback loop. Although I considered feedback from committee members, I made the final decision on ratings for all reports submitted. Third, I will offer suggestions for your consideration as you plan your assessment for the 2008-2009 academic year. Fourth, I will include my evaluation using the Primary Traits Analysis rubric and will include reviewers’ comments for your information.

General Comments

First, I applaud you for using the Major Field Test in Physics from ETS for purposes of assessing student learning. This allows you to compare your students’ performance to national benchmarks and shows a commitment to program excellence. The construction of this test also allows you to analyze student performance in component areas. Results can help you to pinpoint students’ specific strengths and weaknesses, thus allowing meaningful curricular modifications to address these issues.

I would recommend, however, that you develop student learning outcomes that suggest higher levels of learning. Currently, you talk about students “demonstrating knowledge.” Although students must acquire knowledge before they can do anything with it, by the time they graduate they should be able to use this knowledge in various ways. For example, they should be able to apply knowledge to solve problems. They should be able to analyze problems using physics knowledge. They should be able to synthesize information from various sources to formulate a new hypothesis. They should be able to evaluate the results of an experiment. These are just a few examples of how you might be able to develop outcomes that reflect higher levels of thinking. My recommendation is to write outcomes in this way (and this is just an example): “When students complete the BS in Physics, they will be able to evaluate the results of an experiment in terms of its validity.”
Although I think using the major fields test from ETS is a great idea and one you should continue to do, I would suggest augmenting this measure with other measures. How do course instructors evaluate work? Do they use research papers, lab reports, exam questions, presentation of scientific work, etc? Using these types of projects, with detailed scoring rubrics, also can provide valuable assessment information. Another plus to these types of evaluations is that they can be conducted at several points throughout the student’s tenure in the program, thus allowing you to gauge progress in mastering outcomes over time. Also, although we recommend primarily using direct assessment measures, it also is a good idea to supplement these with indirect measures, such as student satisfaction surveys. Survey questions should pertain specifically to the student learning outcomes you have identified for your program. I recommend that the benchmarks you set should be the mean score (across students, although I realize you don’t have many each year) you expect your students to achieve. Results would be the actual mean score achieved. Actions taken would be what you are doing (or plan to do) based on the results. This report shows that you are currently using the ETS results to make appropriate programmatic changes.

**Ratings for Student Learning Outcomes, Assessment Measures, and the Feedback Loop**

Student Learning Outcomes = 2. This rating was given because your student learning outcomes clear and reflect student behaviors. To move to level 3, I recommend that your outcomes be written more specifically to reflect higher order learning.

Assessment Measures = 1. This rating was given because measures were identified and they relate to student learning outcomes. To move to level 2, you need to develop more varied measures and, although the emphasis should be on direct measures, you also should include some indirect measures. Additionally, these measures should be integrated into the curriculum. However, I applaud you for using the ETS test and think you should continue to do this.

Feedback Loop = 2. This rating was given because data from the ETS test are being used to make curricular changes with the goal of improving student performance on this test. To move to level 3, you should include data from more sources to help you make these decisions.

**Suggestions to Consider as you plan your assessment strategies for the 2008-2009 academic year**

I believe that your assessment plan should begin with a careful reflection, on the part of the entire faculty, on what you think your students should be able to do when they complete the BS in Physics. After you have agreed on a reasonable number of student learning outcomes, you should decide how each will be measured. Measurements should be both direct and indirect (with an emphasis on direct) and should allow you to identify students’ strengths and weaknesses. I strongly recommend that you spend time developing scoring rubrics for qualitative types of assessments such as papers, lab reports, presentations, and essay exam questions.

As you proceed, one caution I have is that you not try to do everything at once. It is perfectly acceptable and encouraged to assess only a portion of your student learning outcomes each year. So, you may choose to do an in-depth assessment of the first two outcomes during year 1. If this is done using several assessment measures with detailed rubrics, you will be able to collect detailed data regarding the outcomes. These data should allow you to identify specific strengths and weaknesses regarding student learning (and hence, your program). Changes to strengthen these areas of learning
can be implemented the following year, while you assess two more outcomes. This will allow you to assess all outcomes on a three-four year rotation and will give you sufficient time to allow curricular modifications to have an effect before the next assessment.

I appreciate the work you are doing to make your assessment stronger. If I can be of additional help, please do not hesitate to contact me at 62987 or at reynoldm@marshall.edu.

Sincerely,

Mary Beth

Mary E. Reynolds
Interim Director of Assessment

C: Dr. Andrew Rogerson, Dean, COS
Appendices I - VIII
## Appendix I
### Required/Elective Course Work in the Program

**Degree Program:**  **B.S. in Physics**  
**Person responsible for the report:**  **John Winfrey**

<table>
<thead>
<tr>
<th>Courses Required in Major (By Course Number and Title)</th>
<th>Total Required Hours</th>
<th>Elective Credit Required by the Major (By Course Number and Title)</th>
<th>Elective Hours</th>
<th>Related Fields Courses Required</th>
<th>Total Related Hours</th>
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<tr>
<td>General Physics Laboratory – PHY 202/PHY 204</td>
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<td></td>
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<td>Differential Equation – MTH 335</td>
<td>4</td>
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<td>Electricity and Magnetism – PHY 300/PHY 302</td>
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<td>CoS Requirement: Humanities</td>
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<td>Thermal Physics – PHY 308</td>
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<td>Introductory Modern Physics – PHY 320</td>
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<td>Classical Mechanics – PHY 330</td>
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<td>Modern Physics Laboratory – PHY 421</td>
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<td>Quantum Mechanics – PHY 442</td>
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<td>Quantum Mechanics II – PHY 443</td>
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<tr>
<td>Mathematical Methods of Physics – PHY 445</td>
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<td>Capstone – PHY 491/PHY 492</td>
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<td><strong>Total:</strong></td>
<td><strong>8</strong></td>
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<td><strong>35-45</strong></td>
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Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Robert Elwyn Bellis
Rank: Professor

Status (Check one): Full-time _X_ Part-time __Adjunct__
Current MU Faculty: Yes __ No _X_

Highest Degree Earned: _Ph.D._ Date Degree Received: 9/1/64
Conferred by: _University of Wales_

Area of Specialization: __Physics__

Professional Registration/Licensure __ Agency: ____________

Years non-teaching experience __7__
Years of employment other than Marshall __7__
Years of employment at Marshall __26__
Years of employment in higher education __33__
Years in service at Marshall during this period of review __1__

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment.  (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.

3) Discipline-related books/papers published (provide a full citation).

4) Papers presented at state, regional, national, or international conferences.

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
6) Externally funded research grants and contracts you received.
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
8) Community service as defined in the Greenbook.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Nicola Orsini

Rank: Professor and Chairman

Status (Check one):  Full-time  X Part-time  ___ Adjunct  ___ Current MU Faculty:  Yes  X  No

Highest Degree Earned: Ph.D.  Date Degree Received: Sept. 1977

Conferral by: The University of Michigan

Area of Specialization: Atmospheric Physics

Professional Registration/Licensure  Agency: ____________________________

Years non-teaching experience

6

Years of employment other than Marshall

3

Years of employment at Marshall

32

Years of employment in higher education

35

Years in service at Marshall during this period of review

5

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment.  (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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<td>Fall ‘09</td>
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<td>Conceptual Physics</td>
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<td>PHY 101L</td>
<td>Conceptual Physics Lab</td>
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<td>PHY 201</td>
<td>General Physics</td>
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<td></td>
<td>UNI 101</td>
<td>New Student Seminar</td>
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<td>PHY 101</td>
<td>Conceptual Physics</td>
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<td>PHY 101L</td>
<td>Conceptual Physics Lab</td>
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<td>General Physics</td>
<td>49</td>
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<tr>
<td>Intercession ‘10</td>
<td>PHY 101</td>
<td>Conceptual Physics</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>PHY 101L</td>
<td>Conceptual Physics Lab</td>
<td>21</td>
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<tr>
<td>Summer II ‘10</td>
<td>PS 500</td>
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<td>Astronomy Lab</td>
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<td>Conceptual Physics</td>
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<td>PHY 101L</td>
<td>Conceptual Physics Lab</td>
<td>21</td>
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<td>Course Title</td>
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<tr>
<td>Summer II ’11</td>
<td>PS 109</td>
<td>General Physical Science</td>
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<td>General Physical Science Lab</td>
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</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.
   N/A

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
   Demonstrations in the classroom and talks I give to elementary students. It forces me to find ways to simplify more complicated topics. These simplifications have been very useful in the classes I teach at the university.

3) Discipline-related books/papers published (provide a full citation).
   None

4) Papers presented at state, regional, national, or international conferences.
   None

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
   Chairman of the Physics and Physical Science Department; Member of the American Association of Physics Teachers (AAPT); Member of Partnership Schools Project Advisory Committee; Member of Education Personnel Preparation Advisory Committee (EPPAC); Member of the Mathematics/Science Taskforce (M/ST); Member of the Undergraduate Program Liaisons Committee for Initial Teacher Education (UPLCITE); Liaison faculty member of the College of Science for the COEHS (2000 – present)

6) Externally funded research grants and contracts you received.
   None

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
   None

8) Community service as defined in the Greenbook.
   Consultant/Liaison for local high school teachers.
   Science resource for local TV stations.
   Workshop on electrostatics for the 3rd grade class at Guyandotte Elementary School
   Promote teaching physics in all the state’s high schools as a required science by communicating and providing information to State Senator, State Representatives, and high school teachers.
   Consultation with Ms. Pam Scaggs of RESA 2 to set up a program to certify middle and high school teachers to teach physics.
   Consultation with Mr. Joe Gonzales on Higg’s particles.
   Lectured for Boy Scout Merit Badge Masters on topic of “Astronomy” required for merit badge.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Richard Bady            Rank: Part Time Adjunct
Status (Check one): Full-time   Part-time   Adjunct
Current MU Faculty: Yes   No

Highest Degree Earned: Ed. D   Date Degree Received: 1979
Conferred by: Rutgers University

Area of Specialization: ________________________________

Professional Registration/Licensure Agency: ____________

Years non-teaching experience
Years of employment other than Marshall  7
Years of employment at Marshall  25
Years of employment in higher education  32
Years in service at Marshall during this period of review  25

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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</thead>
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<td>PS 109 &amp; 109L</td>
<td>General Physical Science &amp; Lab</td>
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<tr>
<td>Spring 2010</td>
<td>PS 110 &amp; 110L</td>
<td>General Physical Science &amp; Lab</td>
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<tr>
<td>Fall 2010</td>
<td>PS 109 &amp; 109L</td>
<td>General Physical Science &amp; Lab</td>
<td>100</td>
</tr>
<tr>
<td>Spring 2011</td>
<td>PS 110 &amp; 110L</td>
<td>General Physical Science &amp; Lab</td>
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</tbody>
</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.

2) Activities that have enhanced your teaching and or research.
3) Discipline-related books/papers published (provide a full citation).
4) Papers presented at state, regional, national, or international conferences.
5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended.
List any panels on which you chaired or participated. List any offices you hold in professional organizations.

6) Externally funded research grants and contracts you received.
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
8) Community service as defined in the *Greenbook*. 
Appendix II
Faculty Data Sheet
(for the period of this review)

Name: Dr. Thomas E. Wilson  Rank: Professor

Status (Check one): Full-time X Part-time _____ Adjunct _____ Current MU Faculty: X yes _____ no

Highest Degree Earned: Ph.D. Date Degree Received: 1984

Conferred by: Indiana University

Area of Specialization: Physics (Condensed Matter)

Professional Registration/Licensure: Agency:

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<thead>
<tr>
<th>Years non-teaching experience</th>
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</thead>
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<td>Years of employment other than Marshall</td>
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</tr>
<tr>
<td>Years of employment at Marshall</td>
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</tr>
<tr>
<td>Years of employment in higher education</td>
<td>28</td>
</tr>
<tr>
<td>Years in service at Marshall during this period of review</td>
<td>5</td>
</tr>
</tbody>
</table>

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
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<td>PHY 330</td>
<td>Mechanics</td>
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NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.
If your degree is not in your area of current assignment, please explain.
N/A

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.

Activities that have enhanced your teaching and or research.
Using personal response system in PHY 211/213 for student electronic feedback 2002 – present

Discipline-related books/papers published (provide a full citation).
- TE Wilson, “Fabrication and characterization of granular aluminum/palladium bilayer microbolometer”, in review to Meas. Sci. Technol. 9.27.06

Papers presented at state, regional, national, or international conferences.
- Student (Daniel Velazquez) co-authored paper “Anisotropic Wave Propagation in a Ripple Tan”, Physics Diversity Summit 09, a joint (NSBP, NSHP) national conference on diversity in physics, held from February 11-15, 2009, at the Nashville Renaissance Hotel.
- Presented paper at Acoustics ’08, a joint international conference on acoustics held from June 29-July 4, 2008, at the Palais de Congrès in Paris, France.

Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
- American Physical Society
- Amer. Assoc. Physics Teachers
- I.E.E.E.,
- Army Research Office Proposal

Externally funded research grants and contracts you received.
- WV EPSCoR Research Seed Grant: “Demonstration of Coherent Phonon Generation at 1.5 THz”, Amount $20,000. (2011)
- National Science Foundation/ENG/ECS/GOALI award 0622060 $245,896: “Coherent acoustic phonon generation and development of terahertz cryogenic acoustic microscope” (sole Principal Investigator), NSF ENG/ECCS/REU Supplement to IV.1 above, Number 0924691, Amount: $6,000 (2006-2011)

Awards/honors (including invitations to speak in your area of expertise) or special recognition.
- Marshall University Distinguished Arts and Scholar Award (2011)

Community service as defined in the Greenbook.
- Arranged for Dr. Wolfgang Grill and public lecture.
- Arranged for Dr. Ronald Walsworth from APS DTL competition
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Ralph Oberly
Rank: Professor

Status (Check one): Full-time X Part-time ___ Adjunct ___ Current MU Faculty: Yes X No ___

Highest Degree Earned: PhD Physics ___ Date Degree Received: June 1970

Conferred by: Ohio State University

Area of Specialization: Physics: High Resolution Molecular Spectroscopy

Professional Registration/Licensure: N/A

Years non-teaching experience: 2
Years of employment other than Marshall: 2
Years of employment at Marshall: 41
Years of employment in higher education: 41
Years in service at Marshall during this period of review: 5

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title, and enrollment. (Expand the table as necessary)

<table>
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<th>Title</th>
<th>Enrollment</th>
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<tr>
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<td>General Physics II</td>
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<td>General Physics Lab II</td>
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<td>PS 410*</td>
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<td>PS 510*</td>
<td>Remote Sensing</td>
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</tr>
<tr>
<td></td>
<td>BSC 510*</td>
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<td></td>
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<td>PS 681</td>
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<td>Summer 2010</td>
<td>PHY 203</td>
<td>General Physics II</td>
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<td>Spring 2010</td>
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<td></td>
<td>PS 511*</td>
<td>Image Processing</td>
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<td>BSC 411*</td>
<td>Image Processing</td>
<td>4</td>
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<td>PHY 415</td>
<td>Electronics Lab</td>
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<td></td>
<td>PHY 492</td>
<td>Capstone</td>
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<tr>
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<td>PHY 515</td>
<td>Electronics Lab</td>
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<td>PHY 586</td>
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<td></td>
<td>PS 660*</td>
<td>Independent Study</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PS 681*</td>
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<td>PS 670*</td>
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<td>Fall 2009</td>
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<td>PS 410*</td>
<td>Remote Sensing</td>
<td>2</td>
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<td></td>
<td>PS 510*</td>
<td>Remote Sensing</td>
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<td>BSC 410*</td>
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<td></td>
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<td>Yeager Science and Mathematics Seminar</td>
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<td>PS 681</td>
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<td>Independent Study</td>
<td>5</td>
</tr>
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<td>Summer 2009</td>
<td>PHY 203</td>
<td>General Physics II</td>
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<td>PS 660</td>
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<td>1</td>
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<td>Spring 2009</td>
<td>PHY 304</td>
<td>Optics</td>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain. N/A

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
   Attendance at national AAPT meeting in Jacksonville, FL, January 2011
   Advise Society of Physics Students local chapter.

3) Discipline-related books/papers published (provide a full citation).
   N/A

4) Papers presented at state, regional, national, or international conferences.

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
   Professional Memberships: Optical Society of America (OSA)
   American Association of Physics Teachers (AAPT)
   International Society for Optics and Photonics (SPIE)


6) Externally funded research grants and contracts you received. N/A

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition. N/A

8) Community service as defined in the Greenbook.
   • Laser safety presentation to Biology students
   • Electricity – Merit Badge College each of last five years, Marshall University
   • 2 days – hands-on Science/Engineering Days (Chesapeake Middle School)
   • Talk to high school honors class on college prep (Chesapeake High School)

Organized YGS 271 Class field trip to Green Bank Radio Astronomy Observatory

Appendix II
Faculty Data Sheet
(for the period of this review)

Name: ____________________
Huong Nguyen

Rank: ____________
Associate Professor

Status (Check one): Full-time___ X ___ Part-time_____ Adjunct______
Current MU Faculty: X yes ___ no

Highest Degree Earned: __________ Ph.D.____ Date Degree Received: ______ 2001____

Conferred by: _____________________
The City University of New York

Area of Specialization: ________________
Physics (Condensed Matter Theory)

Professional Registration/Licensure: N/A______
Agency: ____________________________

Years non-teaching experience: _____________
Years of employment other than Marshall: _____________
Years of employment at Marshall: _____________
Years of employment in higher education: _____________
Years in service at Marshall during this period of review: _____________

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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<td>Fall ’09</td>
<td>PHY 202</td>
<td>General Physics Laboratory</td>
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<td></td>
<td>PHY 204</td>
<td>General Physics Laboratory</td>
<td>24</td>
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<tr>
<td></td>
<td>PHY 442/542</td>
<td>Quantum Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Spring ’10</td>
<td>PHY 425/525</td>
<td>Solid State Physics</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>PHY 443/543</td>
<td>Quantum Mechanics II</td>
<td>3</td>
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<td>Fall ’10</td>
<td>PHY 300</td>
<td>Electricity and Magnetism</td>
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<tr>
<td></td>
<td>PHY 445/545</td>
<td>Math Methods of Physics</td>
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<tr>
<td></td>
<td>PHY 600</td>
<td>Electricity and Magnetism</td>
<td>1</td>
</tr>
<tr>
<td>Spring ’11</td>
<td>PHY 302</td>
<td>Electricity and Magnetism</td>
<td>2</td>
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<td></td>
<td>PHY 442/542</td>
<td>Quantum Mechanics</td>
<td>3</td>
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NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.

1 If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities. N/A)

2 Activities that have enhanced your teaching and or research The City University of New York Participation in
   • Capstone supervisor for Sarah Hall, “Effect of Magnetic Field on Phonoritons”
   • Teach new course PHY 600 (Graduate) Electricity & Magnetism

3 Discipline-related books/papers published (provide a full citation).
Papers presented at state, regional, national, or international conferences.

- Invited Seminar presented to faculty of Physics and Chemistry Departments, WVU April 2009, Inorganic-Organic Hybrid Exciton in Semiconducting Quantum Dot System
- First International Conference on Multifunctional, Hybrid and Nanomaterials, Tours France, March 2009
- Michael Jayson Price, Que Huong Nguyen, 2008 APS Spring Meeting of Ohio-Region Section, Effect of Electric Field on Phononitons in Semiconductors

Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.

- Membership of American Physics Society

Participation at professional meetings:
- APS March Meeting, Portland, OR; March 2010
- APS March Meeting, Pittsburgh, PA; March 2009
- First International Conference on Multifunctional, Hybrid and Nanomaterials, Tours, France; March 2009
- Sixth Annual Undergraduate Research Day at Capitol, with Daniel Velazquez 2009
- APS March Meeting, Colorado, March 2009

Externally funded research grants and contracts you received.
- NSF DMR – MPS SUST ENERGY SCI, December 8, 2009
- NSF DMR Condensed Matter Physics, November 2, 2009
- EU COMMISSION MARIE CURIE ACTION, August 2009

Awards/honors (including invitations to speak in your area of expertise) or special recognition.

Invited speaker:
- Invited Seminar presented to faculty of Physics and Chemistry Departments, WVU April 2009, Inorganic-Organic Hybrid Exciton in Semiconducting Quantum Dot System

Community service as defined in the Greenbook.
- Supervisor of Vietnamese Student Association
Appendix II
Faculty Data Sheet
(for the period of this review)

Name: Vaseashta, Ashok
Rank: Professor

Status (Check one): Full-time__X__ Part-time_____ Adjunct_____ Current MU Faculty: X yes ___ no

Highest Degree Earned: __Ph.D._________________ Date Degree Received:____ 1990____

Conferred by: Virginia Polytechnic Institute & State University, Blacksburg, VA

Area of Specialization: Solid State Electronics, Materials Engineering & Science

Professional Registration/Licensure ___________________________________________________________________
Agency:_____________________________________________________________________________________

Years non-teaching experience __________ 6 __
Years of employment other than Marshall __________ 7 __
Years of employment at Marshall __________ 10 __
Years of employment in higher education __________ 17 __
Years in service at Marshall during this period of review __________ 2 __

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, course title and enrollment. (Expand the table as necessary)

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NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.

1. If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.

2. Activities that have enhanced your teaching and or research.

3. Discipline-related books/papers published (provide a full citation).

4. Papers presented at state, regional, national, or international conferences.

5. Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.

6. Externally funded research grants and contracts you received.

7. Awards/honors (including invitations to speak in your area of expertise) or special recognition.

8. Community service as defined in the Greenbook.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Maria C. Babiuc-Hamilton  Rank: Assistant Professor

Status (Check one): Full-time X  Part-time  Adjunct
Current MU Faculty: Yes X  No

Highest Degree Earned: PhD
Date Degree Received: June 2000
Conferred by: “Al. I. Cuza” University, Iasi, Romania

Area of Specialization: Theoretical Physics

Professional Registration/Licensure  Agency:

Years non-teaching experience  4
Years of employment other than Marshall  7
Years of employment at Marshall  4
Years of employment in higher education  11
Years of service at Marshall during this period of review  4

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
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<tr>
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<th>Title</th>
<th>Enrollment</th>
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<td>PHY 480</td>
<td>SpTp:Special &amp; Gen Relativity</td>
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<td>PHY 610</td>
<td>Special and Gen Relativity</td>
<td>2 students</td>
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<td>Summer 2011</td>
<td>PHY 585</td>
<td>Independent Study: Radiative Processes in Astrophysics</td>
<td>1 student</td>
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<td>FYS 100</td>
<td>First Year Seminar</td>
<td>16 students</td>
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<td>PHY 350</td>
<td>Biomedical Physics</td>
<td>5 students</td>
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<td>FYS 100</td>
<td>First Year Seminar</td>
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<td>PHY 320</td>
<td>Intro Modern Physics</td>
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<td>Summer 2010</td>
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<td>Independent Study: Modern Astrophysics II</td>
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<td>General Physics Lab</td>
<td>16 students</td>
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<td>Independent Study: Modern Astrophysics I</td>
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<td>Capstone Course II: Introduction to General Relativity</td>
<td>1 Student</td>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.
(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)
Activities that have enhanced your teaching and or research.

1. Participation and presentation of the proposal: “Is there a formula for success?” as member of the panel: “FYS 100, Year One: Lessons Learned”, 3rd Annual Conference on Teaching and Learning IPED: Inquiring Pedagogies 2011 Marshall University, Huntington, WV.
3. CI-TRAIN Lecture Series Spring 2010, Jan. 11–May 1, 2010, Marshall University, Huntington, WV.

Discipline-related books/papers published (provide a full citation).


Papers presented at state, regional, national, or international conferences.


Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.

1. Membership: Society of Physics Students; American Physical Society; American Association of Physics Teachers; Sigma Xi, the Scientific Research Society.
2. Jan. 11–May 1, 2010: The First Year Seminar Faculty Development Workshop, at The Center for the Advancement of Teaching and Learning, Marshall University, Huntington, WV—Participated.

Externally funded research grants and contracts you received.

1. March 2010, M.C. Babiuc: (P.I) “Cauchy-Characteristic Extraction of Gravitational Waves from Binary Black Hole Merger”, TeraGrid Supercomputer Award (30,000 CPU hours), Nr. PHY090008, Type: DAC-TG.

Awards/honors (including invitations to speak in your area of expertise) or special recognition.


Community service as defined in the Greenbook.

1. Workshop presenter, Esteem Physics: Experiments in Modern Physics, Expanding Your Horizons outreach event for middle school girls on Saturday April 2nd at Mountain State University in Beckley, WV.
2. Organized “Open-ended Discussion with the Faculty” on campus outreach meetings, Spring 2010, once a month, Marshall University, Huntington, WV.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: **Xiaojuan Fan**  
Rank: **Assistant Professor**

Status (Check one):  
- **Full-time** [X]  
- **Part-time** [ ]  
- **Adjunct** [X]

Current MU Faculty:  
- **Yes** [X]  
- **No** [ ]

Highest Degree Earned: **Ph.D.** 
Date Degree Received: **07/01/99**

Conferred by: **University of Science and Technology of China**

Area of Specialization: **Condensed matter physics**

Professional Registration/Licensure: 
Agency: 

Years non-teaching experience: **6**
Years of employment other than Marshall: **13**
Years of employment at Marshall: **3**
Years of employment in higher education: **16**
Years in service at Marshall during this period of review: **3**

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
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<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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<td>General physics and lab</td>
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<td>2011/spring</td>
<td>PHY201, PHY202</td>
<td>General physics and lab</td>
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<td>2010/fall</td>
<td>FYS, PHY421</td>
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<td>PHY201, PHY202, PHY204</td>
<td>General Physics and lab</td>
<td>80</td>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
   New course setups: “first year seminar”, “modern physics”, and “modern physics lab”.

3) Discipline-related books/papers published (provide a full citation).
   - Honghan Fei, Yuchen Yang, David L. Rogow, *Xiaojuan Fan*, Scott R. J.


4) Papers presented at state, regional, national, or international conferences.
- 2011 Invited talk, Department of Physics, Anhui University, China
- 2011 International Semiconducting, Optical and Photonic, Wuhan, China, talk presentation
- 2011 American Physical Society March Meeting, Austin, TX, talk presentation
- 2010 SigmaX and West Virginia Star Symposium, Marshall University
- 2010 APS March Meeting, Portland, OR, talk presentation
- 2009 American Physical Society March Meeting, Pittsburg, PA, talk presentation
- The 5th international congress of NBCT 2008, San Francisco, CA, talk presentation
- 2008 American Physical Society Spring Meeting, New Orleans, LA, talk presentation
- 2007 MRS Spring Meeting, San Francisco, CA, talk presentation

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
- NSF SBIR Phase I proposal review panelist, March 2009
- NSF SBIR Phase I proposal review panelist and Aug. 2010

6) Externally funded research grants and contracts you received.
- NASA WVEPScOR Seed Grant, 2009
- NASA WVURC subcontract, 2009
- MU Advance new faculty fellowship, 2010

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
- Invited talk, Anhui University, China

8) Community service as defined in the Greenbook.
- Marshall university open house receptions, 2007-2010
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: ___John Winfrey___ Rank: ___Term Assistant___
Profit___

Status (Check one): Full-time ___Part-time___ Adjunct ___ Current MU
Faculty: Yes ___ No ___

Highest Degree Earned: ___Ph. D.____ Date Degree Received: ___March 1975___

Conferred by: ___University of California: San Diego___

Area of Specialization: ___Plasma Physics___

Professional Registration/Licensure___ Agency: ___

Years non-teaching experience ___10____
Years of employment other than Marshall ___35___
Years of employment at Marshall ___2___
Years of employment in higher education ___25___
Years in service at Marshall during this period of review ___2___

List courses you taught during the final two years of this review. If you participated in a
team-taught course, indicate each of them and what percentage of the course you
taught. For each course include the year and semester taught (summer through
spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
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<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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<td>General Physics Lab</td>
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<td></td>
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<td>Spring 2011</td>
<td>PHY 204 L PHY 101 L PS 110 L PHY 204</td>
<td>General Physics Lab</td>
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<td>Conceptual Physics Lab</td>
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<td>Sum III 2011</td>
<td>PS 110</td>
<td>General Physical Science</td>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this
document.

1) If your degree is not in your area of current assignment, please explain.
(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
3) Discipline-related books/papers published (provide a full citation).
4) Papers presented at state, regional, national, or international conferences.
5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
6) Externally funded research grants and contracts you received.
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
8) Community service as defined in the *Greenbook*.

I was a physics judge at the West Virginia State Science Fair, Spring 2011.

I was a SCORE judge, Spring 2011.

I participated in Green & White day, Fall 2010.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Curt W. Foltz
Rank: Assistant Professor

Status (Check): Full-time X Part-time Adjunct
Current MU Faculty: Yes X No

Highest Degree Earned: Ph.D. Date Degree Received: 1991 Dec.
Conferred by: The Catholic University of America

Area of Specialization: Experimental (Nuclear) Physics

Professional Registration/Licensure Agency:

Years non-teaching experience
Years of employment other than Marshall
Years of employment at Marshall
Years of employment in higher education
Years in service at Marshall during this period of review

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 Fall</td>
<td>PHY 201</td>
<td>General Physics I</td>
<td>32</td>
</tr>
<tr>
<td>2009 Fall</td>
<td>PHY 202</td>
<td>General Physics Lab I (3 sections)</td>
<td>61</td>
</tr>
<tr>
<td>2009 Fall</td>
<td>PHY 204</td>
<td>General Physics Lab II</td>
<td>25</td>
</tr>
<tr>
<td>2010 Spring</td>
<td>PHY 204</td>
<td>General Physics Lab II</td>
<td>22</td>
</tr>
<tr>
<td>2010 Spring</td>
<td>PHY 211</td>
<td>Principles of Physics I</td>
<td>9</td>
</tr>
<tr>
<td>2010 Spring</td>
<td>PHY 213</td>
<td>Principles of Physics II</td>
<td>9</td>
</tr>
<tr>
<td>2010 Spring</td>
<td>PHY 486</td>
<td>201+203 upgrade to 211+213</td>
<td>1</td>
</tr>
<tr>
<td>2010 Summer III</td>
<td>PS 109</td>
<td>General Physical Science</td>
<td>14</td>
</tr>
<tr>
<td>2010 Summer III</td>
<td>PS 109 L</td>
<td>General Physical Science Lab</td>
<td>14</td>
</tr>
<tr>
<td>2010 Fall</td>
<td>PHY 202</td>
<td>General Physics Lab I (3 sections)</td>
<td>45</td>
</tr>
<tr>
<td>2010 Fall</td>
<td>PHY 211</td>
<td>Principles of Physics I</td>
<td>25</td>
</tr>
<tr>
<td>2010 Fall</td>
<td>PS 109 L</td>
<td>General Physical Science Lab</td>
<td>9</td>
</tr>
<tr>
<td>2011 Spring</td>
<td>PHY 204</td>
<td>General Physics Lab II (2 sections)</td>
<td>41</td>
</tr>
<tr>
<td>2011 Spring</td>
<td>PHY 211</td>
<td>Principles of Physics I</td>
<td>14</td>
</tr>
</tbody>
</table>
NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.

2) Activities that have enhanced your teaching and or research.
   On-Going: Physics Forums Homework Helper and discussion contributor
   2010 Summer: WVU Science Institute (Active Learning, mostly in Biology)

3) Discipline-related books/papers published (provide a full citation)

4) Papers presented at state, regional, national, or international conferences.
   2010 April: “Decades of Dark Matter and Dark Energy in Intro Astronomy”
   2009 Spring: “Teaching the Accelerating Universe”

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended.
   List any panels on which you chaired or participated. List any offices you hold in professional organizations.
   2010 Spring AAPT Western Pennsylvania section
   2010 April AAPT National Conference
   2009 Summer AAPT National Conference
   2009 Spring AAPT Western Pennsylvania section
   2008 Oil Region Astronomical Society “AstroBlast”
   2008 Fall AAPT Western Pennsylvania section

6) Externally funded research grants and contracts you received.
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
8) Community service as defined in the Greenbook.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Howard L. Richards  Rank: Assistant Professor

Status (Check one): Full-time X Part-time_____ Adjunct _____ Current MU Faculty: Yes ___ No ___

Highest Degree Earned: Ph.D.  Date Degree Received: April 1996

Conferred by: Florida State University

Area of Specialization: Physics

Professional Registration/Licensure__________________________ Agency: _______________________________

Years non-teaching experience 4
Years of employment other than Marshall 11 4
Years of employment at Marshall 4 4
Years of employment in higher education 12.5
Years in service at Marshall during this period of review 4

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year /Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 / Spring</td>
<td>PHY 101L</td>
<td>Conceptual Physics Lab</td>
<td>19</td>
</tr>
<tr>
<td>2010 / Spring</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>18</td>
</tr>
<tr>
<td>2010 / Spring</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>13</td>
</tr>
<tr>
<td>2010 / Spring</td>
<td>PS 110</td>
<td>General Physical Science</td>
<td>38</td>
</tr>
<tr>
<td>2010 / Spring</td>
<td>HON 280</td>
<td>SpTp: Ancient / Modern Astronomy</td>
<td>18</td>
</tr>
<tr>
<td>2010 / Fall</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>23</td>
</tr>
<tr>
<td>2010 / Fall</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>18</td>
</tr>
<tr>
<td>2010 / Fall</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>20</td>
</tr>
<tr>
<td>2010 / Fall</td>
<td>PS 400</td>
<td>Astronomy</td>
<td>5</td>
</tr>
</tbody>
</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

• If your degree is not in your area of current assignment, please explain.

N/A

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

• Activities that have enhanced your teaching and or research.

Attended WAC retreat October 17-18, 2008. I have used the ideas from this retreat in my Astronomy courses. This semester (fall 2011) I am compiling a portfolio to obtain WAC certification, so that I will be able to teach writing-intensive classes. (On previous occasions I waited too late in the semester – up to about the 3rd week – to begin.)

I have also designed a “problem-solving sheet” for use in PHY 201/203/211/213. Based on How to Solve It by G. Polya, these sheets
• give students practice in the methodical and systematic solution of physics problems;
• reward students for setting up problems even if they cannot (initially) see how to finish the solutions;
• make it obvious to students if they have omitted part of the solution; and
• simplify the consistent assignment of partial credit to attempted solutions.

• Discipline-related books/papers published (provide a full citation).

None. However, I did write all of the labs that I use for PS 400L/PS 500L, so in essence I have written a lab manual (which I am continuing to edit and use this year).

4) Papers presented at state, regional, national, or international conferences.

Joint Fall 2010 Meeting of the APS Ohio Section and AAPT Appalachian and Southern Ohio Sections; October 8-9, 2010; Marietta, OH. C2.03: “Metastable Decay in the Square-Lattice Ising Model: Restriction to a Single Droplet”, Howard L. Richards and James W. Howard.


2008 Spring Meeting of the Ohio-Region Section of the APS; March 28-29, 2008; Youngstown, OH. C2.06: “Ensemble Approach to Vicinal Crystal Surfaces”, Howard L. Richards and Ryan P. Jacob.

2008 Fall Meeting of the Ohio-Region Section of the APS; October 10-11, 2008; Fairborn, OH. C6.05: “Terrace Width Distributions in the Limit $\tilde{\beta}_B / \tilde{\beta}_A \to \infty$: Numerical Transfer Matrix Results”, Howard L. Richards.

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.

Member of
- the American Physical Society,
- the IEEE Computer Society,
- the Society for Industrial and Applied Mathematics, and
- Sigma Xi.

Made significant progress towards a master's degree in software engineering:

<table>
<thead>
<tr>
<th>School</th>
<th>Title</th>
<th>Hours</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTU</td>
<td>CS 5303 Foundations of Computer Engineering</td>
<td>3</td>
<td>B</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 530 Validation and Verification</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 691T Dynamic and Static Models</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 520 Software Analysis and Design</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 510 Software Project Management</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 540 Software Evolution</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 610 Advanced Software Project Management</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>WVU</td>
<td>SENG 591 Object-Oriented Design</td>
<td>3</td>
<td>A</td>
</tr>
</tbody>
</table>

$326,484: 6) Externally funded research grants and contracts you received.

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.

N/A

8) Community service as defined in the Greenbook.

- Judged the physics SCORES competition 2 years.
- Served as a judge in a science fair.
- Gave demonstrations at a middle-school science and engineering day.
- Taught Astronomy in 2 Boy Scout Merit Badge events.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name:  Seiji Takemae  Rank:  Temporary Assistant Professor

Status (Check one):  Full-time  X  Part-time  Adjunct  Current MU Faculty:  Yes  No  X

Highest Degree Earned:  Ph.D.  Date Degree Received:  May 2002

Conferred by:  Penn State University

Area of Specialization:  Particles and Fields

Professional Registration/Licensure  N/A  Agency:  

Years non-teaching experience  0
Years of employment other than Marshall  1
Years of employment at Marshall  5
Years of employment in higher education  6
Years in service at Marshall during this period of review  1

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
   None

3) Discipline-related books/papers published (provide a full citation).
   None

4) Papers presented at state, regional, national, or international conferences.
   None

5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended.
List any panels on which you chaired or participated. List any offices you hold in professional organizations.
None

6) Externally funded research grants and contracts you received.
None

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
None

8) Community service as defined in the *Greenbook*.
None
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: ___Wesley Shanholtzer_________ Rank: ___Professor Emeritus_________

Status (Check one): Full-time___ Part-time____ Adjunct ___ Current MU Faculty: Yes ___ No ___

Highest Degree Earned: _____ Ph.D.   Date Degree Received: __Spring 1968___

Conferred by: ___West Virginia University______________________________

Area of Specialization: ___Physics - Condensed Matter________________________

Professional Registration/Licensure______________ Agency: _________________

Years non-teaching experience   ________

Years of employment other than Marshall ________

Years of employment at Marshall   ___37 +___

Years of employment in higher education   ________

Years in service at Marshall during this period of review ___Part time____

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009/Fall</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>25</td>
</tr>
<tr>
<td>2010/Spring</td>
<td>PHY 201</td>
<td>General Physics</td>
<td>48</td>
</tr>
<tr>
<td>2010/Fall</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>21</td>
</tr>
<tr>
<td>2010/Fall</td>
<td>PHY 204</td>
<td>General Physics Lab</td>
<td>25</td>
</tr>
<tr>
<td>2011/Spring</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>25</td>
</tr>
<tr>
<td>2011/Spring</td>
<td>PHY 204</td>
<td>General Physics Lab</td>
<td>21</td>
</tr>
<tr>
<td>2011/Spring</td>
<td>PHY 202</td>
<td>General Physics Lab</td>
<td>11</td>
</tr>
</tbody>
</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.
1) If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
3) Discipline-related books/papers published (provide a full citation).
4) Papers presented at state, regional, national, or international conferences.
5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
6) Externally funded research grants and contracts you received.
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
8) Community service as defined in the Greenbook.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: David L. Adkins

Rank: Part-time Faculty

Status (Check one): Full-time___ Part-time__ X ___ Adjunct ____Current MU Faculty: Yes _X__ No ___

Highest Degree Earned: ___M.S.________________________

Date Degree Received: 2003

Conferred by: Marshall University

Area of Specialization: ___Physics Education Remote Sensing and Application

Professional Registration/Licensure ______ Agency: __________________________

Years non-teaching experience
Years of employment other than Marshall 13
Years of employment at Marshall 9
Years of employment in higher education 9
Years in service at Marshall during this period of review 5

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall ’09</td>
<td>PS 109</td>
<td>General Physical Science</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS 109L 2 sections</td>
<td>41</td>
</tr>
<tr>
<td>Spring ’10</td>
<td>PS 110</td>
<td>General Physical Science</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>PS 110L</td>
<td>General Physical Science Lab</td>
<td>20</td>
</tr>
<tr>
<td>Fall ’10</td>
<td>PS 109</td>
<td>General Physical Science</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS 109L 2 sections</td>
<td>46</td>
</tr>
<tr>
<td>Spring ’11</td>
<td>PS 110</td>
<td>General Physical Science</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS 110L 2 sections</td>
<td>47</td>
</tr>
</tbody>
</table>

NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.
(For each of the following sections, list only events during the period of this review and begin with the most recent activities.)

2) Activities that have enhanced your teaching and or research.
3) Discipline-related books/papers published (provide a full citation).
4) Papers presented at state, regional, national, or international conferences.
5) Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.
6) Externally funded research grants and contracts you received.
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
8) Community service as defined in the Greenbook.
## Appendix IIa
### Teaching Assistant Data Sheet

<table>
<thead>
<tr>
<th>GTA Name</th>
<th>Course No.</th>
<th>Course Name</th>
<th>Year 1 20__-20__</th>
<th>Year 2 20__-20__</th>
<th>Year 3 20__-20__</th>
<th>Year 4 20__-20__</th>
<th>Year 5 20__-20__</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>(e.g. 101)</td>
<td></td>
<td>Su</td>
<td>Fa</td>
<td>Sp</td>
<td>Su</td>
<td>Fa</td>
</tr>
</tbody>
</table>

Complete graduate teaching assistant’s name; course number and course name taught; indicate enrollment in the semesters taught.

*Expand table as needed.*
## Appendix III

### Students’ Entrance Abilities (Undergraduate Programs)

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Mean High School GPA</th>
<th>Mean ACT</th>
<th>Mean ACT Math</th>
<th>Mean ACT Science</th>
<th>Mean SAT Verbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>2</td>
<td>4.28</td>
<td>26.0</td>
<td>24.0</td>
<td>25.0</td>
<td>585.0</td>
</tr>
<tr>
<td>2007-08</td>
<td>5</td>
<td>2.61</td>
<td>24.4</td>
<td>24.4</td>
<td>26.0</td>
<td>-</td>
</tr>
<tr>
<td>2008-09</td>
<td>7</td>
<td>3.77</td>
<td>28.7</td>
<td>30.0</td>
<td>27.9</td>
<td>610.0</td>
</tr>
<tr>
<td>2009-10</td>
<td>3</td>
<td>3.61</td>
<td>26.3</td>
<td>23.8</td>
<td>26.7</td>
<td>-</td>
</tr>
<tr>
<td>2010-11</td>
<td>11</td>
<td>3.53</td>
<td>27.1</td>
<td>29.3</td>
<td>27.8</td>
<td>580.0</td>
</tr>
</tbody>
</table>

*Expand table as needed.*
Appendix IV
Students’ Exit Abilities (Undergraduate Programs)

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Mean GPA</th>
<th>Licensure Exam Results</th>
<th>Certification Test Results</th>
<th>Other Standardized Exam Results (Major Field Test) Our results/National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>1</td>
<td>3.98</td>
<td>N/A</td>
<td>N/A</td>
<td>142/148</td>
</tr>
<tr>
<td>2007-08</td>
<td>2</td>
<td>2.83</td>
<td>N/A</td>
<td>N/A</td>
<td>139/148</td>
</tr>
<tr>
<td>2008-09</td>
<td>3</td>
<td>3.56</td>
<td>N/A</td>
<td>N/A</td>
<td>152/148</td>
</tr>
<tr>
<td>2009-10</td>
<td>3</td>
<td>3.63</td>
<td>N/A</td>
<td>N/A</td>
<td>143/148</td>
</tr>
<tr>
<td>2010-11</td>
<td>2</td>
<td>3.47</td>
<td>N/A</td>
<td>N/A</td>
<td>-</td>
</tr>
</tbody>
</table>

Expand table as needed.
## Appendix V

### Assessment Summary

#### Marshall University

#### Assessment of the Program’s Student Learning Outcomes

5 year summary

**Component Area/Program/Discipline:** Physics

<table>
<thead>
<tr>
<th>Program’s Student Learning Outcomes</th>
<th>Assessment Measures (Tools)</th>
<th>Standards/Benchmark</th>
<th>Results/Analysis</th>
<th>Action Taken to improve the program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad knowledge of major areas in physics</td>
<td>Major Field Test in Classical Mechanics, Electromagnetism, Optics and Thermodynamics</td>
<td>Above average 90% students</td>
<td>43/48 Department Score/National Mean</td>
<td>Added two new required courses to our program: Optics and Thermal Physics.</td>
</tr>
<tr>
<td>Deep understanding of core subjects in physics</td>
<td>Major Field Test in Quantum Mechanics, Atomic Physics and Special Topics</td>
<td>Above average 90% students</td>
<td>46/48 Department Score/National Mean</td>
<td>Added two courses to our program: Mathematical Methods in Physics, and Quantum Mechanics II</td>
</tr>
<tr>
<td>Fundamental physics laboratory and computational skills</td>
<td>Introductory and advanced physics labs</td>
<td>Write reports for experiments and use computer-based technology</td>
<td>At least a C in lab courses</td>
<td>Purchased lab experiments and equipment</td>
</tr>
<tr>
<td>Use of logical reasoning in problem solving</td>
<td>Multiple measures, integrated in the curriculum</td>
<td>Quizzes and exams</td>
<td>Exit GPA of 3 or higher</td>
<td>Implement innovative teaching styles</td>
</tr>
<tr>
<td>Objective</td>
<td>Course/Activity</td>
<td>Ability/Outcome</td>
<td>Grade Required</td>
<td>Other Information</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>-----------------</td>
<td>----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Appreciation and pursuit of new discoveries in physics</td>
<td>Upper level elective courses and physics capstone research course</td>
<td>Ability to read, analyze and interpret peer-reviewed research papers. Ability of producing reports on the research papers studied</td>
<td>At least a B</td>
<td>Added new electives, independent studies and special topic courses</td>
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<tr>
<td>Experience of undergraduate physics research</td>
<td>Physics Capstone Research project</td>
<td>Ability to carry independent research, write report and deliver oral presentation</td>
<td>At least C</td>
<td>Using the results systematically for program assessment.</td>
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<tr>
<td>Ability to succeed in graduate school and/or workplace</td>
<td>Student and alumni enrichment programs</td>
<td>More than 50% of graduates accepted into graduate schools and employment of 90%</td>
<td></td>
<td>We anecdotally know that our graduates are accepted to major universities</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Increasing the participation in consulting, the SPS program, the Facebook group, department web page</td>
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# Appendix VI
## Program Course Enrollment

<table>
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<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Required/Elective/Service</th>
<th>Delivery Method</th>
<th>Location</th>
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<th>Year 3 2008-2009</th>
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<td>S</td>
<td>Td</td>
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</table>

Indicate all program and service courses. Please include all special topics courses offered as well as independent studies. When listing Independent studies, please list the **number of independent study students enrolled**, but **DO NOT** include individual names or the titles of the independent studies. Please use the following codes:

- Required/Elective: Required = R; Elective = E; Service = S (Please indicate all that apply; e.g. E + S, if the course is both an elective and a service course.
- Delivery Method: Traditional = Td, Online = O, Hybrid = H
- Location: Huntington, South Charleston, Point Pleasant, etc.
Appendix VII  
Program Enrollment

<table>
<thead>
<tr>
<th>Students</th>
<th>Year 1 2006-2007</th>
<th>Year 2 2007-2008</th>
<th>Year 3 2008-2009</th>
<th>Year 4 2009-2010</th>
<th>Year 5 2010-2011</th>
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<td>Principal Majors Enrolled Additional Areas of Emphasis</td>
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*If known. This information is not completely accurate at this time, as students often do not declare a second major until the junior evaluation or the student has her/his primary major in another college.
**On occasion you may have a student enrolled in your program who is declaring your program as a 3rd major.
***If known. This information is not completely accurate at this time, as students often do not declare minors until the junior evaluation or senior application for graduation.
Figure 1. Trend Line for Total Enrollment and Program Graduates
Appendix VIII
Job and Graduate School Placement Rates

<table>
<thead>
<tr>
<th>Year</th>
<th># of graduates employed in major field</th>
<th># of graduates employed in related fields</th>
<th># of graduates employed outside field</th>
<th># of graduates accepted to Graduate Programs</th>
<th># of graduates not accounted for</th>
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<td>Five –Year Total</td>
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