

UNIVERSITY OF ILLINOIS
AT URBANA - CHAMPAIGN

EP.10.18

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Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820



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OCT 29 2009

OFFICE OF THE SENATE

October 29, 2009

Abbas Aminmansour, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Aminmansour:

Enclosed is a copy of a proposal from the College of Engineering to revise the BS in Engineering Physics.

This proposal has been approved by the College of Engineering Executive Committee. It now requires Senate review.

Sincerely,

Kristi A. Kuntz
Assistant Provost

KAK/dkk

Enclosures

- c: I. Adesida
R. Dennis
G. Gladding
S. Kamin
P. Kumar
S. Lamb
C. Livingstone
N. Makins
M. Pleck
M. Rood
C. Tucker
D. Van Harlingen

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering
Executive Committee
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801



RECEIVED
OCT 24 2009
OFFICE OF THE PROVOST

October 23, 2009

Kristi Kuntz
Assistant Provost
217 Swanlund Administration Building
MC-304

Via: Ilesanmi Adesida, Engineering College

Dear Ms. Kuntz:

The College of Engineering Executive Committee has reviewed and approved the following:

Program Revision - "Undergrad Physics Curriculum Revision"

Attached is a copy of the request.

Sincerely yours,

Samuel N. Kamin, Secretary
Executive Committee

Approval Recommended:

Ilesanmi Adesida, Dean
College of Engineering

10/23/09
Date

SNK/rd

Enclosure

c: Praveen Kumar
Dale Van Harlingen
Michael Pleck
Mark Rood
Susan Lamb, Naomi C.R. Makins and Gary Gladding
Robin Dennis



Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE: Modification of the B.S. Degree in Engineering Physics, College of Engineering

SPONSOR: Gary Gladding, Professor and Associate Head, Department of Physics, 333-0864, geg@illinois.edu

COLLEGE CONTACT: Charles Tucker III, Associate Dean for Undergraduate Programs, 244-3822, ctucker@illinois.edu

BRIEF DESCRIPTION: The overall change is credit-neutral with 128 hours remaining required for the degree.

1. Introduce a new required course PHYS 225 – Relativity & Math Applications (2 hours), replacing two hours of free electives.
2. Revise required course PHYS 325 and elective sequel PHYS 326 in synchronization with the introduction of PHYS 225.
3. No longer recommend special topics honors sections PHYS 199 HO, HM, HT as free electives.

JUSTIFICATION: Overall, the introduction of PHYS 225 and revisions to PHYS 325 and PHYS 326 will result in a more appropriate timing of the introduction of relevant topics in the curriculum for physics majors, as well as providing a somewhat broader range of courses for the many students pursuing the Physics Minor. The advanced physics courses will be well served by providing students with preparation in relativity and a more mathematically sophisticated approach to introductory physics topics prior to beginning the 300-level courses.

1. PHYS 225 will fill a perceived need for an introductory undergraduate course in Special Relativity and some of the more mathematical aspects of intermediate-level physics. It is designed as a bridge between the introductory courses (PHYS 211-214) and the advanced courses (PHYS 3XX, PHYS 4XX).
2. The revisions of PHYS 325 (required Physics Technical Core course) and PHYS 326 (elective Flexible Physics Core course) are a logical minor reorganization integral to the introduction of PHYS 225. Special Relativity and some of the more mathematical aspects of intermediate-level physics are moved from PHYS 325 to PHYS 225. Lagrangian and

Hamiltonian mechanics are moved from PHYS 326 to PHYS 325. The coverage of continuous media and fluid dynamics in PHYS 326 is increased for two reasons: First, fluids provide an intuitive conceptual basis for electromagnetic and quantum field theories. Second, many fields, such as biophysics require a working knowledge of fluids.

3. The material from elective special topics honors sections PHYS 199 HM and HO is incorporated into PHYS 225. All of PHYS 199 HM, HO, and HT will no longer be offered. These special topics are not listed in the Programs of Study statement's Overview of Curricular Requirements, but do appear in the Suggested Sequence of course completion, hence the formality of their removal.

BUDGETARY AND STAFF IMPLICATIONS:

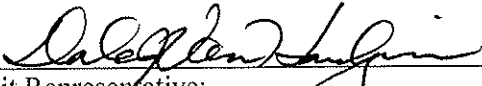
- a. *Additional staff and dollars needed:* None
- b. *Internal reallocations (e.g., change in class size, teaching loads, student-faculty ratio, etc.):* Resources previously devoted to PHYS 199 sections HM and HO will be reallocated to PHYS 225.
- c. *Effect on course enrollment in other units and explanations of discussions with representatives of those departments:* None.
- d. *Impact on the University Library:* None.
- e. *Impact on computer use, laboratory use, equipment, etc.:* None.

DESIRED EFFECTIVE DATE: Fall 2010

STATEMENT FOR PROGRAMS OF STUDY CATALOG: See Appendix

CLEARANCES:

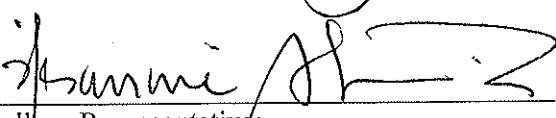
Signatures:



Unit Representative:

8/18/09

Date:



College Representative:

10/23/09

Date:

Graduate College Representative:

Date:

Provost Representative:

Date:

Educational Policy Committee Representative:

Date:

Appendix: Statement for the Programs of Study Catalog

Changes to result from the proposed curriculum revision are shown as Track Changes edits applied to the current 2009-10 version at http://courses.illinois.edu/cis/2009/fall/programs/undergrad/engin/engin_physics.html.

Physics

physics.illinois.edu

Head of Department: Dale Van Harlingen

Department Office: 209 Loomis Laboratory of Physics, 1110 West Green, Urbana, (217) 333-3761

Curriculum in Engineering Physics

physics.illinois.edu/education/undergraduate

Fax: (217) 333-9819

E-mail: undergrad@physics.uiuc.edu

For the Degree of Bachelor of Science in Engineering Physics

The Engineering Physics curriculum is a flexible program that combines a firm foundation in physics and mathematics with the freedom to choose from a diverse range of technical options. The curriculum is designed to prepare students for a wide variety of technical and professional careers, including graduate study in physics or a closely allied field.

Overview of Curricular Requirements

The curriculum requires 128 hours for graduation and is organized as shown below.

A technical grade point average requirement for graduation applies to students in this curriculum. This rule is summarized at the College of Engineering's [undergraduate advising Web site](#).

Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Hours	Requirements
0	ENG 100—Engineering Orientation ¹
0	PHYS 110—Physics Careers ¹
0	Total

1. External transfer students take ENG 300—Engrg Transfer Orientation instead.

Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Hours	Requirements
3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
4	MATH 221—Calculus I ¹
3	MATH 231—Calculus II
4	MATH 241—Calculus III
3	MATH 285—Intro Differential Equations ²
4	PHYS 211—University Physics: Mechanics
4	PHYS 212—University Physics: Elec & Mag
2	PHYS 213—Univ Physics: Thermal Physics
2	PHYS 214—Univ Physics: Quantum Physics
<u>302</u>	<u>Total</u> PHYS 225—Relativity & Math Applications
<u>3230</u>	<u>Total</u>

1. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

2. MATH 285 may be replaced by MATH 441 followed by MATH 442.

Engineering Physics Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of engineering physics.

Hours	Requirements
3	CS 101—Intro Computing: Engrg & Sci
3	PHYS 325— Classical Mechanics and Relativity I
3	PHYS 435—Electromagnetic Fields
4	PHYS 486—Quantum Mechanics I ¹ or PHYS 485—Atomic Physics & Quantum Theory ²

13	Total
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1. If PHYS 486 is chosen, take prerequisite MATH 415, which may be used to meet free elective requirements.

2. If PHYS 485 is taken, an additional free elective hour or a surplus flexible physics core course hour offsets the one-hour credit differential.

Flexible Physics Core Electives

These courses complement the Engineering Physics Technical Core, extending the intellectual understanding of Engineering Physics.

Hours	Requirements
9-15	Flexible physics core electives. Choose three courses from the list below, with at least one being PHYS 401, 403, 404, or 405. The number of hours varies depending upon the courses chosen.
3	PHYS 326— Classical Mechanics and Relativity II
3	PHYS 401—Classical Physics Lab
4	PHYS 402—Light
5	PHYS 403—Modern Experimental Physics
5	PHYS 404—Electronic Circuits I
5	PHYS 405—Electronic Circuits II
4	PHYS 427—Thermal & Statistical Physics
3	PHYS 436—Electromagnetic Fields II
4	PHYS 460—Condensed Matter Physics
4	PHYS 470—Subatomic Physics
4	PHYS 487—Quantum Physics II
9-15	Total

Mathematics Elective

Hours	Requirements
3	Mathematics elective, chosen from a departmentally approved <u>list of Mathematics Electives</u> .

Technical/Professional Option Electives

Students may select from a list of preapproved options or design a custom option, subject to departmental approval. The current preapproved options, requiring 12-22 credit hours of course work, are:

- Professional Physics
- Astrophysics
- Bioengineering
- Biophysics
- Computational Physics
- Materials Science
- Optical Physics
- Physical Electronics

The course work is selected in consultation with the student's advisor to address an intellectually coherent body of knowledge.

Hours	Requirements
12-27	Technical/professional option electives for the option selected, chosen from a departmentally approved list of <u>Technical/Professional Option Electives</u> (or a list designed for a departmentally approved custom option). The number of hours varies depending upon the option chosen.

Social Sciences and Humanities

The social sciences and humanities courses, as approved by the College of Engineering, ensure that students have exposure in breadth and depth to areas of intellectual activity that are essential to the general education of any college graduate.

Hours	Requirements
18	Electives in social sciences and humanities approved by the College of Engineering and satisfying the campus general education requirements for social sciences and humanities, including cultural studies western and non-western.

Composition

These courses teach fundamentals of expository writing.

Hours	Requirements
4	RHET 105—Principles of Composition
	Advanced Composition. May be satisfied by completing a course with the Advanced Composition designation in either the social sciences and

	humanities or the free elective categories.
4	Total

Free Electives

These unrestricted electives, subject to certain exceptions as noted at the [College of Engineering advising Web site](#), give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

Hours	Requirements
13-37 15-39	Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site , so that there are at least 128 credit hours earned toward the degree. The number of hours varies depending upon the total hours earned in both the Flexible Physics Core and the Technical/Professional Option and whether or not MATH 415 and PHYS 486 are taken in place of PHYS 485.

Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

First year

Hours	First Semester
3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
0	ENG 100—Engineering Orientation
4	MATH 221—Calculus I ^{1,2}
0	PHYS 110—Physics Careers
4-3	RHET 105—Principles of Composition ³ or Elective in social sciences or humanities ⁴
3	Elective in social sciences or humanities ⁴
15-14	Total

Hours	Second Semester
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3	CS 101—Intro Computing: Engrg & Sci
3	MATH 231—Calculus II
(1)	PHYS 199—Undergraduate Open Seminar: Section HM ⁵
4	PHYS 211—University Physics: Mechanics ²
3-4	Elective in social sciences or humanities ⁴ or RHET 105—Principles of Composition ³
3	Elective in social sciences or humanities ⁴
16-17	Total

Second year

Hours	First Semester
4	MATH 241—Calculus III
(1)	PHYS 199—Undergraduate Open Seminar: Section HO ⁵
4	PHYS 212—University Physics: Elec & Mag
3-2	Technical/professional option elective⁶ PHYS 225—Relativity & Math Applications
6	Electives in social sciences or humanities ⁴
1716	Total

Hours	Second Semester
3	MATH 285—Intro Differential Equations ⁷⁵
(1)	PHYS 199—Undergraduate Open Seminar: Section HT ⁵
2	PHYS 213—Univ Physics: Thermal Physics
2	PHYS 214—Univ Physics: Quantum Physics
3	PHYS 325— <u>Classical</u> Mechanics and Relativity I
3	Technical/professional option elective ⁶
3	Elective in social sciences or humanities ⁴
16	Total

Third year

Hours	First Semester
3	MATH 415—Applied Linear Algebra (if PHYS 486 will be taken) or Free elective
3	PHYS 435—Electromagnetic Fields
3	Flexible physics core elective ^{7,8,9}
3	Mathematics elective ^{10,9}
3	Technical/professional option elective ⁶
3	Free elective
18	Total

Hours	Second Semester
4	PHYS 486—Quantum Mechanics I or PHYS 485—Atomic Physics & Quantum Theory ^{11,10}
6	Flexible physics core electives ^{7,8,9}
6	Technical/professional option electives elective ⁶
3	Free elective
16	Total

Fourth year

Hours	First Semester
10	Technical/professional option electives ^{6,12,11} or Free electives
6	Flexible physics core electives ^{7,8,9} or Free electives
16	Total

Hours	Second Semester
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1012	Free electives
5	Technical/professional option electives ^{6,12,11} or Free electives
1517	Total

1. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

2. Students with proficiency or advanced placement (AP or IB) credit in MATH 221 are strongly encouraged to enroll in MATH 231 and PHYS 211 for the first semester.

3. RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is a social sciences or humanities elective.

4. Each student must satisfy the 18-hour social sciences and humanities requirements of the College of Engineering and the campus general education requirements for social sciences and humanities.

5. MATH 285 may be replaced by MATH 441 followed by MATH 442.

~~Honors Seminars (PHYS 199—Sections HM, HO, and HT—paired to PHYS 211, 212, 213/214 respectively) are recommended for Physics majors but are not required. Register in the General Physics Office, 233 Loomis Lab (333-4361). Credit may be used to help meet free elective requirements.~~

6. To be chosen from a departmentally approved list of Technical/Professional Option Electives, in consultation with the student's advisor, for the option elected (or a list fashioned for a departmentally approved custom option). The number of credit hours varies 12-22 depending upon the option chosen.

7. ~~MATH 285 may be replaced by MATH 441 followed by MATH 442.~~

78. The flexible physics core requirement consists of three courses from PHYS 325, 401, 402, 403, 404, 405, 427, 436, 460, 470, and 487 with at least one of them being a lab course (401, 403, 404, or 405). The number of credit hours varies 9-15 depending upon the courses chosen.

89. For courses chosen with more than 3 hours credit, the surplus hours may be used to meet free elective requirements.

910. To be chosen from a departmentally approved list of Mathematics Electives. Any course satisfying the Mathematics Elective cannot be used to satisfy any other requirement.

- | 1044. If PHYS 485 is taken, an additional free elective hour or a surplus flexible physics core course hour offsets the one-hour credit differential.

- | 1142. Taken if needed to complete a technical/professional option requiring more than 12 hours of credit.

Draft Minutes
College of Engineering Executive Committee (EC) Meeting
Tuesday, 1:00 p.m., October 20, 2009
301 Engineering Hall

Present:

N. Cheng (MNTL)	P. Goldbart (Phys)	D. Jones (ECE)
V. Coverstone (Admin)	B. Heuser (NPRE)	D. Sarwate (CSL)*
B. Cunningham (BioE)	P. Kalita (ABE)	R.S. Sreenivas (IESE)
G. Dullerud (MechSE)	S. Kamin (CS)	C. Tucker (Admin)

Absent:

I. Adesida (Admin)	M. Rood (CEE)	M. Wong (CSL)
B. Conway (AE)	J. Weaver (MatSE)	H. Zhao (ChBE)

* = alternate

1. The meeting was called to order at 1:05.

2. Approval of the Draft Minutes from Sept. 29, 2009.
The minutes were approved unanimously, pending revisions.

3. New/Old Business

a. Subcommittee replacement members to "Revision to B.S. Degree in IESE"

Previously chosen members were: Sheldon Jacobson (CS, Chair), Barb Minsker (CEE), Tolga Tezkan (IESE), Prashant Mehta (MechSE), Kevin Pitts (Phys). Jacobson and Minsker were unable to serve. It was agreed that a four-person committee would suffice. Riyadurgam Srikant (ECE) was chosen as the chair. *Thus, the ad hoc committee is now: Riyadurgam Srikant (ECE), Tolga Tezkan (IESE), Prashant Mehta (MechSE), Kevin Pitts (Phys).*

4. Course Outlines/Proposals/Reports

a. New/Revised Course Outlines and Program Proposals

b. Subcommittee Reports

– B.S. in ABE ad hoc committee report

The committee voted unanimously to accept the report. There was some discussion about an issue raised in the committee's report, which is the way in which the various "biology + engineering" programs – ABE, BioE, and ChBE – were differentiating themselves. Chuck Tucker stated that Dean Ade was taking action on this issue, and had seen this committee's report (among other things).

– BIOE 301 *ad hoc* committee report

The committee voted unanimously to accept the report.

– ENG 460 and 466 *ad hoc* committee report

The committee voted unanimously (with one abstention) to accept the report.

– ME 483 *ad hoc* committee report

The committee voted unanimously to accept the report. There was some discussion about overlap between this course, Mechanobiology, and other courses, in particular, BIOE 301, Introductory Biomechanics, just approved. However, despite the similarity of names, the topics and intended

audiences are quite different. There was also discussion about the possible cross-listing of ME 483 with BIOE 483, which was requested by both departments and endorsed by the ad hoc committee. The EC had previously ruled that the cross-list request did not meet the cross-listing guidelines, and the position was reaffirmed. It was left open whether, in the future, ad hoc committees should be asked to consider cross-list requests (in which case they should be made aware of the guidelines).

– M.S. in AE *ad hoc* committee report
The committee voted unanimously to accept the report.

– PHYS 221 and 222 *ad hoc* committee report
The committee voted unanimously to accept the report.

– Revision to Undergrad Physics Curriculum *ad hoc* committee report
The committee voted unanimously to accept the report. It was noted that the cover letter from Chuck Tucker had a minor typo in the titles of the proposed new courses; this will be corrected before forwarding to the next administrative level.

– Revision to Undergrad Minor in Physics *ad hoc* committee report
Dilip Sarwate asked whether there are rules concerning the numbers of hours allowed in a minor, and it was determined that the campus guidelines call for minors to have 16-21 hours. At 21-25 hours, the Physics minor would push that limit. *The item was tabled until the next meeting.* Chuck Tucker will consult with the provost's office (Kristi Kuntz) to determine whether this proposal is likely to be rejected, and Paul Goldbart will give Gary Gladding a heads-up about this issue.

5. Additional items

–The letter from Becky Osgood thanking the EC for its gift on the occasion of her retirement was read by Sam Kamin.

– Brent Heuser told the committee that he had done some research on the question of the 128-hour limit on engineering degrees. He found that, when taken in comparison with degrees offered at our peer institutions, 128 hours is a very reasonable and defensible number, quite in line with our peers. asdf – asdf

5. The meeting adjourned at 2:00.

The minutes have not yet been approved.
Respectfully submitted,

R.S. Sreenivas, Acting Secretary

cc: Robin Dennis
Michael Pleck