APPLICATION FOR NEW COURSE

1. Submitted by the College of Arts and Sciences Date: February 11, 2009

   Department/Division proposing course: Physics and Astronomy

2. Proposed designation and Bulletin description of this course:

   a. Prefix and Number PHY 605

   b. Title* Gravity

   *If title is longer than 24 characters, offer a sensible title of 24 characters or less: _____

   c. Courses must be described by at least one of the categories below. Include number of actual contact hours per week..

   (___) CLINICAL (___) COLLOQUIUM (___) DISCUSSION (___) LABORATORY (X) LECTURE

   (___) INDEPEND. STUDY (___) PRACTICUM (___) RECITATION (___) RESEARCH (___) RESIDENCY

   (___) SEMINAR (___) STUDIO (_____) OTHER – Please explain: _____

   d. Please choose a grading system: ☒ Letter (A, B, C, etc.) ☐ Pass/Fail

   e. Number of credit hours: 3

   f. Is this course repeatable? YES ☐ NO ☒ If YES, maximum number of credit hours: _____

   g. Course description:

   An introduction to the general theory or relativity, covering tensor analysis, Einstein's equations, experimental tests, black holes, and cosmology. Prerequisites: PHY 504 and PHY 417G, or permission of instructor.

   h. Prerequisite(s), if any:

   PHY 504 and PHY 417G, or consent of instructor

   i. Will this course also be offered through Distance Learning? YES ☐ NO ☒

   If YES, please check one of the methods below that reflects how the majority of the course content will be delivered:

   Internet/Web-based ☐ Interactive video ☐ Extended campus ☐

3. Supplementary teaching component: ☒ N/A or ☐ Community-Based Experience ☐ Service Learning ☐ Both

4. To be cross-listed as: _____ / _____
   Prefix and Number printed name Cross-listing Department Chair signature

5. Requested effective date (term/year): Spring / 2011

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6. Course to be offered (please check all that apply): ☐ Fall ☒ Spring ☐ Summer

7. Will the course be offered every year? ☐ YES ☒ NO
If NO, please explain: Depending on demand, probably to be offered in alternate years, like many of our advanced topical courses.

8. Why is this course needed?
There has been consistent demand for this by our students (and it has been offered as PHY 600 a few times in the last several years, including Spring 2009). A course like this is taught in most graduate physics departments.

9. a. By whom will the course be taught? Professors Shapere, Das, Elitzur, Gardner, Eides

b. Are facilities for teaching the course now available? ☒ YES ☐ NO
If NO, what plans have been made for providing them?

10. What yearly enrollment may be reasonably anticipated?
10 students (in alternate years)

11. a. Will this course serve students primarily within the department? ☒ Yes ☐ No

b. Will it be of interest to a significant number of students outside the department? ☒ YES ☐ NO
If YES, please explain.
A few students in mathematics may be interested.

12. Will the course serve as a University Studies Program course[†]? ☐ YES ☒ NO
If YES, under what Area?
[†]AS OF SPRING 2007, THERE IS A MORATORIUM ON APPROVAL OF NEW COURSES FOR USP.

13. Check the category most applicable to this course:

☒ traditional – offered in corresponding departments at universities elsewhere

☐ relatively new – now being widely established

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

14. Is this course applicable to the requirements for at least one degree or certificate at UK? ☒ Yes ☐ No

15. Is this course part of a proposed new program? ☐ YES ☒ NO
If YES, please name:

16. Will adding this course change the degree requirements for ANY program on campus? ☐ YES ☒ NO
If YES[‡], list below the programs that will require this course:

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†In order to change the program(s), a program change form(s) must also be submitted.

17. ☒ The major teaching objectives of the proposed course, syllabus and/or reference list to be used are attached.

18. ☐ Check box if course is 400G or 500. If the course is 400G- or 500-level, *you must include a syllabus showing differentiation* for undergraduate and graduate students by (i) requiring additional assignments by the graduate students; and/or (ii) the establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4)*

19. Within the department, who should be contacted for further information about the proposed new course?

Name: Professor Al Shapere Phone: 7-8896 Email: shapere@pa.uky.edu

20. Signatures to report approvals:

February 2, 2009	Michael Cavagnero		
DATE of Approval by Department Faculty	printed name	Reported by Department Chair	signature
revised 3/23/09 3/10/09	Leonides S. Blekas		
DATE of Approval by College Faculty	printed name	Reported by College Dean	signature
		/	
* DATE of Approval by Undergraduate Council	printed name	Reported by Undergraduate Council Chair	signature
		2009.09.24 15:26:00 -04'00'	
* DATE of Approval by Graduate Council	printed name	Reported by Graduate Council Chair	signature
		/	
* DATE of Approval by Health Care Colleges Council (HCCC)	printed name	Reported by Health Care Colleges Council Chair	signature
* DATE of Approval by Senate Council		Reported by Office of the Senate Council	
* DATE of Approval by University Senate		Reported by Office of the Senate Council	

*If applicable, as provided by the *University Senate Rules.* (http://www.uky.edu/USC/New/RulesandRegulationsMain.htm)

ARTS AND SCIENCES
EDUCATIONAL POLICY COMMITTEE
INVESTIGATOR REPORT

http://www.as.uky.edu/working/collegiate-governance/education-policy-committee/proposals/default.aspx

INVESTIGATING AREA: **Natural & Math. Sci.** (COURSE, MAJOR, DEGREE or PROGRAM: **PHY 605 .**

DATE FOR EPC REVIEW: **Mar. 10, 2009** 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.

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

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

4. Additional information as needed.

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

   (APPROVE,) APPROVE WITH RESERVATION, OR DISAPPROVE

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

   (APPROVE,) APPROVE WITH RESERVATION, OR DISAPPROVE

7. J. James Holler Date: **3/10/09**

A&S Educational Policy Committee, Natural & Mathematical Sciences Area Coordinator
Jim Holler, jim.holler@uky.edu 257-5884

Hanson, Roxie

From: Hanson, Roxie
Sent: Thursday, March 12, 2009 9:35 AM
To: Yates, Diane L
Subject: PHY 605 - signed hardcopy needed

Diane, the form and syllabus are in the Physics folder ... see right navigator panel for curriculum proposals
http://www.as.uky.edu/working/collegiate-governance/education-policy-committee/Pages/default.aspx

Best, Roxie

Roxie Hanson | University of Kentucky | College of Arts & Sciences | Office of the Associate Dean |
275 Patterson Office Tower | Lexington, KY 40506 | p. 859.257.6689 | f. 859.323.1073 | www.as.uky.edu

PHY605

Gravity

Instructor: Alfred Shapere
Office: CP383
e-mail: shapere@pa.uky.edu
Phone: 257 8896 (day); 559 4324 (eve)

Textbook:
Gravity: An Introduction to General Relativity, by James B. Hartle, Addison-Wesley.

Recommended books:
A First Course in General Relativity, by Bernard F. Schutz, Cambridge Press.
Relativity: Special, General, and Cosmological, by Wolfgang Rindler, Oxford Press.
Introducing Einstein's Relativity, by Ray d'Inverno, Oxford Press.

Prerequisities: Physics 504 and 417, or permission of instructor.

Overview:
It is more than 100 years since Einstein radically changed our conceptions of space and time with his Special Theory of Relativity, which has by now become a cornerstone of almost every aspect of modern physics. Einstein's revolution continued with the General Theory of Relativity, a theory of the dynamics of spacetime which, still largely in its original form, is our best modern theory of gravity and the basis for much of astrophysics and cosmology. However, in contrast to Special Relativity, the consequences and deep structure of General Relativity are still far from fully understood; their investigation is at the forefront of some of the most active areas of research in physics.

In this course, we will study the Special and General Theories of Relativity and some applications to cosmology and astrophysics. By the end of the course, you should have developed an appreciation for the physical concepts underlying these theories and for the way in which these concepts lead to quantitative predictions, you should have some facility with the mathematical techniques of tensor analysis and curved-space geometry, and you should be able to apply them to a wide range of physical problems.

Grading:
Grades will be based on homework assignments (30%), midterm test (30%), and final exam (40%). Relative to this weighting, students' percentage scores on homework assignments and tests will be added to compute their final percentage scores. Normally, grades will be determined on the following scale: A = 90 – 100%, B = 80 – 89%, C = 70 – 79%, E < 70%. However, the instructor reserves the right to relax these numerical standards as a function of student scores on exams and homework if the instructor determines that students have adequately mastered course material.

You are encouraged to discuss homework problems with others, but to get maximum benefit you should at least try to solve all the problems on your own first, and you should write out your solutions in your own words. Identical solutions will be regarded as plagiarism. You should also note for each problem any significant discussions with others

and references consulted (this will not reduce your grade in any way). The problem sets will be distributed and collected at the beginning of class every Friday, and late work will not be accepted. Not all problems will be graded in detail; on longer homeworks, some problems will be graded for completeness but not correctness.

During the in-class tests, you are not allowed to consult any text book, reference book, class notes, or any other written materials, unless explicitly directed. Cheating and plagiarism on tests or exams, as well as in all other aspects of the course, are very serious academic offenses. Violators of the academic code are subject to punishment in accordance with University Senate Rules sections 6.3 and 6.4.

In case of excused absence from a test, a makeup test will be offered. Except in cases of extreme emergency, the professor must be notified by email or phone at least 24 hours prior to the test. For examples of excusable absences consult University Senate Rule 5.2.4.2.

Course Evaluations:

Course evaluations are an important component of our Department's instructional program. An on-line course evaluation system was developed to allow each student ample time to evaluate each component of the course and instructor, thus providing the Department with meaningful numerical scores and detailed commentary while minimizing the loss of instructional time in the classroom. To access the system during the evaluation period, simply go the Department of Physics Web page at www.pa.uky.edu and click on the link for Course Evaluations; then follow the instructions. When you log in, you will be assigned a random identification number that will keep all your comments and scores anonymous.

Course Outline:

Weeks 1 – 3: Review of Special Relativity
Weeks 4 – 6: Tensors and the geometry of curved space
Weeks 7 – 8: Experimental tests
Weeks 9 – 10: Black holes
Weeks 11 – 12: Einstein’s equations
Weeks 13 – 14: Cosmology