

Senate Transmission
February 6, 2003

Having reviewed additional information made available to the Undergraduate Council, the following are approved:

COLLEGE OF ARTS AND SCIENCES

Department of Physics and Astronomy

Undergraduate Program Changes

B.A. in Physics

Rationale:

1. The accompanying New Course Proposal describes the role of PHY 228 in our majors' program.
2. CHE 115 is a laboratory course that is associated with CHE 105 and 107. In exit interviews seniors have asked that this course be removed from the requirements, and the department agrees with their suggestion. Chemistry and physics disciplines are strongly linked and the requirement for CHE 105 and 107 is an expression of this link in our major, but the link with chemistry lab is not strong. It is not a prerequisite for any of our courses, and is not essential for developing an understanding of what physics is, does and values. In the present day world of the physics profession, only for a few physicists is chemistry laboratory important. Students can always choose this lab if their career goals call for it, but we should not be requiring it of everyone. Our program requires an unusually large number of premajor requirements (and our courses require an unusually large number of prerequisites). We are adding PRY 228 to this list because of the need for learning of the relativity, thermal physics and geometrical optics at the sophomore level. Deleting CHE 115 will help reduce this premajor load.
3. and 4. The accompanying New Course Proposal describes the role of PHY 306 in our Majors' program. The proposal also describes why we are replacing PHY 308 with it.

B.S. in Physics

Rationale:

1. The accompanying New Course Proposal describes the role of PHY 228 in our majors' program.
2. CHE 115 is a laboratory course that is associated with CHE 105 and 107. In exit interviews seniors have asked that this course be removed from the major requirements, and the department agrees with their suggestion. Chemistry and physics disciplines are strongly linked and the requirement for CHE 105 and 107 is an expression of this link in our major, but the link with chemistry lab is not strong. It is not a prerequisite for any of our courses, and is not essential for developing an understanding of what physics is, does and values. In the present day world of the physics profession, only for a few physicists is chemistry laboratory important. Students can always choose this lab if their career goals call for it, but we should not be requiring it of everyone. Our program requires an unusually large number of premajor requirements (and our courses require an unusually large number of prerequisites). We are adding PHY 228 to this list because of the need for learning of the relativity, thermal physics and geometrical optics at the sophomore level. Deleting CHE 115 will help reduce this premajor load.
3. and 4. The accompanying New Course Proposal describes the role of PHY 306 in our Majors' program. The proposal also describes why we are replacing PHY 308 with it.

5. and 6. PHY/EE 567, Introduction to lasers and masers, is a course that is not regularly taught, and when it is, it is taught by professors in the electrical engineering department. From the list of courses for Requirement II, students only choose one course, so we would like to include courses that we see as central to what we do. PHY/EE 567 is not as central as the other courses listed or PHY 592. We have had several requests to include PHY 592, Astrophysics II -The galaxy, in students' field of concentration and have had to petition it in for individual students because it was not on the list of courses in requirement II. We do see this course as one to be listed here, since it is an advanced course that allows student to apply in a particular area the physics they have learned in the core part of their program.

New Course

PHY 228 Optics, Relativity and Thermal Physics (3)

A lecture and problems course covering the principles of geometrical optics, special relativity, and thermal physics.

Prereq or concur: MA 114

PHY 306 Theoretical Methods of Physics (3)

A lecture and problems course on the applications in physics of vector calculus, Fourier series and transforms, special functions and asymptotic forms.

Prereq or concur: MA 214

Course Change

PHY 231 General Physics (4)

(change in description and prerequisite)

Change to:

PHY 231 General Physics (4)

First part of a two-semester survey of classical physics. Consequences of the principles of mechanics are developed conceptually, analytically and quantitatively. Lecture, three hours; recitation, one hour.

Prereq or concur: MA 113.

PHY 232 General University Physics (4)

(change in description)

Change to:

PHY 232 General University Physics (4)

A general course covering electricity, magnetism, electromagnetic waves and physical optics. Lecture, three hours; recitation, one hour.

PHY 361 Principles of Modern Physics (3)

(change in description and prerequisites)

Change to:

PHY 361 Principles of Modern Physics (3)

An introduction to the foundations of quantum mechanics and selected topics in atomic, nuclear, particle, solid state, and statistical physics.

Prereq: MA 213; PHY 232 or, with consent of instructor, PHY 213

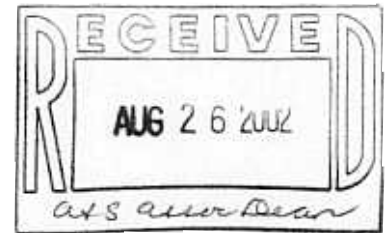
Drop Course

PHY 308 Principles of Optics (3)

APPLICATION FOR NEW COURSE

Submitted by College of Arts & Sciences

Date 2/20/02



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

Proposed designation and Bulletin description of this course:

- (a) Prefix and Number **PHY 228** (b) Title **Optics, Relativity and Thermal Physics**
 *NOTE: If the title is longer than 24 characters (including spaces), write a sensible title (not exceeding 24 characters) for use in transcripts:

Optics relativity thermo

- (c) Lecture/Discussion hours per week **3** (d) Laboratory hours per week **0**
 (e) Studio hours per week **0** (f) Credits **3**

(g) Course description: **A lecture and problems course covering the principles of geometrical optics, special relativity, and thermal physics**

h) Prerequisites (if any): ^{Prereq or Concur:} ~~MA 114~~ **Corequisite: MA 114**

(i) May be repeated to a maximum of _____ (if applicable)

4. To be cross-listed as:

Prefix & No.

Signature, Chairman, cross-listing department

5. Effective Date: **Fall 2003**

(semester and year)

6. Course to be offered

(a) Fall

(b) Spring X

(c) Summer

7. Will the course be offered each year?
 (Explain if not annually):

(a) Yes X

(b) No

8. Why is this course needed: We want to introduce students to the important topics in physics in our introductory course sequence. PHY 231 and PHY 232 and their companion labs, PHY 241 and PHY 242, do this well for the important basic physics, especially that underlying engineering and technology. However there are some additional topics important to physicists to which physics majors and other interested student need a thorough introduction. These topics include relativity, geometrical optics and thermal physics. We are changing PHY 361, Principles of Modern Physics, so that more time is available for discussing the foundation of quantum mechanics and its application, and we are removing relativity, which had little time available previously. Now in PHY 228 a third of a semester is available for relativity. Students are exposed to the ideal gas law and a few related topics in heat in CHE 105/107. The time available in PHY 231 for heat has been so limited that we could not go much beyond that. With a third of semester we can treat thermal physics topics like entropy, the third law and kinetic theory of gasses that have been needed but impossible to include. We will no longer be requiring PHY 308 for the physics major, and the optics needed will be covered in PHY 228 and PHY 232. We have required PHY 308 in the past as a problem-solving transition course, helping students in the transition from the introductory courses to the more mathematical, more problem based upper level courses. We are replacing PHY 308 in our curriculum with PHY 306, Theoretical Methods of Physics. Students will learn both how to apply theoretical approaches and to develop problem solving capabilities here. As a result they will be better prepared for the upper division courses that lie ahead.

9. (a) By whom will the course be taught? **Any faculty member in the department.**

- (b) Are facilities for teaching the course now available? (a) Yes (b) No
If not, what plans have been made for providing them?

10. What enrollment may be reasonably anticipated? **The current number of majors in our department is below that expected of us by the administration. We have been working on ways to make the major more broadly interesting and more approachable. This change is one of those. Typically we have about 10 freshman physics majors. They and some other physics interested students will probably take this course for a total of 15. We hope our recruiting efforts and curriculum changes bring more majors, and then we will have more.**

11. Will this course serve students in the Department primarily? (a) Yes (b) No
Will it be of service to a significant number of students outside the Department? (a) Yes (b) No
If so, explain

Will the course serve as a University Studies Program course? (a) Yes (b) No
If yes, under what Area?

12. Check the category most applicable to this course:

traditional; offered in corresponding departments elsewhere;

relatively new, now being widely established

not yet to be found in many (or any) other universities

13. Is this course part of a proposed new program? (a) Yes (b) No
If yes, which?

14. Will adding this course change the degree requirements in one or more programs? (a) Yes (b) No
If yes, explain the change(s) below:

Of course, our department will have a change, but for the present time that is only one. We will require PHY 228 as a premajor requirement for all BA and BS physics majors. We are dropping CHE 115 from the premajor requirements.

15. Attach a list of the major teaching objectives of the proposed course, outline and/or reference list to be used.

See attached for outline and outcomes.

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

Copies of this proposal and other related proposals have been sent to KCTCS and Lexington Community College.

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

Name: **John Christopher or David Harmin** Phone Extension: **7-5660 or 7-2664**

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

Signatures of Approval:

John W. Bull

 Department Chair
David Leep

 Dean of the College

7-26-02

 Date
 NOV 08 2002

Date
 SEP 05 2002

 Date of Notice to the Faculty
 FEB 5 2003

UNDERGRADUATE COUNCIL

*Undergraduate Council

Date

*University Studies

Date

*Graduate Council

Date

*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:

Course learning objectives:

- 1) Students will be able to relate the principles of geometrical optics, special relativity and thermal physics to situations in physics and the everyday world.**
- 2) Students will be able to solve basic problems in these areas and apply their understanding in these areas in core physics courses that follow.**

Physics 228

Relativity, Optics, and Thermal Physics --- Spring 200N

http://www.pa.uky.edu/~gardner/p520/fall01/p228_test.html

Sample Syllabus

●General Information:

Lecturer: Susan Gardner

Office: Chem-Phys 387B

Phone: 257-4391

E-mail: gardner@pa.uky.edu

Office Hours: Monday, Wednesday 3-4:00 PM, or by appointment.

Required Textbook:

current Phy 231/Phy 232 textbook. [E.g., D. Halliday, R. Resnick, J. Walker *Fundamentals of Physics*, 6th ed.]

Recommended Textbooks:

E.F. Taylor and J.A. Wheeler, *Spacetime Physics* (Freeman, 1966).

F.L. Pedrotti and L.S. Pedrotti, *Introduction to Optics* (Prentice-Hall, 1993).

Daniel V. Schroeder, *An Introduction to Thermal Physics* (Addison-Wesley, 2000).

R.P. Feynman, *The Feynman Lectures on Physics*, vol. 1. (Addison-Wesley, 1963).

Physics 228 is a semester's introductory course in relativity, optics, and thermal physics, to be taken after Phy 231 (General University Physics --- mechanics) and prior to Phy 232 (General University Physics --- electricity & magnetism). Knowledge of mathematics and physics at the level of Ma 113 and Phy 231 is required. It is anticipated that the students will be taking Ma 114 concurrently, in preparation for Phy 232.

Physics 228 treats special relativity, geometrical optics, and thermal physics in roughly three, month-long segments. The course will use the current General University Physics textbook as a starting point, but will develop the indicated topics at somewhat greater

depth, using the recommended texts. The lectures will borrow heavily, though not exclusively, from the required and recommended texts.

A bevy of texts, of varying sophistication and coverage of applications, exist in the literature. An annotated bibliography of them has been included in the course web site. The above books, as well as selections from the bibliography just mentioned, have been placed on reserve in the Chem-Phys library.

Your grade will be determined in the following manner: problem sets (40%), midterm exam (25%), and a final exam (35%). The midterm and final will be in-class, closed book exams, each of two hours in duration. The percentage of total course points you earn will determine your grade in the course. The following guidelines should help you interpret your performance throughout the course of the semester. Typically, a student who earns in excess of 80% of the available points can expect to receive an "A," whereas a student who earns in excess of 60%, but less than 80%, of the available points can expect to receive a "B." A student who earns in excess of 40%, but less than 60%, of the available points can expect to receive a "C". The following condition supercedes the indicated guidelines. *Irrespective of your total earned points, in order to pass the class, you must earn a passing grade on the final examination.*

The bulk of the grade in the course is associated with the problem sets, and rightly so. Working significant problem sets is necessary to develop a genuine understanding of the material. You may discuss the problems with others, and even collaborate, but you are required to write out your solutions independently. The problem sets will be issued in one-two week intervals, and late work will not be accepted.

● Course Topics

<i>Relativity:</i>
The Velocity of Light
The Michelson-Morley Experiment.
The Principles of Special Relativity
Simultaneity
Lorentz Transformations
Time Dilation/Length Contraction
Four-Vectors; Invariant Intervals
The Geometry of Space-time
Relativistic Kinematics
Collisions and Conservation Laws
<i>Optics:</i>

Reflection and Refraction
Total Internal Reflection
Fermat's Principle of Least Time
Optical Instruments
Thick and Thin Lenses
Focal Length
Magnification
Compound Lenses
Aberrations
Resolving Power
The Telescope/Microscope
The Human Eye
Color Vision
The Electron Microscope
<i>Thermal Physics:</i>
Temperature -- the Zeroth Law
The First Law; Work
The Second Law
Heat Engines
Reversible and Irreversible Processes
The Efficiency of an Ideal Engine
Entropy
The Third Law
Kinetic Theory of Gases
Molecular Interpretation of Temperature
The Distribution of Molecular Speeds
Boltzmann Law

Course learning objectives:

- 1) Students will be able to relate the principles of geometrical optics, special relativity and thermal physics to situations in physics and the everyday world.**
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To: smcare0@pop.uky.edu
From: "John E. Christopher" <jchris@uky.edu>
Subject: Fwd: Course and curriculum changes
Cc:
Bcc:
Attached: C:\Documents and Settings\jchris\My Documents\Worddocs\DUS\UPCC0102\Phy 228.doc; C:\Documents and Settings\jchris\My Documents\Worddocs\DUS\UPCC0102\PHY 232.doc; C:\Documents and Settings\jchris\My Documents\Worddocs\DUS\UPCC0102\PHY 231.doc;

Dear Dean Carey:

Date: Fri, 01 Mar 2002 12:32:34 -0500
To: lreve2@pop.uky.edu, Carolyn.O'Daniel@kctcs.net, pjkrae00@pop.uky.edu
From: "John E. Christopher" <jchris@uky.edu>
Subject: Course and curriculum changes
Cc: Roxy Hanson <rhanson@pop.uky.edu>

Dear Dean Revell, Director O'Daniel and Phil: The Department of Physics and Astronomy is submitting course and curriculum changes. See attached for changes in sophomore level courses. There is a proposal for a new 200 level course which is not proposed as a USP course. This new course, PHY 228, will be required of physics majors. There are slight changes proposed in PHY 231 and 232, which are USP courses. We are informing you of our intent and seeking your input on our attempt to improve our course offerings and descriptions. Thanks, John Christopher

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