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Interim Executive Director

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BILL HASLAM
Governor

TO: David Gregory
Acting Chancellor, Tennessee Board of Regents

FROM: Russ Deaton (RD)

SUBJECT: Austin Peay State University
Letter of Application to Plan Engineering Physics BS Program

DATE: May 11, 2016

In accordance with THEC policies, colleges and universities are required to submit Letters of Application for authorization to proceed with developing proposals for new academic programs and units. The THEC financial projection form for the proposed program must accompany the letter of application to plan. Upon THEC approval to proceed with developing proposals, institutions should do so in a manner consistent with THEC policies and criteria.

Programs must document relevance to institution's mission, provide enrollment, graduation and financial projections, describe the anticipated evaluation process, document employer and student demand, and certify that the proposed program will not unnecessary duplicate existing offerings at other Tennessee public institutions. The proposal must ensure faculty sufficiency, existence of student support resources, and adequacy of library, space, equipment, and technology.

I approve Austin Peay State University to plan the Bachelor of Science in Engineering Physics. It is understood that the proposed program will be in accord with the mission at APSU, will meet the *THEC 2015-25 Master Plan for Tennessee Postsecondary Education* degree completion and workforce development objectives, and will be implemented with existing funds.

The Letter of Intent projects implementation of an approved Engineering Physics BS program in January 2017. Please be advised that the Letter of Application itself will be posted on the THEC website for public disclosure.

cc: Dr. Tristan Denley, TBR
Dr. Alisa White, APSU
Dr. Rex Gandy, APSU
Betty Dandridge Johnson, THEC

TENNESSEE BOARD OF REGENTS

Academic Proposal Form for All New Programs

COVER PAGE

This form is submitted with all proposals requiring Board approval to the TBR Vice Chancellor for Academic Affairs. The COVER PAGE may be submitted as a PDF. All other forms should be submitted as MSWord documents.

Please remember to submit only one proposal with related support documents per e-mail.

Sponsoring Institution(s): Austin Peay State University

Proposal Statement: Establish an Engineering Physics program

Degree Designation [or] Type of Certificate:
__BSE_____ in ___Engineering Physics_____
Formal Degree Abbreviation **Title of Proposed Program to be established or impacted**

Proposed Degree [or] Certificate CIP & SOC Codes: CIP: 14.1201, SOC: 17-2199

Concentrations: (if applicable)

Proposed CIP & SOC Codes: None

Anticipated Delivery Site(s): APSU, Clarksville Campus

Proposed Implementation Date: Spring 2017

Cooperative/Collaborative Partners: None

For more information contact: _B. Alex King III_____/__931-221-6102_____
Name Telephone

Institutional Approval: Alisa White /____
Signature of President (required) Date
per Lynne S Crosby

*The Cover Page documents the President's support and that the proposal has been reviewed and approved through the established institutional processes. Collaborative programs require the President's signature from **all** participating institutions.*

Letter of Application for All New Degrees Programs with/without Concentrations, Certificates, Duplications of Existing Community College Programs, Collaborative/Joint Programs

Refer to TBR Policy 2:01:01:00, TBR Guideline A-010, and THEC Policy A1:0 and A1:1 before developing a Letter of Application.

INSTRUCTIONS: Please respond to each question. If the question is not applicable, please use "NA" and include a brief explanation of why the question is not applicable to the proposed action. The form will expand to allow space as needed and must be submitted to the TBR Vice Chancellor for Academic Affairs and the Vice Chancellor for Community Colleges as designated in A-010.

SECTION I. INTRODUCTION

DATE OF SUBMISSION:

INSTITUTION(S): Austin Peay State University

TITLE OF PROGRAM: BSE in Engineering Physics
CIP and SOC CODES: CIP 14.1201, SOC 17-2199

CONCENTRATIONS: N/A
CIP and SOC CODES: N/A

PROJECTED DATE FOR SUBMISSION OF IMPLEMENTATION PORTFOLIO: June 1, 2016

TARGET DATE FOR BOARD APPROVAL: July 2016

PROPOSED DATE OF PROGRAM IMPLEMENTATION: January 2017

A. PURPOSE: (Goals and Objectives in keeping with Institutional Mission) (Specify: campus specific, regional, state-wide, national, International; Population: Traditional, Non-traditional [over 25], Military, Dual Enrollment [High School], Workforce, or other; Academic, Workforce development and/or Research Needs)

Engineering physics (EP) is the interdisciplinary study of physics, mathematics, and engineering with a particular emphasis on developing advanced techniques to solve complex, real-world problems. Engineering physicists are best suited to applying new technologies to problems in engineering design and manufacturing where established mechanical or electrical engineering

approaches are inadequate. Consequently, engineering physics curriculum focuses on advanced theoretical, computational, and experimental topics that are outside the scope of traditional engineering subject areas. Engineering physics requires design as an element of the curriculum, much like an engineering program, while also requiring more advanced physics than a typical engineering degree. The engineering physics degree will share much of the existing physics program's major core, but will differ from the physics degree by a minimum of 20 credit hours, largely due to differences in upper-level engineering-oriented coursework (see Appendix A for a side-by-side comparison of the proposed Engineering Physics BSE and the Physics BS). An undergraduate degree in engineering physics qualifies a student to seek engineering-oriented employment after earning their bachelor's degree, but also provides excellent preparation for students who wish to pursue graduate study in physics or engineering. Engineering physics is accredited by the American Board of Engineering and Technology (ABET). As such, graduates from an ABET-accredited program are eligible to sit for the professional engineer licensure examinations (unlike regular physics graduates). Engineering physicists typically work in high-tech industrial and manufacturing settings on teams with engineers and engineering technologists to solve real-world design and implementation problems.

An engineering physics program will also enable APSU to better prepare students who wish to enter engineering careers or attend graduate school in an engineering discipline. Approximately 40% of the APSU physics graduates over the past 10 years have either found immediate employment in an engineering position or have entered graduate school in an engineering field. Unfortunately, current regulations do not allow these students to pursue a professional engineering license since they do not have a bachelor's degree from an ABET accredited program, thus limiting the positions for which they can apply. An engineering physics program (once ABET accreditation is earned) will correct this shortcoming and formalize this part of our mission. In addition, a significant number of people in APSU's service region have an interest and desire to pursue an engineering education, but lack the resources to attend one of the more traditional engineering institutions in the State. An engineering physics program at APSU will provide these students with an educational path.

Lastly the addition of an engineering physics program to the Department of Physics & Astronomy would allow for efficient use of resources while meeting the growth needs of the University and the Department. Physics at APSU has a reputation as a strong department and program in the state. The Department has grown by approximately 10% in the last 5 years, 30% in the last 10 years, and a staggering 520% since the year 2000. We have the second-highest number of baccalaureate graduates from a state institution in Tennessee (2014 5-year average numbers), and have produced three Barry M. Goldwater scholars in the last 4 years. The Department has an established international reputation for expertise in experimental glass research and computational analysis. In addition, many faculty members have working experience in engineering and science prior to starting their careers in academia. The Department currently has the capacity to handle an additional 50-75 majors with the current faculty and resources. Adding an engineering physics program will leverage the existing resources and capability to expand the Department's success and the development of the University and the region intellectually and economically.

B. INSTITUTIONAL PRIORITY (Justify why this is a priority at this time and summarize

the institution's current program development plans; institutional plans and meeting benchmarks to exit from post-approval monitoring, for any flagged programs; and resource commitments)

Austin Peay State University is committed to raising the educational attainment of our citizenry to support the workforce needs within Tennessee and especially in the greater Clarksville - Ft. Campbell region. This region continues to experience tremendous population and industrial growth. Likewise, APSU has experienced tremendous growth in student enrollment, facilities, and new program offerings; enrollment currently stands at around 10,000. APSU's goal is to continue this trend by growing the student enrollment to 15,000 by the year 2025 in support of Governor Haslam's "Drive to 55" program. The key to growing the University's enrollment is to ensure that we continue to serve the needs of the region by supporting the development of a workforce suited to local needs and industry.

Our objective in creating an engineering physics program within the Department of Physics & Astronomy is to address the workforce needs of the region and of the state. Availability of engineering graduates is a significant consideration when attracting new industry. Clarksville-Montgomery County is home to a number of large manufacturers, such as Ingersoll Rand-Trane, Florim Tile, Bridgestone-Metalpha, Akebono, and others. In addition, in the last several years the Clarksville-Montgomery County Industrial Development Board (IDB), in conjunction with local and state governments, has been successful at attracting a large manufacturing presence in Clarksville, in particular Hankook Tire. Employers such as these are seeking employees with an engineering education as opposed to a technology or science degree. Availability of such a degree is especially important as the IDB undertakes a search for additional industry partners for Clarksville. Similarly, there are several large automotive manufacturers in the state such as Nissan, Volkswagen, General Motors, and the plethora of automotive suppliers such as DENSO Manufacturing that constitute a significant manufacturing and economic presence in Tennessee. These industries are also seeking engineers for technical positions which handle a greater responsibility than is expected of someone with a degree in technology or science. Other Tennessee employers with similar engineering needs are Oak Ridge National Lab, Y-12 National Security Complex, Tennessee Valley Authority, and Arnold Engineering Development Center.

C. NEED: (Identify the academic, workforce development, and/or research needs the program proposed in this letter of application will meet. Cite employment projections and supply/demand data appropriate to the discipline and degree level as justification using the Bureau of Labor Statistics (bls.gov), O*Net (onenetonline.org) and the THEC supply/demand analyses (http://tennessee.gov/thec/Divisions/AcademicAffairs/academic_programs/THEC%20supply%0and%20demand%20Final.pdf), as appropriate, for the degree or certificate field.

A brief survey of the need and demand for the program should be conducted in order to inform development. Summarize the results.

Letters of support from industry stating that the proposed credential is recognized and would add value to their workforce should be included. Address sustainability of the program both in the short term (1-2 years) and longer term (5+ years) beyond the anticipated date of the

first program graduates per THEC policy.

A Bachelor of Science degree in engineering physics prepares one for a number of different engineering-oriented careers in manufacturing and industry. According to the Princeton Review, by combining engineering, physics, and math courses into an engineering physics curriculum, graduates have a wide array of job opportunities[1]. Letters of support from local industry have been received from employers such as Hankook, Ingersoll Rand-Trane, the Clarksville Department of Electricity and others and from the nonprofit workforce development corporation Workforce Essentials Inc. (Appendix E). In addition, a letter of support was received from the Clarksville Montgomery County Economic Development Council which has been very active in the recruitment and support of local industry. A brief survey of a representative subset of the local and regional engineering needs was undertaken, the results of which are provided in Appendix C. The companies surveyed indicated a total of 309 local and 2000 regional engineering positions. All of the companies surveyed indicated that APSU engineering physics graduates would be qualified for these positions. In addition, 100% of the companies surveyed indicated a willingness to take APSU engineering physics students as interns. Each of these organizations recognizes the significance of an engineering physics degree being offered by APSU and its impact on the local workforce.

According to the Bureau of Labor Statics in an article titled "Clusters, pathways and BLS: Connecting Career Information" from March 2015, there are approximately 2 million jobs in the STEM cluster of occupations[2]. Of the projected job openings between the years 2013 and 2022, more than half of them will be in the engineering and technology pathway. Mechanical and industrial engineers will have the most openings. The number of mechanical engineering openings is projected to be approximately 100,000 while the number of industrial engineering openings will be approximately 75,000 nationally. Engineering managers with 61,000 openings and electrical engineers with 44,000 openings are next on the list respectively. Completing the top five is environmental scientists and specialists with 40,000 openings between 2012 and 2022.

Because a degree in engineering physics provides a broad education in engineering and science, graduates will be well qualified to work as industrial, mechanical, chemical, or electrical engineers as well as many other unique engineering titles. Often positions with titles such as industrial engineer, process engineer, or manufacturing engineer are filled by people with degrees in other closely related engineering disciplines. A recent job search on the website www.jobs4tn.gov yield such an example. Job # 6490 – Quality Engineer posted on May 27, 2015 for an unspecified employer in Clarksville TN, is seeking an engineer to act as a technical resource for manufacturing by providing quality expertise to assist with the development of quality control plans and systems. A bachelor's degree is required with a preference for engineering. Another example was also found on the website www.jobs4tn.gov for a support

[1] http://www.princetonreview.com, Princeton Review, College Majors – Engineering Physics, Retrieved Sept 2015.

[2] http://www.bls.gov/careeroutlook/2015/article/career-clusters.htm#Science, technology, engineering, and mathematics, Bureau of Labor and Statics, Career Outlook, "Clusters, Pathways, and BLS: Connecting Career Information, Elka Torpey, March 2015.

engineer in Clarksville TN. Job #21305285 for Airgas, Inc was posted on August 24, 2015. The job requires an engineer to be responsible for the startup, operator training, troubleshooting operations, and minor instrument and electrical work at cryogenic air separations plants. A Bachelor of Science degree in either mechanical engineering, electrical engineering, chemical engineering, or equivalent education is required.

D. IMPACT:

Describe the articulation and transfer avenues projected for the proposed program in compliance with PC§ 49-7-202. Describe the anticipated effect the program will have on existing associated degree programs or concentrations within the institution as well as other institutions within the system.

This program will accept AS graduates from any of the engineering-oriented Tennessee Transfer Pathways. There are no other engineering physics programs at any public institutions in the State Tennessee. One private institution, Belmont University, has an undergraduate degree in Engineering Physics. It is not anticipated that the proposed program will have a significant affect on the other 4-year state institutions of higher learning. The physics program at APSU has approximately 3-5 students at any given time that have expressed an interest in majoring in an engineering discipline rather than physics. It is anticipated that they will choose engineering physics instead, thus reducing the annual number of physics major completions (currently a 5-year average of 9.5) by approximately 1 per year; however, we estimate that the number of graduates from the physics and engineering physics programs together will approach 20 annually. The number of graduates from the physics and engineering physics programs will be considered together for performance funding.

E. DIVERSITY STATEMENT:

Provide a statement in keeping with the TBR approved campus Diversity Plan of how the program will enhance diversity.

A barrier to female and minority students entering graduate programs in non-health-related STEM areas is the perception that they will be unable to obtain a job. The Engineering Physics BS is designed to specifically prepare students for the workplace. We expect that these factors will help us to attract qualified female and minority students.

F. PLANS FOR ACCREDITATION:

(Identify the source and **projected date** of Professional accreditation if applicable; if the proposed program requires a SACSCOC Substantive Change Review and, if so, describe the scope of the substantive change. Information on actions constituting substantive change can be found at the following website: http://www.sacscoc.org/substantivechange.asp . If there are no plans to seek specialized accreditation, please provide reasons.)

The Engineering Accrediting Commission of the Accrediting Board for Engineering and Technology (ABET) accredits Engineering Physics programs through the American Society of Engineering Education (ASEE). Students graduating from an accredited program are qualified to sit for the Fundamentals of Engineering exam in the State of Tennessee (the first step to earning a Professional Engineering License). ABET accreditation is an 18-month process that requires that the program have at least one graduate prior to organizing an accreditation visit. When accreditation is granted, it can be applied retroactively for one year (i.e. the year of the first graduating class). Thus the target for an accreditation visit will be fall of 2021. A brief timeline is as follows – spring 2017 program inception; spring/summer 2017 advertising and recruiting; fall 2017 first class enters; May 2021 first graduating class; 2021-2022 academic year accreditation visit with a decision rendered by August of 2022.

G. IDENTIFY ANY LOW PRODUCING PROGRAMS AT YOUR INSTITUTION(S) BASED ON THEC ANNUAL PROGRAM PRODUCTIVITY REPORT(S):

Engineering Technology, AAS
Interdisciplinary Studies, BS
Philosophy, BS
Physics, BS
Professional Studies, BS
Advanced Studies in Teaching & Learning, MED

H. LIST ALL NEWLY APPROVED AND ESTABLISHED PROGRAMS INCLUDING CERTIFICATES OFFERED THROUGH ANY PUBLIC INSTITUTION IN TENNESSEE INCLUDING THE TENNESSEE COLLEGES OF TECHNOLOGY AT THE SAME LEVEL (WITHIN THE SAME OR SIMILAR CIP [HTTP://NCES.ED.GOV/IPEDS/CIPCODE/SEARCHRESULTS.ASPX?Y=55&CA=2] AND SOC CLASSIFICATIONS [HTTP://WWW.BLS.GOV/OES/CURRENT/OES_STRU.HTM]). A CIP TO SOC AND SOC TO CIP CROSSWALK IS AVAILABLE AT HTTP://NCES.ED.GOV/IPEDS/CIPCODE/RESOURCES.ASPX?Y=55. THE THEC WEB-BASED INVENTORY AND PROGRAM PRODUCTIVITY ANALYSIS FOR STATE INSTITUTIONS ARE AVAILABLE AT: HTTP://TENNESSEE.GOV/THEC/DIVISIONS/ACADEMICAFFAIRS/AA_MAIN.HTML.

None

I. IDENTIFY ANY LOW PRODUCING PROGRAMS IN THE SAME OR SIMILAR CIP/SOC CODES IN ANY PUBLIC INSTITUTION IN TENNESSEE BASED ON THE CURRENT THEC LISTING OF PROGRAMS FAILING TO MEET

ENROLLMENT OR GRADUATION BENCHMARKS AS POSTED ON THE THEC WEBSITE BASED ON THEC ANNUAL PROGRAM PRODUCTIVITY REPORT(S) AT THE TIME OF SUBMISSION OF THE LETTER OF APPLICATION:

None

SECTION II: ARTICULATIONS, COLLABORATIONS AND DUPLICATIONS INCLUDING INTERDISCIPLINARY PROPOSALS

A. If a similar program to the one proposed already exists at other institution(s) in the state, describe any opportunities for collaboration with other institutions that have been or will be pursued.

No other public institutions within the State of Tennessee currently offer a degree of any kind in engineering physics. Belmont University does offer an Engineering Physics degree, though it is not currently ABET accredited. Due to the large cost differences in APSU and Belmont, we are not currently anticipating any active collaboration.

B. For any proposed articulated or collaborative program(s):
   a. Which institution(s) will have a degree-granting authority?
   b. Which institution(s) will have the authority for faculty hiring, course assignment, systematic evaluation, and reappointment decisions?
   c. What agreements exist to ensure that faculty from all participating institutions will be involved in decisions about the curriculum, admissions standards, exit requirements?
   d. Which institution(s) will be responsible for academic and student-support services, e.g., registration, advising, library, academic assistance, financial aid, etc.?
   e. What agreements exist to ensure that the academic calendars of the participating institutions have been aligned as needed?
   f. In addition to the information provided by each participating institution regarding Financial Projections, please address the following items:
      - How will tuition rates be determined if they differ among the institutions?
      - Has a formal agreement been developed regarding cost-sharing policies? If yes, please include it as part of the Letter of Application. If no, please summarize the current understanding between all parties and the plans for developing a formal agreement.
      - What arrangements, if any, have been made for exchange of money between participating institutions?
      - Provide Financial Projections (using the THEC Financial Projection form) for each institution involved PLUS an aggregate form representing all financial projections for proposed programs involving multiple institutions.

- If one institution wishes to discontinue the program, what agreements exist for terminating the offering?
- Specify any other issues and how they are proposed to be addressed.

N/A

B. If the proposed program is currently available through the Academic Common Market (ACM) (http://www.sreb.org/page/1304/academic_common_market.html), explain why the need for the requested program/course development cannot be better met through collaboration or in the case of universities, the ACM.

This Program is not available through the Academic Common Market. Due to its unique nature, we would be interested in offering it through the Academic Common Market ourselves, should it be approved.

C. If a 100% online program is being proposed:

1. If the institution(s) is (are) authorized to offer the same program as a ground program, will the existing program be maintained in addition to on-line delivery?
   Review the State Authorization Reciprocity Agreement (http://www.wiche.edu/sara) for additional requirements if the program will be advertised as open to residents outside of Tennessee.

2. Specify whether
   [ ] ROCC (Regents Online Campus Collaborative)* credit
   [ ] ROCE (Regents Online Continuing Education & Workforce Development)*noncredit
   [ ] Other Institutional Collaborative or Industry-Institutional Partnerships
   Length of Agreement:
   Open-ended or limited (provide start and end dates)

3. Check all institutions and organizations that will participate in the collaborative:
   Universities: ( ) APSU ( ) ETSU ( ) MTSU ( ) TSU ( ) TTU ( ) UOM
   Community Colleges: ( ) CLSCC ( ) COSCC ( ) CSTCC ( ) DSCC ( ) JSCC
   ( ) MSCC ( ) NSCC ( ) NSTCC ( ) PSTCC ( ) RSCC
   ( ) STCC ( ) VSCC ( ) WSCC
4. List any other support agencies including clinical affiliations, government, health and Business that will participate and provide evidence in portfolio per THEC 1.1.20K:

5. List any international collaborations which will be pursued and provide documentation of interest by the international partner institution(s), if available.

This Program is not 100% online.

***For Doctoral Programs*, provide letters from presidents of Tennessee institutions offering same or similar CIP doctoral programs within the same broad geographic service area certifying that the doctoral program will not be perceived as duplicative.**

***For Technical Certificates*, provide documentation of notification to Tennessee Technology Centers within the service area.**

SECTION III: PROGRAM STRUCTURE

A. Residency requirements (in keeping with SACSCOC requirements):

A minimum of 30 semester hours from APSU.

B. Macromajors or Academic Foci:

ACADEMIC FOCI	Check all applicable
Arts	
Business	
Education	
Health Sciences	
Humanities	
Social Sciences	
STEM	X
Applied Science and Technology	
General Education	

C. **CURRICULUM:** The proposed program requires completion of _120_Semester Credit Hours (SCH) distributed as follows (IF more than 120 SCH provide justification per THEC 1.0.60A):

The curriculum outlined below is modeled on that of Murray State University in Murray, Kentucky (see Appendix B for a crosswalk between the proposed program and Murray State's program). Murray State is similar to APSU in that it is a comprehensive regional state institution, only has engineering technology and engineering physics programs (i.e. no traditional engineering degrees), and those programs are ABET accredited. The Student Learning Outcomes required by ABET are attached as Appendix D; a mapping of these SLOs to the APSU Engineering Physics curriculum is also included in Appendix D.

1. General Education (Undergraduate only):

Rubric/Number	Course Title	SCH
APSU 1000	Freshman Experience	1

ECON 2010	Principals of Macroeconomics	3
MATH 1910	Calculus & Analytic Geometry	4
PHYS 2110/2111	University Physics I	4
PHYS 2120/2121	University Physics II	4
Remainder of general education core		27

2. Major Field Core (courses required of ALL students in a program)

Rubric/Number	Course Title	SCH
CHEM 1110/1111	General Chemistry I (w/ Lab)	4
CSCI 2000	Programming & Data Struct	4
MATH 1920	Calculus & Analytic Geometry	4
MATH 2110	Calculus	4
MATH 3120	Differential Equations	3
ENGR 1000	Introduction to Engineering	1
ENGR 2110	Statics	3
ENGR 2120	Particles & Rigid Bodies	3
ENGR/PHYS 3005	Theoretical Methods	4
ENGR 3020	Engineering Thermodynamics	3
ENGR/PHYS 3030	Electricity & Magnetism	3
ENGR 3050/3051	Introductory Circuits (w/ Lab)	4
ENGR/PHYS 3550/3551	Experimental Methods (w/ Lab)	4
ENGR/PHYS 4000/4001	Computational Methods (w/lab)	4
ENGR 4510	Design I	3
ENGR 4520	Design II	3
PHYS 3100/3101	Optics (with Lab)	4
PHYS 3700	Modern Physics	3

3. Concentrations(s): (Identify and list courses for each concentration separately; undergraduate concentrations must be at least 15 SCH; graduate concentrations at least 12 SCH.)

Rubric/Number	Course Title	SCH
NONE		

4. Electives: (May be guided or general electives; Include descriptions, prerequisites, or restrictions that may apply.)

Major electives, 13 hours (10 hours must be ENGR) chosen from the following list:

Rubric/Number, Course Title, SCH

CSCI 4780, High Performance Computing, 3
Prerequisite of PHYS 4000 w/ grade of C or higher

ENGR/PHYS 3060/3061, Advanced Circuits (w/ Lab), 4
Prerequisite of ENGR/PHYS 3050 w/ grade of C or higher

ENGR/PHYS 3600, Materials Science, 3
Prerequisite of PHYS 2120 and ENGR/PHYS 3550 w/ grades of C or higher

ENGR/PHYS 3650, Fluid Dynamics, 3
Prerequisites of PHYS 2120, MATH 3120, and ENGR/PHYS 3005 w/ grades of C or higher

ENGR/PHYS 3740, Thermal and Statistical Physics, 3
Prerequisite of ENGR/PHYS 3005 w/ grade of C or higher

ENGR/PHYS 3900/3901, Nuclear & Radiation Physics, 3
Prerequisite of ENGR/PHYS 3005 and ENGR/PHYS 3550 w/ grades of C or higher

ENGR/PHYS 4110, Cooperative Educational Experience, 1-6
Prerequisite: approval of advisor and prior arrangement with employer

ENGR/PHYS 4150, Special Topics, 1-3
Prerequisite: six hours of upper-division ENGR or PHYS w/ grades of C or higher and permission of instructor.

ENGR/PHYS 4151, Research Experience, 1-3
Prerequisite: six hours of upper-division ENGR or PHYS w/ grades of C or higher and permission of instructor.

ENGR/PHYS 4200/4201, Intro. to Solid State (w/ Lab), 4
Prerequisite of CHEM 1120, PHYS 3800 w/ grades of C or higher

ENGR 4300, Signal Processing, 3
Prerequisite of ENGR/PHYS 3005 w/ grade of C or higher

ENGR/PHYS 4830, Theoretical Electricity and Magnetism, 3
Prerequisite of ENGR/PHYS 3030 w/ grade of C or higher

ENGR/PHYS 4950, Independent Study, 1-3
Prerequisite: six hours of upper-division ENGR or PHYS w/ grades of C or higher and permission of instructor.

PHYS 3010, Intermediate Mechanics, 3
Prerequisite of MATH 3120 and ENGR/PHYS 3005 with grades of C or higher

PHYS 3701, Advanced Lab, 2
Prerequisite of ENGR/PHYS 3550/3551 with grade of C or higher

PHYS 3800, Quantum Mechanics, 3
Prerequisite of MATH 3120 and ENGR/PHYS 3005 with grades of C or higher

General electives, 3 hours.

5. Other credits (If applicable, describe requirements for thesis, dissertation, clinical experience, internship, portfolio or other capstone experience.)
   Rubric/Number Course Title SCH
   NONE

6. Number of NEW courses (include newly developed yet never taught courses):
   __3___ with __9__ SCH

   ENGR 3020, Engineering Thermodynamics, 3
   ENGR 4510, Design I, 3
   ENGR 4520, Design II, 3

In addition, two courses which have already been developed and taught as Special Topics on an alternating year basis will be given permanent course numbers:
ENGR/PHYS 3600, Materials Science, 3
ENGR 3650, Fluid Dynamics, 3

7. Number of SCH anticipated from transfer, articulation, PLA and other sources per THEC 1.06.0) (specify source): 60 (transfer/articulation/TTP)

8. For Universities only: Indicate all Tennessee Transfer Pathways (TTP) acceptable for entry into the proposed program per THEC 1.0.60:

TTP	Yes	No
Accounting		
Agriculture-AGBUS		
Agriculture-Animal Science		
Agriculture-Plant and Soil Science		
Art (Studio)		
Biology		
Business Administration		
Chemistry		
Civil Engineering	X	
Computer Science		
Criminal Justice		
Economics-Business		
Economics-Liberal Arts		
Electrical Engineering	X	

English		
Exercise Science		
Foreign Language		
Geography		
History		
Information Systems		
Kinesiology		
Mathematics		
Mass Communication		
Mechanical Engineering	X	
Music		
Physics	X	
Political Science		
Pre-Health (Pre-Dental, Vet, Med, OPT, Pharm)		
PreK-12		
Pre-Nursing		
Pre-Occupational Therapy		
Pre-Physical Therapy		
Psychology		
Social Work		
Sociology		
Speech Communication		
Theatre Arts		

SECTION IV: STUDENT ENROLLMENT PROJECTIONS

Estimate the unduplicated annual full-time, part-time and FTE enrollments and number of graduates for the first five years of program operation. Include anticipated international enrollment if used as a primary recruiting tool. If the proposed program involves more than one institution, provide aggregated as well as disaggregated data for all institutions.

Complete a minimum of 3 years projection for certificates and associate degrees, 5 years projection for undergraduate and masters degrees and 7 years for doctoral degrees.

Year (specify Term & AY start)	Full-Time Headcount	Part-time Headcount	International Headcount Anticipated	Total Year Headcount	FTE	Graduates
Fall 2017	15	1	0	16	15.5	0
Fall 2018	28	2	2	30	29	0

Fall 2019	45	3	4	48	46.5	0
Fall 2020	57	3	6	60	58.5	8
Fall 2021	61	4	8	65	63	10

A. Explain the basic assumptions including attrition rate used in estimating the size of the proposed program by benchmark against other comparable programs in the discipline and institution to establish a baseline for your projected enrollments. Assumptions should be related to the evidence of need and to other supportive data.

Murray State's engineering physics program and the existing APSU physics program are being used as benchmarks for student enrollment. Murray State's current 3-year average FTE enrollment is 89 and their current 3-year average number of graduates 12.3 per year. The existing APSU physics program has an average of 20 incoming majors each fall; the addition of engineering concepts will make the engineering physics program more popular, so we conservatively estimate a steady state of 25 full time incoming majors each fall for this program (ramping up over three years). The part-time headcount as a percentage of full-time headcount is is estimated to be 6% (using the APSU physics program as a benchmark).

The APSU Physics program is being used as a benchmark for attrition rates – those rates are based on current DFW rates for benchmark classes in the freshman and sophomore years that are common to both the proposed program and the existing physics program – in particular, PHYS 2110 with an attrition rate of 30%, PHYS 2120 with an attrition rate of 15%, and ENGR/PHYS 3550 with an attrition rate of 6%. Very little attrition is expected in the junior and senior years based on that observed in the existing physics program (attrition rates of 1-2% are typical in upper-level physics courses).

As mentioned above, the physics program at APSU has approximately 3-5 students at any given time that are interested in engineering applications. Those students will likely choose engineering physics instead, thus reducing the annual number of physics major completions (currently a 5-year average of 9.5) by approximately 1 per year; however, we estimate that the number of graduates from the physics and engineering physics programs together will approach 20 annually. The number of graduates from the physics and engineering physics programs will be considered together for performance funding.

B. Describe the recruitment plan for both domestic and international enrollment if anticipated. Please note: Programs may not be advertised prior to final approval through the THEC commission meeting per the THEC Policy 1.0.60.B

We are requesting program approval by Spring 2017 so that we may use the spring and summer of 2017 to advertise and recruit for the first incoming class during the fall of 2017.

The program is designed to serve the workforce of the local region. To connect with that group, APSU's Public Relations will undergo an advertising campaign via print, online, and television.

In addition, the University has committed to increasing both its out-of-state and international student populations. APSU has contracted Royall & Company to assist with out-of-state recruitment and with several different international recruiting agencies from different parts of the globe to assist with this effort. Many of these students are looking for engineering-related majors.

The Department itself recruits heavily from the Governor's School for Computational Physics (GSCP). The GSCP is a State of Tennessee Department of Education-funded program for high-achieving K-12 students. It has allowed the Department to attract a number of high-achieving students from Tennessee high schools. Historically, 15% of the program's attendees ultimately choose APSU to obtain a degree in physics. However, many GSCP scholars are interested in engineering-related fields. A survey of attendees from 2008 to 2013 shows that 43% of GSCP participants chose to attend an out-of-state institution of higher education, many majoring in an engineering discipline. Currently no institution in the State of Tennessee has an engineering physics program. An engineering physics program will allow us to better recruit those students directly as well as other students from the high-schools they represent.

SECTION V: RESOURCES

A. Provide the most recent accreditation report/audits for any existing offerings within the same division/department/college which speaks to need or resource allocations.

None speak to resource allocations.

B. List any requirement for needed resources support along with any industry contributions

None

C. Cite the THEC annual degree productivity data where funds may be redirected from closed low-producing programs (THEC A1:1.2OP) of relevant.

The Chemical Engineering Technology AAS program (housed within the Department of Physics & Astronomy) has been inactivated as of Fall 2015, and it will be terminated within the academic year. Resources allocated to that program will be reallocated as necessary.

D. Faculty: Describe the strengths of the existing faculty in credentials and available FTE (state number of full- and part-time faculty). Estimate additional FTE (specify number of full-time and part-time faculty) needed to support the program. If faculty are drawn from multiple departments or are committed to teach in multiple programs, identify which faculty and the percentage of their time dedicated to each program.

As of the fall 2016 semester (after termination of the ChET program is complete), the Department of Physics & Astronomy will consist of 10 tenured or tenure-track faculty and 5

adjunct faculty for a total of 12.67 FTE. Currently, the Department has available capacity in many of the courses that will be common between the physics and engineering physics programs; consequently, faculty will not be moved off of their usual assignments, they will simply serve engineering physics students in their current classes. In addition to two of the faculty having Ph.D.s in engineering disciplines and professional engineering licensure, several of the other faculty members have backgrounds and skills consistent with those needed in engineering disciplines. Faculty who will be teaching courses in direct support of the engineering physics program include:

- Roman Holovchak, Ph.D. in Optical & Laser Physics (materials)
- Alex King, Ph.D. in Theoretical Physics (computational)
- Andriy Kovalskiy, Ph.D. in Solid State Physics (materials)
- Chester Little, Ph.D. in Chemical Engineering, Licensed Professional Engineer in TX
- Russ Longhurst, Ph.D. in Mechanical Engineering, Licensed Professional Engineer in TN and KY
- Justin Oelgeotz, Ph.D. in Chemical Physics (computational)
- Pei Xiong-Skiba, Ph.D. in Surface Physics (materials)

All courses that faculty can contribute to are listed below. Courses typically covered by that faculty member (used in calculation of % time) are denoted with an asterisk.

Faculty member	% Time	Courses
Roman Holovchak	37	PHYS 2110/2111 University Physics I* PHYS 2120/2121 University Physics II ENGR 3050/3051 Introductory Circuits ENGR 3060/3061 Advanced Circuits ENGR/PHYS 3030 Electricity & Magnetism* PHYS 3100/3101 Optics* PHYS 3700 Modern Physics* PHYS 3701 Advanced Lab* ENGR/PHYS 4830 Theoretical Electricity & Magnetism
Alex King	43	PHYS 2110/2111 University Physics I* PHYS 2120/2121 University Physics II* PHYS 3800 Quantum Mechanics* ENGR/PHYS 3900/3901 Nuclear & Radiation Physics
Andriy Kovalskiy	37	ENGR 3050/3051 Introductory Circuits* ENGR 3060/3061 Advanced Circuits ENGR/PHYS 3550/3551 Experimental Methods* ENGR/PHYS 3600 Materials Science* PHYS 3701 Advanced Lab*
Chester Little	13	ENGR 1000 Introduction to Engineering* ENGR 2110 Statics* ENGR 2120 Dynamics* ENGR/PHYS 3650 Fluid Dynamics ENGR/PHYS 4110 Cooperative Experience ENGR 4500 Design I ENGR 4600 Design II
Russ Longhurst	40	ENGR 1000 Introduction to Engineering

		ENGR 2110 Statics ENGR 2120 Dynamics PHYS 2110/2111 University Physics I* PHYS 2120/2121 University Physics II ENGR 3650 Fluid Dynamics* ENGR/PHYS 4110 Cooperative Experience ENGR 4510 Design I* ENGR 4520 Design II* PHYS 3701 Advanced Lab*
Justin Oelgeotz	47	ENGR/PHYS 3005 Advanced Engineering Mathematics* ENGR 3020 Engineering Thermodynamics* PHYS 3700 Modern Physics* ENGR/PHYS 4000/4001 Computational Methods* CSCI 4780 High Performance Computing ENGR/PHYS 4300 Signal Processing ENGR/PHYS 3740 Thermal & Statistical Physics*
Pei Xiong-Skiba	17	ENGR 2110 Statics ENGR 2120 Dynamics PHYS 3010 Intermediate Mechanics* ENGR/PHYS 4200/4201 Introduction to Solid State*

It is expected that program growth will necessitate a new tenure-track faculty line in year 3 dedicated full-time to the engineering physics program (1 FTE).

E. Administrative/organizational structure and personnel

College of Science and Mathematics (Dean, 1 Associate Dean, 1 Assistant Dean)

- Department of Agriculture (6 tenured or tenure-track faculty)
    - General Agriculture, BS
        - Concentration in Agribusiness
        - Concentration in Agricommunications
        - Concentration in Agriscience
        - Concentration in Pre-Veterinary Medicine
        - Concentration in Sustainable Development
- Department of Allied Health Sciences (8 tenured or tenure-track faculty)
    - Medical Laboratory Science, BSMLS
        - Concentration in Pre-professional
    - Radiologic Technology, BSRT
        - Concentration in Nuclear Medicine
        - Concentration in Radiation Therapy
        - Concentration in Radiography
        - Concentration in Sonography
- Department of Biology (21 tenured or tenure-track faculty)
    - Biology, BS
    - Biology, MS

- Department of Chemistry (10 tenured or tenure-track faculty)
    - Chemistry, BS
        - Concentration in Biochemistry
        - Concentration in Forensic Biochemistry
        - Concentration in Forensic Chemistry
- Department of Computer Science and Information Systems (11 tenured or tenure-track faculty)
    - Computer Science & Information Systems, BS
        - Concentration in Computer Science
        - Concentration in Database Administration
        - Concentration in Information Systems
        - Concentration in Internet & Web Technology
        - Concentration in Networking
    - Professional Science Masters, PSM
        - Concentration in Data Management and Analysis
        - Concentration in Predictive Analytics
- Department of Geosciences (9 tenured or tenure-track faculty)
    - Geosciences, BS
        - Concentration in Environmental Hazards
        - Concentration in Geographic Information Analysis
        - Concentration in Geology
        - Concentration in Global Environment & Development
- Department of Mathematics (22 tenured or tenure-track faculty)
    - Mathematics, BS
- Department of Physics & Astronomy (10 tenured or tenure-track faculty)
    - Physics, BS
    - **Engineering Physics, BSE (this proposal)**

F. Clerical and Support Personnel, available and needed

The department includes one full-time Laboratory Manager and a full-time/part-time Administrative Assistant 2. We judge these support personnel to be adequate to support the engineering physics program in addition to the existing physics program.

G. Describe existing library and information technology resources to be available to support the projected program.

The APSU library currently subscribes to a number of online article databases that include physics and engineering content such as Wiley Online Library, Science Direct, and Springer Online. Some funding to assist with building the library's book collection in this area has been included in the financial projections. The University also has a number of open computer labs, as well as campus licenses for commonly used physics and engineering software such as MATLAB, Mathematica, LabView, and AutoCAD.

H. Describe Student Advisement Support. If the proposed program is part of a collaboration or articulation agreement, how will student advising be coordinated by all participating institutions to facilitate progression and completion across all participating institutions.

Student advisement will be handled by the faculty of the Department of Physics & Astronomy. In addition, the Office of Career Services has expertise in advising students near graduation on securing a job as well as contacts for internship positions.

I. Describe existing and anticipated instructional facilities & instructional equipment to support the proposed program.

The Department of Physics & Astronomy is housed in the Sundquist Science Complex which includes three lower-level and three upper-level classrooms dedicated to physics as well as stocked equipment rooms for lower and upper division classes. There are also a number of research labs with equipment such as: a friction stir welding apparatus, thermal evaporator, high-temperature furnace, vacuum chambers, an optical parametric oscillator, a parallel computing cluster, 3D printers, etc. In addition, the department has a machine shop and there is laboratory space available in the Hemlock Semiconductor Building.

SECTION VI: FINANCIAL PROJECTIONS

A. Use the THEC Financial Projections Form (FP) to provide revenues and expenditures for the proposed program. If the proposed program involved more than one institution, provide a separate excel FP Form for each institution as well as an aggregate for the combined financial projections. **Submit as an Appendix the THEC Financial Projection Form.**

One-time Expenditures:

- $50,000 in each of years 2, 3, and 4 for purchase of equipment to support our workforce development goals. Purchases begin in year 2 so they may be incorporated into upper-division coursework for the first cohort in year 3.
- $5000 in year 4 for an external consultant and to cover required ABET readiness review fees prior to accreditation.
- $15,000 in year 5 to cover costs associated with the ABET on-site review.

Recurring Expenses

- Salary and benefits for one faculty member starting in year 3 in support of the first cohort reaching upper-level coursework.
- $1000/year in travel/professional development beginning in year 3 for said faculty line.
- $5000/year in support of equipment repair and replacement not covered by student laboratory fees.
- $1500/year in printing/advertising costs.

Revenue – Revenue from tuition and fees is expected to be approximately $100,000 in the first year and increase by approximately $150,000/year through year 5 stabilizing at approximately $700,000/year. Revenues are projected to be sufficient to cover all necessary expenses for the program.

B. If reallocation is used, provide a rationale and source for reallocation of budgeted funds. Cite THEC annual degree productivity data where funds may be redirected from closed/ low producing programs (A1:1.2OP), if relevant.

Reallocation is not necessary.

C. List for each institution involved:
    1. All active Letters of Application
    2. Approved programs not meeting benchmarks
    3. Low producing programs at all levels
    4. Programs terminated within the last 12 months

1. No current active Letters of Application.
2. Chemical Engineering Technology AAS (currently inactivated)
   Engineering Technology MS
3. Engineering Technology AAS
   Professional Studies BS
   Philosophy BS
   Physics BS
   Interdisciplinary Studies MS
   Advanced Studies in Teaching & Learning MED
4. None.

Appendix A: Engineering Physics BSE/Physics BS comparison

APSU Engineering Physics BSE		**APSU Physics BS**	
Required Courses	**Credit Hours**	**Required Courses**	**Credit Hours**
ENGR 1000 Introduction to Engineering	1		
ENGR 2110 Statics	3		
ENGR 2120 Dynamics	3		
ENGR/PHYS 3005 Theoretical Methods	4	ENGR/PHYS 3005 Theoretical Methods	4
ENGR 3020 Engineering Thermodynamics	3		
ENGR 3050/3051 Circuits I (w/lab)	4		
ENGR/PHYS 3550/3551 Experimental Methods (w/ lab)	4	ENGR/PHYS 3550/3551 Experimental Methods (w/ lab)	4
ENGR 4510 Engineering Design I	3		
ENGR 4520 Engineering Design II	3		
PHYS 2110/2011 University Physics I (w/ lab)	4	PHYS 2110/2011 University Physics I (w/ lab)	4
PHYS 2120/2121 University Physics II (w/lab)	4	PHYS 2120/2121 University Physics II (w/lab)	4
ENGR/PHYS 3030 Electricity & Magnetism	3	ENGR/PHYS 3030 Electricity & Magnetism	3
PHYS 3100/3101 Optics (w/lab)	4		
PHYS 3700 Modern Physics	3	PHYS 3700 Modern Physics	3
ENGR/PHYS 4000/4001 Computational Methods (w/ lab)	4	ENGR/PHYS 4000/4001 Computational Methods (w/ lab)	4
MATH 1910 Calculus & Analytic Geometry I	4	MATH 1910 Calculus & Analytic Geometry I	4
MATH 1920 Calculus & Analytic Geometry II	4	MATH 1920 Calculus & Analytic Geometry II	4
MATH 2110 Calculus	4	MATH 2110 Calculus	4
MATH 3120 Differential Equations I	3	MATH 3120 Differential Equations I	3
CHEM 1110/1111 General Chemistry I (w/ lab)	4		
CSCI 2000 Programming & Data Structures	4	CSCI 2000 Programming & Data Structures	4
ECON 2010 Principles of Macroeconomics	3		
Required Total	**76**		
Electives (13 hours, 10 must be ENGR)	**13**		
ENGR 3060/3061 Circuits II	4		
ENGR/PHYS 3600 Materials Science	3		
ENGR 3650 Fluid Mechanics	3		
ENGR/PHYS 3740 Thermal and Statistical Physics	3		
ENGR/PHYS 3900/3901 Nuclear and Radiation Physics	4		

ENGR/PHYS 4110 Cooperative Educational Experience	1-6		
ENGR/PHYS 4150 Special Topics	1-3		
ENGR/PHYS 4151 Research	1-3		
ENGR/PHYS 4200/4201 Solid State Physics	4		
ENGR 4300 Signal Processing	3		
ENGR/PHYS 4830 Theoretical Electricity & Magnetism	3		
ENGR/PHYS 4950 Independent Study	1-3		
PHYS 3010 Intermediate Mechanics	3	PHYS 3010 Intermediate Mechanics	3
PHYS 3701 Advanced Lab	2	PHYS 3701 Advanced Lab	2
PHYS 3800 Quantum Mechanics	3	PHYS 3800 Quantum Mechanics	3
CSCI 4780 High Performance Computing	3		
		PHYS 3740 Intro to Relativity	1
		ENGL 2700 Science Writing	3
		Required Total	**57**
		Science Electives (any level)	**8**
		Upper Division Major Electives	**10**
Core Requirements not included above	**27**	**Core Requirements not included above**	**30**
Freshman Experience	**1**	**Freshman Experience**	**1**
Free Electives	**3**	**Free Electives**	**14**
Degree Total	**120**	**Degree Total**	**120**
The Engineering Physics BSE and the Physics BS will differ by a minimum of 20 hours and a maximum of 40 hours depending on electives chosen (not including core and free electives).			

Appendix B: APSU-Murray State Engineering Physics Curriculum Crosswalk

APSU Engineering Physics	**Murray State Engineering Physics**
Required Courses	**Required Courses (unless otherwise noted)**
No equivalent course	EGR 099 Transitions
ENGR 1000 Introduction to Engineering	EGR 101 Introduction to Engineering
ENGR 2110 Statics	EGR 259 Statics
ENGR 2120 Dynamics	EGR 330 Dynamics
ENGR/PHYS 3005 Theoretical Methods	Mathematics Depth Elective
ENGR 3020 Engineering Thermodynamics	EGR 240 Thermodynamics I
ENGR/PHYS 3030 Electricity & Magnetism	EGR/PHY 460 Electricity and Magnetism I
ENGR 3050/3051 Circuits I (w/lab)	EGR 264 Linear Circuits I
ENGR/PHYS 3550/3551 Experimental Methods (w/ lab)	EGR 390 Engineering Measurements
ENGR/PHYS 4000/4001 Computational Methods (w/ lab)	EGR 376 Computational Analysis in Engineering (elective)
ENGR 4510 Engineering Design I	EGR 498 Senior Engineering Design I
ENGR 4520 Engineering Design II	EGR 499 Senior Engineering Design II
PHYS 2110/2011 University Physics I (w/ lab)	PHY 235 Mechanics, Heat and Wave Motion
	PHY 236 Mechanics, Heat and Wave Motion Laboratory
PHYS 2120/2121 University Physics II (w/lab)	PHY 255 Electricity, Magnetism and Light
	PHY 256 Electricity, Magnetism and Light Laboratory
PHYS 3100/3101 Optics (w/lab)	PHY 470 Optics
PHYS 3700 Modern Physics	PHY 370 Introduction to Modern Physics
MATH 1910 Calculus & Analytic Geometry I	MAT 250 Calculus and Analytic Geometry I
MATH 1920 Calculus & Analytic Geometry II	MAT 308 Calculus and Analytic Geometry II
MATH 2110 Calculus	MAT 309 Calculus and Analytic Geometry III
MATH 3120 Differential Equations I	MAT 338 Ordinary Differential Equations
CHEM 1110/1111 General Chemistry I (w/ lab)	CHE 201 General College Chemistry
CSCI 2000 Programming & Data Structures	EGR 140 Introduction to Computing Applications in Science and Engineering
ECON 2010 Principles of Macroeconomics	ECO 231 Principles of Microeconomics
Electives (13 hours, 10 must be ENGR)	**Electives (unless otherwise noted)**
ENGR 3060/3061 Circuits II	EGR 365 Linear Circuits II
ENGR/PHYS 3600 Materials Science	EGR 375 Materials Science (required)
ENGR 3650 Fluid Mechanics	EGR 344 Fluid Mechanics
ENGR/PHYS 3740 Thermal and Statistical Physics	EGR 342 Thermodynamics II
ENGR/PHYS 3900/3901 Nuclear and Radiation Physics	No equivalent course
ENGR/PHYS 4110 Cooperative Educational Experience	EGR 488/489 Cooperative Education/Internship

ENGR/PHYS 4150 Special Topics	EGR/PHY 515 Special Topics
ENGR/PHYS 4151 Research	EGR/PHY 599 Senior Research
ENGR/PHYS 4200/4201 Solid State Physics	PHY 575 Solid State Physics
ENGR 4300 Signal Processing	EGR 363 Circuits, Signals, and Systems (required)
ENGR/PHYS 4830 Theoretical Electricity & Magnetism	EGR/PHY 461 Electricity and Magnetism II
ENGR/PHYS 4950 Independent Study	EGR/PHY 520 Independent Study
PHYS 3010 Intermediate Mechanics	PHY 530 Mechanics I
PHYS 3701 Advanced Lab	No equivalent course
PHYS 3800 Quantum Mechanics	PHY 535 Introduction to Quantum Physics
CSCI 4780 High Performance Computing	No equivalent course
	Additional electives are offered for which APSU has no equivalencies

Appendix C: Survey of Industrial Employers

Employers Contacted:

Local	Regional
Trane	NASA
Akebono	GM Spring Hill Manufacturing
Hankook Tire	Denso Manufacturing Tennessee, Inc.
Bridgestone Metalpha	Bridgestone Americas, Inc.
Dal-Tile	TVA
Chemours (DuPont)	
Electrolux	
A.O. Smith	

Survey Questions

Name of Company: _____

Name of Person Completing Survey: _____

Position/Title: _____

1. Does your company hire Engineers? If so, approximately how many do you have on staff?

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program if the program receives ABET Accreditation?

3. Would your company consider providing internships for the Engineering Physics students?

Results Summary

Total number of reported engineers on staff: local: **309** regional: **2000**

100% of the employers who responded said they would consider hiring graduates of APSU's Engineering Physics program if the program receives ABET Accreditation.

100% of the employers who responded said they would considering providing internships for the Engineering Physics students.

Detailed Results:

Name of Company: Chemours

Name of Person Completing Survey: Kristi Spurgeon

Position/Title: Human Resources

1. Does your company hire Engineers? Yes. If so, how many do you currently have on staff? 35

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program with an emphasis on Manufacturing if the program receives ABET Accreditation? Yes

3. Would your company consider providing internships for the Engineering Physics students? Yes

Name of Company: NASA

Name of Person Completing Survey: Tracie Prater

Position/Title: Aerospace engineer, materials and processes laboratory

1. Does your company hire Engineers? If so, approximately how many? Yes. The technical workforce at NASA Marshall is around 2000.

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program if the program receives ABET Accreditation? Yes. All NASA technical positions are filled through USA Jobs (staffing website for all government civil servant positions), which require a degree in a STEM field from an accredited program. NASA also relies on a large number of contractors and those positions are filled through the individual companies working under NASA contracts (typically those requisitions also require a STEM degree from an accredited program).

3. Would your company consider providing internships for the Engineering Physics students? Yes. NASA posts internship opportunities through the OSSI web portal. Internships are offered for spring, summer, and fall terms. Several summer interns I know of have been engineering physics majors.

Name of Company: AO Smith

Name of Person Completing Survey: Shawn Schmonsky

Position/Title: Vice President - Human Resources

1. Does your company hire Engineers? Yes If so, how many (appx) do you currently have on staff? Approximately 80 in Tennessee. This number does not include other positions where an engineering degree (project manager, director of engineering, etc…) would be expected.

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program with an emphasis on Manufacturing if the program receives ABET Accreditation? Yes

3. Would your company consider providing internships for the Engineering Physics students? Yes

Name of Company: Trane Company

Name of Person Completing Survey: Mark Catri

Position/Title: General Manager

1. Does your company hire Engineers? If so, how many do you currently have on staff? Yes, 175

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program with an emphasis on Manufacturing if the program receives ABET Accreditation? Yes

3. Would your company consider providing internships for the Engineering Physics students? Yes

Name of Company: Bridgestone Metalpha, USA

Name of Person Completing Survey: Jo Lanza

Position/Title: HR Manager

1. Does your company hire Engineers? Yes (mechanical, chemical, electrical, process) If so, how many do you currently have on staff? 15

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program with an emphasis on Manufacturing if the program receives ABET Accreditation? Yes

3. Would your company consider providing internships for the Engineering Physics students? Yes

Name of Company: Dal-Tile

Name of Person Completing Survey: Kimberly Meade

Position/Title: Human Resources Manager

1. Does your company hire Engineers? Yes. If so, how many do you currently have on staff? 4

2. Would your company consider hiring graduates of APSU's proposed Engineering Physics program with an emphasis on Manufacturing if the program receives ABET Accreditation? Yes

3. Would your company consider providing internships for the Engineering Physics students? Yes

Appendix D: ABET Student Learning Outcomes for Engineering Physics Programs & Crosswalk with Proposed Curriculum

a) an ability to apply knowledge of mathematics, science, and engineering;
b) an ability to design and conduct experiments, as well as to analyze and interpret data;
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
d) an ability to function on multi-disciplinary teams;
e) an ability to identify, formulate, and solve engineering problems;
f) an understanding of professional and ethical responsibility;
g) an ability to communicate effectively;
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context;
i) a recognition of the need for, and an ability to engage in life-long learning;
j) a knowledge of contemporary issues;
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Required Courses	**ABET Student Learning Outcome**
ENGR 1000 - Introduction to Engineering	f, h, i, j
ENGR 2110 - Statics	a, e, k
ENGR 2120 – Dynamics	a, e, k
ENGR/PHYS 3005 – Theoretical Methods	a, e, k
ENGR 3020 - Engineering Thermodynamics	a, e, k
ENGR/PHYS 3030 - Electricity & Magnetism	a, e, g, k
ENGR 3050/3051 - Introductory Circuits (w/ Lab)	a, b, c, d, e, g, k
ENGR/PHYS 3550/3551 - Experimental Methods (w/ Lab)	a, b, c, d, e, g, k
ENGR/PHYS 4000/4001 - Computational Methods (w/lab)	a, b, c, e, g, i, j, k
ENGR 4510 - Design I	a, b, c, d, e, f, g, h, i, j, k
ENGR 4520 - Design II	a, b, c, d, e, f, g, h, i, j, k
PHYS 2110/2111 - University Physics I	a, b, d, e, f, g, h, i, k
PHYS 2120/2121 - University Physics II	a, b, d, e, f, g, h, i, k
PHYS 3100/3101 - Optics (with Lab)	a, b, c, d, e, g, i, k
PHYS 3700 - Modern Physics	a, e, h, i, j
MATH 1910 - Calculus & Analytic Geometry	a, h, k
MATH 1920 - Calculus & Analytic Geometry	a, k
MATH 2110 - Calculus	a, k
MATH 3120 - Differential Equations	a, k
CHEM 1110/1111 - General Chemistry I (w/ Lab)	a, b, f, g, h
CSCI 2000 - Programming & Data Struct	a, b, h, k
ECON 2010 - Principals of Macroeconomics	c, h, i, j
APSU General Education Core	h, i, j
Electives (13 hours, 10 in ENGR)	**ABET Student Learning Outcome**
ENGR 3060/3061 - Advanced Circuits (w/ Lab)	a, b, c, d, e, g, i, j, k
ENGR/PHYS 3600 - Materials Science	a, b, e, g, i, j, k

ENGR/PHYS 4100 - Fluid Dynamics	a, e, i, j, k
ENGR/PHYS 3740 - Thermal & Statistical Physics	a, e
ENGR/PHYS 3900/3901 - Nuclear & Rad. Physics (w/ Lab)	a, b, e, g, i, j, k
ENGR/PHYS 4110 – Cooperative Educational Experience	a, b, c, d, e, f, g, h, i, j, k
ENGR/PHYS 4150 – Special Topics	a, b, c, d, e, f, g, h, i, j, k
ENGR/PHYS 4151 – Research	a, b, c, d, e, f, g, h, i, j, k
ENGR/PHYS 4200/4201 - Intro. to Solid State (w/ Lab)	a, b, e, g, i, j, k
ENGR 4300 - Signal Processing	a, b, e, i, j, k
ENGR/PHYS 4830 Theoretical Electricity & Magnetism	a, e, g, k
ENGR/PHYS 4950 Independent Study	a, b, c, d, e, f, g, h, i, j, k
PHYS 3010 Intermediate Mechanics	a, e, i, j, k
PHYS 3701 Advanced Lab	a, b, c, d, e, f, g, h, i, j, k
PHYS 3800 - Quantum Mechanics	a, e, i, j, k
CSCI 4780 - High Performance Computing	a, e, i, j, k

Appendix E: Letters of Support

1. Hankook
2. Trane
3. Dal-Tile
4. Clarksville Department of Electricity
5. Industrial Development Board
6. Workforce Essentials

Tennessee Higher Education Commission
Attachment A: THEC Financial Projections
Austin Peay State University
BS in Engineering Physics

Seven-year projections are required for doctoral programs.
Five-year projections are required for baccalaureate and Master's degree programs
Three-year projections are required for associate degrees and undergraduate certificates.
Projections should include cost of living increases per year.

	Year 1	Year 2	Year 3	Year 4	Year 5
I. Expenditures					
A. One-time Expenditures					
New/Renovated Space	$ -	$ -	$ -	$ -	$ -
Equipment	-	50,000	50,000	50,000	-
Library	1,000	1,000	1,000	1,000	1,000
Consultants	-	-	-	5,000	15,000
Travel	-	-	-	-	-
Other	-	-	-	-	-
Sub-Total One-time	$ 1,000	$ 51,000	$ 51,000	$ 56,000	$ 16,000
B. Recurring Expenditures					
Personnel					
Administration					
Salary	$ -	$ -	$ -	$ -	$ -
Benefits	-	-	-	-	-
Sub-Total Administration	$ -	$ -	$ -	$ -	$ -
Faculty					
Salary	$ -	$ -	$ 60,000	$ 61,800	$ 63,654
Benefits	-	-	26,840	27,140	27,448
Sub-Total Faculty	$ -	$ -	$ 86,840	$ 88,940	$ 91,102
Support Staff					
Salary	$ -	$ -	$ -	$ -	$ -
Benefits	-	-	-	-	-
Sub-Total Support Staff	$ -	$ -	$ -	$ -	$ -
Graduate Assistants					
Salary	$ -	$ -	$ -	$ -	$ -
Benefits	-	-	-	-	-
Tuition and Fees* (See Below)	-	-	-	-	-
Sub-Total Graduate Assistants	$ -	$ -	$ -	$ -	$ -
Operating					
Travel	$ -	$ -	$ 1,000	$ 1,000	$ 1,000
Printing	1,500	1,500	1,500	1,500	1,500
Equipment	5,000	5,000	5,000	5,000	5,000
Other	-	-	-	-	-
Sub-Total Operating	$ 6,500	$ 6,500	$ 7,500	$ 7,500	$ 7,500
Total Recurring	**$ 6,500**	**$ 6,500**	**$ 94,340**	**$ 96,440**	**$ 98,602**
TOTAL EXPENDITURES (A + B)	**$ 7,500**	**$ 57,500**	**$ 145,340**	**$ 152,440**	**$ 114,602**

***If tuition and fees for Graduate Assistants are included, please provide the following information.**

Base Tuition and Fees Rate	$ -	$ -	$ -	$ -	$ -
Number of Graduate Assistants	-	-	-	-	-

	Year 1	Year 2	Year 3	Year 4	Year 5
II. Revenue					
Tuition and Fees[1]	105,875	255,078	426,082	593,106	696,603
Institutional Reallocations[2]	(98,375)	(197,578)	(280,742)	(440,666)	(582,001)
Federal Grants[3]	-	-	-	-	-
Private Grants or Gifts[4]	-	-	-	-	-
Other[5]	-	-	-	-	-
BALANCED BUDGET LINE	**$ 7,500**	**$ 57,500**	**$ 145,340**	**$ 152,440**	**$ 114,602**

Notes:

(1) In what year is tuition and fee revenue expected to be generated and explain any differential fees. Tuition and fees include m tuition, and any applicable earmarked fees for the program.

From year 1 onward.

(2) Please identify the source(s) of the institutional reallocations, and grant matching requirements if applicable.

None

(3) Please provide the source(s) of the Federal Grant including the granting department and CFDA(Catalog of Federal Domestic As

None

(4) Please provide the name of the organization(s) or individual(s) providing grant(s) or gift(s).

None

(5) Please provide information regarding other sources of the funding.

None