C082

UNIVERSITY OF KENTUCKY
APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR & MINOR

1. Submitted by **College of Arts and Sciences** Date **October 6, 2003**

   Department/Division offering course **Physics & Astronomy**

2. Changes proposed:
   (a) Present prefix & number **PHY 716** Proposed prefix & number **PHY 716**

   (b) Present Title **Advanced Quantum Mechanics**

   New Title **Quantum Field Theory II**

   (c) If course title is changed and exceeds 24 characters (including spaces), include a sensible title (not to exceed 24 characters) for use on transcripts:

   (d) Present credits: **3** Proposed credits: **3**

   (e) Current lecture:laboratory ratio Proposed:

   (f) Effective Date of Change: (Semester & Year) **Spring 2005**

3. To be Cross-listed as:
   (Prefix & Number) (Signature: Dept. Chair)

4. Proposed change in Bulletin description:
   (a) Present description (including prerequisite(s): **A continuation of PHY 615. Topics covered will include relativistic wave equations, second quantization, quantum electrodynamics Prereq: 615**

   (b) New description: **A continuation of PHY 616. Topics include approximation methods in many body theory and applications to condensed matter and nuclear systems, quantum electrodynamics, radiative corrections, Higgs mechanism and applications to particle physics and superconductivity, introduction to non-Abelian gauge fields and the standard model.**

   (c) Prerequisite(s) for course as changed: **PHY 616**

5. What has prompted this proposal? **We have extensively examined our offerings of graduate courses in specialized research areas, and we are reorganizing some of our courses to meet the needs of a larger number of advanced physics graduate students. This course is the second semester of a two-course sequence on quantum field theory. The course is primarily intended to meet the needs of advanced graduate students planning to do research in theoretical nuclear and particle physics.**

6. If there are to be significant changes in the content or teaching objectives of this course, indicate changes: **Although we are using the same course number as we previously used for a related course, the new version of PHY 716 is a different and more advanced course. Whereas the original version of PHY 716 was a follow-on to our core course sequence in quantum mechanics (PHY 614, 615), the new PHY 716 has a new advanced course (PHY 616) as a prerequisite. Very roughly, the old version of PHY 716 was equivalent to our new PHY 616. However, the new PHY 616, 716 sequence provides a much tighter integration of advanced theoretical material. The theoretical research efforts of our department have been enhanced in the last few years by the addition of Prof. Das, Eides and Grotch to our faculty. The new PHY 616, 716 sequence will be especially useful to students planning to work with these faculty.**

7. What other departments could be affected by the proposed change?

8. Is this course applicable to the requirements for a least one degree or certificate at the University of Kentucky? **Yes** No

ORIGINAL

9. Will changing this course change the degree requirements in one or more programs? * Yes **No**
   If yes, attach an explanation of the change.*

10. Is this course currently included in the University Studies Program? Yes **No**
    If yes, please attach correspondence indicating concurrence of the University Studies Committee.

11. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted.

*NOTE: Approval of this change will constitute approval of the program change unless other program modifications are proposed.

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12. Is this a minor change? Yes No

(NOTE: See the description on this form of what constitutes a minor change. Minor changes are sent directly from the Dean of the College to the Chair of the Senate Council. If the latter deems the change not to be minor, it will be sent to the appropriate Council for normal processing.)

13. Within the Department, who should be consulted for further information on the proposed course change?

Name/e-mail: **T. Troland** Phone Extension: **7-8620**

Signatures of Approval:

Department Chair	Date: 10-7-03
Dean of the College	Date: DEC 09 2003
	Date of Notice to the Faculty: NOV 21 2003
*Undergraduate Council	Date
*University Studies	Date
*Graduate Council	Date: 3-19-04
*Academic Council for the Medical Center	Date
*Senate Council	Date of Notice to Univ. Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

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The Minor Change route for courses is provided as a mechanism to make changes in existing courses and is limited to one or more of the following:

a. change in number within the same hundred series;
b. editorial change in description which does not imply change in content or emphasis;
c. editorial change in title which does not imply change in content or emphasis;
d. change in prerequisite which does not imply change in content or emphasis;
e. cross-listing of courses under conditions set forth in item 3.0;
f. correction of typographical errors. [University Senate Rules, Section III - 3.1]

PHY 616 - Learning Objectives

1. Students will master topics in advanced quantum mechanics of special interest to current research in theoretical nuclear and particle physics.
2. Students will gain a deep understanding of quantization theory, including path integral quantization and quantization of gauge theory.
3. Students will understand and be able to explain radiative corrections and renormalization.
4. Students will become well acquainted with renormalization group and critical phenomena theory.
5. Students will thoroughly understand the standard model of particle physics.

PHY 616 - Course outline

Please see Course Syllabus (attached).

PHY 616 – List of references

Please see Course Syllabus (attached), section on textbooks.

PHY 716 : QUANTUM FIELD THEORY II : Spring Semester 2003

Instructor : Sumit R. Das
Classes : Tuesdays and Thursdays 5:00 PM- 5:50 PM CP397
Wednesdays 1:00 PM - 1:50 PM CP 183
First Day of Class : January 15, 2002. 1:00 PM
Last Day of Class : May 1, 2002 5:00 PM
Office hours : Tuesdays and Wednesdays 2:00 PM - 3:00 PM.

Exams

There will be no in-class exam. Grades will be decided on the basis of homework assigments and oral exams. In the oral exams, the student will be asked to work out and explain some of the home work problems and some related questions will be asked. This will be done twice, once during the week beginning March 10, and once during the finals week, May 5-9 These oral exams will last for about an hour each and may be arranged during mutually convenient times.

Course Syllabus

1. Path Integral Quantization
2. Quantization of gauge theory and Feynman rules for electrodynamics
3. Elementary processes in QED
4. Introduction to radiative corrections and renormalization
5. Spontaneous symmetry breaking and superconductivity. Higgs mechanism
6. Renormalization group and critical phenomena
7. Introduction to the standard model.

Textbooks

Primary Textbook : M. Peskin and D. Schroeder, "An Introduction to Quantum Field Theory" (Perseus Books, 1995). This is an excellent introduction to methods in field theory with general applicability but with a slant towards applications in particle physics.

Other suggestions : Ryder "Quantum Field Theory"

UNIVERSITY OF KENTUCKY

October 6, 2003

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To Whom it may concern:

The attached course applications are the product of many discussions in the Physics & Astronomy Department. These discussions concerned our offerings of advanced level graduate courses in the research specialties of our department.

A careful audit of enrollments in these courses over the last 15 years demonstrated that we offer more of them than our student population permits. Therefore, more than a year ago, we began to consider how these advanced courses might be consolidated, which courses might be dropped, and which had outdated course descriptions or prerequisites. As a result of these discussions, we decided to drop four existing courses (PHY 625, 629, 640, 756), create a new interdisciplinary physics course (PHY 616) and make a major change in another course (PHY 716) so it will become a sequel to PHY 616. Also, we decided to update the course descriptions and/or prerequisites to six existing courses (PHY 525, 591, 592, 600, 624, 632).

As the appropriate committees review these course applications, I ask them to bear in mind the following considerations:

- All courses included in this submission are graduate courses in advanced research topics. Changes in these courses do not affect our graduate core course requirements in fundamental physics, nor any other course requirements in our department nor any students outside our department.
- Apart from PHY 616 and 716, all proposed changes in course descriptions or prerequisites are minor in the sense that they will not affect the ways in which the courses are currently taught. Our goal with these minor changes is to update the course descriptions to reflect the evolution that has occurred in advanced subject matter over the course of a decade or more.

Sincerely,

T. Troland
Director of Graduate Studies
troland@pa.uky.edu

ARTS AND SCIENCES COLLEGE COUNCIL/CURRICULUM COMMITTEE

INVESTIGATOR REPORT

INVESTIGATING BODY **Nat. & Math Sci.** (Area) COURSE, MAJOR, DEGREE or PROGRAM PHY 760 (department or college)

DATE FOR COUNCIL REVIEW **Dec. 9, 2003** CATEGORY: NEW, CHANGE, DROP

INSTRUCTIONS: This completed form will accompany the course application to the Graduate/Undergraduate Council(s) in order to avoid needless repetition of investigation. The following questions are included as an outline only. Be as specific and as brief as possible. If the investigation was routine, please indicate this. The term "course" is used to indicate one course, a series of courses or a program, whichever is in order. Return the form to **David Leep Associate Dean, 231 Patterson Office Tower** for forwarding to the Council(s). ATTACH SUPPLEMENT IF NEEDED.

1. List any modifications made in the course proposal as submitted originally and why.

None

2. If no modifications were made, review considerations that arose during the investigation and the resolutions.

None

3. List contacts with program units on the proposal and the considerations discussed therein.

None

4. Additional information as needed.

5. A&S **Area A Curriculum Committee** Recommendation:

APPROVE, APPROVE WITH RESERVATION, OR DISAPPROVE

6. A&S **Council** Recommendation:

APPROVE, APPROVE WITH RESERVATION, OR DISAPPROVE

7. _____ Date: 11-20-03
A&S Council Investigator, Tom Troland

File: \InvestigatorRpt