

## SIGNATURE ROUTING LOG



### General Information:

Proposal Type: Course  Program  Other   
 Proposal Name<sup>1</sup> (course prefix & number, pgm major & degree, etc.): Physics BS  
 Proposal Contact Person Name: Kwok-Wai Ng Phone: 7-1782 Email: kwng@uky.edu

### INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

### Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
Physics & Astronomy	8/19/10	Kwok-Wai Ng, DUS / 7-1782 / kwng@uky.edu	
Physics & Astronomy	8/19/10	Mike Cavagnero / 7-6901 / mike@pa.uky.edu	
		/ /	
		/ /	
A&S Ed. Policy Cmte.	9/21/10	G. Murthy, Nat. Sci. / 7-4729 / ganpathy.murthy@uky.edu	
A&S Dean	9/21/10	Anna Bosch, Associate Dean / 7-6689 / bosch@uky.edu	

### External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision <sup>2</sup>
Undergraduate Council	3/1/2011		
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

<sup>1</sup> Proposal name used here must match name entered on corresponding course or program form.

<sup>2</sup> Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

CHANGE UNDERGRADUATE PROGRAM FORM

**1. General Information**

College: Arts and Sciences Department: Physics and Astronomy  
 Current Major Name: Physics Proposed Major Name: Physics  
 Current Degree Title: BS Proposed Degree Title: BS  
 Formal Option(s): \_\_\_\_\_ Proposed Formal Option(s): \_\_\_\_\_  
 Specialty Field w/in Formal Option: \_\_\_\_\_ Proposed Specialty Field w/in Formal Options: \_\_\_\_\_  
 Date of Contact with Associate Provost for Academic Administration<sup>1</sup>: 4/20/2010  
 Bulletin (yr & pgs): 2009; 145 CIP Code<sup>1</sup>: 400801 Today's Date: Aug 17, 2010  
 Accrediting Agency (if applicable): \_\_\_\_\_  
 Requested Effective Date:  Semester following approval. OR  Specific Date<sup>2</sup>: \_\_\_\_\_  
 Dept. Contact Person: Kwok-Wai Ng Phone: 7-1782 Email: kwng@uky.edu

**2. University Studies Requirements or Recommendations for this Program.**

	Current	Proposed
I. Mathematics	<u>MA 113</u>	<u>MA 113</u>
II. Foreign Language	<u>6 hours in single language</u>	<u>6 hours in single language</u>
III. Inference-Logic	<u>MA 114</u>	<u>MA 114</u>
IV. Written Communication	ENG 104 or Honors	<u>ENG 104 or Honors</u>
V. Oral Communication	Suspended through Fall 2009	<u>Suspended through Fall 2009</u>
VI. Natural Sciences	<u>PHY 231, 232</u>	<u>PHY 231, 232</u>
VII. Social Sciences	<u>2 courses in separate disciplines</u>	<u>2 courses in separate disciplines</u>
VIII. Humanities	<u>6 hours</u>	<u>6 hours</u>
IX. Cross-Cultural	<u>300+-level PHI course</u>	<u>1 course</u>
X. USP Electives (3 must be outside the student's major)	<u>300+-level Social Science course</u>	<u>6 hours</u>

**3. Explain whether the proposed changes to the program (as described in sections 4 to 12) involve courses offered by another department/program. Routing Signature Log must include approval by faculty of additional department(s).**

No changes in the program involve another department.

**4. Explain how satisfaction of the University Graduation Writing Requirement will be changed.**

Current  Standard University course offering. Proposed  Standard University course offering.

<sup>1</sup> Prior to filling out this form, you MUST contact the Associate Provost for Academic Administration (APAA). If you do not know the CIP code, the (APAA) can provide you with that during the contact.

<sup>2</sup> Program changes are typically made effective for the semester following approval. No program will be made effective until all approvals are received.

CHANGE UNDERGRADUATE PROGRAM FORM

List: Any of a number of courses outside physics

List: \_\_\_\_\_

Specific course – list: \_\_\_\_\_

Specific course) – list: PHY 535W

5. List any changes to college-level requirements that must be satisfied.

Current

Standard college requirement.

List: Arts and Sciences (BS)

Specific required course – list: \_\_\_\_\_

Proposed

Standard college requirement.

List: Arts and Sciences (BS)

Specific course – list: \_\_\_\_\_

6. List pre-major or pre-professional course requirements that will change, including credit hours.

Current

PHY 231/232/241/242(10) or 211/213(10)

PHY 228(3)

CHE 105(3)/107(3)

MA 113(4)/114(4)

Proposed

PHY 231/232/241/242(10) or 211/213(10)

PHY 228(3)

CHE 105(3)/107(3) (Chemistry Dept. is changing the credit hours of CHE105 from 3 to 4.)

MA 113(4)/114(4)

7. List the major's course requirements that will change, including credit hours.

Current

PHY 306(3)

PHY 335(1)

PHY 361(3)

PHY 404G(3)

PHY 416G(3)/417(3)

PHY 520(3)

PHY 520(3)

PHY 535(2)

MA 213(4)

MA 214(3)

Two from: AST/PHY 395(3), PHY 402G(3), 422(3), 435W(3)

One from: PHY 522(3), 524(3), 554(3), 555(3), 556(3), 591(3), 592(3)

Proposed

PHY 306(3)

PHY 335(1)

PHY 361(3)

PHY 404G(3)

PHY 416G(3)/417(3)

PHY 520(3)

PHY 520(3)

PHY 521(3)

PHY 535W(3)

MA 213(4)

MA 214(3)

Two from: AST/PHY 395(3), PHY 402G(3), 422(3), 435W(3)

8. Does the pgm require a minor AND does the proposed change affect the required minor?  N/A  Yes  No

If "Yes," indicate current courses and proposed changes below.

Current

\_\_\_\_\_

Proposed

\_\_\_\_\_

9. Does the proposed change affect any option(s)?

N/A  Yes  No

If "Yes," indicate current courses and proposed changes below, including credit hours, and also specialties and subspecialties, if any.

Current

\_\_\_\_\_

Proposed

\_\_\_\_\_

10. Does the change affect pgm requirements for number of credit hrs outside the major subject in a related field?

Yes  No

If so, indicate current courses and proposed changes below.

Current  
\_\_\_\_\_

Proposed  
\_\_\_\_\_

11. Does the change affect pgm requirements for technical or professional support electives?  
If so, indicate current courses and proposed changes below.

Yes  No

Current  
\_\_\_\_\_

Proposed  
\_\_\_\_\_

12. Does the change affect a minimum number of free credit hours or support electives?  
If "Yes," indicate current courses and proposed changes below.

Yes  No

Current  
\_\_\_\_\_

Proposed  
\_\_\_\_\_

13. Summary of changes in required credit hours:

	Current	Proposed
a. Credit Hours of Premajor or Preprofessional Courses:	<u>27</u>	<u>27</u>
b. Credit Hours of Major's Requirements:	<u>37</u>	<u>38</u>
c. Credit Hours for Required Minor:	_____	_____
d. Credit Hours Needed for a Specific Option:	_____	_____
e. Credit Hours Outside of Major Subject in Related Field:	<u>14 @ 200+-level</u>	<u>14 @ 200+-level</u>
f. Credit Hours in Technical or Professional Support Electives:	_____	_____
g. Minimum Credit Hours of Free/Supportive Electives:	<u>6</u>	<u>6</u>
h. Total Credit Hours Required by Level:		
	100: <u>14</u>	<u>14</u>
	200: <u>27</u>	<u>27</u>
	300: <u>7</u>	<u>7</u>
	400-500: <u>23</u>	<u>24</u>
i. Total Credit Hours Required for Graduation:	<u>120</u>	<u>120</u>

14. Rationale for Change(s) – if rationale involves accreditation requirements, please include specific references to that.

The current capstone requirement for the BS in physics is a 3-hour course at the 500-level. The options include two courses that do not require a quantum mechanics prerequisite: PHY 522, a core course in thermodynamics and statistical mechanics, and PHY 591 or 592, astrophysics. The remainder of the options all require quantum (PHY 520), and are all of the topical applications variety: 524 (solid state), 554 (atomic), 555 (nuclear), and 556 (particle). As part of our SACS studies, we have each semester monitored the performance of our majors in all of these classes by having random faculty independently score the final exams of each undergraduate physics major. In general, we find that most students have difficulty grasping both the concepts and the mathematical formulation of quantum mechanics (PHY 520). As a consequence, students then avoid selecting one of the topical application courses (which freely use material from the quantum course) in favor of PHY 522, thermodynamics. Moreover, those students who do select a topical course find themselves greatly outnumbered by graduate students in the class, since all grad students are required to complete several topical courses.

We propose to change the capstone requirement for the BS physics majors and at the same time address the

general difficulty which our majors have in learning introductory quantum mechanics. We propose to develop a coordinated set of classes in quantum, PHY 520 (QM I) and PHY 521 (QM II), and require all students to complete both courses. In this new scenario, PHY 520 will operate at a slightly slower pace, giving students more time to master the material. The follow-up course, 521, will then build upon the 520 syllabus, and use applications from a wide variety of fields to introduce new quantum mechanical concepts. For example, 520 usually ends with a treatment of the "spinless" hydrogen atom, but 521 will introduce spin by applying it to hydrogen. Methods of perturbation theory are introduced by studying the helium atom. The symmetry requirements of the multi-particle wavefunction are introduced by considering the eigenstates of a periodic potential such as occurs in condensed matter, or by calculating the quark spin and flavor wavefunction of the proton and estimating the resultant magnetic moment. All of these applications are each a small part of the current set of our topical courses, but in 521 we propose to offer undergrads the opportunity to see them presented in a consolidated, coherent context.

**15. List below the typical semester by semester program for the major. If multiple options are available, attach a separate sheet for each option.**

<p><b>YEAR 1 – FALL:</b> (e.g. "fall 101; 3 credits")</p>	<p><u>MA 113(4)</u> <u>PHY 231/241(5)</u> <u>CHE 105(3)</u> <u>ENG 104 (4)</u></p>	<p><b>YEAR 1 – SPRING:</b></p>	<p><u>MA 114(4)</u> <u>PHY 228(3)</u> <u>CHE 107(3)</u> <u>CS115 or Major related electives (3)</u> <u>USP Humanities (3)</u></p>
<p><b>YEAR 2 - FALL :</b></p>	<p><u>MA 213(4)</u> <u>PHY 232/242(5)</u> <u>PHY 335(1)</u> <u>Foreign Language (4)</u></p>	<p><b>YEAR 2 – SPRING:</b></p>	<p><u>MA 214(3)</u> <u>PHY 306(3)</u> <u>PHY 361(3)</u> <u>Foreign Language (4)</u> <u>USP Humanities (3)</u></p>
<p><b>YEAR 3 - FALL:</b></p>	<p><u>PHY 404G(3)</u> <u>PHY 416G(3)</u> <u>USP Social Sciences (3)</u> <u>Foreign Language (3)</u> <u>MA322 or Major related electives (3)</u></p>	<p><b>YEAR 3 - SPRING:</b></p>	<p><u>PHY 417G(3)</u> <u>Foreign language(3)</u> <u>USP Social Sciences (3)</u> <u>Major related electives (3)</u> <u>Electives (3)</u></p>
<p><b>YEAR 4 - FALL:</b></p>	<p><u>PHY 402(3)</u> <u>PHY 520(3)</u> <u>PHY522 (suggested) (3)</u> <u>PHI300+ (3)</u> <u>Electives (3)</u></p>	<p><b>YEAR 4 - SPRING:</b></p>	<p><u>PHY 521(3)</u> <u>PHY 535W(3)</u> <u>Socience Science 300+ (3)</u> <u>Electives (4)</u></p>

**Hanson, Roxie**

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**Subject:** FW: EPC committee New PHY major (BA pending EPC review, BS pending submission to EPC)

**From:** Hanson, Roxie  
**Sent:** Thursday, May 13, 2010 1:50 PM  
**To:** McMahan, Adrienne; Caton, Erica  
**Cc:** Ng, Kwok-Wai  
**Subject:** RE: EPC committee New PHY major (BA pending EPC review, BS pending submission to EPC)

Erica and Adrienne,

On March 31, a change to the BA was submitted but Jeannine Blackwell had not been contacted. She raised some issues and gave Professor Ng approval April 20. The EPC had the last meeting April 27. So this proposal will go to the EPC in the fall.

On April 14, I was copied on an email from Professor Ng to Jeannine Blackwell notifying her that the dept was planning to make changes to the BS for the major. The last correspondence I was copied on, Ng replied to Blackwell's concern about 500-level crs requirements. No BS program change has been submitted.

No proposal has been submitted for the minor. It may be a part of the BA or BS proposal.

Hope this helps. Roxie

**From:** Caton, Erica  
**Sent:** Wednesday, May 12, 2010 12:38 PM  
**To:** McMahan, Adrienne  
**Subject:** EPC committee New PHY major

Adrienne,

Do you know where the proposal for the new PHY major and minor stands – the department has been telling students that there will be a change, however Steve has yet to see anything and it seems that the process has stalled.

Erica

**Mrs. Erica Caton**  
**Director of Advising**  
**College of Arts and Sciences Advising Center**  
**239 Patterson Office Tower**  
**859-257-8712**  
**Email: [ecato2@uky.edu](mailto:ecato2@uky.edu)**

## Hanson, Roxie

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**From:** Ng, Kwok-Wai  
**Sent:** Wednesday, April 14, 2010 3:14 PM  
**To:** Blackwell, Jeannine  
**Cc:** Mike Cavagnero; Bosch, Anna; Noe, JoLynn; Hanson, Roxie  
**Subject:** Change in Physics BA program (PHY notifying Blackwell)

Jeannine L. Blackwell  
Associate Provost for Academic Administration

Dear Dr. Blackwell,

The Physics and Astronomy plans to submit a Change Undergraduate Program form for approval to make the following changes to its BA program:

This proposed BA curriculum shifts the required coursework from the difficult 400- and 500-level classes (currently 404 mechanics, 416 electrodynamics, and 520 quantum mechanics) to lower-level requirements. By better distinguishing the BS and BA curricula, we hope to attract new students to the program. The proposed BA program is not a pre-graduate school curriculum like the BS, but it will prepare graduates for lower-level jobs of a technical nature. This will also serve as a fall-back option to BS students having trouble with the difficult upper-level curriculum.

Please let me know if you have any question about these changes. I would appreciate very much if you can acknowledge this e-mail. Thanks.

Sincerely yours,  
Kwok-Wai Ng  
DUS  
Department of Physics and Astronomy  
University of Kentucky  
Tel: 859-257-1782 (Office)  
257-4796 (Lab)

## Hanson, Roxie

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**From:** Blackwell, Jeannine  
**Sent:** Tuesday, April 20, 2010 2:48 PM  
**To:** Ng, Kwok-Wai  
**Cc:** Mike Cavagnero; Bosch, Anna; Noe, JoLynn; Hanson, Roxie  
**Subject:** RE: Change in Physics BS program

Thank you, Dr. Ng,

The only caveat that I would list has to do with 500-level courses.

I know that Physics and some other departments use 500 levels for advanced undergraduate courses, but actually they are undergraduate/graduate-level courses in the university system. So in any new or changed 500-level courses, please include a statement in the syllabus that they are used for undergraduate majors (and minors?) only. Graduate students, for example, could not take PHY 535, since it includes the undergraduate graduation writing requirement.

With that statement on each new or changed 500 level course, you are ready to go.

Jeannine Blackwell  
Dean of the Graduate School  
Associate Provost for Academic Administration University of Kentucky  
102 Gillis Building  
Lexington, KY 40506-0033  
[blackwell@uky.edu](mailto:blackwell@uky.edu)

-----Original Message-----

**From:** Ng, Kwok-Wai  
**Sent:** Wednesday, April 14, 2010 3:13 PM  
**To:** Blackwell, Jeannine  
**Cc:** Mike Cavagnero; Bosch, Anna; Noe, JoLynn; Hanson, Roxie  
**Subject:** Change in Physics BS program

Jeannine L. Blackwell  
Associate Provost for Academic Administration

Dear Dr. Blackwell,

The Physics and Astronomy plans to submit a Change Undergraduate Program form for approval to make the following changes to its BS program:

1. Making PHY535 a three credit course that satisfies the University Graduation Writing Requirement. This will change the credit hours of major's requirements from 37 hours to 38 hours.
2. Instead of taking one selected course from topical physics PHY 522(3), 524(3), 554(3), 555(3), 556(3), 591(3), 592(3), physics majors (BS) will be required to take a new course PHY521 on quantum mechanics. This will require physics (BS) majors to take two quantum mechanics courses (PHY520 and PHY521) before graduation.



Since PHY521 is a new course, a New Course Form will be submitted together for approval.

Please let me know if you have any question about these changes. I would appreciate very much if you can acknowledge this e-mail. Thanks.

Sincerely yours,

Kwok-Wai Ng

DUS

Department of Physics and Astronomy

University of Kentucky

Tel: 859-257-1782 (Office)

257-4796 (Lab)