

LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No:	UWUCC Action-Date:	Senate Action Date:
		11-33C	App-10/25/11	App-11/08/11

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person Devki Talwar or Stanley Sobolewski	Email Address sobolews@iup.edu
Proposing Department/Unit Physics	Phone (724) 357-2370

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply)

<input type="checkbox"/> New Course	<input type="checkbox"/> Course Prefix Change	<input type="checkbox"/> Course Deletion
<input type="checkbox"/> Course Revision	<input type="checkbox"/> Course Number and/or Title Change	<input type="checkbox"/> Catalog Description Change

Current Course prefix, number and full title

Proposed course prefix, number and full title, if changing

2. Additional Course Designations: check if appropriate

<input type="checkbox"/> This course is also proposed as a Liberal Studies Course.	<input type="checkbox"/> Other: (e.g., Women's Studies, Pan-African)
<input type="checkbox"/> This course is also proposed as an Honors College Course.	

3. Program Proposals

<input type="checkbox"/> New Degree Program	<input type="checkbox"/> Catalog Description Change	<input checked="" type="checkbox"/> Program Revision
<input type="checkbox"/> New Minor Program	<input type="checkbox"/> Program Title Change	<input type="checkbox"/> Other
<input type="checkbox"/> New Track		

B.S. in Physics

Current program name

Proposed program name, if changing

4. Approvals		Date
Department Curriculum Committee Chair(s)	<i>STW</i>	9/7/10/11
Department Chair(s)	<i>Talwar</i>	9/7/2011
College Curriculum Committee Chair	<i>Ann Kopf</i>	9/22/11
College Dean	<i>Deane Huff</i>	9/22/11
Director of Liberal Studies		
Director of Honors College		
Provost	<i>Heidi Johnson</i>	9/23/11
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	<i>Gail Sedquist</i>	11/08/11

Received

OCT 13 2011

Liberal Studies

Received

SEP 22 2011

Liberal Studies

Part I. Curriculum Proposal Cover Sheet (see above)

Part II. Description of Curriculum Change

1. Catalog Description

Old description

The goal of the Department of Physics is to prepare fully qualified individuals for productive careers in physics. Five degrees are offered within the College of Natural Sciences and Mathematics: the Bachelor of Science degree with a major in Physics, the Bachelor of Arts degree with a major in Physics, the Bachelor of Science degree with a major in Applied Physics, the Associate in Applied Science in Electro-Optics, and the Associate in Science in Electro-Optics. The first three programs offer very good preparation for graduate study in physics or for research in industrial technology. The applied physics degree provides a strong technical background for work in solid-state electronics or electro-optics or for interdisciplinary research in the areas of computer science, chemistry, biology, and geology.

A Bachelor of Science in Education with a major in Physics is also offered. A two year pre-engineering program is offered in cooperation with Drexel University wherein students transfer to Drexel after two years. The department also offers a minor in Physics, as well as general science courses that satisfy the Natural Science requirements of the Liberal Studies program. The two associate degrees in Electro-Optics, Associate in Applied Science in Electro-Optics (A.A.S.E.O.) and Associate in Science in Electro-Optics (A.S.E.O.), are designed to produce trained and skilled workers that will move into senior technician slots in the electro-optics industry, both locally and nationally. With the A.S.E.O. degree the student has a choice of either going directly to work or matriculating at the IUP main campus in the Electro-Optics track in Applied Physics. The two associate degrees, A.A.S.E.O and A.S.E.O., are offered at the IUP Northpointe Campus.

Nanomanufacturing Technology Track

The Bachelor of Science degree with a major in Applied Physics/ Nanomanufacturing Technology Track (NMT) will help IUP students to take one semester of experiential learning in the high-tech field of semiconductor device manufacturing at the state-of-the-art facility at Penn State-University Park Campus. Nanofabrication industries using this technology are rapidly growing from biomedical applications to microelectronics. Graduates of the Applied Physics/NMT Track may enter careers in industry and education. The students enrolled in Applied Physics/NMT Track will spend one semester (16 weeks) (18cr Capstone) in their Junior/Senior year at Penn State (in the fall, spring, or summer [12 weeks]) for hands-on experience in high tech semiconductor device manufacturing field. Students must earn a GPA of at least 3.0 in the required Science and Mathematics courses to be considered for admission into the Capstone semester at Penn State.

Minor in Physics To minor in Physics, a student must successfully complete 15 credits in Physics consisting of at least three courses at the 200 level or higher.

Cooperative Pre-Engineering (Chemical, Civil, Electrical, Materials, Mechanical) Program with Drexel University

Common to all pre-engineering programs are the following science and mathematics requirements: *PHYS 131-141, PHYS 132-142, PHYS 322, PHYS 342, *MATH 123, *MATH 124, MATH 171, MATH 241, *CHEM 111, *CHEM 112 (*or appropriate substitute). Further requirements depend on the particular engineering program chosen. Complete information regarding a specific program may be obtained from the Physics Department. For information on the Cooperative Pre- Engineering

program with the University of Pittsburgh, see the catalog section for Natural Science and the program outline for "B.S.-Natural Science/Pre-Engineering."

New description

The goal of the Department of Physics is to prepare students for productive careers in physics. Three degrees are offered: Bachelor of Science in Physics, Bachelor of Science in Physics Education and the Associate of Science in Electro-Optics. The B.S. in Physics offers preparation for graduate study in physics or for research in industrial technology. There are four tracks in the B.S. Physics Program: Electro-Optics, Nanotechnology Manufacturing, Applied Physics, and Pre-Engineering. The Associate of Science (A.S.) in Electro-Optics produces trained and skilled workers who will move into senior technician slots in the electro-optics industry, both locally and nationally. Some of the coursework completed for the A.S. may be applied to the B.S. in Physics/Electro-Optics Track. The A.S. is offered at the IUP Northpointe Campus.

Students in the B.S. Physics/Nanomanufacturing Technology Track (NMT) take one semester of experiential learning in the high-tech field of semiconductor device manufacturing at the state-of-the-art facility at Penn State-University Park Campus. Students must earn a GPA of at least 3.0 in the required Science and Mathematics courses to be considered for admission into the Capstone semester at Penn State. Graduates of the B.S. Physics/NMT Track may enter careers in industry and education.

The B.S. in Physics /Pre-engineering track is designed to prepare students for admission to engineering school. The student transfers to the affiliated engineering school after appropriate IUP course work has been completed. When sufficient credit from the affiliated engineering school has been earned, the student transfers the credit back to IUP to earn the Physics degree.

The B.S. in Physics Education combines the content knowledge of Physics with the pedagogical training offered by the College of Education and Educational Technology to prepare graduates to teach Physics as well as Science in the secondary school.

The Associate of Science (A.S.) in Electro-Optics produces trained and skilled workers who will move into senior technician slots in the electro-optics industry, both locally and nationally. The A.S. is offered at the IUP Northpointe Campus. A two-year pre-engineering program is offered in cooperation with Drexel University wherein students transfer to Drexel after two years. The Physics department also offers a minor in Physics, as well as general science courses that satisfy the Natural Science requirements of the Liberal Studies program.

Minor in Physics To minor in Physics, a student must successfully complete 15 credits in Physics consisting of at least three courses at the 200 level or higher.

Cooperative Pre-Engineering (Chemical, Civil, Electrical, Materials, Mechanical) Program with Drexel University

Common to all Drexel pre-engineering programs are the following science and mathematics requirements: *PHYS 131-141, PHYS 132-142, PHYS 322, PHYS 342, *MATH 125, *MATH 126, MATH 171, MATH 241, *CHEM 111, *CHEM 112 (*or appropriate substitute). Further requirements depend on the particular engineering program chosen. Complete information regarding a specific program may be obtained from the Physics Department.

Bachelor of Science –Physics

Liberal Studies: As outlined in Liberal Studies section with the following specifications: Mathematics: MATH 125 Natural Science: PHYS 131-141 and 132-142 Liberal Studies Electives: 3cr, MATH 126, no courses with PHYS prefix		44
Major:		34
Required Core Courses:		
PHYS 131 Physics I-C Lecture	*cr (1)	
PHYS 132 Physics II-C Lecture	*cr (1)	
PHYS 141 Physics I-C Lab	*cr (1)	
PHYS 142 Physics II-C Lab	*cr (1)	
PHYS 331 Modern Physics	3cr	
PHYS 345 Optics	3cr	
PHYS 441 Classical Mechanics	3cr	
PHYS 451 Electricity and Magnetism	3cr	
Additional Required Courses:		
PHYS 231 Electronics	4cr	
PHYS 342 Thermal and Statistical Physics	3cr	
PHYS 350 Intermediate Experimental Physics I	3cr	
PHYS 401 Theoretical Physics	3cr	
PHYS 461 Quantum Mechanics I	3cr	
One course from the following: PHYS 472 or 490	3cr	
One additional PHYS majors course	3cr	
Other Requirements:		16-22
COSC 110 Problem Solving and Structured Programming (2)	3cr	
MATH 225 Calculus III	3cr	
MATH 241 Differential Equations	3cr	
MATH 342 Advanced Mathematics for Applications	4cr	
One course from the following:		
COSC 250, MATH 171, 363, 421, 423	3cr	
Foreign Language Intermediate Level (2)	0-6cr	
Free Electives:		11-26
Total Degree Requirements:		120
<p>(1) Credits are counted in the Liberal Studies Natural Science requirement.</p> <p>(2) 6cr of computer programming will substitute for the foreign language requirement: COSC 110, COSC 210 or higher-level computer science courses (COSC 250 recommended), with department permission.</p>		

2. Summary of Change

The Physics Department is proposing new tracks in the B.S. Physics degree. The objective of this program revision is to align the B.S. in Physics program with the new tracks. There are no course additions or deletions from the core B.S. Physics Program.

Bachelor of Science–Physics

Old Program		New Program	
Liberal Studies: As outlined in Liberal Studies section with the following specifications: Mathematics: MATH 125 Natural Science: PHYS 131-141 and 132-142 Liberal Studies Electives: 3cr, MATH 126, no courses with PHYS prefix	48	Liberal Studies: As outlined in Liberal Studies section with the following specifications: Mathematics: MATH 125 Natural Science: PHYS 131-141 and 132-142 Liberal Studies Electives: 3cr, MATH 126, no courses with PHYS prefix	44
Major:	34	Major:	34
Required Courses:		Required Core Courses:	
PHYS 131 Physics I-C Lecture	*cr (1)	PHYS 131 Physics I-C Lecture	*cr (1)
PHYS 132 Physics II-C Lecture	*cr (1)	PHYS 132 Physics II-C Lecture	*cr (1)
PHYS 141 Physics I-C Lab	*cr (1)	PHYS 141 Physics I-C Lab	*cr (1)
PHYS 142 Physics II-C Lab	*cr (1)	PHYS 142 Physics II-C Lab	*cr (1)
PHYS 231 Electronics	4cr	PHYS 331 Modern Physics	3cr
PHYS 331 Modern Physics	3cr	PHYS 345 Optics	3cr
PHYS 342 Thermal and Statistical Physics	3cr	PHYS 441 Classical Mechanics	3cr
PHYS 345 Optics	3cr	PHYS 451 Electricity and Magnetism	3cr
PHYS 350 Intermediate Experimental Physics I	3cr	Additional Required Courses:	
PHYS 401 Theoretical Physics	3cr	PHYS 231 Electronics	4cr
PHYS 441 Classical Mechanics	3cr	PHYS 342 Thermal and Statistical Physics	3cr
PHYS 451 Electricity and Magnetism	3cr	PHYS 350 Intermediate Experimental Physics I	3cr
PHYS 461 Quantum Mechanics I	3cr	PHYS 401 Theoretical Physics	3cr
Controlled Electives:		PHYS 461 Quantum Mechanics I	3cr
One course from the following: PHYS 472 or 490	3cr	One course from the following: PHYS 472 or 490	3cr
One additional PHYS majors course	3cr	One additional PHYS majors course	3cr
Other Requirements:	16-22	Other Requirements:	16-22
COSC 110 Problem Solving and Structured Programming	3cr	COSC 110 Problem Solving and Structured Programming (2)	3cr
MATH 225 Calculus III	3cr	MATH 225 Calculus III	3cr
MATH 241 Differential Equations	3cr	MATH 241 Differential Equations	3cr
MATH 342 Advanced Mathematics for Applications	4cr	MATH 342 Advanced Mathematics for Applications	4cr
Foreign Language Intermediate Level (2, 3)	0-6cr	One course from the following: COSC 250, MATH 171, 363, 421, 423	3cr
		Foreign Language Intermediate Level (2)	0-6cr
Free Electives:	16-22	Free Electives:	20-26
Total Degree Requirements:	120	Total Degree Requirements:	120
(1) Credits are counted in the Liberal Studies Natural Science requirement. (2) Intermediate-level Foreign Language may be included in Liberal Studies electives. (3) 6 cr of computer language may substitute for the foreign language requirement: COSC 110 and 210 or higher-level computer science courses (COSC 250 recommended), with department permission.		(1) Credits are counted in the Liberal Studies Natural Science requirement. (2) 6cr of computer programming will substitute for the foreign language requirement: COSC 110, COSC 210 or higher-level computer science courses (COSC 250 recommended), with department permission.	

2b List of course changes if any

There are no new courses, course additions, nor course deletions involved in this program revision. The intent of this revision is to organize the courses in a manner that matches new physics tracks being proposed.

New physics tracks in the areas of applied physics, electro optics, nanotechnology, and pre engineering will be proposed.

The description of the foreign language requirement has been modified to be less ambiguous. The term “programming” will replace “language”, since some courses, which have counted in the past, are not language courses, the “may” has been changed to “will” making this replacement clearer.

3 Rationale for Change

As part of the physics department’s effort to improve efficiency, the organization of the degrees being offered is modified to reduce the total number of different degrees. The department currently has four separate BS degree programs: (i) BS Physics (ii) BS Applied Physics (iii) BS Applied Physics/Nanomanufacturing Technology and (iv) BS Applied Physics/Electro-Optics. Students in these separate degrees take the same courses, and seek similar employment after graduation. Therefore it has been decided to take these four separate degrees and combine them under the Physics BS degree as individual tracks. There is no change in specific courses being offered.

In the past, upper level classes in physics have been canceled at times due to low enrolment. This puts a burden on the students who need those classes for timely graduation. The consolidation of the various degrees into tracks, combined with a course rotation plan, will increase upper level physics course enrolment to a viable level. This will assure that classes will be offered as planned, allowing student to take courses as expected.

Part III. Implementation. Provide answers to the following questions:

1. How will the proposed revision affect students already in the existing program?

There is no change for students currently in the program; the courses and prerequisites remain the same.

2. Are faculty resources adequate? If you are not requesting or have not been authorized to hire additional faculty, demonstrate how this course will fit into the schedule(s) of current faculty.

While it is anticipated that the enrollment in upper level class will increase, the number will not increase past the occupancy limit of classrooms in Weyandt Hall. There will be no additional need for added sections, and therefore no additional faculty resources will be required.

3. Are other resources adequate? (Space, equipment, supplies, travel funds)

Most classrooms where physics courses are taught can hold 30 to 50 students; currently there are about 20 per class so space is adequate. Equipment and supplies are only an issue in one class, PHYS 350. Up to this point in time the class maximum has been 16, so there is still room for expansion in that class. If students in this course work in groups of three, rather than two, then up to 24 students could be accommodated. Travel funds are not required.

4. Do you expect an increase or decrease in the number of students as a result of these revisions? If so, how will the department adjust?

The total number of students in the BS Physics program would remain unchanged following this rearrangement - the students in the separately listed programs (now deleted) would transfer into the new tracks.

Part IV. Periodic Assessment

Departments are responsible for an on-going review of curriculum. Include information about the department's plan for program evaluation:

The assessment of the proposed changes described in this proposal will be performed as part of the Physics Departments' overall curriculum assessment policies. The department evaluates both students currently in the program as well as graduates. Current students are assessed at the beginning and at the end of the program. During the first week of the first physics course, (PHYS 131) all students must take the Force Concept Inventory (FCI), a nationally recognized assessment on physics thinking. The test distinguishes between Aristotelian thinkers and Newtonian thinkers. Students below a certain score are required to talk to their advisor during the second week of class. During this advisement meeting, the advisor will ask about the student's background, performance in other courses and will advise the student to seek extra help, especially in the physics departments tutoring center. Advisers will carefully monitor the progress of students in this category. At the end of the same semester, students will again take the FCI and the improvement of the class as a whole as well as the target individuals will be examined. If over a few semesters, a sufficient number of students do not show a significant gain in their scores, the department will consider a modification of the introductory course sequence. The second assessment is given to students and their eighth semester. This assessment is a collection of physics problems from the various topics in physics that the students must solve. This assessment identifies the strengths and weaknesses in the student knowledge base. The result of this program evaluation has resulted in the development of the new course PHYS 401, which shows the students connection between various topics in physics. These two assessments have a yearly cycle, the first in the fall and the second in the spring. The department also surveys graduates. We asked them what their current position is, the usefulness of different courses, and ways to change the program for the better. While we are happy to learn that most of our graduates are successful in their fields, and have positive things to say about our program; there has not been a major change as a result of this assessment. Students enrolled in the physics education program also take the ETS administered PRAXIS II test. When this assessment was first required, some of our students did not achieve a satisfactory score. Over the years we have changed our advising policy to include meetings with the Physics education majors twice per month. Since we have invoked this policy, all of our Physics education majors have passed the PRAXIS II test on the first attempt.

Part V. Course Proposals

There will be no new courses proposed.

Part VI. Letters of Support or- Acknowledgement N.A.