

PROGRAM MODIFICATION

Proposing Institution: South Carolina State University

Program Title: Bachelor of Science in Physics

Program Options: B.S. Physics
B.S. Physics with Astronomy Option
B.S. Physics with Health Physics Option
B.S. Physics with Medical Physics Option

Date of submission: January 14, 2013

APPROVED: _____
Thomas J. Elzey, President

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2. Classification

Program Title: Bachelor of Science in Physics

Options: B.S. Physics
B.S. Physics with Astronomy Option
B.S. Physics with Health Physics Option
B.S. Physics with Medical Physics Option

Academic unit in which the program resides: The Department of Biological and Physical Sciences

Designation/Type/Level: Baccalaureate; Bachelor of Science; Four-year program

Proposed date of implementation: This is an update to the SC CHE *Inventory of Approved Programs* of currently existing options in the B.S. Physics degree program. These options were approved over several years and were recently reauthorized by the SC State University Board of Trustees on December 5, 2013.

Current CIP code of the program: 400801

Site: Main campus of South Carolina State University in Orangeburg, SC

Qualifies for supplemental Palmetto Fellows Scholarship and LIFE Scholarship awards: Yes

Delivery Mode: Traditional lecture and laboratory course delivery.

Area of Certification: N/A

3. Institutional Approval

Provost	November 14, 2013 (reauthorized)
President	November 14, 2013 (reauthorized)
Academic Affairs & Faculty Liaison Committee	November 14, 2013 (reauthorized)
Board of Trustees	December 5, 2013 (reauthorized)

4. Purpose

Description of the proposed modification:

This program modification proposal is to update the SC CHE *Inventory of Approved Programs* to reflect the undergraduate Physics program and its three options in astronomy, health physics, and medical physics as they are currently offered by SC State. Please find enclosed on pages 7-9 the curricula of the three options under consideration. The unique courses of these options are listed immediately below.

Astronomy Option's Unique Courses: (credits listed in parentheses total 15)

Physical Science 203 Elementary Astronomy (3)
Physics 326 Introduction to Astrophysics (3)
Physics 338 Scientific Image Analysis (3)
Physics 498 Special Topics – Research Project (3)
Physics 499 Special Topics – Research Project (3)

Health Physics Option's Unique Courses: (credits listed in parentheses total 16)

Physics 160 Medical Physics Seminar (1)
Physics 180 Essentials of Medical Physics (3)
Nuclear Engineering 408 Ionizing Radiation (3)
Physics 338 Scientific Image Analysis (3)
Physics 420 Health Physics Instrumentation (1)
Physics 421 Foundations of Health Physics (3)
Physics 499 OR Nuclear Engineering 499 Special Topics – Research Project (2)

Medical Physics Option's Unique Courses: (credits listed in parentheses: total 18)

Biology 150 General Zoology Lecture (3)
Biology 154 General Zoology Laboratory (1)
Biology 202 Introduction to Vertebrate Physiology Lecture (3)
Biology 212 Vertebrate Physiology Laboratory (1)
Physics 160 Medical Physics Seminar (1)
Physics 180 Essentials Medical Physics (3)
Physics 338 Scientific Image Analysis (3)
Physics 498 OR Physics 499 Special Topics – Research Project (3)

Statement of the purpose of the modified program:

The purpose of the program modification proposal is to update the SC CHE *Inventory of Approved Programs* to reflect the undergraduate Physics program and its three options as they are currently offered by SC State. After consultation with faculty in Physics programs at other universities, the options were added to help attract additional students to the SC State program. The specific options were selected based on the faculty's credentials, university resources and infrastructure, as well as employment opportunities for our graduates.

Discussion of the objectives of the modified program:

The objectives of the program are to:

- 1) Enhance overall enrollment in the physics degree program by offering options in specific subfields while maintaining a high level of quality in the students and a competitive degree
- 2) Increase diversity in the fields of astronomy, medical, and health physics which are extremely underrepresented with respect to African-Americans
- 3) Enhance employment and graduate school opportunities for physics majors by allowing them to gain specialized experience in these expanding fields

5. Justification

Discussion of the need and rationale for the proposed modification:

This modification is needed so that the SC CHE *Inventory of Approved Programs* reflects the program as it is currently offered by SC State. The astronomy option will prepare students to pursue graduate studies in the field or enter a technical career that utilizes the specific skills (e.g. image analysis) developed under this options. Graduates of this SC State option are currently in graduate school. There is a shortage of medical physicists and this will prepare our graduates to be competitive in graduate school and/or the job market. Graduates of this SC State option enroll in graduate school or seek employment in the field. There is a significant shortage of health physicists nationally and numerous job opportunities around the country including the Southeastern United States. SC State graduates from this option seek employment in the field. There is a significant, in some cases extreme, underrepresentation of African-Americans in the subfields related to these options. Graduates from these SC State options will help address this diversity issue.

Discussion of the centrality of the modified program to the Commission-approved mission of the institution.

In keeping with the University's mission, all three of these options will contribute to "highly skilled" graduates who use current technology and methods that make them competitive in the job market and for acceptance in graduate or professional school. As highly skilled graduates, they will become productive members of society that contribute to the "economic development of the state and the nation." Additionally, as an Historically Black College and University (HBCU), SC State would produce graduates for employment fields in which minority professionals traditionally have been underrepresented.

6. Enrollment

Between 2008 and 2013, the Physics program at SC State has had an average enrollment of 18 students. The three options currently enroll 4 astronomy option students, 2 health physics option majors, 3 medical physics option majors and 4 other (general) physics majors. No significant new enrolment is expected as a result of this modification.

7. Curriculum

There are no curriculum changes under the proposed modification. Please find attached the programs of study for the three options in this program modification

8. Faculty

No faculty changes are necessary to support the proposed modification.

9. Physical Plant

There are no additional requirements on the physical plant since there is adequate space and facilities to support the existing Physics program in its current locations in Hodge Hall and Leroy Davis Hall.

10. Equipment

No new equipment is needed to support these already existing options of the proposed modification.

11. Library Resources

Library resources are adequate and no new library resources are needed to support the already existing options of the proposed modification.

12. Accreditation, Approval, Licensure, or Certification

No specialized accreditation, licensure, or certification are required for the Physics program and its options.

13. Estimated Costs and Sources of Financing*

The Academic Program Coordinator (APC) will administer the program using 25% of his time which is worth \$17,677 per year or \$88,385 over five years.

The Physics program employs: three professors (including the APC) whose salaries (minus the 25% for the APC) total \$176,776; two associate professors with a combined salary of \$106,605; and two adjunct instructors with a combined salary of \$72,660. The total expenditure on faculty salaries in the Physics program is \$356,041.

The clerical support staff is shared with the following programs: physics, chemistry, and biology. Therefore, one-third of her salary is attributed to the physics program at \$9,863 per year. The program does not employ graduate students. No new library resources, equipment or physical facilities are needed for the existing options.

The enrollment for the next five years is based on current enrollment of 13 students with an average of 50% in-state students (roughly 7) and 50% out-of-state students (roughly 6). Annual in-state tuition for a full load of courses is \$9776 and \$18,910 for out-of-state students. Thus $7 \times 9776 = \$68,432$; and $6 \times 18910 = \$113,460$; giving a grand total of \$181,892 for the 13 students each year.

All program administration costs, faculty salaries, clerical support costs, and supplies and materials are already funded through the E&G budget and thus will constitute a reallocation of existing funds as the source of finance.

From the chart below, the modification of the Physics program as it currently exists has a five-year price tag of \$1,930,405 but will generate \$2,839,865 in revenue over the same period; providing a net income of \$909,460.

Table I - Costs to the Institution and Sources of Financing

ESTIMATED COSTS BY YEAR						
CATEGORY	1st	2nd	3rd	4th	5th	TOTALS
Program Administration	17,677	17,677	17,677	17,677	17,677	88,385
Faculty Salaries	356,041	356,041	356,041	356,041	356,041	1,780,205
Graduate Assistants	0	0	0	0	0	0
Clerical/Support Personnel	9,863	9,863	9,863	9,863	9,863	49,315
Supplies and Materials	2500	2500	2500	2500	2500	12500
Library Resources	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
TOTALS	386,081	386,081	386,081	386,081	386,081	1,930,405
SOURCES OF FINANCING BY YEAR						
Tuition Funding	181,892	181,892	181,892	181,892	181,892	909,460
Program-Specific Fees						
State Funding*						
Reallocation of Existing Funds*	386,081	386,081	386,081	386,081	386,081	1,930,405
Federal Funding						
Other Funding (Specify)						
TOTALS	567,973	567,973	567,973	567,973	567,973	2,839,865

* As stated above, all program administration costs, faculty salaries, clerical support costs, and supplies and materials are already funded through the E&G budget and thus will constitute a reallocation of existing funds as the source of finance.

CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN PHYSICS

Astronomy Option (126 Credits)

FRESHMAN			
First Semester		Second Semester	
	Credits		Credits
ET 250 Tech. Comm	3	CS 150 Intro. Comp w/App	3
E 150 Eng. Comp & Comm	3	E 151 Eng. Comp & Comm	3
M 152 Pre-Calculus	3	M 158	4
C 150 Gen. Chemistry I	3	C 152 Gen. Chemistry II	3
C 151 Gen. Chemistry I Lab	1	C 153 Gen. Chemistry II Lab	1
PE 150/HED 151/MS 101.	2	PSC 203 Elem Astronomy	3
UNIV 101 Univ Comm	2		
Total	17	Total	17

SOPHOMORE			
First Semester		Second Semester	
	Credits		Credits
M 250 Linear Algebra/Sci	3	ET 255 Eng. Econ. Analysis	3
H 250 or H 251 World Hist	3	E 250 or E 251 World Lit	3
P 254 Gen. Physics I w/Cal	3	P 255 Gen. Physics II w/Cal	3
P 251 Gen. Physics I Lab	1	P 253 Gen. Physics II Lab	1
M 168	4	M 278	4
Lang Comp I	3	Lang Comp II	3
Total	17	Total	17

JUNIOR			
First Semester		Second Semester	
	Credits		Credits
P 203 Gen. Phys III w/Cal	3	P 326 Intro Astrophysics	3
P 223 Gen. Physics III Lab	1	P 406 Intro Modern Physics	3
P 303 Mechanics I	3	P 304 Mechanics II	3
P 403 Thermodynamics	3	HU 250 African-Amer. Exp.	3
M 403 Differential Equations	3	ARTS 250/MU 250/D 254	3
		Elective	3
Total	13	Total	18

SENIOR			
First Semester		Second Semester	
	Credits		Credits
P 498 Special Topics	3	P 499 Special Topics	3
P 401 Elec. & Mag. I	3	P 402 Elec. & Mag. II	3
P 407 Advanced Lab	3	P 410 Intro. Quant Mech.	3
PSY 250/SOC 250	3	P 338 Scientific Image Anal	3
Elective	3		
Total	15	Total	12

Note: P 498/499: Topics for these courses must relate to astronomy and must be approved by the physics academic program coordinator or the department chair.

CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN PHYSICS

Health Physics Option (127 Credits)

FRESHMAN	
First Semester	Second Semester
Credits	Credits
CS 150-Intro. Comp w/App 3	M 250 Linear Algebra/Sci 3
E 150 Eng. Comp & Comm 3	E 151 Eng. Comp & comm. 3
M 158 4	M 168 4
P 254 Gen. Physics I w/Cal 3	P 255 Gen Physics II w/Cal 3
P 251 General Physics I Lab 1	P 253 General Physics II Lab 1
P 160 Med Phys Seminar 1	P 180 Essential Med Physics 3
UNIV 101 Univ Comm 2	
<hr/> Total 17	<hr/> 17

SOPHOMORE	
First Semester	Second Semester
Credits	Credits
H 250 or H 251 World Hist 3	ET 255 Eng. Econ. Analysis 3
P 203 Gen. Physics III 3	M 403 Differential Equations 3
P 223 Gen. Physics III Lab 1	P 406 Modern Physics 3
C 150 Gen Chemistry I 3	C 152 Gen Chemistry II 3
C 151 Gen Chem I Lab I 1	C 153 Gen Chem II Lab 1
SOC/PSY Component 3	
M 278 4	
<hr/> Total 18	<hr/> 13

JUNIOR	
First Semester	Second Semester
Credits	Credits
NE 408 Ionizing Radiation 3	P 313 Radioisotope Lab 3
P 420 Health Physics Instru 1	P 421 Foundations of Health 3
P 403 Thermodynamics 3	ET 250 Tech Comm 3
Language Comp. I 3	P 304 Mechanics II 3
P 303 Mechanics I 3	Language Comp. II 3
Elective 3	
<hr/> Total 16	<hr/> 15

SENIOR	
First Semester	Second Semester
Credits	Credits
P 499/NE 499 Special Topics 2	P 402 Electy & Magnetism II 3
P 338 Scientific Image Anal 3	P 410 Intro. Quantum Mech 3
P 401 Electricity & Mag I 3	HU 250 African-Amer. Exp. 3
P 407 Advanced Laboratory 3	ARTS 250/MU 250/D 254 3
PE 150/HED 151/MS 101 2	Elective 3
E 250 or 251 World Lit. 3	
<hr/> Total 16	<hr/> 15

CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN PHYSICS

Medical Physics Option (126 Credits)

FRESHMAN

First Semester	Credits	Second Semester	Credits
CS 150-Intro. Comp w/App	3	M 250 Linear Algebra/Sci	3
E 150 Eng. Comp & Comm	3	E 151 Eng. Comp & comm.	3
M 158	4	M 168	4
P 254 Gen. Physics I w/Cal	3	P 255 Gen Physics II w/Cal	3
P 251 General Physics I Lab	1	P 253 General Physics II Lab	1
P 160 Med Phys Seminar	1	P 180 Essential Med Physics	3
UNIV 101 Univ Comm	2		
Total	17	Total	17

SOPHOMORE

First Semester	Credits	Second Semester	Credits
B 150 General Zoology Lec	3	B 202 Intro Vert Physiology	3
B 154 General Zoology Lab	1	B 212 Vert Physiology Lab	1
M 278	4	ET 255 Eng. Econ. Analysis	3
P 203 Gen. Physics III	3	SOC 250/PSY 250	3
P 223 Gen. Physics III Lab	1	M 403 Differential Equ	3
C 150 Gen Chemistry I	3	C 152 Gen Chemistry II	3
C 151 Gen Chem I Lab I	1	C 153 Gen Chem II Lab	1
Total	16	Total	17

JUNIOR

First Semester	Credits	Second Semester	Credits
P 403 Thermodynamics	3	ARTS 250/MU 250/D 254	3
P 406 Intro. Modern Physics	3	P 313 Radioisotope Lab	3
H 250 or H 251 World Hist	3	P 304 Mechanics II	3
P 303 Mechanics I	3	E 250 or 251 World Lit	3
Elective	3	ET 250 Tech Comm	3
Total	15	Total	15

SENIOR

First Semester	Credits	Second Semester	Credits
P 401 Electricity & Mag I	3	P 402 Electy & Magnetism II	3
P 407 Advanced Laboratory	3	P 410 Intro. Quantum Mech	3
P 338 Scientific Image Anal	3	P 498/499 Med Phys Project	3
PE 150/HED 151/MS 101	2	HU 250 African-Amer. Exp.	3
Elective	3	Elective	3
Total	14	Total	15