



June 10, 2008

Dr. Kay Halasek  
Chair, Council on Academic Affairs  
Denney Hall  
164 West 17<sup>th</sup> Avenue  
CAMPUS

Dear Kay:

The Arts and Sciences Committee on Curriculum and Instruction (CCI) approved a revision to the Physics Minor on May 30, 2008. The CCI Subcommittee on Natural and Social Sciences approved the major at their meeting on April 30, 2008. The proposal was also endorsed by the MPS Curriculum Committee on April 21, 2008. Please see the attached transmittal history for detailed minutes from these meetings.

The changes in this proposal are modest and straightforward: Physics is requesting that Computer Science and Engineering 202 (4 credit hours), be added as a prerequisite to Physics 416, and that Physics 416 be added to as a prerequisite to Physics 555, 631, and 621. This increase in structure was driven by student surveys and feedback, which indicated a desire for increased rigor in order to be better prepared for upper-division major coursework, graduate study and career placement.

The addition of CSE 202 as a prerequisite to Physics 416 would allow students more exposure to sophisticated mathematics tools. The transition would be a smooth one since seventy percent of Physics majors are already taking CSE 202. Also, by adding Physics 416 as a prerequisite the courses listed above, students will be compelled to take courses in an order that ensures the best possible preparation for upper level coursework.

These changes were approved unanimously and with praise by all Arts and Sciences committees.

Please let me know if I can be of further assistance as CAA considers these changes.

Sincerely,

A handwritten signature in blue ink, appearing to read "Kathleen M. Hallihan".

Kathleen M. Hallihan  
Director, Curriculum and Assessment

c: Randy Smith  
Edward Adelson  
Briggs Cormier

Date: May 23, 2008

Subject: Proposed Revision to the Major in Physics

From: Mike Vasey, Chair, Subcommittee C

Subcommittee C considered the proposal for revisions to the Physics major on 4/30/08.

This revision proposes a single change to the requirements for a major in physics: All students must complete Computer Science and Engineering 202, Introduction to Programming and Algorithms for Engineers and Scientists. The proposal states that the addition of this 4 credit hour course is needed to meet the increased needs of students for exposure to sophisticated mathematical computing tools. This exposure is justified both because facility with such programs is required in advanced physics courses and in careers pursued by many graduates with a major in physics. A student survey provided clear support for additional preparation in the use of scientific software and programming tools, which students rated as very poor in the current major. Because some 70% of physics majors already take CSE 202, the impact on students in the major is limited. Furthermore, it is clear that despite the increase of 4-credits, it remains possible for students to complete the major and graduate with a minimum of 181 credit hours.

The consensus of the committee was that the proposed change to the requirements for the Physics major was clearly articulated and well-justified. The only question raised by the committee was whether the Department of Computer Science and Engineering would be able to handle the increased demand for CSE 202. However, a memo from Professor Bruce Weide, Associate Chair of the CSE department made it clear that CSE is prepared to meet this increased demand. It was noted that because some 70% of physics majors already take this course, the increase in demand would not be large. The subcommittee therefore voted unanimously in favor of the proposal.

## **Transmittal History for Revision to Physics Major**

**ASC CCI-**

**5-31-08 UNAPPROVED Minutes excerpt**

### **1. Physics Major revisions (Guest: Richard Kass)**

- a. History and Context (Mike Vasey, Sub-C Chair): Straightforward proposal which grants students greater exposure to sophisticated mathematics tools, student survey indicated strong support for increased rigor for purposes of preparation for later careers. Committee felt increase of 4 credit hours was well justified and supports the proposal strongly. 70% of Physics majors are already taking these courses for extra preparation.
- b. Forces a hierarchy within the curriculum which compels students to take courses in their proper order (Physics 416) for best possible preparation for later studies.
- c. Also accommodates astronomy majors, most of whom are already double majors in Physics. Advising and departmental permissions from Physics will make transition with any pre-reqs seamless and supportive for astronomy students.
- d. Physics majors take 230-240 credit hours anyway, within 4 years, and Astronomy majors take more.
- e. Q: Is there a discrepancy between the 70% of students who are already taking CS courses, and those who are asking for more preparation? A: Earlier computing courses plus requiring it of other 30% of majors will improve program generally.

**Unanimously Approved**

**CCI Sub-Committee C – Approved with all associated course change requests**

**4-30-08 minutes excerpt**

### **7. Physics major revision**

- i. Discussion of the main changes—credit hour increase, adding computing course requirement, changing pre-regs to courses
- ii. In proposal p.3 last paragraph, Bruce Weide is the “Associate Chair,” not Chair

**MAPS CCC- Approved Unanimously with Contingencies**

**4-21-08 minutes excerpt**

### **1. Physics Major revision and associated courses (416, 555, 621, 631)**

- a. Intro by Richard Hughes

- b. waiting for concurrence from Astronomy (received by Curriculum Office on 4/25)
- c. Justification for adding computing courses and changing pre-reqs: (1) it is the need of the field, (2) to allow later courses to focus on the content rather than students' computing struggles. Other 9 bench mark institutions also make the same requirements-- a good reference for the change.
- d. Discussion on the relationship btw CIS202, Physics 350, 416, 517, 616, 780 and how the changes will affect different student groups, including Astronomy majors, transfers, and students from regional campuses. Richard will discuss this change with Astronomy more. Astronomy majors can wave the pre-reqs. Instructors can take care of individual students' needs (in terms of computing skills needed for the class) when the majority of the class is prepared (because of the proposed pre-req change).
- e. CIS concurred with the change (rec'd 4/21) and expressed that they are able to accommodate the expected increasing needs of CIS 202.

## **Proposed Changes to the Physics Major program**

Date: April 14<sup>th</sup>, 2008

Prepared by: Richard E. Hughes, Vice Chair for Undergraduate Studies, Physics;  
Dr. Sandy Doty, Director of Undergraduate Studies, Physics

### **Background/Motivation**

The Physics Undergraduate Studies Committee has discussed the addition of computing to the curriculum for at least 10 years. There have been persistent efforts of the part of physics instructors to add computing based tools such as MATLAB and Mathematica to the upper division courses Physics 555, Physics 631, and Physics 621. These efforts have been hampered by the lack of familiarity incoming students have with true computing tools (beyond something like Excel).

In addition, organizations like the American Institute for Physics (AIP) have noted the importance of computing both for Physics bachelors degree students, as well as those intending to pursue a physics PhD. In particular, they find:

- 1) 24% of Physics Bachelors have a job in software 5-8 years after graduation.
- 2) Students rated their preparation in Scientific Software and Scientific programming very poorly, while rating their importance to their current job as very high.
- 3) 75% of PhD recipients rated “Software Development or Modeling” as skills necessary “Some or Most of the Time”.

Clearly, computing skills are a necessary, yet overlooked, part of the undergraduate Physics major. See <http://www.aip.org/statistics/trends/reports/bachplus5.pdf> for more details on this topic.

### **Other Universities:**

We have examined the computing requirements for Physics majors among our nine benchmark institutions. The results of this study fall into 4 basic categories:

- 1) A formal requirement for all majors:  
Penn State University, the University of Arizona, the University of Illinois, and the University of Minnesota, all require a computing course as part of their undergraduate Physics Major curriculum.
- 2) A formal requirement for a subset of majors:  
The University of Texas requires a computing course in 3 of their 6 options for a B.S. in Physics. The University of Washington Seattle has a technical elective requirement in which computing is 1 of 6 choices from which 2 must be chosen.
- 3) Encouragement, but no formal requirement:  
The University of Wisconsin at Madison strongly encourages their physics majors to take a computing course, but there is no formal requirement to do so.
- 4) No requirement:  
Among our 9 benchmark institutions, only the University of Michigan and UCLA have no computing requirement in their Physics Major curriculum.

The majority of our benchmark institutions have recognized the importance that computing skills play in the educational experience of their undergraduate physics majors.

### **Summary of Changes**

The changes fall into two categories: the addition of a new prerequisite, and modification of prerequisites for courses that students are already required to take.

The new prerequisite will be for Physics 416: CSE 202, Introduction to Programming and Algorithms for Engineers and Scientists. This is a 4 credit hour course which has a single prerequisite of Math 151. Math 151 is already required for our majors, and all of our incoming students should be able to take CSE 202 in their first year, or in the first two quarters of their second year. Alternate courses offered by CSE would be considered as substitutes subject to approval by the Physics Undergraduate Studies Committee or their designee.

The modification of prerequisites essentially requires that Physics 416 be taken prior to Physics 555, 621, and 631 – which is typically the case for most of our majors already.

The summary of all of these prerequisite changes are as follows:

- 1) Physics 416: Add CSE 202 to the current prerequisite of Physics 133
- 2) Physics 555 (Fields and Waves I): Add Physics 416 to current prerequisites of Physics 261, Math 415 and Math 513
- 3) Physics 631 (Introductory Quantum Mechanics I): Add Physics 416 to current prerequisites of Physics 263, Math 415 and Math 568
- 4) Physics 621 (Statistical Physics I): Add Physics 416 to current prerequisites of Physics 263, Math 254 or Math 263

The primary motivations for these changes is twofold:

- 1) Physics 416 teaches experimental techniques of physics and the statistical analysis of data to students. To do this effectively requires the use of some programming. Since there is no computing requirement for this course presently, the instructor provides some simple programming instruction. However, since the programming skills of students varies greatly, the course instructor is usually forced to spend significant time training students in this important skill. A formal programming class prior to this course will allow the instructor to focus on the core aspects of data analysis which Physics 416 is intended to deliver.
- 2) The upper division courses of Physics 555, Physics 631, and Physics 621 are taken in the 3<sup>rd</sup> and/or 4<sup>th</sup> year by the overwhelming majority of our students. By adding Physics 416 as a requirement for these courses, this effectively requires students to take Physics 416 by the end of their second year, which is when Physics 416 was originally intended for students in the first place. Since computing will still be used in Physics 416, this ordering, plus the requirement of CSE 202, will give each student two formal programming experiences by the end of their second year. This will enable instructors of the upper division courses to integrate complex computer programming examples into their curriculum, without having to spend valuable time teaching programming techniques as well.

### **Impact of the Changes**

Looking at graduates of the ASC Physics Major program for the years 2006 through 2007, which includes approximately 70 students, we determined that approximately 70% had taken CSE 202 or an equivalent course. As a result, the addition of CSE 202 as a required course would on average impact approximately 30% of our ASC physics majors.

The ASC Physics Majors choose among 6 different options when planning their major program: A:Advanced, B:General Sciences, C:Biophysics, D:Pre-med, E:Secondary Education, and F:Personalized. The total minimum number of hours to graduation remains at 181 credit hours for our students, even with this change. A sample curriculum for the Advanced Physics Major option A is attached as an appendix to this document.

Finally, an important result of both the CSE 202 requirement, as well as the prerequisite modifications, will be the impact on student readiness for research. If the proposed changes are approved, ALL of our ASC Physics majors will have two significant classroom computing experiences prior to the summer of their second year. Conversations with many faculty in the Physics department indicate that students who are already prepared with computing skills are at a significant advantage when they seek research employment with physics faculty. Research experience is a significant contributor to any physics student's success, whether they intend to seek employment immediately after graduation, or if they intend to go on to graduate work in physics. These changes will make students more attractive candidates for research positions.

### **Process/Recommendation**

The changes were discussed in a series of Physics undergraduate studies meetings, through the spring and fall of 2007. The committee formally voted on the changes on January 8<sup>th</sup>, 2008, and unanimously approved them. A presentation of the proposed changes was made to the full faculty on January 24<sup>th</sup>, 2008, and approved at that meeting as well.

The changes were also discussed extensively with a broad collection of undergraduates at a Society of Physics Students (SPS) meeting on September 25<sup>th</sup>, 2007. The purpose of this meeting was to discuss the possible computing requirement as well as solicit student comments. The response was overwhelmingly favorable. In addition, a smaller meeting involving just the leadership officers of both SPS and Sigma Pi Sigma (the national honor society of Physics students) was held to discuss the changes. This group of 6 students was also very supportive of these changes. Finally, we should note that there are 3 student representatives on the Undergraduate Studies committee (only one of whom is in the previously mentioned leadership group), and they expressed strong support for these changes as well.

This addition of CSE 202 as a requirement has been discussed with the Chair of CSE, Prof Bruce Weide, and he has indicated that the additional students should not pose any problem from a staffing perspective. A copy of the letter of concurrence from CSE is attached to this proposal.

*Associate*

## SAMPLE FOUR-YEAR PROGRAM

### Bachelors of Science – Physics – Option A

The Physics Department offers 6 options to complete a Bachelors of Science in Physics. Option A is the program designed for those interested in pursuing graduate study in Physics. All other options require less Physics but may have specific other technical electives. Please consult the on-line handbook for details.

YR	AUTUMN	WINTER	SPRING
<b>1</b>	<b>MATH 151</b> (5 hrs) Calculus and Analytical Geometry I <b>PHYS 131</b> (5hrs) Intro. Physics; Particles and Motion <b>GEC</b>	<b>MATH 152</b> (5 hrs) Calculus and Analytical Geometry II <b>PHYS 132</b> (5hrs) Intro. Physics; Elec. and Magnetism <b>GEC</b>	<b>MATH 153</b> (5 hrs) Calculus and Analytical Geometry III <b>PHYS 133</b> (5hrs) Intro. Physics; Waves and Quantum <b>CSE 202 (Proposed)</b>
<b>2</b>	<b>MATH 254</b> (5 hrs) Calculus and Analytical Geometry IV  <b>PHYS 261</b> (4 hrs) Dynamics of Particles and Waves, I <b>PHYS 295</b> (1 hr) Undergraduate Seminar <b>GEC</b>	<b>MATH 415</b> (4 hrs) Ordinary and Partial Differential Equations <b>PHYS 262</b> (4 hrs) Dynamics of Particles and Waves, II <b>GEC</b>  <b>GEC</b>	<b>MATH 568</b> (3 hrs) Introductory Linear Algebra  <b>PHYS 263</b> (4 hrs) Dynamics of Particles and Waves, III <b>PHYS 416</b> (4 hrs) Meth. Of Exper. Phys <b>GEC</b>
<b>3</b>	<b>PHYS 555</b> (4 hrs) Fields and Waves I <b>PHYS 631</b> (4 hrs) Intro. to Quantum Mechanics I <b>MATH 513</b> (3 hrs) Vector Analysis <b>GEC</b>	<b>PHYS 656</b> (4 hrs) Fields and Waves II <b>PHYS 632</b> (4 hrs) Intro. to Quantum Mechanics II  <b>GEC</b>	<b>PHYS 657</b> (4 hrs) Fields and Waves III <b>PHYS 633</b> (4 hrs) Intro. to Quantum Mechanics III <b>PHYS 517</b> (4 hrs) Intro. Electronics <b>GEC</b>
<b>4</b>	<b>PHYS 621</b> (4 hrs) Statistical Physics I <b>PHYS 596</b> (3 hrs) Senior Seminar, Writing and Speaking <b>GEC</b>	<b>PHYS 622</b> (4 hrs) Statistical Physics II <b>PHYS 616</b> (4 hrs) Advanced Physics Lab  <b>GEC</b>	<b>PHYS 664</b> (4 hrs) Theoretical Mechanics <b>GEC</b>  <b>GEC</b>

\*A minimum of 101 total hours is required for graduation in the College of Arts and Sciences. The sample program above illustrates the physics and math courses. The remaining hours are comprised of courses chosen to complete the General Education Curriculum (GEC) of the College. The number of hours in the core program, GEC, and remaining free electives are indicated below the sample curriculum.

#### COURSES IN RED ONLY OFFERED ONCE PER YEAR

Credit Hrs in Core Courses	113
Credit Hrs in GEC	65
Free Electives	3
<hr/>	
<b>Total Hours in Program</b>	<b>181</b>



**CSE concurrence for Physics Major revision courses change**

Hi Sophia

Here is the email of concurrence from Bruce Weide regarding adding CSE 202 to the Physics prereqs.

Richard

----- Forwarded message -----  
Date: Fri, 14 Dec 2007 08:54:46 -0500  
From: Bruce W. Weide <weide@cse.ohio-state.edu>  
To: Sandy Doty <dotys@pacific.mps.ohio-state.edu>  
Cc: Richard Hughes <hughes@mps.ohio-state.edu>,  
Subject: Re: Letter of concurrence

Hi Sandy,

On 12/13/07 4:12 PM, "Sandra Doty" <dotys@pacific.mps.ohio-state.edu> wrote:

> Hi Bruce,

>

> It was good to meet with you Tuesday. Thank you for the information about > CSE 294P:  
> Computational Thinking in Context. Richard and I have discussed > this as a viable option for  
> the computing requirement he is planning to > implement for Physics majors starting in AU08.

>

> As we had discussed, due to a number of factors, Dr. Hughes is interested > in implementing  
> a computing requirement for all majors. After much > consideration, it seems reasonable that  
> CSE 202: Introduction to > Programming and Algorithms for Engineers and Scientists or an  
> equivalent > course, such as the pilot course CSE 294P; would fulfill that > need.

>

> Based on past scheduling behavior of our majors, a significant number of > whom already  
> take CSE 202 or an equivalent, we project that introducing > this requirement would result in  
> approximately 20 more physics students > taking this course each year.

>

> I am writing to confirm with you that this change in our curriculum is > acceptable to you and  
> that you feel CSE can handle the increased load.

>

> Please let me know if this is indeed acceptable OR if you have any > questions/ concerns.

>

> Sincerely,

>

> Sandy

To confirm, yes, CSE will be able to handle these students in CSE 202 and/or CSE 294P. We look forward to the opportunity to work with you and to help however we can in this important initiative.

--

Cheers,  
-Bruce

Bruce W. Weide  
Professor and Associate Chair  
Dept. of Computer Science and Engineering The Ohio State University  
2015 Neil Ave.  
Columbus, OH 43210-1277

## **Concurrence from Astronomy for Physics Major Revision**

From: dmterndrup@gmail.com; on behalf of; Don Terndrup [terndrup@astronomy.ohio-state.edu]  
Sent: Fri 4/25/2008 6:27 PM  
Subject: Re: concurrence request for Physics Major revision

Hi --

We concur with the proposed major changes in Physics. If there is anything else to do other than sending this email, please let me know.

### **Don Terndrup**

On Fri, Apr 25, 2008 at 4:32 PM, Sophia Lee <lee.1307@osu.edu> wrote:

- >
- > Hi Don,
- >
- > Would you please let us know if Astronomy concurs with Physics Major
- > revision proposal? Your concurrence is the last contingency for it to
- > be approved at the college level. The proposal can be reviewed at:
- > <http://artsandsciences.osu.edu/currofc/tracking.cfm?TrackingID=1223>
- >
- > Please let us know by 4/30 (wed) if possible. If you need more time,
- > please also feel free to let us know. Thank you very much and have a good weekend.
- >
- > Sophia
- >
- > Sophia Lee, Ph.D.
- >
- > Program Coordinator, Curriculum and Assessment Office
- >
- > Colleges of Arts and Sciences
- >
- > The Ohio State University
- >
- > Phone (614) 688-5679
- >
- > Fax (614) 688-5678
- >
- > E-mail: lee.1307@osu.edu
- >

**The Ohio State University  
Colleges of the Arts and Sciences Course Change Request**

Physics

Academic Unit

Methods of Experimental Physics

416

Book 3 Listing (e.g., Portuguese)

Course Number

Summer      Autumn    x    Winter      Spring      Year 2008

**Proposed effective date:** choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

**A. Course Offerings Bulletin Information.** Follow instructions in the OAA curriculum manual. Before you fill out the "Present Course" information, be sure to check the latest edition of the *Course Offerings Bulletin* and subsequent Circulating Forms. You may find that the changes you need have already been made or that additional changes are needed. If the course offered is less than quarter or term, please also complete the Flexibly Scheduled/OffCampus/Workshop Request form.

**COMPLETE ALL ITEMS THIS COLUMN**

**Present Course**

1. Book 3 Listing: \_\_\_\_\_
2. Number: 416 \_\_\_\_\_
3. Full Title: Methods of Experimental Physics \_\_\_\_\_
4. 18-Char. Transcript Title: \_\_\_\_\_
5. Level and Credit Hours U4 \_\_\_\_\_
6. Description: (25 words or less)  
Introduction to the experimental techniques of physics and the statistical analysis of data, through lectures and a variety of experiments. \_\_\_\_\_
7. Qtrs. Offered : Au Wi Sp \_\_\_\_\_
8. Distribution of Contact Time: 1 1-hr cl, 2 2-hr labs.  
(e.g., 3 cl, 1 3-hr lab) \_\_\_\_\_
9. Prerequisite(s): Physics:131, 132, and 133. \_\_\_\_\_
10. Exclusion:  
(Not open to....) \_\_\_\_\_
11. Repeatable to a maximum of \_\_\_\_\_ credits. \_\_\_\_\_
12. Off-Campus Field Experience: \_\_\_\_\_
13. Cross-listed with: \_\_\_\_\_
14. Is this a GEC course? Yes. \_\_\_\_\_
15. Grade option (circle): Ltr    S/U    P  
If P graded, what is the last course in the series? \_\_\_\_\_
16. Is an honors version of this course available? Y  NX  
Is an Embedded Honors version of this course available?    Y  N

17. Other general course information:

**COMPLETE ONLY THOSE ITEMS THAT CHANGE  
Changes Requested**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. Add prerequisite of CSE 202. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_

**B. General Information**

1. Do you want the prerequisites enforced electronically (see the OAA manual for what can be enforced)?  
Yes

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2. Does this course currently satisfy any GEC requirement, if so indicate which category?  
GEC data analysis course.

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3. What other units require this course? Have these changes been discussed with those units?  
None

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4. Have these changes been discussed with academic units that might have a jurisdictional interest in the subject matter? Attach relevant letters.  
Yes.

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5. Is the request contingent upon other requests, if so, list the requests?  
No

---

6. Purpose of the proposed change. (If the proposed change affects the content of the course, attach a revised syllabus and course objectives and e-mail to [ascurofc@osu.edu](mailto:ascurofc@osu.edu).)  
Provide computing experience necessary for taking Physics 416.





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7. Please list Majors/Minors affected by the proposed change. Attach revisions of all affected programs. This course is (check one):  Required on major(s)/minor(s)       A choice on major(s)/minors(s)  
 An elective within major(s)/minor(s)       A general elective:

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8. Describe any changes in library, equipment or other teaching aids needed as a result of the proposed change or if the proposed change involves budgetary adjustments, describe the method of funding:  
None

**Approval Process** The signatures on the lines in ALL CAPS ( e.g. ACADEMIC UNIT) are required.

- |  |                                   |                 |
|--|-----------------------------------|-----------------|
| <br>1. Academic Unit Undergraduate Studies Committee Chair  | Richard E. Hughes<br>Printed Name | 3/5/08<br>Date  |
| 2. Academic Unit Graduate Studies Committee Chair  | Printed Name                      | Date            |
| <br>3. <b>ACADEMIC UNIT CHAIR/DIRECTOR</b>  | Richard E. Hughes<br>Printed Name | 3/5/08<br>Date  |
| 4. After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17 <sup>th</sup> Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to <a href="mailto:ascurofc@osu.edu">ascurofc@osu.edu</a> . The ASC Curriculum Office will forward the request to the appropriate committee. |                                   |                 |
| <br>5. <b>COLLEGE CURRICULUM COMMITTEE</b>  | Richard E. Hughes<br>Printed Name | 3/5/08<br>Date  |
| <br>6. <b>ARTS AND SCIENCES EXECUTIVE DEAN</b>  | Edward H. Adelman<br>Printed Name | 5-30-08<br>Date |
| 7. Graduate School (if appropriate)  | Printed Name                      | Date            |
| 8. University Honors Center (if appropriate)   | Printed Name                      | Date            |
| 9. Office of International Affairs (study tours only)  | Printed Name                      | Date            |
| 10. <b>ACADEMIC AFFAIRS</b>  | Printed Name                      | Date            |

**The Ohio State University  
Colleges of the Arts and Sciences Course Change Request**

Physics

Academic Unit

Fields and Waves I

555

Book 3 Listing (e.g., Portuguese)

Course Number

Summer      Autumn    x    Winter      Spring      Year 2008

**Proposed effective date:** choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

**A. Course Offerings Bulletin Information.** Follow instructions in the OAA curriculum manual. Before you fill out the "Present Course" information, be sure to check the latest edition of the *Course Offerings Bulletin* and subsequent Circulating Forms. You may find that the changes you need have already been made or that additional changes are needed. If the course offered is less than quarter or term, please also complete the Flexibly Scheduled/OffCampus/Workshop Request form.

**COMPLETE ALL ITEMS THIS COLUMN**

**Present Course**

1. Book 3 Listing: \_\_\_\_\_
2. Number: 555 \_\_\_\_\_
3. Full Title: Fields and Waves I \_\_\_\_\_
4. 18-Char. Transcript Title: \_\_\_\_\_
5. Level and Credit Hours U G 4 \_\_\_\_\_
6. Description: (25 words or less)  
Introduction to the description of electrostatic fields; dielectrics; boundary-value problems. \_\_\_\_\_
7. Qtrs. Offered : Au \_\_\_\_\_
8. Distribution of Contact Time: 4 1-hr cl.  
(e.g., 3 cl, 1 3-hr lab) \_\_\_\_\_
9. Prerequisite(s): Physics133 and prereq or concur Phys 261, and Math 415 or Math 255, and Math 513 or 551 or 416. \_\_\_\_\_
10. Exclusion:  
(Not open to....) \_\_\_\_\_
11. Repeatable to a maximum of \_\_\_\_\_ credits.
12. Off-Campus Field Experience: \_\_\_\_\_
13. Cross-listed with: \_\_\_\_\_
14. Is this a GEC course? No. \_\_\_\_\_
15. Grade option (circle): Ltr    S/U    P  
If P graded, what is the last course in the series? \_\_\_\_\_
16. Is an honors version of this course available? Y  NX  
Is an Embedded Honors version of this course available?    Y  N
17. Other general course information: \_\_\_\_\_

**COMPLETE ONLY THOSE ITEMS THAT CHANGE**

**Changes Requested**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
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7. \_\_\_\_\_
8. \_\_\_\_\_
9. Add prerequisite of Physics 416 \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_

**B. General Information**

1. Do you want the prerequisites enforced electronically (see the OAA manual for what can be enforced)?  
Yes

2. Does this course currently satisfy any GEC requirement, if so indicate which category?  
No.

3. What other units require this course? Have these changes been discussed with those units?  
None require this course.

4. Have these changes been discussed with academic units that might have a jurisdictional interest in the subject matter? Attach relevant letters.

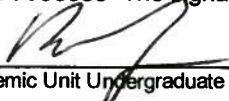
5. Is the request contingent upon other requests, if so, list the requests?  
No.

6. Purpose of the proposed change. (If the proposed change affects the content of the course, attach a revised syllabus and course objectives and e-mail to [ascurofc@osu.edu](mailto:ascurofc@osu.edu).)  
Provide computing/analysis skills prior to 555. Allows integration of computing into Physics 555.


7. Please list Majors/Minors affected by the proposed change. Attach revisions of all affected programs. This course is (check one):  Required on major(s)/minor(s)  A choice on major(s)/minors(s)  
 An elective within major(s)/minor(s)  A general elective:

8. Describe any changes in library, equipment or other teaching aids needed as a result of the proposed change or if the proposed change involves budgetary adjustments, describe the method of funding:  
No changes necessary


**Approval Process** The signatures on the lines in ALL CAPS ( e.g. ACADEMIC UNIT) are required.


1.  Academic Unit Undergraduate Studies Committee Chair Printed Name: RICHARD E. HUGHES Date: 3/5/08

2. Academic Unit Graduate Studies Committee Chair Printed Name Date

3.  ACADEMIC UNIT CHAIR/DIRECTOR Printed Name: RICHARD E. HUGHES Date: 3/5/08

4. After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17<sup>th</sup> Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to [ascurofc@osu.edu](mailto:ascurofc@osu.edu). The ASC Curriculum Office will forward the request to the appropriate committee.

5.  COLLEGE CURRICULUM COMMITTEE Printed Name: RICHARD E. HUGHES Date: 3/5/08

6.  ARTS AND SCIENCES EXECUTIVE DEAN Printed Name: EDWARD A. SCHAEFER Date: 5-30-08

7. Graduate School (if appropriate) Printed Name Date

8. University Honors Center (if appropriate) Printed Name Date

9. Office of International Affairs (study tours only) Printed Name Date

10. ACADEMIC AFFAIRS Printed Name Date

**The Ohio State University**  
**Colleges of the Arts and Sciences Course Change Request**

Physics

Academic Unit

Statistical Physics I

621

Book 3 Listing (e.g., Portuguese)

Course Number

Summer

Autumn

x Winter

Spring

Year 2008

**Proposed effective date:** choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

**A. Course Offerings Bulletin Information.** Follow instructions in the OAA curriculum manual. Before you fill out the "Present Course" information, be sure to check the latest edition of the *Course Offerings Bulletin* and subsequent Circulating Forms. You may find that the changes you need have already been made or that additional changes are needed. If the course offered is less than quarter or term, please also complete the Flexibly Scheduled/OffCampus/Workshop Request form.

**COMPLETE ALL ITEMS THIS COLUMN**

**Present Course**

1. Book 3 Listing:

2. Number: 621

3. Full Title: Statistical Physics I

4. 18-Char. Transcript Title:

5. Level and Credit Hours U G 4

6. Description: (25 words or less)  
 Thermodynamics and statistical mechanics; applications to noninteracting classical and quantum systems.

7. Qtrs. Offered : Au

8. Distribution of Contact Time: 4 1-hr cl.  
 (e.g., 3 cl, 1 3-hr lab)

9. Prerequisite(s): Physics 263

10. Exclusion:  
 (Not open to....)

11. Repeatable to a maximum of \_\_\_\_\_ credits.

12. Off-Campus Field Experience:

13. Cross-listed with:

14. Is this a GEC course? No.

15. Grade option (circle): Ltr S/U P  
 If P graded, what is the last course in the series?

16. Is an honors version of this course available? Y  NX  
 Is an Embedded Honors version of this course available? Y  N

17. Other general course information:

**COMPLETE ONLY THOSE ITEMS THAT CHANGE**  
**Changes Requested**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. Add prerequisite of Physics 416
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_

**B. General Information**

1. Do you want the prerequisites enforced electronically (see the OAA manual for what can be enforced)?  
Yes

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2. Does this course currently satisfy any GEC requirement, if so indicate which category?  
No.

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3. What other units require this course? Have these changes been discussed with those units?  
None

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4. Have these changes been discussed with academic units that might have a jurisdictional interest in the subject matter? Attach relevant letters.  
Yes

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5. Is the request contingent upon other requests, if so, list the requests?  
No.

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6. Purpose of the proposed change. (If the proposed change affects the content of the course, attach a revised syllabus and course objectives and e-mail to [ascurofc@osu.edu](mailto:ascurofc@osu.edu).)  
Provide computing/analysis skills prior to physics 621. Allows integration of computing into Physics 621.


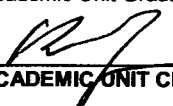


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7. Please list Majors/Minors affected by the proposed change. Attach revisions of all affected programs. This course is (check one):  
 Required on major(s)/minor(s)       A choice on major(s)/minors(s)  
 An elective within major(s)/minor(s)       A general elective:

---

8. Describe any changes in library, equipment or other teaching aids needed as a result of the proposed change or if the proposed change involves budgetary adjustments, describe the method of funding:  
No changes necessary.

**Approval Process** The signatures on the lines in ALL CAPS ( e.g. ACADEMIC UNIT) are required.

- |  |   |                   |         |
|--|---|-------------------|---------|
| 1. Academic Unit Undergraduate Studies Committee Chair   |  | Richard E. Hughes | 3/5/08  |
|  |   | Printed Name      | Date    |
| 2. Academic Unit Graduate Studies Committee Chair  |   | Printed Name      | Date    |
| 3. ACADEMIC UNIT CHAIR/DIRECTOR  |  | Richard E. Hughes | 3/5/08  |
|  |   | Printed Name      | Date    |
| 4. After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17 <sup>th</sup> Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to <a href="mailto:ascurofc@osu.edu">ascurofc@osu.edu</a> . The ASC Curriculum Office will forward the request to the appropriate committee. |   |                   |         |
| 5. COLLEGE CURRICULUM COMMITTEE  |  | RICHARD E. HUGHES | 3/5/08  |
|  |   | Printed Name      | Date    |
| 6. ARTS AND SCIENCES EXECUTIVE DEAN  |  | Edward Adelsen    | 5/30/08 |
|  |   | Printed Name      | Date    |
| 7. Graduate School (if appropriate)  |   | Printed Name      | Date    |
| 8. University Honors Center (if appropriate)   |   | Printed Name      | Date    |
| 9. Office of International Affairs (study tours only)  |   | Printed Name      | Date    |
| 10. ACADEMIC AFFAIRS   |   | Printed Name      | Date    |



**The Ohio State University  
Colleges of the Arts and Sciences Course Change Request**

Physics

Academic Unit

Introductory Quantum Mechanics I

631

Book 3 Listing (e.g., Portuguese)

Course Number

Summer      Autumn    x    Winter      Spring      Year 2008

**Proposed effective date:** choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

**A. Course Offerings Bulletin Information.** Follow instructions in the OAA curriculum manual. Before you fill out the "Present Course" information, be sure to check the latest edition of the *Course Offerings Bulletin* and subsequent Circulating Forms. You may find that the changes you need have already been made or that additional changes are needed. If the course offered is less than quarter or term, please also complete the Flexibly Scheduled/OffCampus/Workshop Request form.

**COMPLETE ALL ITEMS THIS COLUMN**

**Present Course**

1. Book 3 Listing: \_\_\_\_\_

2. Number: 631 \_\_\_\_\_

3. Full Title: Introductory Quantum Mechanics I \_\_\_\_\_

4. 18-Char. Transcript Title: \_\_\_\_\_

5. Level and Credit Hours U G 4 \_\_\_\_\_

6. Description: (25 words or less)  
Introduction to quantum mechanics, including its historical background, the Schrodinger equation, solutions of one-dimensional scattering and bound state problems.

7. Qtrs. Offered : Au \_\_\_\_\_

8. Distribution of Contact Time: 4 1-hr cl.  
(e.g., 3 cl, 1 3-hr lab) \_\_\_\_\_

9. Prerequisite(s): Course in modern physics beyond 133 and Math 255 or 415 and Math 568 or 571. \_\_\_\_\_

10. Exclusion:  
(Not open to....) \_\_\_\_\_

11. Repeatable to a maximum of \_\_\_\_\_ credits.

12. Off-Campus Field Experience: \_\_\_\_\_

13. Cross-listed with: \_\_\_\_\_

14. Is this a GEC course? No. \_\_\_\_\_

15. Grade option (circle): Ltr    S/U    P  
If P graded, what is the last course in the series?

16. Is an honors version of this course available? Y  NX  
Is an Embedded Honors version of this course available?    Y  N

17. Other general course information: \_\_\_\_\_

**COMPLETE ONLY THOSE ITEMS THAT CHANGE**

**Changes Requested**

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

\_\_\_\_\_

9. Add prerequisite of Physics 416 \_\_\_\_\_

\_\_\_\_\_

10. \_\_\_\_\_

\_\_\_\_\_

11. \_\_\_\_\_

12. \_\_\_\_\_

13. \_\_\_\_\_

14. \_\_\_\_\_

15. \_\_\_\_\_

16. \_\_\_\_\_

17. \_\_\_\_\_

**B. General Information**

1. Do you want the prerequisites enforced electronically (see the OAA manual for what can be enforced)?  
Yes

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2. Does this course currently satisfy any GEC requirement, if so indicate which category?  
No.

---

3. What other units require this course? Have these changes been discussed with those units?  
None

---

4. Have these changes been discussed with academic units that might have a jurisdictional interest in the subject matter? Attach relevant letters.  
Yes

---

5. Is the request contingent upon other requests, if so, list the requests?  
No.

---

6. **Purpose of the proposed change. (If the proposed change affects the content of the course, attach a revised syllabus and course objectives and e-mail to [ascurofc@osu.edu](mailto:ascurofc@osu.edu).)**  
Provide computing/analysis skills prior to physics 631. Allows integration of computing into Physics 631.

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7. Please list Majors/Minors affected by the proposed change. Attach revisions of all affected programs. This course is (check one):  
 Required on major(s)/minor(s)       A choice on major(s)/minors(s)  
 An elective within major(s)/minor(s)       A general elective:

---

8. Describe any changes in library, equipment or other teaching aids needed as a result of the proposed change or if the proposed change involves budgetary adjustments, describe the method of funding:  
No changes necessary

---

**Approval Process** The signatures on the lines in ALL CAPS ( e.g. ACADEMIC UNIT) are required.

- |     |   |  |                 |
|-----|---|--|-----------------|
| 1.  | Academic Unit Undergraduate Studies Committee Chair   | <br>RICHARD E. HUGHES<br>Printed Name | 3/5/08<br>Date  |
| 2.  | Academic Unit Graduate Studies Committee Chair  | Printed Name   | Date            |
| 3.  | ACADEMIC UNIT CHAIR/DIRECTOR  | <br>RICHARD E. HUGHES<br>Printed Name | 3/5/08<br>Date  |
| 4.  | After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17 <sup>th</sup> Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to <a href="mailto:ascurofc@osu.edu">ascurofc@osu.edu</a> . The ASC Curriculum Office will forward the request to the appropriate committee. |  |                 |
| 5.  | COLLEGE CURRICULUM COMMITTEE  | <br>RICHARD E. HUGHES<br>Printed Name | 3/5/08<br>Date  |
| 6.  | ARTS AND SCIENCES EXECUTIVE DEAN  | <br>EDWARD ADELSON<br>Printed Name    | 5/30/08<br>Date |
| 7.  | Graduate School (if appropriate)  | Printed Name   | Date            |
| 8.  | University Honors Center (if appropriate)   | Printed Name   | Date            |
| 9.  | Office of International Affairs (study tours only)  | Printed Name   | Date            |
| 10. | ACADEMIC AFFAIRS  | Printed Name   | Date            |