**Department/Program Review**

**Self-Study Report Template**

**2011 - 2012**

**Department: Physics/Astronomy**

**Program: Associate of Science and Associate of Arts**

**Section I: Overview of Department**

1. **Mission of the department and its programs(s)**

What is the purpose of the department and its programs? What publics does the department serve through its instructional programs? What positive changes in students, the community and/or disciplines/professions is the department striving to effect?

The primary function of the faculty and staff of the Physics Department is to guide and motivate students in learning to think about their physical universe. Physics is the foundation for all other areas of science and technology, and the Department strives to help each student become proficient in applying the discipline’s broad principles and powerful analytic techniques within a wide variety of career and vocational areas.

Effective learning requires active participation by students in diverse activities, and the Physics Department is deeply committed to integrating various types of laboratory and other experiences into the total course structure. Although the human interaction between students and well-qualified professors will always be the heart of the learning experience, the environment of the Department must also encourage and facilitate extensive interactions among students, regular hands-on work with appropriate physical equipment, and convenient access to information resources.

Every student can learn physics and/or astronomy. Each student can learn to use the principles and techniques of physics and/or astronomy as essential parts of his or her scientific or technical career. For other students, physics and/or astronomy will simply provide a more general understanding, empowering them to think more insightfully about everything from the problem of developing sustainable energy resources to the beauty of a clear, starry night. Whatever the differences among students in their career goals, their mathematical expertise, or in other areas, Sinclair astronomy, physics, teacher education and computational science courses can make a life-long difference in how they think.

1. **Description of the self-study process**

Briefly describe the process the department followed to examine its status and prepare for this review. What were the strengths of the process, and what would the department do differently in its next five-year review?

The self study process consisted of six distinct phases. These phases were: 1) the definition of the review and associated tasks, 2) the information and data gathering in preparation for writing the self study, 3) the writing of the self study, 4) the reviewing of the self study for accuracy and completeness, 5) the completion of the self study, and 6) the building of the department review document in accordance with the Department Review Manual.

In order to build a positive and inclusive environment, all faculty and staff participated by providing input for the self study. The department review process kindled the cooperation and support necessary to clarify the importance of the department and its contributions to the community and college.

The department will use the findings of this review process to meet the challenges it must face over the next five years. The definition of the department’s strengths and opportunities will assist in the development of the resources for growth, in supporting continuous improvement of the learning environments and in the correcting of weaknesses.

**Section II: Overview of Program**

1. **Analysis of environmental factors**

This analysis, initially developed in a collaborative meeting between the Director of Curriculum and Assessment and the department chairperson, provides important background on the environmental factors surrounding the program. Department chairpersons and faculty members have an opportunity to revise and refine the analysis as part of the self-study process.

The department supports a wide variety of university parallel transfer degree programs and career degree programs. These programs are located in all four academic divisions as well as the distance learning division. The department’s offerings predominately support the critical thinking/problem solving general education outcome while teaching more specific physical principles and competency skills.

University parallel transfer degree programs normally require one laboratory based science series as one of the requirements. The department has three offerings meeting this requirement, one in astronomy and two in physics. The astronomy series has a minimal mathematics prerequisite and provides a science enrichment experience while teaching critical thinking skills. The physics offerings occur at two levels, College Physics which is algebra based and General Physics which is calculus based. Each of these series covers the same basic principles of physics while preparing students for numerous baccalaureate degrees leading to professional and technical careers.

At the time of our last department review a three quarter conceptual sequence (AST 101, PHY 100, PHY 104) was experiencing a severe drop in enrollment. Students were being advised not to consider this sequence in university parallel transfer programs because of an increase in transfer in problems. More recently, this sequence has seen a healthy enrollment increase. This increase coincides with a policy change at Sinclair. Students are no longer limited to taking an entire sequence of a lab based science. Now they’re permitted to complete one year of lab based science courses. This has had a significant impact on the enrollment in AST101. As for PHY104, it’s enrollment has increased for two reasons; students from Kettering Medical School and a new ATI program.

Of all the university parallel transfer degree programs, the department experiences its largest enrollment in three programs, the Engineering University Transfer (EUT) program (previously known as Engineering Science University Parallel program ESUP), the Associate of Science and Associate of Arts. The Physics Department has an Area of Emphasis in Physics, Area of Emphasis in Computational Physics and a Short Term Certificate in Computational Physics and an Area of Emphasis in Teacher Education. Because of low enrollment all four programs are being deactivated in the move to semesters. Students wishing to pursue a B.S. in Physics are being advised to work towards the Area of Emphasis in Mathematics. The Computational Physics programs never reached a sustainable level of enrollment despite extensive marketing efforts under the grant that built them.

In support of career degree programs, the department offers several conceptual courses and a three quarter algebra based sequence. The conceptual offerings include three courses, one astronomy course and two physics courses. The astronomy course (AST 101) still provides a stand-alone science enrichment opportunity and the two conceptual physics courses support allied health career programs. Approximately two years ago, the Advanced Technical Intelligence (ATI) program added PHY104 to their requirements. The greatest enrollment experienced is in “Introduction to Physics”, PHY 100. Students with aspirations in radiology and physical therapy, must have completed high school physics in the past five years or successfully pass this course to be admitted into these programs. Once admitted into the Radiology program students must take a second course entitled, “Physics for Radiologic Technology”. The algebra-based sequence is entitled, “Technical Physics”. It supports all of the two-year engineering technology career programs. Students planning to transfer into a baccalaureate degree in engineering technology are advised to take the College Physics series.

The teacher education courses were developed a few years ago under a collaborative grant with several Greater Miami Valley universities, colleges and community colleges. Wright State had the leading teacher education program in the area and the majority of our students transfer into their program hence we used their program as a model. With our two courses and offerings in the Mathematics, Chemistry and Geology Departments, a student can complete nearly two years in an Early Childhood teacher track and one year in a Middle Childhood teacher track. Unfortunately, low enrollment in the Physics courses in the past few years has prevented us from successfully offering them.

Under a NSF ATE grant four courses were developed to build a program in computational science. This was to meet the substantial growth in industry for students having modeling and simulation skills. Despite the grant developing a collaborative program with several community colleges and universities, transferability of our courses torpedoed the success of the program. The first group of students having taken some or all of these courses, found that the courses would not transfer other than technical electives. This simple fact negatively impacted enrollment. One course in the program, “Problem Solving in Physics with Matlab” has been included in the EUT program as an elective. This has provided adequate enrollment to offer the course each quarter.

1. **Statement of program learning outcomes and linkage to courses**

Include the program outcomes for each program(s) in Section V.

Of the five general education outcomes,

Computer Literacy

Problem Solving and Critical Thinking

Information Literacy

Oral Communication

Values/Citizenship/Community

Written Communication

the majority of the courses in astronomy and physics declare only the Problem Solving and Critical Thinking Outcome.

In the astronomy courses, both live and online versions, there are writing assignments including research papers hence the instructors are assessing additional general education outcomes through these assignments.

One of the computational science courses developed under the ATE NSF grant, Introduction to Modeling & Simulation, declares three outcomes, Written Communication, Oral Communication and Problem Solving and Critical Thinking. Students are required to give one presentation and to write several reports. These assignments provide data to assess the three declared outcomes. The course has not had adequate enrollment to properly document

1. **Admission requirements**

List any admission requirements specific to the department/program. How well have these requirements served the goals of the department/program? Are any changes in these requirements anticipated? If so, what is the rationale for these changes?

The department works closely with advisory groups, accreditation reviewers and/or program managers to assure that prerequisites and/or corequisites for courses supporting their programs are appropriate.

The conceptual physics offering, “Introduction to Physics”, PHY 100 has the prerequisite of DEV 108. This is a minimum requirement that has served our students well.

The AST 101/107 course originally didn’t have a math prerequisite. Because of assessment results and low student success rates, a prerequisite has been added. It is DEV 108 which is identical to our conceptual physics course. This change has improved success rates significantly and enrollment in the course has actually improved.

The prerequisite for Technical Physics PHY 131 is Math 132. The Physics Department provided assessment data for several engineering technology TAC/ABET accreditations over the last couple of years and we were not notified of any issues pertaining the technical physics courses or their prerequisites.

The prerequisite for College Physics is Math 116. Although some basic trigonometry is needed in this course, the department assessments have not revealed the need to change this prerequisite to MAT 117, Trigonometry.

The General Physics series is calculus based and demands strong mathematical and analytic skills. At the time of our last review, these courses had math co-requisites. For example, the co-requisite for PHY 201 was MAT 201, the co-requisite for PHY 202 was MAT 202 and for PHY 203 it was MAT 203. After reviewing the evidence from several years, the department changed the co-requisites to prerequisites. The department also checked a few area community colleges and found that they have identical prerequisites for their General Physics students.

When the new prerequisites were first implemented they were a bit of a surprise to our transient students. After the first year, the change was widely known and the enrollment process was much smoother. This single change in prerequisites had greatly lowered the number of challenged students that were at risk of failure due to poor math preparation and skills.

For the benefit of the reviewers, a complete list of all astronomy and physics courses with their prerequisites and co-requisites is provided below.

|  |  |  |
| --- | --- | --- |
| **Course** | **Prerequisites** | **Co-requisites** |
| AST 101 | DEV 108 | AST 107 |
| AST 111 | DEV 108 | AST 117 |
| AST 112 | AST 111 | AST 118 |
| AST 113 | AST 111 | AST 119 |
| AST 117 |  | AST 111 |
| AST 118 | AST 111 and AST 117 | AST 112 |
| AST 119 | AST 111 and AST 117 | AST 113 |
| PHY 100 | DEV 108 | PHY110 |
| PHY 104 | PHY 100 or PHY 141 | PHY 119 |
| PHY 106 | Admission into Radiology Program which requires PHY 100 | PHY 107 |
| PHY 131 | MAT 132 | None |
| **Course** | **Prerequisites** | **Co-requisites** |
| PHY 132 | PHY 131 | None |
| PHY 141 | MAT 116 | None |
| PHY 142 | PHY 141 | None |
| PHY 143 | PHY 141 | None |
| PHY 201 | MAT 201 | PHY 207 |
| PHY 202 | MAT 202 and PHY 201 |  |
| PHY 203 | MAT 203 and PHY 202 |  |
| PHY 210 | MAT 116 |  |
| PHY 211 | MAT 117 |  |
| PHY 212 | MAT 117 |  |
| PHY 220 | PHY 201 and MAT 201 | None |
| PHY 245 | ASE 145, MAT 110, and ENG 112 | None |
| PHY 246 | ASE 145 , AND  MAT 142 , OR MAT 110 ,  AND ENG 112 |  |

**Section III: Student Learning**

1. **Evidence of student mastery of general education competencies**

What evidence does the department/program have regarding students’ proficiency in general education competencies? Based on this evidence, how well are students mastering and applying general education competencies in the program?

The department offers three different levels of sequences in support of university parallel transfer programs. These sequences provide year long experiences in laboratory based science courses that address the problem solving and critical thinking general education outcome. These sequences are General Physics (calculus based), College Physics (algebra based) and Astronomy (conceptually based).

In General Physics and the College Physics sequence instructors utilize formative assessments and summative assessments. Typically, the formative assessments include classroom discussions, classroom observations and results on short term assignments. A variety of small learning instruments (worksheets and hands-on activities) are distributed during class for students to complete with peer learning groups. The discussions and peer group activities provide partition the material hence providing a modularized form of curriculum. This allows the students to concentrate on the material at hand while building a stronger holistic understanding of the entire course. During these times the instructor can more closely observe student comprehension and mastery by interacting with groups as needed. Misconceptions can quickly be addressed which assists students in overcoming shortfalls in their understanding of the material. Some of these assignments are given to the instructor for grading which provides the instructor the opportunity to assess the accomplishments of the entire class especially for complex physical principles.

In the online astronomy laboratory offerings three methods of assessment are utilized; formative assessment, summative assessment, and student surveys for assessment and improvement. The formative assessment includes observation of peer interactions in the discussion forums and grading student submissions, through which instructors are able to identify major errors and misconceptions and then provide timely feedback to assist student learning. The success is evidenced by the student completion rate in the online laboratory offerings. The summative assessments consists of a midterm and a final laboratory tests. These tests are not memorization questions. They are open book critical thinking questions that require students to analyze scientific methods learned from the labs and then synthesize concepts and skills to make best judgments and draw conclusions.

The success of online astronomy lab assessment is evidenced by its average success rate of 70% (from 2007~2011). It is lower than the face-to-face lab sequence (78%) but higher than the average college overall face-to-face success rate (65%).

In the online astronomy courses, discussion forums are used extensively to assess the critical thinking skills of students. Writing a paper on a topic of their choice is a requirement that necessitates them to engage in research and present their findings in written format. Reading and reading comprehension is part and parcel of that format since most of the content in delivered in the written format and all their communications with the instructor and each other occur via the use of the written word.

A variety of methods are used for assessment in the in-class version of the three quarter astronomy sequence. In the first course of the sequence, AST 111: Introduction to Astronomy, a pretest is given at the beginning of the quarter to check for common misconceptions. At the end of the quarter a posttest is given to determine the increase is students’ understanding of the material covered. For the sequence, the Astronomy Diagnostic Test (ADT), a nationally normed multiple choice test on standard astronomy concepts is given at the end of the third quarter. The ADT version 2.0 was published in 1999 by The Collaboration for Astronomy Education Research. Results for the in-class sections of the astronomy sequence, AST 111, AST 112, and AST 113, are at or slightly above the national average for the past 5 years.

The Technical Physics sequence places a strong emphasis on “authentic tasks” which engage student groups in working together to solve practical problems that are related to both their own career goals and the broader needs of the community. This sequence is evaluated as a component of the Engineering Technology programs through TAC/ABET accreditations. When the last accreditations occurred the department provided a comprehensive amount of student work from all Technical Physics offerings over several quarters. These samples of student work were examined by the accreditation team in addition to interviewing the chairperson. The feedback from these TAC/ABET accreditations are evidence that Technical Physics teaches the expected program outcomes.

The teacher education courses address the critical thinking/problem solving outcome while acquainting the students with the inquiry method of learning. Assessment tasks include a pre and post exam and several inquiry learning activities. In order to successfully complete the course, a student must pass the post exam and complete key assessment activities. Students completing these courses are successfully transferring into four-year teacher education programs and receiving their state teacher licenses.

The conceptual physics courses predominately serve career programs especially the Radiology program at Sinclair. Students completing these courses learn basic physics principles while engaging in activities that develop critical thinking and problem solving skills. Students successfully completing these courses are being admitted into the Radiology program and are transferring these courses into other health care programs in the Greater Miami Valley.

1. **Evidence of student achievement in the learning outcomes for the program**

What evidence does the department/program have regarding students’ proficiency in the learning outcomes for the program? Based on this evidence, how well are students mastering and applying the learning outcomes? Based on the department’s self-study, are there any planned changes in program learning outcomes?

In the case of the Astronomy & Physics Department, the majority of our course inventory addresses only the general education outcome; Problem Solving and Critical Thinking. The single exception to this is PHY 212; Introduction to Modeling & Simulation which includes the general education outcomes of Written and Oral Communication.

In the previous section several measures of success were provided. If the reader turns to the data set under the section entitled, Course Success Percentages (pages 113-114), it can be seen that success rates are extremely high for a difficult science and across the entire curriculum the percentages of success are improving.

While it is anecdotal, the department continuously receives positive feedback from numerous students. Feedback from transfer and transient students is especially high. These students are very grateful for the outstanding learning experiences they had with the Astronomy and Physics Department. They attribute this to the exemplary instruction, the small class size and the superb facilities.

1. **Evidence of student demand for the program**

How has/is student demand for the program changing? Why? Should the department take steps to increase the demand? Decrease the demand? Eliminate the program? What is the likely future demand for this program and why?

The single largest effort for the department over the past five years has been the development of the three quarter astronomy sequence with laboratories to an online delivery format. This effort was not without problems but has provided a very resource for students. The enrollment in astronomy courses has more than tripled since the addition of the online lab based sequence.

The demands for the conceptual physics course, PHY100/110 have changed in the past year. The Radiology Program no longer uses it as requirement for entrance into the program instead it is only recommended. With this change the department has experienced a small decrease in enrollment in the course and has responded by reducing the number of sections being offered. As semester conversion began, the Physics Department met with several program managers to determine their changing needs with conceptual physics. It was decided to create two semester courses, one that would meet the needs of the new technical semester programs and one to continue serving the needs of the general education student. The courses created were PHY1106/1107, Physics for Technology (3 sem hrs) and PHY1100/1110, Introduction to Physics (4 sem hrs). Since this change, the department has been informed that the new course, PHY1106/1107 has been added to several new semester programs. In addition, the department has been requested by the CIS department to create an online version of the PHY1100/1110 for one of their programs that is moving to a 100% online delivery. Beginning in the Fall semester the department will begin this process to achieve a completion date of Fall 2013. Because of these changes the department is confident that enrollment will improve under semesters.

Under an ATE NSF grant a course entitled, Problem Solving in Physics with Matlab, was created. It predominately serves students seeking an associates in the Engineering University Transfer (EUT) program. Since it has been created it has been successfully offered an average of twice per year. This course also is a perfect candidate for the online format so once we’ve made the move to semesters the department plans to submit a proposal to Distance Learning.

Originally the department had a conceptual science sequence, PHY100/110, PHY104/119 and AST101/107. In the move to semesters, the department did not convert the AST101/107. In it’s place the department created two year long general education sequences, PHY1100/1110 – PHY1104/1119 and AST1111/1117 – AST1112/1118.

The General Physics and College Physics sequences continue to serve a large number of transfer and transient students. Enrollments continue to grow as students realize the quality of education delivered by the department. As the EUT program grows, the department expects to support the needs with flexible offerings in these sequences.

Technical Physics originally consisted of a three quarter sequence. Because of changes in demand only Technical Physics I will be converted to semesters. It continues to serve several engineering technology programs.

1. **Evidence of program quality from external sources (e.g., advisory committees, accrediting agencies, etc.)**

What evidence does the department have about evaluations or perceptions of department/program quality from sources outside the department? In addition to off-campus sources, include perceptions of quality by other departments/programs on campus where those departments are consumers of the instruction offered by the department.

Not possessing an actual career program, the department does not have any direct measures or documented evidence of quality from external sources, such as advisory committees and accrediting agencies. The two largest career programs at Sinclair requiring physics courses are Radiology and Engineering Technology. The Technical Physics sequence is evaluated as a component of the Engineering Technology programs. The most recent TAC/ABET accreditation brought our department high marks for the quality of instruction in this sequence. Recent discussions with the health care programs that the department supports indicate that our students are being adequately prepared by the conceptual physics course.

1. **Evidence of the placement/transfer of graduates**

What evidence does the department/program have regarding the extent to which its students transfer to other institutions? How well do students from the department/program perform once they have transferred? What evidence does the department have regarding the rate of employment of its graduates? How well do the graduates perform once employed?

Students completing the EUT program transfer to several local universities. Some of these schools have stated that Sinclair students are typically better prepared than students having completed the first two years at the baccalaureate school. It is this program and a variety of other four year professional programs that the General Physics sequence serves. Upon completing the General Physics sequence, EUT students must complete Statics and Dynamics. These students successfully complete these two courses because they have achieved excellent problem solving skills. The personal testimonies from these students state they are very satisfied with the preparation they received in the General Physics sequence and their success in these courses support their comments. The department also has numerous discussions with Department Chairpersons and faculty at Wright State University receiving our transfer students. They confidently state that our students are very well prepared and successfully complete professional programs, in physics, engineering and computer science.

1. **Evidence of the cost-effectiveness of the department/program**

How does the department/program characterize its cost-effectiveness? What would enhance the cost-effectiveness of the department/program? Are there considerations in the cost-effectiveness of the department/program that are unique to the discipline or its methods of instruction?

At the time of our last review, cost per FTE data was available but isn’t for this review cycle. The department has maintained a very low grow in the discretionary budget and an average class size above the average for the division. This has occurred while the department faced a huge enrollment increase in 2009-2010 and supported offerings at ELC and CVCC. The department supports multiple online sections of astronomy courses and laboratories with high success rates (~70%) and average class sizes above the SME division average. The major factors contributing to this success are a very effective use of apparatus and classroom space, a success rate of 80% for the majority of our offerings, and a Physics Resource Laboratory (PRL) providing assistance to students especially those that are over challenged.

The department has increased the number of combined lecture and laboratory offerings in the past five years. This change coupled with superb instruction and with an extremely effective Physics Resource Laboratory (PRL) have assisted the department in improving the student success rates over the past five years. The department offers comprehensive, lab-based experiences for students from diverse backgrounds and provides a specialized tutorial service through the PRL for all physics and astronomy students. This is especially important for the over challenged students who would be at risk of not completing their physics course or failing it. The department also has a very effective use of equipment. Equipment costs are kept under control by good stewardship of existing equipment and by only buying equipment that is needed. At times, equipment support for a new exercise or lab activity can be built from materials purchased locally. Since, demonstrational equipment can be expensive, the department promotes the use of media based demonstrations that would otherwise require expensive equipment or equipment that is not widely used in other activities.

**Section IV: Department/Program Status and Goals**

1. **List the department’s/program’s strengths, weaknesses and opportunities**

The exemplary performance and commitment of the faculty and staff give the department several strengths. As a whole, the department strives to provide its students with teaching methodologies that are consistent with best-practice methodologies in science. Active engagement, cooperative learning, integration of technology, and inquiry are the methodologies that enhance student retention and learning. Coupled with this performance is the Physics Resource Laboratory (PRL).

The PRL is paramount to the academic success of the Science, Mathematics and Engineering focused students. The PRL provides an effective way to support student’s academic studies. Under the management of Charles Grooms, the PRL has evolved into a more friendly and effective resource lab, where all students feel welcome and motivated while performing their lab work and assignments. Charles has hired an eclectic mix of tutors who represent mature professionals who come from engineering and science backgrounds. They bring a high measure of professionalism and maturity in their interactions and demonstrate an enthusiasm and willingness to help students. The PRL does not have the ability to track individuals by their student academic records, so we carefully attend to those who we perceive to be in greater need.

Over the previous five years, the PRL has experienced a dramatic lab visit increase of approximately 18% (Refer to the charts in the appendices for greater detail). By virtue of this increase we are reaching and helping a more challenged population of students who otherwise may be more susceptible to academic failure.

The Physics Department identifies opportunities for improvement and for growth. In the past five years the department has increased the number of combined lecture and lab offerings and has lead the college in developing the first entire lab based science sequence for online delivery. In addition, the department maintains a student success rate ~70% in both the lecture and lab sections.

The physics department acquired a portable laptop cart in 2004 and a second laptop cart 3 years ago under the NSF STEP grant in support of the new SME 110 course. The integration of these assets has been not without its issues, but has become indispensible with regards to the increase number of integrated lecture and laboratory sections. The laptop carts permit seamless integration of activities using computer assisted data collection and analysis into the learning environment. This has created a much richer learning experience for all students and has been a significant part of the higher student success rates.

Through the work of Doug Bradley-Hutchison and Lalitha Locker, the department is a recognized leader in teacher education and community outreach. Ms. Locker’s leadership skills and knowledge of teacher education, enabled her to savage the NSF grant entitled, Dayton Urban STEM Teacher Academy. Ms. Locker and Mr. Bradley-Hutchison present numerous workshops and develop curriculum that has brought recognition of their teacher education skills to the college and to the department.

The department has two basic weaknesses. First, the department has a solid connection with the part time faculty, but much more could be accomplished through formal meetings and training sessions. These training sessions would address the two major areas needing improvement; the effective use of technology and to convey the benefits of integrated lecture and laboratory offerings. Secondly, the department lacks a comprehensive assessment process that documents learning in all courses in the department’s inventory. As the department goes forward it will review the assessment plans other science departments in order to determine some best practices for assessing science classes. From the results of this survey, the department will draft a reputable assessment plan that will be utilized over the next five years.

The department has had faculty involved in three NSF grants. These grants are providing professional growth opportunities, building professional contacts and relationships in the Greater Dayton community. These are providing the tools that can be used to strengthen the department’s leadership in the area of STEM teacher education and training in a variety of areas.

The department’s proven expertise with online science developments provides the opportunity to convert two courses to an online delivery format; Introduction to Physics, PHY 1100/1110 and Problem Solving in Physics with Matlab, PHY 2210.

1. **Describe the status of the department’s/program’s work on any issues or recommendations that surfaced in the last department review.**

All faculty in the department are conducting some form of formative and summative assessment but the department has not made adequate progress towards a formal assessment process that will include all courses and the offerings staffed by part time faculty.

Shortly, after the department’s last review, 2004-05, an assessment plan was initiated in the College Physics series and the General Physics series. A team of faculty developed standardized exam problems that were inserted into the regular exams for each course. Prior to the problems being graded, the instructor would score the results against a four level problem solving rubric. This process continued for approximately two years and the data that was collected indicated that students who were successfully completing the courses were achieving the outcome; Problem Solving and Critical Thinking. After this initial phase the department failed to continue this practice.

The department has diligently worked with part time faculty to assure a consistent quality of instructor for offerings they staff. The department has encouraged part time faculty to professionally grow by using newer technology and to adapt teaching methodologies that follow best practices for teaching physics. The department has more part time faculty using their Angel course shells in a productive fashion as well as they’re using newer technology for activities and laboratory offerings. This is an ongoing effort but the department is pleased with the progress that has been made since the last review.

The move to semesters was an opportunity to update master syllabi for the entire course inventory as well as deactivate courses that were no longer needed. Courses that have been deactivated include AST 101, PHY 132, 133, 270 and 295.

The department has made the necessary changes in curriculum and courses to adopt to changes in supported healthcare and engineering technology programs. The move to semesters expedited the process and the department is prepared to provide excellent course offerings for students pursuing technical careers as well as transfer students needing general education offerings.

1. **Based on feedback from environmental scans, community needs assessment, advisory committees, accrediting agencies, Student Services, and other sources external to the department, how well is the department responding to the (1) current and (2) emerging needs of the community? The college?**

Approximately 2 years ago, the department was requested to develop an astronomy course to be offered at the Senior Centers in the Dayton area. The first offering was so successful that the department continues to offer this course at alternating centers each year.

During the most recent TAC/ABET accreditation process for several engineering technology programs, the department provided requested materials for review and received high marks for the instruction on the technical physics courses.

The department pioneered the development of an online version of a laboratory based science course. The entire three quarter sequence and labs were converted to an online delivery format. These courses continue to achieve ~70% student success rates.

In 2010, two faculty participated in the evaluation of the science curriculum of the Oakwood Public Schools. Teachers were interviewed, classes were observed, curriculum was examined and a report with recommendations was submitted the superintendent.

The CIS department is building a new program which they wish to complete offer online. One of our courses, Introduction to Physics, PHY1100/1110 is in this new program, hence the department is beginning the development in Fall 2012 of an online version of this course.

With the extensive use of Matlab in engineering and science in the Dayton area the course entitled, Problem Solving in Physics with Matlab (PHY 2210), has had strong enrollment since it was created. Because of the widespread usage, it is felt that an online version would expand the number of students who could be reached. Once the move to semesters has stabilized the department will submit a proposal to Distance Learning to prepare an online format version of the course.

The department has several faculty who present workshops in the SME division’s summer WiSTEM program. The department plans to continue its involvement in this important community outreach program.

1. **List noteworthy innovations in instruction, curriculum and student learning over the last five years**

Under the leadership of Doug Bradley-Hutchison a new course was developed under the NSF STEP. This course addresses the retention issue with first year science and engineering majors. The course is SME110 and is entitled “Scientific Thought and Method”. It is a required course in the EUT program and has been converted to semesters as PHY1161.

The increase in the number of integrated lecture and laboratory offerings allows the department to provide its students with teaching methodologies that are consistent with best-practice methodologies in science. Active engagement, cooperative learning, integration of technology, and inquiry are the methodologies that enhance student retention and learning. It is this improvement and the improved quality of the PRL that have significantly increased student success in the astronomy and physics offerings. Over the past five years the number of students using the PRL has increased by 18% of all enrolled students.

1. **What are the department’s/program’s goals and rationale for expanding and improving student learning, including new courses, programs, delivery formats and locations?**

A few years ago, a part timer who had a strong background in space weather and meteorology worked with a full time faculty member to develop a Weather and Climate course. Because this part timer left abruptly this effort was never completed. The department is still of the opinion this course would provide a fantastic opportunity for students needing a general education laboratory based science course at the conceptual level. Once this course has completed two to three successful offerings, it would be a perfect candidate for the online delivery format. The department’s rationale is simple. There is a vast amount of online resources for the course as well as the laboratory is the world around us.

The department intends to expand and improve its integrated lecture and laboratory offerings. This will include further imbedding laptop based computer activities into the courses as well as a new technology called the Vernier LabQuest. The department has purchased 24 of these units because they provide a less complicated and less intimidating platform than the laptops. That makes them a worthy technology to further improve the quality of the conceptual physics offerings.

The conversion of the Introduction to Physics course will begin in the Fall 2012. This effort is very large but will serve as another model for the delivery of laboratory based science in the online format.

It is the department’s plan to create an online format for the Problem Solving in Physics with Matlab. This course has a strong enrollment and is held with high regard with students. The department hopes to use this course to possibly rekindle interest in the other Computational Science courses.

1. **What are the department’s goals and rationale for reallocating resources? Discontinuing courses?**

Under an ATE NSF grant a Computational Physics program was created. This program consists of four courses;

1. Introduction to Computational Methods
2. Introduction to Modeling & Simulation
3. Introduction to Computational Physics
4. Problem Solving in Physics with Matlab

The first three courses have only been offered once in the live format and this was during the grant. In a collaborative effort with Columbus State Community College, the Introduction to Modeling & Simulation course was converted to the online format and offered once as a Workforce Development workshop. Despite this effort, an extensive marketing effort during the grant and an involvement in the statewide consortium of Ralph Regula Computational Science, the department has not been able to generate adequate enrollment to sustain a continued enrollment. If the attempt to revive these courses through the strategy discussed in section IV-E doesn’t work, the department is considering deactivating

1. **What resources and other assistance are needed to accomplish the department’s/program’s goals?**

The PRL has been a significant part of the department’s high student success rate. Over the past five years 18% more of all physics students are using the PRL (Refer to the appendices to review the graphs and data). The department continuously receives positive remarks and high marks from students using the facility. This is attributed to the professional, warm and inviting environment maintained by the PRL coordinator. The coordinator hires and manages all student and master tutors as well as he tutors. It is absolutely necessary for the department to maintain this part time staff position in order to operate the PRL at its current level of success.

The department will work closely with Distance Learning to convert the Introduction to Physics, PHY 1100/1110 and the Problem Solving in Physics with Matlab, PHY 2210. For these efforts to be successful, the department will need the appropriate support and funding from Distance Learning and committed development faculty.

The two laptop carts have become an integral part of the combined lecture and lab offerings. It is imperative for the department to have the necessary support to keep these resources operational and reliable. The department lab technician works closely with ITS to expedite solutions to problems. With this maintenance model the department has managed to avoid catastrophic problems that would prevent their use in a scheduled class.

**Section V: Appendices: Supporting Documentation**

1. Program Review Data Set
2. Average Class Size Reports
3. Course List and Curriculum Requirements
4. Physics Resource Laboratory Data and Charts
5. Department Member Contributions
6. Department Member Activities & Accomplishments
7. Student Awards & Recognitions