

FY2013 DEPARTMENTAL ANNUAL REPORT OF CONTINUOUS IMPROVEMENT

Department of Physics Fort Hays State University

I. DEPARTMENTAL OVERVIEW

The faculty and staff of the Physics Department are committed to the assessment process as a means of continuously improving the quality of the learning experience that we provide. The goal for the FHSU physics major is to prepare students for technical post-baccalaureate employment in business, industry, and government or for entrance into graduate study in physics, engineering or other related areas. Central to this preparation is the integration of undergraduate research into the department culture. The Department of Physics at FHSU has been actively engaging undergraduate students in the research process long before this became an initiative of any kind.

The Educational Testing Service (ETS) Major Field Test in Physics has been used since 1995 to assess the students' mastery of the fundamental principles of physics and their ability to apply them in the solution of problems. This is a nationally normed exam providing individually reliable total scores for each student and group-reliable scores known as assessment indicators. Physics graduates are also expected to develop communication and presentation skills, critical thinking skills, computing skills, library\information literacy skills and life-long learning skills. Graduates have the ability to work individually and also cooperatively as a member of a team. Assessment of these auxiliary skills is directly assessed by a faculty committee review of the student's research as well as in numerous embedded assessments throughout the curriculum. Alumni questionnaires and individual discussions with alumni and employers will be used to assess whether physics graduates possess these non-physics specific workplace skills. This provides short-term and long-term feedback loops through which the effectiveness of the department's physics major program can be monitored and continuously improved.

A. Departmental Mission and Vision Statements

- Mission Statement

We produce graduates with the necessary knowledge, skills and attributes that will enable them to enter and be successful in graduate school or the STEM workforce.

- Vision Statement

We are the best undergraduate physics department in Kansas.

The Department of Physics at Fort Hays State University offers a high quality learning experience for science, pre-professional, and non-science majors in order to prepare each student for advancement in his or her chosen field of study. Student learning will occur through classroom instruction, laboratory exploration, independent study, research experience, and distance learning courses. The department will serve as a regional resource on physics-related matters through consultation and outreach with a major emphasis on serving pre-college teachers of physics. The scholarly activities of the Physics Department will emphasize the preparation of upper-division undergraduate majors in research methods by providing the opportunity for them to collaborate with a faculty member on a research project. The strength of the Fort Hays State University physics programs is its flexibility, which allows students to build on their individual interests throughout the program.

The Physics Department mission statement is compatible with college of arts and sciences and the university mission statements. The FHSU mission statement maintains in part “the university’s primary mission is undergraduate liberal education, which includes the humanities, the fine arts, the social/behavioral sciences, and the natural/physical sciences. These disciplines serve as the foundation of all programs.” The Department of Physics supports this mission through its general education offerings, cognate courses required for other disciplines, courses for students in pre-professional areas of study, and the preparation of graduates for entry into graduate school, employment by government or industry and entry into K-12 science teaching.

B. Departmental Goals, Objectives, and Strategic Priorities

To fulfill the department’s mission, courses are designed to accomplish the following goals:

- Provide students with knowledge of physics: the fundamental laws of nature, which form the foundation upon which astronomy, biology and allied health, chemistry and geosciences are based.
- Provide students with the skills needed in a technological society: oral, written and electronic communication skills, critical thinking skills, analytical thinking skills, problem

solving skills, logical thinking, ability to define a problem, computer skills, ability to design an experiment, and the ability to draw conclusions from an experiment.

- Provide students with research experiences: develop the traits and work ethic important in a technological environment including being creative, persistent, self confident, being able to work individually, and most importantly, being able to works as a part of a team.

The curriculum, which is used to fulfill these goals, can be found on the affinity diagram under section IV. Supporting Materials, A. Degree Program Affinity Diagrams.

The strategic priorities of the physics department are:

- A faculty and staff for whom undergraduate teaching and student success are top priorities.
- Recruitment and retention of highly qualified students to populate the degree programs offered by the physics department.
- Graduates who are in demand by industry, government, K-12 schools, and post-graduate educational institutions.
- Students engaged in undergraduate research.
- Thoughtful adoption of changes in courses and the curriculum in response to needs of industry, government and graduate schools.

C. Department Productivity and Distinctive Accomplishments

Fiscal Year 2013 has been a productive year with some exciting new directions and opportunities for the Department of Physics. Particularly noteworthy accomplishments include:

- Successful completion of program review for the physics and physical science degree programs

Extensive self-study documents for the physics and physical science degree programs were submitted. Based on these documents the physics degree program was continued and the departmental recommendation for the physical science degree program to be discontinued as accepted. The physics degree program was 'red flagged' for not meeting the KBOR minima for number of graduates and number of junior / senior students. Analysis of this data for all physics bachelors granting institutions in the state clearly indicates that FHSU physics is very productive (only exceeded by KU for four year average number of degrees in physics). Changes to the physics curriculum and approach (see Task Force and Open Educational Resources items below) should help to

improve recruitment, retention and ultimately graduation rates. The physical science degree program was developed several decades ago to serve those interested in secondary education certification in the physical sciences. Chronic low subscription to this program coupled with many changes in teacher licensure and certification over the years has made this program obsolete. It was the recommendation of the department to discontinue this degree program as soon as possible. With the graduation of the two students in this program in May 2013, the program has been cancelled.

- Development and adoption of a set of statewide student learning outcomes for Physics I, Physics I Laboratory, Physics II, and Physics II Laboratory as part of the Kansas Core Outcomes Group (KCOG) project

Dr. Buffington served as the chair of the KCOG physics group. The meeting at KSU in the fall 2012 semester was wildly successful. Initially tasked with the development and adoption of a statewide set of student learning outcomes for all of the algebra based physics courses in Kansas (PHYS 111 at FHSU), the group exceeded the charge by developing and *unanimously* adopting a consistent and comprehensive set of student learning outcomes for both the first and second semester of the algebra based physics courses and their associates laboratories.

- Implementation of Department of Physics Curriculum Redesign Task Force results

Over the past two years Dr. Clark has lead a focused and intense effort in curriculum redesign for the physics degree program. The recommendations of this group have been carefully considered with the full implementation beginning in FY 2014. A new course has been developed for first semester freshman with the specific purpose of helping them bridge to the university physics program and build skills to promote success (PHYS 100 – Succeeding in Physics and Engineering 3cr). Enabled by increased enrollments in PHYS 211, PHYS 211L, PHYS 212, and PHYS 212L (in large part due to KAMS) as well as reimagining the laboratory experience (with sharp focus on student learning outcomes) the department will begin to offer PHYS 211/PHYS 211L and PHYS 212/PHYS 212L every semester. This will enable considerably more flexibility in the ‘entry point’ for incoming physics / pre-engineering students. The work of the task force has been driven by two simple goals; increase physics student retention and improve physics student learning outcomes.

- Construction of experimental laser bio-effects laboratory

Dr. Rohleder was successful in receiving strategic planning funding in FY 2012 for the purpose of building an experimental laser biophysics research laboratory. Specifically, this laboratory was designed to investigate the effects of directed energy at the cellular level. A cell line analog for the human retinal pigment epithelium is currently being used to investigate and characterize the hazards of readily and commercially available blue laser pointers on the eye. Initial results are exciting and are demonstrating the

dangers of these devices to the human eye. There is much more work to do in the build-up and construction of this laboratory. Significantly, the addition of this experimental laser bio-effects laboratory complements the existing and long standing research collaboration of Dr. Buffington and Dr. Clark's theoretical and computational work on the same topic. This laboratory supports multiple undergraduate research projects including KAMS students.

- Multiple FHSU URE / Faculty Research Grant awards

Dr. Aflatooni, Dr. Deyo and Dr. Maseberg were all successful in being awarded URE monies to help further their research agendas and support undergraduate student research. Dr. Deyo, along with an undergraduate research student has been working with some (expensive) existing equipment in the physics department that is designed to accomplish experimental analysis using nuclear magnetic resonance (NMR). This equipment was previously purchased to construct an NMR research laboratory as part of a former faculty member's research program. This faculty member was unsuccessful in this effort. Dr. Deyo's efforts will hopefully lead to the addition of a valuable research instrument at FHSU. Dr. Maseberg with three undergraduate research students, continues to build an experimental research in electron energy loss spectroscopy. Progress has been made in re-building the electron gun, development of LabVIEW code for experiment control and data acquisition. Part of the URE funding enabled the purchase of a pulse discriminator, which is a key component of the experiment. Dr. Aflatooni and three undergraduate research students continue the process of relocating equipment to a new site in addition to improving the experimental design and capabilities. FHSU Faculty Research Grant funds have helped enable this process.

- Two refereed publications

C.D. Clark III, W.J. Marshall, R.J. Thomas "Theoretical analysis of multiple-pulse thermal damage thresholds of the retina," *Journal of Laser Applications* 25, 012005 (2013)

Brett Hokr, C.D. Clark III, Robert Thomas "Higher-order wide-angle split-step spectral method for non-paraxial beam propagation," *Optics Express*, in press (2013)

- Fifteen undergraduate student research projects

All of the faculty in the Department of physics actively engage undergraduate research students, including several KAMS students.

- Two funded external grants

Kansas Space Grant Consortium / NASA Scholarship Program – Dr. Buffington

Kansas Space Grant Consortium / Midwest Kansas Lego Robot Competition – Dr. Maseberg

- Multiple strategic plans funded

Two plans were to improve and enhance undergraduate student learning by upgrading and expanding laboratory equipment inventories in general education laboratories and major specific laboratories. A third plan involved the renovation of teaching spaces on the first floor of Tomanek Hall.

- Redevelopment of Engineering Physics I (PHYS 211) based entirely on open educational resources (OER) – pioneering OER based coursework at FHSU

Dr. Buffington is currently redeveloping the Engineering Physics I course based entirely on OER's. Dr. Clark will follow by redeveloping Engineering Physics II in a similar manner as well as developing a new virtual college course, Physics II based on OER's. The physics department desires to lead in the development of OER based courses.

- Eleven graduates (several dual-degree graduates are still waiting for their paperwork to be processed by the registrar and may not post until the end of summer).

II. DEPARTMENTAL PERFORMANCE METRICS

A. Department Performance Indicators

Key Performance Indicator	FY2009	FY2010	FY2011	FY2012	FY2013
Freshmen	23	25	25	22	17
Physical Science (BS,113-1901)	1	0	0	2	0
Physics (BA,BS,113-1902)	22	25	25	20	17
Transfer Students	5	4	6	5	1
Physical Science (BS,113-1901)	0	0	1	0	0
Physics (BA,BS,113-1902)	5	4	5	5	1
Undergraduate (first majors/second majors)	51/4	58/5	70/3	66/1	49/3
Physical Science (BS,113-1901)	4/1	1/0	2/0	5/1	3/1
Physics (BA,BS,113-1902)	47/3	57/5	68/3	61/0	46/2
Major Retention	58.33%	77.27%	76.00%	84.00%	59.09%
Undergraduate Student Credit Hours	3811	4150	3865	4026	4584
Graduate Student Credit Hours	8	9	6	3	0
Tenured or Tenure-track Faculty (Headcount)	5	5	4	5	5
Non Tenure-Track Faculty (Headcount)	1	1	2	0	1
Undergraduate Degrees	4	7	4	2	8
Physical Science (BS,113-1901)	1	0	1	0	1
Physics (BA,BS,113-1902)	3	7	3	2	7
Briefly note 2-3 improvements over the last year prompted from the above enrollment indicators.					
Number of books, book chapters, and refereed articles published	5	3	2	0	2
Percent of faculty publishing refereed books, chapters, or articles	60%	60%	50%	0%	17%
Number of non-refereed articles and presentations	9	14	6	8	10
Percent of faculty publishing non-refereed articles or presentations	80%	100%	100%	100%	83%
Number of scholarly performances and other creative activities	8	5	4	3	4
Percent of faculty in scholarly performances or other creative activities	80%	40%	100%	40%	50%
Total number of external grant applications submitted/percent of faculty submitting	7/60%	4/40%	2/20%	3/20%	2/100%
Total number of funded external grants/percent of faculty funded	4/60%	3/40%	2 / 20% \$69k	2 / 20% \$69k	2/34% \$84k

Key Performance Indicator	FY2009	FY2010	FY2011	FY2012	FY2013
Total number students successfully completing an undergraduate research/creative project			38	45	48 <small>(only includes enrollment in projects courses)</small>
Briefly note 2-3 improvements over the last year prompted from the above scholarly/creative activities indicators.					
[NOTE: Each department MUST report at least two direct measures of student learning outcomes and two indirect measures. Examples of direct measures include: first-time pass rate or average scores on standard exit exam, number of students successfully completing reviewed portfolios. Indirect measures would include student satisfaction, alumni and employer data, or any other perception based data.]					
Direct Outcome 1 ETS Major Field Test in Physics % exceeding National Mean Score: Total Score Introductory Physics Advanced Physics	86% 71% 100%	100% 100% 100%	80% 60% 100%	50% 50% 50%	29% 14% 29% <small>(29% within 1 SD or above)</small> <small>(57% within 1 SD or above)</small>
Direct Outcome 2 Senior Seminar: % passing with grade of A, B, or C	80%	90%	100%	100%	100%
Indirect Indicator 1 Graduating Senior Exit Survey	N/A	N/A	N/A	Under development, data not yet available	Under development, data not yet available
Indirect Indicator 2 Graduate Placement (% of graduating seniors employed or placed in a program of further study by 1 June 2013)	90%	86%	100%	100%	75%
Dept senior students' Level of Academic Challenge	54.65 61.35	55.9 67.10	56.4 54.27	56.2 58.52	58.5 55.17
Dept senior students' Active and Collaborative Learning	45.34 60.32	46.1 60.00	43.9 54.76	44.5 50.00	45.1 60.32
Dept senior students' Student-Faculty Interaction	45.34 62.22	41.0 66.67	38.5 61.67	38.4 76.67	38.6 51.11
Dept senior students' Enriching Educational Experiences	34.72 42.33	34.0 31.83	32.9 28.37	32.7 37.90	34.0 21.30
Dept senior students' Supportive Campus Environment	59.57 56.94	60.3 77.78	60.8 70.83	59.8 79.17	61.9 46.30
Number of NSSE participants	6 46.2%	5 62.5%	2 33.3%	2 50.00%	3 50%
Briefly note 2-3 improvements over the last year prompted from the above student learning/engagement indicators.					

Key Performance Indicator	FY2009	FY2010	FY2011	FY2012	FY2013
[NOTE: Departments may pick up to three key performance indicators they currently measure but are not captured above. These measures could be used to track departmental results on specific yearly goals. Examples might include: number of SRPs attended, number of new freshmen contacted. (These will vary by department based on goals.)]					
Outcome/Indicator 1 % of full time faculty engaged in supporting undergraduate research	60%	100%	80%	100%	100%
Outcome/Indicator 2 % of faculty contributing to physics seminar series				100%	83%
Briefly note 2-3 improvements over the last year prompted from the above indicators. All full time, tenured or tenure-track faculty are supporting undergraduate research. Increased effort to involve students in research earlier in their undergraduate career. Increased student retention activities through research involvement.					

B. Department Quality Initiatives and Results

FY2013 Quality Initiatives	Results
Student recruiting and retention	RESPONSIBLE PARTY: Physics Chairperson RESOURCES REQUIRED: Faculty time, student labor funds, EOF funds SPECIFIC MEASUREMENT: <ul style="list-style-type: none"> • 50 students visiting department • 21 registered incoming freshman • 59% major retention
Re-sequence undergraduate curriculum to improve student success	RESPONSIBLE PARTY: Physics Chairperson RESOURCES REQUIRED: Faculty time Curriculum redesign complete, new course development underway, new course sequencing starting Fall 2013

FY2014 Quality Initiatives	Responsible Party, Resources, and Plan
Development and Expansion of Research offerings and laboratory capabilities	RESPONSIBLE PARTY: Physics Chairperson RESOURCES REQUIRED: Internal and External funding, amount unknown SPECIFIC MEASUREMENT: <ul style="list-style-type: none"> • Number of undergraduate research students involved • Number of undergraduate research presentations • Number of undergraduate research publications • Number of faculty presentations Number of faculty publications
Student recruiting and retention	RESPONSIBLE PARTY: Physics Chairperson RESOURCES REQUIRED: Faculty time, student labor funds, EOF funds SPECIFIC MEASUREMENT: <ul style="list-style-type: none"> • # students visiting department • # registered incoming freshman • % major retention

C. Institutional Quality Results

FY2013 University Initiatives	Department Activities/Results
Align Programs and Services with North Central Kansas Technical College (NCKTC)	No direct activity to report at the departmental level. Adoption of KCOG student learning outcomes for PHYS 111, PHYS 111L, PHYS 112, PHYS 112L
Increase Enrollment	All faculty actively involved in recruiting new students. 23% increase in registered freshman physics majors for Fall 2013 over FY 2013 data from section II. A. Department Performance Indicators
Improve Persistence and Retention	New department freshman success course (PHYS 100), new course sequencing to provide flexibility in freshman 'entry point'. Results should be reflected in improved major retention % in future years.
Improve Student Learning	New department freshman success course (PHYS 100) to help freshman bridge to the university physics program. PHYS 211 / PHYS 212 course redesign based on OER's and flipped classroom. Results should be reflected in improved introductory physics knowledge on future ETS MFT's.

III. FY2013 STRATEGY AND OPPORTUNITIES FOR IMPROVEMENT

A. Departmental Reflection of Strengths, Needs, Opportunities, and Threats

Strategic planning is a continuous process in the Department of Physics; it involves all aspects of the departmental operation (personnel, curriculum, research, recruiting, retention, public service). The department has a history of producing Action Plans that continue to be resubmitted if unsuccessful. This is partial evidence of careful evaluation of needs and goals of the department. All of our efforts work toward the vision of being the best undergraduate physics department in the state.

Current Strengths	Current Needs
<ul style="list-style-type: none"> • High quality faculty dedicated to undergraduate education. • Outstanding and effective departmental administrative assistant. • Strong support from upper level administration. • Faculty willingness to mentor students in real-world undergraduate research projects. • Cooperative research program with the Air Force Research Laboratory • Affiliate membership in the Kansas Space Grant Consortium. 	<p>The department currently has a high quality faculty that is dedicated to undergraduate education. This dedication coupled with the desire to maintain our Virtual College offerings is spreading the faculty very thin and has the potential to cause burn-out. The department could benefit greatly from the expansion of our half-time position to a full-time temporary position.</p> <p>SIGNIFICANT Salary increases are desperately needed if FHSU is to be remotely competitive in the attraction and retention of quality teaching faculty. 1 or 2% raises when the physics faculty is already ~25% below the national average is not going to help much.</p>
Future Opportunities	Future Threats
<ul style="list-style-type: none"> • Develop / re-develop courses based on OER and carefully considered student learning outcomes • Recruiting majors from exiting Kansas Academy of Mathematics and Sciences (KAMS) students • Repurpose the space on 1st floor Tomanek Hall for research and teaching. We are desperate for more research space. 	<ul style="list-style-type: none"> • Continued 20% reduction of OOE, 15% reduction of student labor (compared to FY2008), suspension of strategic planning funding and reduction of classified staff at a time when our enrollment by high quality students is increasing. • FACULTY BURN-OUT – we are a small department with five full time faculty. This creates a significant service and research load on each faculty member. It is quite challenging to implement all of our initiatives in a timely manner as we would like. • The gap between faculty salaries at FHSU and other similar institutions threatens the recruitment and retention of high quality FHSU faculty. • Decreasing potential student population in our primary service area

B. Opportunities for Improvement

Aside from recruiting and retention, the Department of Physics will be reorganizing research and teaching laboratories in order to improve efficiency and maximize use of physical resources.

Opportunity for Improvement	Resources Required	Expected Result and Completion Date
Develop / re-develop coursework based on OER and carefully considered and focused student learning outcomes	Faculty time, faculty time, faculty time, financial resources for equipment and travel	Improvement in recruiting, retention, student learning and graduation rates (not all next year, this will take time)
Add a lab/demonstration equipment maintenance and developer position to the department. An M.S. in physics would be required and it could be a classified position or a non-tenure track unclassified position.	Unknown	There would be an increased use of lecture demonstrations and the quality of student laboratory experiences will be enhanced. The department's virtual college courses would serve additional off-campus students.

IV. SUPPORTING MATERIALS

A. Department Degree Program Affinity Diagram(s)

Department of Physics – Affinity Diagram for BA in Physics (4/1/12)

Characteristics of Major	Expected Learning Outcomes	Curriculum	Assessment Approach and Methods	Assessment Results	Curricular/ Pedagogical Changes
<p><u>Adaptable</u> Physicists find employment in all areas of scientific and non-scientific fields.</p> <p><u>Think Critically</u> Physicists take fundamental concepts and information from diverse sources to generate an understanding of or solution to any complex process or problem.</p> <p><u>Articulate</u> Physicists must be able to communicate their ideas and findings to both peers and the public.</p> <p><u>World Ready</u> Physicists, with a mastery of the core concepts in physics, appreciate all fields of human endeavor.</p> <p><u>Civic Minded</u> Physicists by virtue of their knowledge, training in analytical thought, and problem solving abilities contribute to society.</p>	<ol style="list-style-type: none"> 1. Demonstrate ability for life-long learning. 2. Demonstrated proficiency with technology. 3. Demonstrated commitment to civic responsibility. 4. To demonstrate effective communication skills. 5. To demonstrate a command of the core theoretical concepts in physics. 6. Shows critical thought and reason as applied to problem solving. 7. To demonstrate working knowledge of applied mathematical analysis. 8. To demonstrate command of experimental design and implementation. 9. To demonstrate skill in the analysis and presentation of data. 10. To gain adequate preparation to succeed in graduate studies and/or a career. 	<p><u>Program Core Curriculum</u></p> <p>Acquire Knowledge, Develop Problem Solving and Analytical Skills, Develop Communication Skills</p> <p>PHYS 211/211L Physics for Scientists and Engineers I/Lab PHYS 212/212L - Physics for Scientists and Engineers II/Lab PHYS 313 – Modern Physics PHYS 603 – Research Projects PHYS 621 - Mechanics PHYS 632 - Electricity & Magnetism PHYS 651 - Advanced Lab I PHYS 654 - Advanced Lab II CHEM 120/120L - University Chemistry I/Lab CHEM 122/122L - University Chemistry II/Lab MACS 234 - Analytic Geometry and Calculus I MACS 235 - Analytic Geometry and Calculus II MACS 236 - Analytic Geometry & Calculus III ENG 246 Technical Writing</p> <p><u>B.A. Curriculum</u></p> <p>Develops Perspective Physics Electives</p>	<ol style="list-style-type: none"> 1. PHYS 603, PHYS 651, PHYS 654 2. PHYS 211L, PHYS 211L, PHYS 332, PHYS 603, PHYS 651, PHYS 654 3. % majors participating in service activities 4. PHYS 603 5. ETS Major Field Test, Major GPA 6. ETS Major Field Test, PHYS 332, PHYS 603, PHYS 651, PHYS 654, Major GPA 7. ETS Major Field Test, Major GPA 8. PHYS 211L, PHYS 212L, PHYS 332, PHYS 651, PHYS 654 9. PHYS 651, PHYS 654 10. % alums placed in graduate school or career (alumni survey) <p><i>Note on course numbers: Unless otherwise specified, all course numbers refer to embedded assessment quantified by course final grade of A, B or C.</i></p> <p><i>Note on GPA: goals are for % graduating students to attain <u>at least</u></i> 68.2% 2.0 < GPA < 3.0 13.6% 3.0 < GPA < 3.5 2.1% 3.5 < GPA < 4.0</p>	<p><i>Note: These referenced results are relevant to the previous affinity diagram</i></p>	

Department of Physics – Affinity Diagram for BS in Physics (4/1/12)

Characteristics of Major	Expected Learning Outcomes	Curriculum	Assessment Approach and Methods	Assessment Results	Curricular/ Pedagogical Changes
<p><u>Adaptable</u> Physicists find employment in all areas of scientific and non-scientific fields.</p> <p><u>Think Critically</u> Physicists take fundamental concepts and information from diverse sources to generate an understanding of or solution to any complex process or problem.</p> <p><u>Articulate</u> Physicists must be able to communicate their ideas and findings to both peers and the public.</p> <p><u>World Ready</u> Physicists, with a mastery of the core concepts in physics, appreciate all fields of human endeavor.</p> <p><u>Civic Minded</u> Physicists by virtue of their knowledge, training in analytical thought, and problem solving abilities contribute to society.</p>	<ol style="list-style-type: none"> 1. Demonstrate ability for life-long learning. 2. Demonstrated proficiency with technology. 3. Demonstrated commitment to civic responsibility. 4. To demonstrate effective communication skills. 5. To demonstrate a command of the core theoretical concepts in physics. 6. Shows critical thought and reason as applied to problem solving. 7. To demonstrate working knowledge of applied mathematical analysis. 8. To demonstrate command of experimental design and implementation. 9. To demonstrate skill in the analysis and presentation of data. 10. To gain adequate preparation to succeed in graduate studies and/or a career. 	<p><u>Program Core Curriculum</u></p> <p>Acquire Knowledge, Develop Problem Solving and Analytical Skills, Develop Communication Skills</p> <p>PHYS 211/211L Physics for Scientists and Engineers I/Lab PHYS 212/212L - Physics for Scientists and Engineers II/Lab PHYS 313 – Modern Physics PHYS 603 – Research Projects PHYS 621 - Mechanics PHYS 632 - Electricity & Magnetism PHYS 651 - Advanced Lab I PHYS 654 - Advanced Lab II CHEM 120/120L - University Chemistry I/Lab CHEM 122/122L - University Chemistry II/Lab MACS 234 - Analytic Geometry and Calculus I MACS 235 - Analytic Geometry and Calculus II MACS 236 - Analytic Geometry & Calculus III ENG 246 Technical Writing</p> <p><u>B.S. Curriculum</u></p> <p>Develops knowledge and problem solving techniques</p> <p>PHYS 620 -Mathematics for the Physical Sciences MACS 354 - Differential Equations</p> <p>Develops Perspective Physics Electives</p>	<ol style="list-style-type: none"> 1. PHYS 603, PHYS 651, PHYS 654, PHYS 675 seminar deliverables and grade 2. PHYS 211L, PHYS 211L, PHYS 332, PHYS 603, PHYS 651, PHYS 654, PHYS 675 seminar deliverables and grade 3. % majors participating in service activities 4. PHYS 603, PHYS 675 seminar deliverables and grade 5. ETS Major Field Test, Major GPA 6. ETS Major Field Test, PHYS 332, PHYS 603, PHYS 651, PHYS 654, PHYS 675 seminar deliverables and grade, Major GPA 7. ETS Major Field Test, PHYS 620, Major GPA 8. PHYS 211L, PHYS 212L, PHYS 332, PHYS 651, PHYS 654 9. PHYS 651, PHYS 654, PHYS 675 seminar deliverables and grade 10. % alums placed in graduate school or career (alumni survey) <p><i>Note on course numbers: Unless otherwise specified, all course numbers refer to embedded assessment quantified by course final grade of A, B or C.</i></p> <p><i>Note on GPA: goals are for % graduating students to attain <u>at least</u></i> 68.2% 2.0 < GPA < 3.0 13.6% 3.0 < GPA < 3.5 2.1% 3.5 < GPA < 4.0</p>	<p><i>Note: These referenced results are relevant to the previous affinity diagram</i></p> <p><i>See section II: Assurance of student learning in FY2011 DARCI</i></p>	<p>Previous changes (based on earlier affinity diagram and assessment) include increased emphasis on meaningful undergraduate research experience.</p> <p>Increased emphasis on small student tutorial sessions (instructor and student lead)</p>

B. Department Staffing Plan

College of Arts and Sciences
Department Staffing Plan and Assignments
Department of Physics
FY2013

(1)	(2)	(3)	(5)	(6)	(7)	(8)
Current Department Needs	Faculty Member	Current Faculty Expertise	Assigned Instructional FTE's	Rank Current Date	Degree Completed	Track
1.0	Aflatooni, K.	Exp. Atomic / Optics	1.0*	Professor 2011	Ph.D. 1998	Tenured
1.0	Buffington, G.	Atomic Theory / Laser Biophysics / Computational Physics / Administration	1.0*	Professor 2011	Ph.D. 1997	Tenured
1.0	Clark, C. D.	Laser Biophysics	1.0*	Assistant Professor 2011	Ph.D. 2011	Tenure Track
1.0	Deyo, E	Solid State Theory	1.0*	Assistant Professor 2009	Ph.D. 2009	Tenure Track
1.0	Maseberg, J	Exp. Atomic Physics	1.0*	Assistant Professor 2009	Ph.D. 2009	Tenure Track
0.5	Rohleder, K.	Molecular Biophysics	1.0*	Instructor (2010)	Ph.D. 2004	Temporary
		Total	6.0			

Diversity Ratio = 0.167

Tenure Density = 0.333

* Assigned Instructional FTE does not include projects courses which are currently being taught on an overload basis.

C. Bibliography of Departmental Scholarly Activity

C.D. Clark III, W.J. Marshall, R.J. Thomas, "Theoretical analysis of multiple-pulse thermal damage thresholds of the retina," *Journal of Laser Applications* 25, 012005 (2013)

Brett Hokr, C.D. Clark III, Robert Thomas, "Higher-order wide-angle split-step spectral method for non-paraxial beam propagation," *Optics Express*, in press (2013)

C. D. Clark III, "The Finite-Difference Method: Solving Differential Equations on a Computer", Department of Physics Seminar Series, Fort Hays State University, Hays, KS, 31 August 2012

G. D. Buffington, "The Basis-Spline Collocation Method: A More Sophisticated Method for Solving Differential Equations on a Computer", Department of Physics Seminar Series, Fort Hays State University, Hays, KS, 14 September 2012

Jack Maseberg, "Numerically Solving the Time-Dependent Schrodinger Equation", Department of Physics Seminar Series, Fort Hays State University, Hays, KS, 28 September 2012

Eric C. Deyo, "The Higgs Boson", Department of Physics Seminar Series, Fort Hays State University, Hays, KS, 9 November 2012

C. D. Clark III and Jack Maseberg, "The Dangers of Lasers and Safe Practices For Their Use", Department of Physics Seminar Series, Fort Hays State University, Hays, KS, 15 February 2013

Emily G. Cress, G. D. Buffington, C. D. Clark III, and K. J. Rohleder, "Damage to Retinal Pigment Epithelial Cells Due to Exposure to 445nm Lasers", Scholarly and Creative Activities Week, Fort Hays State University, Hays, KS, 1 May 2013

Cole Mosier, Eric C. Deyo, Stephen Donnelly, "An Examination of Various Properties and Applications of Ferromagnetic Fluid", Scholarly and Creative Activities Week, Fort Hays State University, Hays, KS, 1 May 2013

Earl Watkins, Cole Studer, Bryan Figger, Brad Leupold, Paul Adams, Sam Zwenger, and Jack Maseberg, "BalloonDuino", Scholarly and Creative Activities Week, Fort Hays State University, Hays, KS, 1 May 2013

Justin Maughan and C. D. Clark III, "Infrared Laser Induced Cell Membrane Currents / Nerve Impulses", Scholarly and Creative Activities Week, Fort Hays State University, Hays, KS, 1 May 2013

Alec Weaver and Eric C. Deyo, "Chaos Theory and Regions of Stability", Scholarly and Creative Activities Week, Fort Hays State University, Hays, KS, 1 May 2013

D. Department Program Assessment Results

See ETS Major Field Test in Physics direct outcome results in section II. A. above. Additional assessment results follow:

In order to protect student privacy names will be omitted

	Scaled Score	Introductory Physics	Advanced Physics
Student 1	130	29	34
Student 2	151	45	58
Student 3	139	40	41
Student 4	152	51	54
Student 5	130	29	34
Student 6	121	24	23
Student 7	134	29	44
FHSU Average	136.7	35.3	41.1
National Average	149.2	49.1	49.8
National SD	8.9	8.5	8.9



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MFT Custom Comparative Data Report for Fort Hays State University
 Institution List
 MFT in Physics (form: 4IMF)
 Data Includes Seniors From Domestic Institutions - September 2012 to June 2013

School Name	Number of Students
Austin Peay State University, TN	9
Ball State University, IN	8
Benedict College, SC	5
Berry College, GA	6
Brigham Young University (ID), ID	17
Central Michigan University, MI	6
Central Washington University - Ellensburg, WA	10
College of Saint Benedict & Saint John's Univ., MN	9
East Stroudsburg University, PA	9
Florida International University, FL	7
Fort Hays State University, KS	6
Furman University, SC	5
Ithaca College, NY	7
James Madison University, VA	9
Juniata College, PA	13
Kalamazoo College, MI	9
Kent State University, OH	9
Kenyon College, OH	7
Macalester College, MN	17
Middle Tennessee State University, TN	7
Millersville University of Pennsylvania, PA	7
Millikin University, IL	5
Missouri State University, MO	10
Morehouse College, GA	5
New Mexico State University, NM	7
Northwest Nazarene University, ID	5
Point Loma Nazarene University, CA	7
Rose-Hulman Institute of Technology, IN	10
San Francisco State University, CA	7
South Carolina State University, SC	5
Tarleton State University, TX	5
Tennessee Tech University, TN	6
Truman State University, MO	9
United States Air Force Academy, CO	8
United States Military Academy, NY	9
United States Naval Academy, MD	19
University of Alabama at Birmingham, AL	5
University of Alabama at Tuscaloosa, AL	6
University of Central Florida, FL	20
University of Dallas, TX	6
University of Maine - Orono, ME	8
University of Massachusetts Lowell, MA	11
University of Mississippi, MS	5
University of North Florida, FL	7
University of North Georgia, GA	10
University of Oklahoma, OK	15
University of Wisconsin - Eau Claire, WI	5
University of Wisconsin - La Crosse, WI	7
University of Wyoming, WY	9
Washington College, MD	5
West Chester University, PA	7
Wheaton College, IL	9
Total	434

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MFT Custom Comparative Data Report for Fort Hays State University
 Institutional Means Total Score Distribution
 MFT in Physics (form: 4IMF)
 Data Includes Seniors From Domestic Institutions - September 2012 to June 2013

Mean Total Score Range (120 - 200)	Percent Below
173 - 200	99
172	98
171	98
170	98
169	98
168	98
167	96
166	94
165	94
164	94
163	94
162	94
161	92
160	90
159	80
158	80
157	76
156	75
155	73
154	69
153	67
152	63
151	55
150	53
149	51
148	46
147	38
146	32
145	26
144	23
143	21
142	17
141	15
140	13
139	7
138	5
137	5
136	5
135	5
134	5
133	5
132	3
131	3
130	3
120 - 129	1
Number of Institutions	52
Mean	149.2
Median	148.0
Standard Deviation	8.9

Total Scores are reported as *scaled scores*.
 Percent Below based on percent below the lower limit
 of the score interval.



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MFT Custom Comparative Data Report for Fort Hays State University
 Institutional Means Subscore Distributions
 MFT in Physics¹ (form: 4IMF)
 Data Includes Seniors From Domestic Institutions - September 2012 to June 2013

Subscores ² Range (20 -100)	Subscore Percent Below		Subscores ² Range (20 -100)
	S1	S2	
75- 100	99	99	75- 100
74	99	98	74
73	99	98	73
72	99	96	72
71	99	96	71
70	99	96	70
69	98	96	69
68	98	96	68
67	98	96	67
66	96	94	66
65	96	94	65
64	96	94	64
63	96	92	63
62	96	92	62
61	94	88	61
60	92	86	60
59	90	84	59
58	82	80	58
57	76	76	57
56	75	76	56
55	73	76	55
54	71	71	54
53	63	65	53
52	59	57	52
51	53	57	51
50	50	55	50
49	44	50	49
48	42	44	48
47	38	34	47
46	28	32	46
45	28	28	45
44	25	23	44
43	21	13	43
42	17	9	42
41	13	9	41
40	11	9	40
39	11	9	39
38	9	9	38
37	5	7	37
36	5	7	36
35	5	3	35
34	5	1	34
33	5	1	33
32	5	1	32
31	3	1	31
20 - 30	1	1	20 - 30
Number of Institutions	52	52	
Mean	49.1	49.8	
Median	49.5	48.5	
Standard Deviation	8.5	8.9	

Subscores for this test cannot be compared to testing years prior to 2012 due to changes in the Physics Test that were introduced in 2012.

² Subscore 1: Introductory Physics
 Subscore 2: Advanced Physics

Subscores are reported as *scaled scores*.
 Percent Below based on percent below the lower limit of the score interval.

E. Other Departmental Information