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

1. Submitted by College of Arts & Sciences ___________________________ Date 22 March 2006
   Department/Division offering course Physics & Astronomy

2. Changes proposed:
   (a) Present prefix & number PHY 535 Proposed prefix & number

   (b) Present Title Experimental Physics: Advanced Physics Laboratory
       New Title Advanced Physics Laboratory

   (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:

       Advanced Physics Lab

   (d) Present credits: 2 Proposed credits: 3

   (e) Current lecture: laboratory ratio 0:4 Proposed: 0:4

   (f) Effective Date of Change: (Semester & Year) Spring 2007

3. To be Cross-listed as: ___________________________ Signature: Department Chair

4. Proposed change in Bulletin description:
   (a) Present description (including prerequisite(s):
       And advanced laboratory course covering topics in atomic, solid state, and nuclear physics, geometrical
       and wave optics, and principles and techniques of spectroscopy. May be repeated to a maximum
       of 4 credits.

   (b) New description:
       An advanced laboratory course emphasizing quantum phenomena in atomic, solid state and nuclear systems.
       Laboratory techniques include optical spectroscopy, gamma-ray and particle detection, optical
       pumping, atomic and nuclear collisions, and interferometry. This course satisfies the Graduation Writing
       Requirement.

   (c) Prerequisite(s) for course as changed: PHY 335, PHY 361

5. What has prompted this proposal?
   Presently, PHY 535 is a repeatable laboratory course in which the instructor tailors the experimental project
   content to each student's degree requirements. Students in the BS program are required to complete several of
   the more challenging projects, while BA students and Physics minors are not. This has led to confusion for
   both the students and the instructor. We propose to instead offer two lab courses: a new Intermediate Physics
   lab (PHY 435) and the more advanced PHY 535 lab. PHY 535 will primarily contain the more difficult
   projects, and PHY 435 the less demanding ones. Neither course will be repeatable.
   Students can then select the course or courses which meet their degree requirements: BS students MUST
   take PHY 535 and may also take PHY 435 (though not as a prerequisite); non-BS students may select among
   PHY 435, PHY 535 and other lab courses to satisfy their degree requirements. Both courses will be taught at
   the same days and times, in the same laboratory, and by the same instructor. Enrollments in both PHY 435 and
   PHY 535 will be combined for accounting purposes, as will the instructor's teaching credit, which will total
   only 3 hours.

6. If there are to be significant changes in the content or teaching objectives of this course, indicate changes:
   Currently, students complete 7 projects and submit a final report on each. Their daily work in the lab, the lab
   notebook they keep, and the final report are all evaluated to determine the project grade. We propose to use
   PHY 535 (and PHY 435) to satisfy the Graduation Writing Requirement of our students. ALL students in
   both courses will be held to higher standards of writing than at present, and their written reports will be
   routinely returned for corrections. While the time spent in class will remain unchanged, this represents a
   significant increase in the overall workload of the students. We therefore also propose to increase the course
   credit from 2 to 3 hours.

ITEM #7 on this form will not allow the answer to be entered. The answer to Item # 7 is Radiation Medicine.
ITEM #9 on this form will not allow the answer to be entered. The answer to Item #9 is BS-Physics adds 1 hour (see * below)

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

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

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

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.
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]
Abbreviated Syllabus:
PHYSICS 535W
ADVANCED PHYSICS LAB
SPRING 2007

Instructor: Prof. Michael A. Kovash
Office: CP-171, 257-1150
Office Hours: Wednesday, 1-2
Electronic mail: kovash@pa.uky.edu

GOALS

Physics 535 is an advanced laboratory course in which a variety of projects spanning the fields of atomic, solid state and nuclear physics will be investigated. In this largely self-directed course, students will learn laboratory skills and also gain valuable practice using statistical methods of data analysis.

The specific goals of PHY535 include:

• To gain first-hand experience working in a laboratory setting by completing several 'classic' physics experiments, many of which were instrumental in defining our modern, quantum-mechanical picture of atomic and nuclear systems,

• To learn numerical methods for evaluating the uncertainties associated with laboratory measurements, and for determining optimized parametric representations of measured data, and,

• To learn effective methods for recording and reporting the results of laboratory measurements.

EXPERIMENTAL PROJECTS

Physics 535 contains experimental projects grouped into three broad categories: Atomic Physics, Nuclear Physics, and Optics and Spectroscopy. Every student will be assigned projects from each of these categories. Note that there is some overlap between the projects used in PHY 435 and those listed below for PHY 535. Any student who previously completed a particular project in PHY 435 will not be assigned the same project in PHY 535.
The experiments which are available this semester are:

**Atomic Physics**
A1 Millikan Oil Drop: e
A5 X-Ray Scattering and Absorption: Cu X-Rays, h, Moseley’s Law
A6 Electron Spin Resonance: g-factor

**Nuclear Physics**
N2 Gamma-Ray Spectroscopy: Energy Calibration, Resolution, Efficiency
N5 Compton Scattering: Kinematics, Angular Distribution, Recoil Energy
N6 $^{60}$Co Decay: $\gamma\gamma$ Correlation

**Spectroscopy and Optics**
SO1 The Fabry-Perot Interferometer
SO2 Two-Slit Interference: Optical Waves and Photons
SO4 High Resolution Spectroscopy: The Grating Spectrometer
SO6 The Michelson Interferometer
SO8 Optical Pumping: Spin Physics in Rubidium

All experiments except N5, N6, SO1 and SO8 are assigned a total of 4 two-hour lab periods, i.e. they span two weeks of classes. Because of their greater complexity, projects N5, N6, SO1 and SO8 require 8 periods, or 4 weeks, to complete. Graduate students enrolled in PHY 535 will complete the same number of laboratory projects as undergraduate students. However, the instructor will suggest additional work for graduate students to do in each of their projects. This may take the form of requiring additional measurements or more sophisticated data analysis, or both.

**NOTEBOOKS**

Everyone is required to purchase a *bound* laboratory notebook from the instructor for use throughout the term. The cost is only $6. The book contains *gridded paper* on which graphs can be easily constructed. No carbon paper is needed. This book will become a record of your preparations, methodologies, observations, graphs, and all other lab work. Throughout the semester we will emphasize the appropriate construction of the notebook, and how it is used to maintain an effective real-time record of your work in the lab.

Students will submit their lab notebook for grading after each experiment. A new experiment can be started only after the graded lab notebook has been returned, which will be within 24 hours of its submission.
REPORTS

Because PHY 435 satisfies the Graduation Writing Requirement (GWR), we will emphasize effective methods for writing concise, coherent, and informative stand-alone lab reports. All undergraduate students enrolled in PHY 435, not just those seeking to satisfy the GWR, will be expected to prepare their reports to the same high standards. Each report must be typewritten and contain at least 4 double-spaced pages of text. All figures must be carefully designed and properly labeled. The overall structure of the report must be carefully organized and contain all of the essential ingredients of a technical report. In addition, the sentences and paragraphs must be clearly constructed and free of grammatical and spelling errors. The first drafts of your reports will be graded and returned to you for correction. Following this iteration procedure, a final grade will be assigned to the report.

Excerpted from www.uky.edu/UGS/WritingInitiative/wchecklist.htm:

**Writing-Intensive Course Requirements**

Any course approved for the Graduation Writing Requirement will involve the following learning outcomes, writing requirements, and grading policies.

**Learning Outcomes**

- Write a paper that is essentially free of mechanical errors (grammar, punctuation, spelling, and syntax) and awkwardness, using a style that is appropriate to the purpose and audience.

- Demonstrate an ability to discover, evaluate, and clearly present evidence in support of an argument in the subject area and utilize documentation that conforms to the formats and the citation conventions of the subject area.

- Be aware that composing a successful text frequently takes multiple drafts, with varying degrees of focus on generating, revising, editing, and proofreading.

**Writing Requirements**

- Students will be required to write a minimum of 15 pages of formal writing. At least 10 of the 15 pages must be single-authored assignments. No assignments requiring fewer than 4 pages may be included in the 15-page minimum.

- All of these 15 pages must go through a draft, review, and revise process.
Grading Policies

- To pass the course, students must submit all formal writing assignments (in draft and final form) and earn a grade of C or higher on each. Assignments other than the formal writing assignments enter into the final grade determination only if the student has achieved grades of C or higher on the formal writing assignments.

- Any major assignment that receives a D or below must be revised to reflect competency and resubmitted. Instructors may limit the number of revision attempts.

- In no case may a student whose writing fails to reach the level of C (competent) receive a passing grade in a course that satisfies the University Writing Requirement.

In summary: To pass the course and fulfill the upper tier of the GWR, students must submit all formal writing assignments and earn a grade of C or better on each assignment. Any major assignment that receives a D or below must be revised to reflect competency and resubmitted. Students may resubmit such assignments 2 times. If they fail to achieve a C grade on the final version of any major writing assignment, the student will receive a failing grade for the course. Note that assignments or requirements other than the formal writing become a factor in the final determination of the course grade only if the student has achieved a grade of C or higher on all formal writing assignments.

Assessment

- Students will submit two copies of their final paper of the semester. One copy will be graded by the instructor; the second copy will be used for SACS assessment and should be a clean copy, with only the student’s social security number listed at the top of the page.

Student Eligibility

- This is a writing-intensive (W) course approved to fulfill the upper tier of the graduation writing requirement (GWR). To receive W credit for this course, students must have successfully completed the first-year writing requirement (ENG 104 or its equivalent) and have completed at least 30 hours of coursework.

Plagiarism

Part II of Student Rights and Responsibilities (available online at http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research,
or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else’s work, whether it be published article, chapter of a book, a paper from a friend or some file, or whatever. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone.

When a student’s assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phrasing intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain. (Section 6.3.1).

The minimum penalty for an academic offense, such as cheating or plagiarism, is an E in the course (Section 6.4.1).

GRADING

A daily classwork grade of 0-10 points will be assigned by the instructor for work in each regular (Tue. & Thur.) lab period. Students who arrive on time and well prepared for class, and who are diligent, careful, accurate and effective in their lab work will receive a daily score of 10; students whose work in the lab is somewhat less than ideal will receive a score of 8; students who exhibit serious deficiencies in their lab work will receive a score of 6; and students with an unexcused absence will receive a daily score of 0. Do not for a minute think that you will be penalized in your daily score for asking questions in class. Indeed, asking insightful questions can actually help you earn a 10-point score. And don’t worry if you have no questions: the instructor will usually have plenty for you.

There will be no mid-term or final exam in this course; each student’s accumulated score on their lab work will be the basis for their final grade assignment. The final Project Grade for each of the 7 experiments will be the weighted average of the score for the lab notebook (1/4), the lab report (1/2), and a classwork grade (1/4). Note that the Project Grade for experiments N5, N6, S01 and SOS will carry double-weighting since these are 8-period projects. Students with unexcused absences may be explicitly penalized when final grades are assigned. Also note that an ‘I’ grade in
this course will only be given in cases where a student is unable to complete the lab work because of illness or similarly debilitating personal circumstance. Other students will receive scores of zero for all uncompleted work, and a final course grade will be assigned.
Abbreviated Syllabus:
PHYSICS 535
ADVANCED PHYSICS LAB
SPRING 2006

Instructor: Prof. Michael A. Kovash
Office: CP-171, 257-1150
Office Hours: Wednesday, 1-2
email: kovash@pa.uky.edu

GOALS

Physics 535 is an upper-level laboratory course in which a variety of projects spanning the fields of optics, spectroscopy, atomic and nuclear physics will be investigated. In this largely self-directed course, students will learn laboratory skills and also gain valuable practice using statistical methods of data analysis.

The specific goals of PHY535 include:

• To gain first-hand experience working in a laboratory setting by completing several ‘classic’ physics experiments, many of which were instrumental in defining our modern, quantum-mechanical picture of atomic and nuclear systems,

• To learn numerical methods for evaluating the uncertainties associated with laboratory measurements, and for determining optimized parametric representations of measured data, and,

• To learn effective methods for recording and reporting the results of laboratory measurements.

EXPERIMENTAL PROJECTS

Physics 535 contains experimental projects grouped into two broad categories: Quantum Physics, and Optics and Spectroscopy. Every student will be assigned projects from these categories based upon his own academic needs and the degree requirements of his Department, noting that 535 may be repeated once for credit. For example, a BA physics major taking 535 for either the first or second time will be assigned projects from both the Quantum Physics and the Optics and Spectroscopy
areas. In contrast, a BS physics major must complete the Quantum Physics unit, which he can do either his first or second time through the course. (BS majors who are certain they will repeat 535 will do several projects in the Optics unit their first time through the course.) Any student repeating 535 will be assigned projects they have not previously completed.

The experiments which are available this semester are:

**Atomic Physics**
A1 Millikan Oil Drop: e
A2 Electron Magnetic Deflection: e/m
A3 Photoelectric Effect: h/e
A4 Franck-Hertz: Hg Excited State
A5 X-Ray Scattering and Absorption: Cu X-Rays, h, Moseley’s Law
A6 Electron Spin Resonance: g-factor

**Nuclear Physics**
N1 Gamma-Ray Absorption: Attenuation Coefficients, Counting Statistics
N2 Gamma-Ray Spectroscopy: Energy Calibration, Resolution, Efficiency
N3 Alpha-Particle Spectroscopy: Bragg Curve, Energy Straggling
N4 Rutherford Scattering: Angular Distribution
N5 Compton Scattering: Kinematics, Angular Distribution, Recoil Energy
N6 $^{60}$Co Decay: $\gamma\gamma$ Correlation

**Spectroscopy and Optics**
SO2 Two-Slit Interference: Optical Waves and Photons
SO3 Microwave Optics: Refraction, Standing Waves, Interferometry
SO7 Optical Dispersion: Index of Refraction

All experiments except N5 and N6 are assigned a total of 4 two-hour lab periods, i.e. they span two weeks of classes. Because of their greater complexity, both N5 and N6 require 8 periods, or 4 weeks, to complete. Graduate students enrolled in PHY 535 will complete the same number of laboratory projects as undergraduate students. However, the instructor will suggest additional work for graduate students to do in each of their projects. This may take the form of requiring additional measurements or more sophisticated data analysis, or both.

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real-time record of your work in the lab.

Students will submit their lab notebook for grading after each experiment. A new experiment can be started only after the graded lab notebook has been returned, which will be within 24 hours of its submission.

We also will emphasize methods of writing a concise, coherent, and informative stand-alone lab report. (Additional information on writing a lab report and maintaining a lab notebook will be supplied at the first class meeting.) These reports, along with the lab notebook, will be submitted for grading at the conclusion of each experiment. For example, the first experiment concludes on Thursday, 26 January, so the first lab report will be due the following Monday, 30 January, by noon. Reports may be submitted in the Physics Department office, or directly to the instructor. All lab materials have a final submission deadline of Monday, 1 May, at 12:00 noon.

GRADING

A daily classwork grade of 0-10 points will be assigned by the instructor for work in each regular (Tue. & Thur.) lab period. Students who arrive on time and well prepared for class, and who are diligent, careful, accurate and effective in their lab work will receive a daily score of 10; students whose work in the lab is somewhat less than ideal will receive a score of 8; students who exhibit serious deficiencies in their lab work will receive a score of 6; and students with an unexcused absence will receive a daily score of 0. Do not for a minute think that you will be penalized in your daily score for asking questions in class. Indeed, asking insightful questions can actually help you earn a 10-point score. And don’t worry if you have no questions; the instructor will usually have plenty for you.

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INVESTIGATING AREA: **Nat. & Math. Sci.**  
COURSE, MAJOR, DEGREE or PROGRAM: **PHY 435, PHY 535**  
DATE FOR EPC REVIEW: **4/14/06**  
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 **Leonidas Bachas, Associate Dean, 275 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 were made.**

2. If no modifications were made, review considerations that arose during the investigation and the resolutions. **It was initially unclear how instructor time and effort would be computed since there is to be one instructor in two courses that meet simultaneously in different but adjacent rooms. Both the Physics department and the Dean of A&S agreed that there is a mechanism for determining time and effort.** The dean's comment is below:

   "This is just fine. John Pica will follow up with the department if there are any specific monitoring issues that need to be observed regarding how everything is counted."

   **Steven L. Hoch**  
   Dean  
   **College of Arts and Sciences**

3. List contacts with program units on the proposal and the considerations discussed therein. **Drs Bhavsar and Kovash, Physics, considered the above concern about instructor time and effort and agreed with the Dean's assessment that no problem exists.**

4. Additional information as needed. **None**

5. **A&S Area Investigator Recommendation:**

   ![Approve]

   **APPROVE, APPROVE WITH RESERVATION, OR DISAPPROVE**

6. **A&S Education Policy Committee Recommendation:**

   ![Approve]

   **APPROVE, APPROVE WITH RESERVATION, OR DISAPPROVE**

7. **A&S Council Investigator, Phil Bonner**  
   Date: **4/20/06**