General Education Course Information Sheet

Please submit this sheet for each proposed course

Department & Course Number Physics 11

Course Title Revolutions in Physics

Indicate if Seminar and/or Writing II course _____

1 Check the recommended GE foundation area(s) and subgroups(s) for this course

Foundations of the Arts and Humanities

- Literary and Cultural Analysis _____
- Philosophic and Linguistic Analysis _____
- Visual and Performance Arts Analysis and Practice _____

Foundations of Society and Culture

- Historical Analysis _____
- Social Analysis _____

Foundations of Scientific Inquiry

- Physical Science 4 units
  With Laboratory or Demonstration Component must be 5 units (or more) _____
- Life Science _____
  With Laboratory or Demonstration Component must be 5 units (or more) _____

2. Briefly describe the rationale for assignment to foundation area(s) and subgroup(s) chosen.

The course is a survey of modern physics ideas including quantum mechanics, relativity, nuclear physics and cosmology. It will include a summary of classical physics including the contradictory experiments in the late 19th century and the ultimate success of very non-intuitive ideas.

3. "List faculty member(s) who will serve as instructor (give academic rank):
Professor James Larkin

Do you intend to use graduate student instructors (TAs) in this course? Yes x No ____

If yes, please indicate the number of TAs 1

4. Indicate when do you anticipate teaching this course over the next three years:

2013-2014	Fall	____	Winter	____	Spring	2014
	Enrollment	____	Enrollment	____	Enrollment	60
2014-2015	Fall	____	Winter	____	Spring	2015
	Enrollment	____	Enrollment	____	Enrollment	90
2015-2016	Fall	____	Winter	____	Spring	2015
	Enrollment	____	Enrollment	____	Enrollment	120

5. GE Course Units

Is this an ***existing*** course that has been modified for inclusion in the new GE? Yes X No ____

If yes, provide a brief explanation of what has changed. _____

It was meant to be a GE course but an oversight occurred and the GE box was not checked.

Present Number of Units: 4 Proposed Number of Units: 4

6. Please present concise arguments for the GE principles applicable to this course.

❑ General Knowledge	Physics 11 is designed for non-majors and provides a broad overview of physics leading up to the revolutions of modern physics that occurred in the 20th century. Students will gain insight into the scientific method, and the physical world on the smallest and largest scales.
❑ Integrative Learning	A broad suite of demos are being developed to give students opportunities to interact with the physical world. The hope is that these will help them to conceptualize the often difficult ideas of quantum mechanics, warped spacetime and cosmology.
❑ Ethical Implications	Modern physics began as an attempt to understand often confusing but seemingly innocent experiments in the late 19th century. But the outcome resulted in the electronic and digital revolutions, a complete upheaval in philosophical thought about the Universe and of course nuclear energy and nuclear weapons. We will discuss the ethical dilemmas many of the physics pioneers dealt with as they began to understand the ramifications of their discoveries.
❑ Cultural Diversity	Although many of the revolutions of modern physics are credited to western european physicists, there are many exceptions to this and many precursors of ideas from other cultures. These will be explored in the class. And today the results of the modern physics revolution affect all of us and the course will discuss the impacts on the planet and society.
❑ Critical Thinking	The concepts covered by the course are often considered some of the most challenging in the physical world. The course will emphasize how results were often resisted even by their discoverers and how critical thinking and experimentation forced us to accept these ideas.
❑ Rhetorical Effectiveness	In the discussion sections students will be expected to debate and discuss the often conflicting ideas of modern physics as well as the ramifications on our society. Often issues surrounding nuclear power and cosmology trigger strong debates.
❑ Problem-solving	Midterms and online quizzes will require the students to apply their knowledge to new situations and integrate several ideas from the course.
❑ Library & Information Literacy	Along with the primary textbook, the course will present the students with original papers by individuals such as Dirac, Einstein and Bohr; and popular articles from Scientific American and other news media.

(A) STUDENT CONTACT PER WEEK (if not applicable write N/A)

1.	Lecture:	**3**	(hours)
2.	Discussion Section:	**1**	(hours)
3.	Labs:		(hours)
4.	Experiential (service learning, internships, other):		(hours)
5.	Field Trips:		(hours)

(A) TOTAL Student Contact Per Week **4** **(HOURS)**

(B) OUT-OF-CLASS HOURS PER WEEK (if not applicable write N/A)

1.	General Review & Preparation:	**2**	(hours)
2.	Reading	**5**	(hours)

3.	Group Projects:	**0**	(hours)
4.	Preparation for Quizzes & Exams:	**2**	(hours)
5.	Information Literacy Exercises:	**2**	(hours)
6.	Written Assignments:	**0**	(hours)
7.	Research Activity:	**0**	(hours)

(B) TOTAL Out-of-class time per week	**11**	**(HOURS)**
GRAND TOTAL (A) + (B) must equal at least 15 hours/week	15.0	**(HOURS)**

Physics 11 – Revolutions in Physics

11. Revolutions in Physics (4) Lecture: Three hours; Discussion: One hour; General survey of "Modern Physics" intended for general UCLA students. No special mathematical preparation required beyond that necessary for admission to UCLA in freshman standing. The course begins with an overview of classical physics from the late 19th century and its growing set of dilemmas. Then we'll cover the revolutions of relativity and quantum mechanics that have led to a much deeper understanding of the structure and evolution of our Universe. Specific topics will include special and general relativity, cosmology (Big Bang), quantization of light, the nucleus and radioactivity, the origin of the elements, and quantum mechanics. P/NP or letter grade.

Course Justification

Although the Physics and Astronomy Department offers several Astronomy courses geared for non-science majors, there is currently only one course listed within the Physics set of classes (Physics 10). Our proposed course (tentatively termed Physics 11) is designed to offer an additional option for non-science majors to satisfy their physical science GE requirements and to increase the capacity of the Physics and Astronomy Department to meet the need of UCLA's growing undergraduate population. The course introduces classical physics topics, but then focuses on developments of the 20th century including relativity, quantum mechanics and cosmology. We believe this material will be exciting to many students, while also demonstrating the scientific method and the ability of science to adapt to new discoveries. These topics are also key to understanding our increasingly technical world. Emphasis will be placed on how our more modern understanding of the physical world led to such everyday conveniences like GPS satellites, microwave ovens, semiconductors and nuclear power.

Textbook:

Physics Concepts and Connections – Art Hobson

Book Description

Publication Date: **December 26, 2009** | ISBN-10: **0321661133** | ISBN-13: **978-0321661135** | Edition: **5**

Key Benefit: Written for the non-science major, this book emphasizes modern physics and the scientific process—and engages readers by drawing connections between physics and everyday experience. Hobson takes a conceptual approach, with an appropriate focus on quantitative skills. The Fifth Edition increases coverage of key environmental topics such as global warming and energy, and adds new topics such as momentum. Hobson's book remains the least expensive book available for readers taking nonmajors physics.

Key Topics: The Way of Science: Experience and Reason, Atoms: The Nature of Things, How Things Move: Galileo Asks the Right Questions, Why Things Move as They Do, Newton's Universe, Conservation of Energy: You Can't Get Ahead, Second Law of Thermodynamics: and you Can't Even Break Even, Light and Electromagnetism, Electromagnetism Radiation and Global Climate Change, The Special Theory of Relativity, The General Theory of Relativity and the New Cosmology, The Quantum Idea, The Quantum Universe, The Nucleus and Radioactivity: An New Force, Fusion and Fission: and a New Energy, The Energy Challenge, Quantum Fields: Relativity Meets the Quantum

Physics 11 – Revolutions in Physics

Instructer: Dr. James Larkin
Email: larkin@astro.ucla.edu
Web: http://www.astro.ucla.edu/~larkin/intro.html
Schedule: MWF 50 minute lectures + TA sessions
Office Hours: TBD; or by appointment
Office: 3-937 Physics and Astronomy Building (PAB)
Textbook: "*Physics Concepts and Connections*", 5th ed., Hobson

Course Description: The course covers many of the revolutionary physics topics of the 20th century. We'll begin with an overview of classical physics from the late 19th century and its growing set of dilemmas. Then we'll cover the revolutions of relativity and quantum mechanics that have led to a much deeper understanding of the structure and evolution of our Universe. Specific topics will include special and general relativity, cosmology (Big Bang), quantization of light, the nucleus and radioactivity, the origin of the elements, and quantum mechanics. I sincerely believe that you will enjoy this class.

Grading: Grades will be based on two midterms, pre-class online quizzes, section participation and a final exam. The quizzes are based on readings done prior to lecture, and are designed to introduce the lecture topics. The final will be comprehensive over the entire course.

Midterm 1:	Week 4 April 23, 2014 Based on weeks 1-3;	25%
Midterm 2:	Week 8 May 21, 2014 Based on weeks 4-7;	25%
Pre-lecture quizzes.		10%
Section Participation		10%
Final:	Date TBD	30%
	Total:	100%

General Rules:

Sections: You must attend your assigned section for participation. On rare instances with good excuses you can go to a different section. In many weeks, the sections will include modern physics demonstrations and you will be able to participate.

Pre-lecture quizzes must be completed before the assigned classes (one quiz will be dropped, so you can miss one without affecting your grade).

No makeup midterms: In extreme situations such as a written medical excuse, the average of the other exams will be used for the missing midterm grade.

The final exam MUST be taken for a passing grade.

All forms of cheating and academic dishonesty will be reported to the Dean of Students. As part of this, midterms, quizzes and the final exam must be completed by the enrolled student without outside assistance and in a manner consistent with standard testing procedures and regulations. I suggest that all students visit the Dean of Students' website, which includes a guide to academic integrity: http://www.studentgroups.ucla.edu/dos/assets/documents/StudentGuide.pdf

Approximate Class Schedule

Week 1 (March 31-April 4)
- Introduction to Modern Physics including classic examples
- Scientific Method and Scientific Inquiry

Week 2 (April 7-11)
- Relative Motion, Newton's "Law" of Gravitation
- Electromagnetic waves and light

Week 3 (April 14-18)
- Problems with classical physics
    - Precession of Mercury's orbit.
    - Michelson-Morley experiment on the speed of light.
    - Photoelectric effect.
    - Wave and particle nature of light.
- Special Relativity

Week 4 (April 21-25) – Midterm on Wednesday April 23rd
- Special Relativity
- General Relativity and Gravity

Week 5 (April 28-May2)
- Curved spacetime, Blackholes
- Big Bang and Universal Expansion

Week 6 (May 5-9)
- Photons
- Blackbody radiation
- de Broglie waves

Week 7 (May 12-16)
- Atomic structure
- Spectroscopy

Week 8 (May 19-23) – Midterm on Wednesday May 21st
- The Nucleus
- Radioactivity

Week 9 (May 28-30) – Monday, May 26th is Memorial Day
- Nuclear Fission and Fusion
- The Origin of the Elements

Week 10 (June 2-6)
- The Energy Challenge
- Quantum Fields

Final Exam (Comprehensive) - TBD

UCLA Course Inventory Management System

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New Course Proposal

	Physics 11 **Revolutions in Physics**
Course Number	**Physics 11**
Title	**Revolutions in Physics**
Short Title	**REVOLUTIONS-PHYSICS**
Units	Fixed: **4**
Grading Basis	**Letter grade or Passed/Not Passed**
Instructional Format	**Lecture - 3 hours per week** **Discussion - 1 hours per week**
TIE Code	**LECS - Lecture (Plus Supplementary Activity) [T]**
GE Requirement	**Yes**
Major or Minor Requirement	**No**
Requisites	**None.**
Course Description	**Lecture, three hours; discussion, one hour. Survey of modern physics intended for general UCLA students. Overview of classical physics from late 19th century and its growing set of dilemmas. Revolutions of relativity and quantum mechanics that have led to much deeper understanding of structure and evolution of our Universe. Specific topics include special and general relativity, cosmology (Big Bang), quantization of light, nucleus and radioactivity, origin of elements, and quantum mechanics. P/NP or letter grading.**
Justification	**Although the Physics & Astronomy department offers several Astronomy courses geared for non-science majors, there is currently only one course listed within the Physics set of classes (Physics 10). Our proposed course (tentatively termed Physics 11) is designed to offer an additional option for non-science majors to satisfy their physical science GE requirements and to increase the capacity of the Physics & Astronomy Department to meet the need of UCLA's growing undergraduate population. The course introduces classical physics topics, but then focuses on developments in the 20th century including relativity, quantum mechanics and cosmology. We believe this material will be exciting to many students, while also demonstrating the scientific method and the ability of science to adopt to new discoveries. These topics are also key to understanding our increasingly technical world. Emphasis will be placed on how our modern understanding of the physical world led to such everyday conveniences such as GPS satellites, microwave ovens, semiconductors and nuclear power.**
Syllabus	File *Revolutions in Physics Syllabus.docx* was previously uploaded. You may view the file by clicking on the file name.
Supplemental Information	
Grading Structure	**Midterm 1: 25%** **Midterm 2: 25%** **Pre-lecture quizzes: 10%** **Section participation: 10%** **Final exam: 30%**
Effective Date	**Spring 2014**

Instructor	Name **James Larkin**	Title **Professor**
Quarters Taught	☐ Fall ☐ Winter ☑ Spring ☐ Summer	
Department	**Physics & Astronomy**	
Contact	Name **FRANCOISE QUEVAL**	E-mail **queval@physics.ucla.edu**
Routing Help		

ROUTING STATUS

Role:	Registrar's Office
Status:	Processing Completed

Role:	Registrar's Publications Office - Hennig, Leann Jean (LHENNIG@REGISTRAR.UCLA.EDU) - 56704
Status:	Added to SRS on 5/18/2013 2:38:30 PM
Changes:	Description
Comments:	Edited course description into official version.

Role:	Registrar's Scheduling Office - Thomson, Douglas N (DTHOMSON@REGISTRAR.UCLA.EDU) - 51441
Status:	Added to SRS on 4/18/2013 1:10:36 PM
Changes:	Short Title
Comments:	No Comments

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (MCASTILLO@COLLEGE.UCLA.EDU) - 45040
Status:	Returned for Additional Info on 4/15/2013 12:56:07 PM
Changes:	No Changes Made
Comments:	Routing to Doug Thomson in the Registrar's office.

Role:	FEC Chair or Designee - Palmer, Christina (CPALMER@MEDNET.UCLA.EDU) - 44796
Status:	Approved on 4/15/2013 12:42:24 PM
Changes:	No Changes Made
Comments:	No Comments

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (MCASTILLO@COLLEGE.UCLA.EDU) - 45040
Status:	Returned for Additional Info on 4/15/2013 10:12:08 AM
Changes:	No Changes Made
Comments:	Routing to Christina Palmer for FEC approval.

Role:	Dean College/School or Designee - Bicad, Mercedi G (MERCYB@COLLEGE.UCLA.EDU) - 54453
Status:	Approved on 4/11/2013 1:41:09 PM
Changes:	No Changes Made
Comments:	Acting as designee on behalf of Dean Joseph Rudnick, Physical Sciences - The UCLA College, Letters and Science.

Role:	FEC School Coordinator - Castillo, Myrna Dee Figurac (MCASTILLO@COLLEGE.UCLA.EDU) - 45040
Status:	Returned for Additional Info on 3/26/2013 4:22:51 PM
Changes:	No Changes Made
Comments:	Routing to Mercy Bicad for Dean Rudnick's approval.

Role:	Department/School Coordinator - Queval, Francoise A (QUEVAL@PHYSICS.UCLA.EDU) - 52453
Status:	Approved on 3/26/2013 3:22:39 PM

Changes:	No Changes Made
Comments:	This course proposal is done on behalf of the Physics & Astronomy Department Chairman, Prof. Rosenzweig.

Role:	L&S FEC Coordinator - Castillo, Myrna Dee Figurac (MCASTILLO@COLLEGE.UCLA.EDU) - 45040
Status:	Returned for Additional Info on 3/26/2013 3:02:46 PM
Changes:	Requisites, Grading Structure
Comments:	Routing to Francoise for dept chair approval. Please also submit GE proposal when ready.

Role:	Initiator/Submitter - Queval, Francoise A (QUEVAL@PHYSICS.UCLA.EDU) - 52453
Status:	Submitted on 3/26/2013 12:03:33 PM
Comments:	Initiated a New Course Proposal

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Comments or questions? Contact the Registrar's Office at
cims@registrar.ucla.edu or (310) 206-7045