General Education Course Information Sheet

Please submit this sheet for each proposed course

Department & Course Number Physics N

Course Title Physics of renewable energy

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 the physics at the foundation of energy production and use. It will include a summary of classical mechanics and fluid-dynamics, thermodynamics, electromagnetism, and nuclear processes. Emphasis will be put on quantitative thinking

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

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

If yes, please indicate the number of TAs 1/2

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

2016-2017	Fall	_____	Winter	2017	Spring	_____
	Enrollment	_____	Enrollment	60	Enrollment	_____
2014-2015	Fall	_____	Winter	2018	Spring	_____
	Enrollment	_____	Enrollment	90	Enrollment	_____
2015-2016	Fall	_____	Winter	2019	Spring	_____
	Enrollment	_____	Enrollment	120	Enrollment	_____

5. GE Course Units

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

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

Present Number of Units: _____ Proposed Number of Units: _____

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

❑ General Knowledge	Physics N is designed for non-majors and provides a broad overview of the physics principle behind energy production and use. Students will gain insight into the scientific method and quantitative thinking.
❑ Integrative Learning	
❑ Ethical Implications	Energy policy and sustainability are some of the fundamental societal issues of our time. This course provides much needed tools that our students can use to inform their thinking and reach a better understanding of the options available and the choices they need to make.
❑ Cultural Diversity	Energy production and use is truly a global problem that affects the entire planet and society. We will explore how different cultures address the issue of energy production and consumption
❑ Critical Thinking	Learning about the physics behind energy production and consumption is an essential piece of developing critical thinking about this all important problem.
❑ Rhetorical Effectiveness	In the discussion sections students will be expected to debate and discuss the often conflicting ideas about energy production and consumption. Often issues surrounding energy production, sustainability and nuclear power trigger strong debates.
❑ Problem-solving	The exams and Essay will require the students to apply their newly acquired knowledge to their own life and integrate several ideas from the course.
❑ Library & Information Literacy	Along with the primary textbook, the course will help students better understand how to use online resources to develop a quantitative approach to problems.

(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 N – Physics of Renewable Energy

N. Physics of Renewable Energy (4) This course is composed of weekly lectures (3 hours) and discussion sessions (1 hour), and is devoted to discussing the Physics underpinnings of energy sources and consumption, with an emphasis on renewables. This course is intended for general UCLA students and no special mathematical preparation is required beyond that necessary for admission to UCLA in freshman standing. The course takes a global view of the energy balance in our lives, from the point of view of the physical processes. Students will reach a deeper understanding of the ways in which energy is used in every day life (transportation, heating, cooling), and the ways in which it is produced, covering all the common and speculative sources of energy (from fossil fuels, to solar, wind, nuclear, and fusion). Students will learn the fundamental physical limitations of each technology and will master concepts such as the efficiency of thermodynamic cycles and of chemical and nuclear reactions. Students will learn to quantitatively estimate the amount of energy they use in their daily lives and what physical processes could produce it. For their final assignment, students will be asked to propose a quantitative sustainable energy plan for their household, California, or the Earth, respecting the laws of physics. P/NP or letter grade.

Course Justification

Renewable Energy is a major concern in our every day life, deeply felt by many of our UCLA students, who regularly read about, discuss, and vote on issues related to energy and sustainability. In fact, UC is currently engaged in a campaign to become the first carbon-neutral major university (http://www.ucop.edu/initiatives/carbon-neutrality-initiative.html). Unfortunately, students (as well as most of the general public) are not always informed about the physical processes that provide the foundations for all these arguments, debates, and choices. In order to appreciate the feasibility of the new technologies, it is important to understand the scientific foundations of renewable energy and the difference between technological and physical limitations. This course will explore different sources of energy by covering topics in classical mechanics and fluid dynamics, thermodynamics, the structure of the atom, fission, and fusion. A solid basic understanding of these processes is key to navigate our increasingly complex energy choices. Emphasis will be placed on quantitative estimates of physical phenomena as constraints and input to important social decisions. There are two courses on similar subjects at the upper division level at UCLA (PHYS-188A: "Physics of Energy"; and EPSS-101 "Earth's Energy: Diminishing Fossil Resources and Prospects for Sustainable Future"), but nothing at the lower division general education level. The proposed course complements well the existing ones, by providing an introduction to the topic to the broadest possible audience. Interested students will acquire through this course the necessary knowledge they need to pursue the subject in more detail at the upper division level, if they wish.

Textbook: **Sustainable Energy – without the hot air**

Book Description

Author: David J MacKay, FRS; Publication Date: **December 2, 2008** (February 20 2009, US) | ISBN-13: **9780954452933** | Edition: **1**

Key Benefits: Written for the non-science majors, this book describes systematically the way energy is used and produced from the point of view of a physicist. It provides a relatively simple understanding of the basic physical phenomena and the tools to approach the subject in a quantitative manner. The textbook can be bought on Amazon but it is also made freely available by the author for personal use.

Key Topics: the physics behind means of transportation: Newton's mechanics and fluid dynamics. Wind power and fluid dynamics. Tide and waves. Solar power, and nuclear fusion. Heating and Cooling and thermodynamics. The nature of light and light production and use. The energy balance of food production. Geothermal energy. The basics of nuclear fission and fusion.

Physics N – Physics of Renewable Energy

Instructer: Dr. Tommaso Treu
Email: tt@astro.ucla.edu
Web: http://www.astro.ucla.edu/~tt/Welcome.html
Schedule: TR 75 minute lectures + TA sessions
Office Hours: TBD; or by appointment
Office: 3-718 Physics and Astronomy Building (PAB)
Textbook: "*Sustainable Energy – without the hot air*", 1st ed., UIT Cambridge.

Course Description: The course is devoted to discussing the Physics underpinnings of energy sources and consumption, with an emphasis on renewables. This course is intended for general UCLA students and no special mathematical preparation is required beyond that necessary for admission to UCLA in freshman standing. The course takes a global view of the energy balance in our lives, from the point of view of the physical processes. Students will reach a deeper understanding of the ways in which energy is used in every day life (transportation, heating, cooling), and the ways in which it is produced, covering all the common and speculative sources of energy (from fossil fuels, to solar, wind, nuclear, and fusion). Students will learn the fundamental physical limitations of each technology and will master concepts such as the efficiency of thermodynamic cycles and of chemical and nuclear reactions. Students will learn to quantitatively estimate the amount of energy they use in their daily lives and what physical processes could produce it. For their final assignment, students will be asked to propose a quantitative sustainable energy plan for their household, California, or the Earth, respecting the laws of physics.

Grading: Grades will be based on one midterm, section participation, a final multiple-choice exam and a written essay. The final will be comprehensive over the entire course.

Midterm: Week 6	30%
Essay: due before end of class	20%
Section Participation	10%
Final: Cumulative	40%
Total:	100%

General Rules:

Sections: You must attend your assigned section for participation. You are allowed to miss up to two sections without penalty.

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
- Introduction to the energy problem: units and quantitative thinking
- Energy, Work, and Power

Week 2
- Means of transportations: cars, planes, trains and Newton's laws

Week 3
- Winds, Waves, and Solar Energy: fluid dynamics and electromagnetism

Week 4
- Heating, cooling and thermodynamics

Week 5
- Gravity, hydro-electric and tide power

Week 6 Midterm
- Geothermal power

Week 7
- Fission and Fusion
- Fossil fuels

Week 8
- Foodstuff
- Manufacturing

Week 9
- Balancing the energy budget: putting it all together.
- How much can we improve things? Physical limits and technological limits

Week 10 Essay due
- Cases studies: examples of sustainable energy plans

Final Exam (Comprehensive) - TBD

UCLA Course Inventory Management System

Main Menu | Inventory | Reports | Help | Exit

Course Revision Proposal

Physics 12
Physics of Sustainable Energy

Requested revisions that apply:

☐ Renumbering ☑ Title ☐ Format ☐ Requisites ☐ Units ☐ Grading ☐ Description

Multiple Listing: ☐ Add New ☐ Change Number ☐ Delete

Concurrent Listing: ☐ Add New ☐ Change Number ☐ Delete

	CURRENT	PROPOSED
Course Number	**Physics 12**	**Physics 12**
Title	**Physics of Renewable Energy**	**Physics of Sustainable Energy**
Short Title	**RENEWABLE ENERGY**	**SUSTAINABLE ENERGY**
Units	Fixed: **4**	Fixed: **4**
Grading Basis	**Letter grade or Passed/Not Passed**	**Letter grade or Passed/Not Passed**
Instructional Format	Primary Format **Lecture**	Primary Format **Lecture - 3 hours per week**
	Secondary Format **Discussion**	Secondary Format **Discussion - 1 hours per week**
TIE Code	**LECS - Lecture (Plus Supplementary Activity) [T]**	**LECS - Lecture (Plus Supplementary Activity) [T]**
GE	**No**	**No**
Requisites	**None**	**None**
Description	Lecture, three hours; discussion, one hour. Special mathematical preparation beyond that necessary for admission to UCLA in freshman standing not required. Discussion of physics underpinnings of energy sources and consumption, with emphasis on renewables. Global view of energy balance in our lives from point of view of physical processes. Ways in which energy is used in everyday life (transportation, heating, cooling), and ways in which it is produced, covering all common and speculative sources of energy from fossil fuels to solar, wind, nuclear, and fusion. Fundamental physical limitations of each technology to master concepts such as efficiency of thermodynamic cycles and of chemical and nuclear reactions. Quantitative estimation of amount of energy students use in their daily lives and what physical processes could produce it. P/NP or letter grading.	**Lecture, three hours; discussion, one hour. Special mathematical preparation beyond that necessary for admission to UCLA in freshman standing not required. Discussion of physics underpinnings of energy sources and consumption, with emphasis on renewables. Global view of energy balance in our lives from point of view of physical processes. Ways in which energy is used in everyday life (transportation, heating, cooling), and ways in which it is produced, covering all common and speculative sources of energy from fossil fuels to solar, wind, nuclear, and fusion. Fundamental physical limitations of each technology to master concepts such as efficiency of thermodynamic cycles and of chemical and nuclear reactions. Quantitative estimation of amount of energy students use in their daily lives and what physical processes could produce it. P/NP or letter grading.**
Justification		**Sustainable is a broader term than renewable (there are some sources of**

		energy that are sustainable without in principle being renewable--even the sun, for example, will eventually run out of fuel so we don't renew this source of energy at a fundamental physics level, but it is sustainable because it would billions of years for solar power to run out. The material and content of the course is the same but "sustainable" is a more accurate description.
Syllabus		
Supplemental Information		
Effective Date	**Winter 2017**	**Winter 2017**
Department	**Physics & Astronomy**	**Physics & Astronomy**
Contact		Name **FRANCOISE QUEVAL** E-mail **queval@physics.ucla.edu**
Routing Help		

ROUTING STATUS

Role: FEC School Coordinator - Castillo, Myrna Dee Figuracion (MKIKUCHI@COLLEGE.UCLA.EDU) - 45040
Status: Pending Action

Role: FEC Chair or Designee - Bristow, Joseph E (JBRISTOW@HUMNET.UCLA.EDU) - 54173
Status: Approved on 9/19/2016 8:19:35 PM
Changes: TIE Code
Comments: Change from "renewable" to "sustainable" is approved

Role: L&S FEC Coordinator - Kikuchi, Myrna Dee Castillo (MKIKUCHI@COLLEGE.UCLA.EDU) - 45040
Status: Returned for Additional Info on 8/31/2016 3:51:40 PM
Changes: TIE Code
Comments: Routing to Joe Bristow for FEC approval.

Role: Department/School Coordinator - Queval, Francoise A (QUEVAL@PHYSICS.UCLA.EDU) - 52453
Status: Approved on 8/12/2016 1:42:49 PM
Changes: TIE Code
Comments: This revision is done on behalf of Professor Ian McLean, Academic Vice Chair who has approved this change.

Role: L&S FEC Coordinator - Kikuchi, Myrna Dee Castillo (MKIKUCHI@COLLEGE.UCLA.EDU) - 45040
Status: Returned for Additional Info on 8/12/2016 12:21:03 PM
Changes: TIE Code
Comments: Routing to Francoise for dept chair approval.

Role: Initiator/Submitter - Queval, Francoise A (QUEVAL@PHYSICS.UCLA.EDU) - 52453
Status: Submitted on 8/12/2016 11:15:59 AM
Comments: Initiated a Course Revision Proposal

Back to Course List

Main Menu Inventory Reports Help Exit
Registrar's Office MyUCLA SRWeb

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