Physics Department Assessment

Applied Physics and Engineering Physics degree Programs

STEP1 – Essence of the program

The essence of the Physics Department	
Uniquely unifies co-op work experience with rigorous curriculum which integrates the applied fields of optics, acoustics, and materials with technical fields of applied science and engineering to grow problem solvers and researchers for advanced and emerging technical fields in demand by knowledge economy.	
The essence of the Applied Physics degree program:	**The essence of the Engineering Physics degree program:**
Uniquely unifies co-op work experience with a rigorous curriculum, which integrates the applied fields of optics, acoustics, materials with mathematics and applied sciences to grow problem solvers for the knowledge economy.	Uniquely unifies co-op work experience with a rigorous curriculum, which integrates the applied fields of optics, acoustics, and materials with a systems approach to engineering to grow problem solvers for emerging technologies.

STEP2 - Stakeholders

Stakeholders

1. Students
    a. Want to learn to solve problems
    b. Success in the workplace
    c. Success in graduate work
    d. Treated as junior colleagues
2. Faculty
    a. Pride in success of students
    b. Professional and personal growth
    c. Rich educational environment
    d. Contribute to success of university and community
3. Coop partners
    a. want to grow a productive worker
    b. match student skills with job requirements
    c. want problem solvers
    d. want students with professional behavior
    e. strong communication skills
4. Future employers
    a. Want problem solvers
    b. Want future leaders, and team players
    c. Want self-starters and self-growers
    d. Want workers with a robust, flexible set of skills
    e. Strong communication skills
5. Graduate schools
    a. Rigorous preparation in prerequisite fields
        i. Physics
        ii. Math
        iii. Sciences
        iv. Engineering
    b. Problem solvers
    c. Independent researchers
    d. Strong communication skills

6. Alumni
    a. A program with a well deserved reputation
    b. An extended community of learners
    c. A resource for further professional growth
7. Advisory Board
    a. A responsive community of educators
    b. A program with “follow through”
    c. Alignment with emerging technologies
    d. Alignment with graduate programs
8. Families
    a. Taking care of the kids
    b. Personal and professional success of their student
    c. Financial independence
    d. An enriching, nurturing environment on campus
9. Community
    a. Spark interest in physics and the sciences
    b. Serve as a knowledge resource for educators and businesses
    c. Be involved in K-12 curricular and professional development
10. Administration
    a. Wants a growing program
11. Accrediting bodies
    a. ABET
    b. North Central
    c.
12. Academic Programs
    a. Offering solid required physics components
    b. Providing opportunities for relevant science elective courses
    c. A physics program that is synchronized with the other academic programs
13. Grant Organizations
    a. Faculty who can deliver project outcomes
    b. Expertise that are in demand based on current technical needs
    c. A department that could grow next generation of scientist and engineers.

Step 3 - Scope:

Aspects of the Program	**Applied Physics**	**Engineering Physics**
Work Integrated Education	Unique in its comprehensive co-op work experience in physics and scientific applications	Unique in its comprehensive co-op work experience in Applied Sciences and advanced technology.
Industrial Physics Component	A program with three applied areas of concentration in Optics, Acoustics, Materials	A program with three applied areas of concentration in Optics, Acoustics, Materials
Industrial Thesis	A program with required industrial thesis component	A program with required industrial thesis component
Technical Sequence of courses	A program with required technical sequence of courses in Applied Science, Engineering or Business	A program with required sequence of courses in Engineering with emphasis on systems engineering
Differentiating against traditional degree programs	Not a traditional physics degree with follow-on courses in physics electives or highly theoretical courses	Not a traditional engineering degree because it is based on combining Industrial Physics, Applied Sciences and systems engineering
Similarities with traditional degree programs	• A program which stresses the application of physical insight and tools to solve practical problems • A program with a rigorous physics core; a thorough background for graduate study • A program with strong laboratory experiences	• A program which stresses the application of physical insight and tools to solve practical problems • A program with a rigorous physics core; a thorough background for graduate study • A program with strong laboratory experiences
Misconceptions	• It is not designed as an	• It is not designed as an

or what we are not	automotive based degree • Not a teacher prep degree. • Not a degree exclusively designed for immediate industrial career or only for graduate studies.	automotive based degree • Not a teacher prep degree. • Not a degree exclusively designed for immediate industrial career or only for graduate studies.
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Step 4 - Goals

Current goals of the physics program

1. Grow our program (student population) at the rate of ~20% annually through active recruitment.
2. Development and revision of courses in support of the Revised AP and newly established EP degree programs
3. Enhance marketing plans to promote both physics degree programs and evolution and contribute to improving marketing materials
4. Development of physics-I online course to enhance retention and student satisfaction
5. Faculty training involvement to support implementation of more effective assessment activities and scholarship

Long-term goals 2012

1. Establish framework and policies for a physics department aligned with University reorganization
2. Provide richer, deeper opportunities for learning in all physics courses
3. Implement a program assessment system to enhance student's preparation for careers and graduate studies.
4. Grow our Kettering Physics community, including current and future students, faculty alumni, and industrial partners connected to our degree programs.
5. Embrace a "Teacher-scholar" model that complements effective teaching with well-balanced activities in research, scholarship, and outreach programs.
6. Enhance study abroad opportunities for physics students
7. Increase the total student population to 60+ students

Step 5 - Assets

1. Successful, well prepared students
2. Collaborative, knowledgeable, insightful faculty… many with significant work experience outside academia
3. Showcase advanced laboratories in optics, acoustics and materials
4. A culture that values integrity, collegiality, student-centered learning, and creativity
5. Co-op employers that desire the opportunity to grow with our students based on mutual interest and value added in collaboration
6. Established curriculum and courses that supports thriving AP and EP degrees.

Step 6 – Key processes, Programs and Systems:

Key Processes, structures, and systems which will help accomplish the goals above

1. Student mentoring: we take care of our own
    a. Each student has a physics faculty academic advisor
    b. Scheduling meetings every term with all majors & minors
    c. Cultivate co-op opportunities which value and grow our students
    d. Interaction outside of coursework: research, career placement, socialization
2. Productive, collegial and open communication within our physics community
    a. frequent, structured meetings where all voices are heard
    b. we discuss among ourselves, then vote…but then move on together
    c. occasional focused longer meetings for specific important issues
3. Active participation in University recruitment efforts, and active collaboration with University recruiting staff
    a. Discover Kettering/Prep for Success
    b. SPS K-12 outreach road-show
    c. Personally initiated outreach efforts
    d. Discover U./Kamp Kettering
    e. Contacting individual prospect students interested in physics program
4. Contributing to the University and the larger community by
    a. Active representation in University committees and working groups
    b. Shared facilities and laboratories (ESEM)

    c. Active participation in marketing and recruitment and cross functional activities to promote physics programs
    d. Contributing and participating in K-12 outreach programs
    e. Contributing and participating in industrial outreach programs including CE and consulting
5. professional development
    a. hiring self-growers, team players
    b. scheduling time resources, teaching assignments, to support scholarship
    c. individual outreach to external scholars
    d. faculty mentoring
6. instructional design
    a. common course goals, text selection, final exams for foundation courses
    b. individual or collaborative effort for course goals, text selection for advanced and elective courses
    c. attending pedagogical workshops to enhance student learning
7. assessment
    a. annual assessment report based on ABET criteria
    b. faculty training in assessment
    c. feedback from student course, lab performance to revise foundation courses

Step 7 – Establishing Program Quality

1. List of characteristics/quality which determine program quality
    - Current qualities:
        i. co-operative
        ii. career oriented
        iii. Applied
        iv. rigorous
        v. responsive
        vi. quality oriented
        vii. friendly
        viii. pro-active
        ix. open-minded
        x. team players
        xi. enthusiastic
        xii. effective teachers
        xiii. outspoken

xiv. efficient
xv. under-resourced

- Future qualities
  i. Nationally recognized
  ii. Assessment driven
  iii. In charge of our own destiny
  iv. Resource rich
  v. Trend setting
  vi. Innovative
  vii. Evidence based
  viii. Credential (accreditation)

2. Look for missing pieces
3. Rank top 10 qualities for the future design of the program
   - co-operative
   - career oriented
   - quality oriented
   - assessment driven
   - resource rich
   - targeted on applications
   - rigorous
   - nationally recognized
   - in charge of our destiny
   - flexible, responsive, adaptable
4. pick critical areas for measuring performance
   - co-operative
   - career oriented
   - quality driven (continuous Quality Improvement)
   - resource rich
   - nationally recognized
   - Community building
5. Characterizing aspects
   - a co-op work experience rich in learning

i. growth environment
ii. opportunity to apply learning
iii. opportunity to take work experiences into learning
iv. students are placed in challenging job positions

Students are carefully placed in challenging and aligned jobs that provide opportunities where job experience and course learning positively influence and enhance each other and produce an outstanding result.

- career oriented
    i. Graduated students are pursuing career affected by their educational experience
    ii. Graduated students are satisfied with their career
    iii. Courses are aligned with career goals

Graduates are employed in advanced and emerging technology related industries, with an excellent skill set so and their careers are positively affected by their educational experience.

- quality driven
    i. assessment based planning and operation department
        1. assessment based classroom teaching improvement
        2. assessment based curricular changes
        3. assessment based resource allocation and budgetary process
    ii. quality is recognized by stakeholders, especially employers and grad schools
    iii. Teacher-scholar approach supports quality teaching, research and service

Physics degree programs is improved based on an on going assessment that benefits from input by faculty, industrial advisory board, current student, graduates and their employers, while allocation of resources will be based on future plan for further improvements.

- resource rich
    i. Laboratory budgets will insure state of the art teaching and research laboratories
    ii. Departmental budget will support the necessary teaching and operational functions
    iii. University resources will support scholar-teacher model

Physics degree programs will be funded through appropriate budget, grants, external resources and vested stakeholders to excel in teaching, learning and scholarship by providing the resources required for professional and program growth.

- nationally recognized
    i. Recognized as a quality program through academic community.
    ii. Recognized as a quality program through industrial community.
    iii. Recognized as a growing quality program by the American Institute of Physics.
    iv. Recognized among the top physics degree programs in the nation through ranking.

Physics degree program have achieved national recognition by actively communicating the accomplishments and uniqueness of our program through publications and presentation.

- community building
    i. Open communication and flow of information
    ii. Open meetings involving faculty, students, and industrial advisory board members.
    iii. Newsletters and electronic communications including all stakeholders.
    iv. Including stakeholders in assessment processes.
    v. Feedback processes and mechanism to enhance community strength.

Physics department will actively support a thriving physics community through meetings, printed and electronic communications, activities, contributions and outreach programs, as well as solicitation and sharing inputs from shareholders.

Step 8 – Attributes (measurable characteristics) for each criterion:

- co-operative
    i. Student satisfaction with their co-op job
    ii. Industrial thesis topics relationship to degree program
    iii. Students interest in seeking a concentration based on their co-op work experience

- career oriented
    i. Percent of students in either graduate school or with full-time career in a technical field within 3-years after graduation

- quality driven
    i. Percent of student success in admission to graduate schools
    ii. Level of success in professional exams such as GRE.
    iii. Ratings from the co-op sponsor performance assessment forms.
    iv. Level of scholarly activity of students and faculty including project, grants, consulting and CE.

- resource rich
    i. Ability to maintain high quality and operational labs
    ii. Ability to offer required and elective courses whenever students demand exist
    iii. Ability to establish or expand new laboratory capability to keep a thriving and expanding physics program

- nationally recognized
    i. Level of success for student admission to highly ranked graduate programs.
    ii. Recognized as a growing program through national physics community and organizations such as American institute of Physics.
    iii. Recognition as a high quality physics program through national ranking

- community building
    i. Number of functions and programs that includes students, faculty and advisory board member each year.
    ii. Publication of Physics newsletters, and electronic communication that includes stakeholders
    iii. Active community participation by all stakeholders
    iv. Retention rate

Criterion (qualities to measure)	**Attribute (what to measure)**	**Weight**	**Means (How to collect data- measure) Capture performance**	**Instrument (Rubric- Index, definition, score sheet SCALE)**	**Benchmark (set by internal data – history)**	**Target (set by external data such as peer institutions)**	**Accountability**
Co-op	Students satisfaction with their co-op job	10	Blackboard Annual Survey	*Alignment (work with studies) *Growth experience *accomplishment *Concentrations pursuit due to co-op experience	Average KU co-op job re-assignments	> 5% higher than the benchmark	
Co-op	Industrial thesis topics relationship to degree program	5	Thesis reports for current students & alumni	*Lab & Hands-on tasks *Theoretical / computational tasks *modeling tasks	KU average values for all degrees	>5% higher than KU average	
Co-op	Students interest in seeking a concentration based on their co-op work experience	3	Blackboard Annual Survey		Percent students pursuing a concentration	> 70 pursuing a concentration	
Career oriented	Percent of students in either graduate school or with full-time career in a technical field within 3-years after graduation	10	Alumni Survey and AIP annual reports- Student feedback	*% in physics GS *% in Technical fields GS *% in A, B, C, and D level GS *%used GRE for GS admission *% with multiple admissions to GS	National percentage for Physics	> 10% higher than the national average	

				% full-time career			
Quality driven	Percent of student success in admission to graduate schools	2	Alumni Survey and AIP reports		National percent for physics	5% higher than the national average	
Quality driven	Level of success in professional exams such as GRE.	2	Alumni Survey & national reports		National average test results	>5% higher than the national average	
Quality driven	Ratings from the co-op sponsors on students performance at work	6	Co-op supervisor work term reports	*laboratory ability *Analytical ability *Flexibility *Professionalism *problem solver? *Self-starter *Team skills	KU average ratings	>5% better than the benchmark	
Quality driven	Level of scholarly activity of students and faculty including project, grants, consulting and CE.	10	Student & faculty feedback & KU reports	*Research projects *pedogagy –teaching/ learning studies. *Grants submitted *publications *presentations * consulting * CE courses	KU average numbers per faculty	>5% higher than the benchmark	
Resource rich	Ability to maintain high quality and operational labs	10	Quarterly scheduling & budgetary process	*reliability and quality of labs *Last major lab improvement *Number of students per lab station * student satisfaction with lab quality	Comparable and Peer & physics programs	Match the benchmark by 2010	
Resource rich	Ability to offer required and elective	7	Quarterly scheduling &	*number of various courses offered per	Comparable and Peer &	Match the benchmark by	

	courses whenever students demand exist		budgetary process	year *student ability to take courses on time *class size of the introductory courses	physics programs	2010	
Resource rich	Ability to establish or expand new laboratory capability to keep a thriving and expanding physics program	7	Quarterly scheduling & budgetary process & IAB Reports	*new laboratory capabilities/year *Strengthening concentrations *technical & lab support *external funding *Capital equipment budget	Comparable and Peer & physics programs	Match the benchmark by 2010	
Nationally recognized	Level of success for student admission to highly ranked graduate programs.	2	Student feedback	Alumni Survey	Comparable and Peer & physics programs	Match the benchmark by 2010	
Nationally recognized	Recognized as a growing program through national physics community and organizations such as American institute of Physics	7	Annual AIP Surveys and complied reports on all Physics departments	*number of current physics students *Annual growth *Annual average for peer institutions *three year average comparison *rate of growth – three years average	Comparable and Peer & physics programs based on AIP reports	Match the benchmark by 2010	
Nationally recognized	Recognition as a high quality physics program through national ranking	3	Tracking national data	Annual Ranking reports & publications	Comparable and Peer & physics programs	EP ranked national by 2012	
Community	Number of functions	7	Quarterly	*Students input	Annual	10% above the	

building	and programs that includes students, faculty and advisory board member each year		tracking and annual reports	*faculty input *Alumni input *various communication tools *programs *activities – SPS, etc.	institutional effectiveness reports for academic departments	benchmark average numbers	
Community building	Publication of Physics newsletters, and electronic communication that includes stakeholders	5	Quarterly newsletter & annual reports	*quality of Physics newsletter (PNL) *number of PNL *contributions and reactions to PNL *role of PNL in strengthening the physics community N	IAB, students, alumni and faculty survey	> 80% satisfaction	
Community building	Active community participation by all stakeholders	4	Level of participation by students, alumni, industrial advisory board members, faculty and other stakeholders in assessment data gathering, and contribution to newsletters, and other means of communication	Quarterly tracking and annual reports	IAB, students, alumni and faculty survey	> 80% satisfaction	
Community	Retention rate	5	Student	*# student left KU	KU	>5% higher	

building			enrolment & retention data	*# students transferred out of physics *#students transferred to physics *#student population *student feedback why transferred in or out of KU and/or physics	retention percent	than the benchmark	