



# Physics of Renewable Energy for Teachers

## COURSE SYLLABUS—Summer 2014

<b>Credits:</b>	Three (3) Graduate Credits
<b>Course Number:</b>	PHSX - 591
<b>Instructors:</b>	Dr. Nicholas Childs ( <i>Nick</i> )
<b>Course Schedule:</b>	This is a 12 week online course, internet and computer access is required

### Course Description:

A wind turbines are an example of circular motion. Nuclear power is derived from fission and fusion processes. Solar energy is an example of energy stored in electromagnetic waves. Temperature gradients found within the ocean or earth can be used as heat engines. With each renewable energy source, introductory physics concepts can be found. These sources can be used as a means of student engagement in the classroom. During this online course, participants will complete a series of online units centered on bringing the physics of renewable energy sources into a high school physics classroom. Students will develop an understanding of the underlying physics associated with renewable energy sources. As this course is intended for classroom teachers, instruction will place an emphasis on creating classroom materials appropriate for secondary science classrooms and consistent with the Next Generation Science Standards. Energy sources covered include power derived from fossil fuels, solar, wind, nuclear, geothermal, hydro, hydrogen, biomass and water waves. World energy consumption, sustainability, energy storage and end users will also be covered.

**Objectives** - Students who successfully complete this course will be able to do the following:

1. Describe the current and projected world energy usage and options.
2. Describe the necessity of renewable energy sources.
3. Explain how energy is obtained from various renewable energy sources covered in the course.
4. Demonstrate mastery of underlying physics concepts utilized in renewable energy sources covered in the course.
5. Identify Next Generation Science Standards and local state standards associated with physics topics found within renewable energy sources.
6. Demonstrate the ability to incorporate the underlying physics of renewable energy sources into the teaching of introductory level physics topics.



**Required Text:** A rigorous college level overview of the field of sustainability. Recently published, the book provides a comprehensive survey of the underlying mechanisms, economics and impacts of renewable energy sources.

*Sustainable Energy: Choosing among options*, second edition

By Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay and William A. Peters  
ISBN: 9780262017473

### Course Requirements:

1. Weekly Participation: Students will participate in a weekly discussion forum managed by the course instructor where they will be expected to engage in class discussions. Other options for participation include posting material resources to the course website.
2. Readings and Ideas Postings: Students will complete weekly readings. Students will identify and describe how a concept presented in the text can be used as an example or application of a physics concept (such as forces, motion, momentum, electricity, magnetism, modern physics, ...)
3. Classroom Activities: Students will meet four out of six classroom activity deadlines. Possible forms are a worksheet, web activity, laboratory plan, but the possibilities are unlimited.
4. Lesson Plans: Students will be required to complete three lesson plans based on renewable energy sources. The identification of Next Generation Science Standards (NGSS) and relevant state standards addressed in the lesson will be identified.
5. Classroom Demonstration: Students will create a classroom demonstration related to a renewable energy source.
6. Reflective Paper: Students will write a 3-5 page paper discussing how the course concepts and/or strategies will influence their classroom and students.

### Evaluation:

Classroom Activities:	There will be 6 deadlines for developing classroom activities. You will be required to meet 4 of them. Each will be worth 7.5% for a total of 30% of the final grade.
Lesson Plans:	There will be three lesson plans developed, each being worth 10% for a total of 30% of the final grade
Classroom Demonstration:	This will constitute 10% of the final grade.
Reflective Paper:	This will constitute 10% of the final grade.



Weekly Participation:

10% of the grade will be based on participation in the course.

Readings and Ideas:

Weekly readings and ideas will be worth 10% of the final grade.

**Grading Scale:**

90.0 to 100	=	A
80.0 to 89.9	=	B
70.0 to 79.9	=	C
65.0 to 69.9	=	D
0.00 to 64.9	=	F

**Schedule:**

*Participation and Reading idea posts are required weekly*

<b><u>Week</u></b>	<b><u>Due Date</u></b>	<b><u>Topic</u></b>	<b><u>Additional Assignments Due</u></b>
1	June 2	Sustainable Energy and Consumption	None
2	June 9	Energy Units, Forms and Fossil Fuels	Classroom Activity Deadline 1
3	June 16	Solar	Lesson Plan 1
4	June 23	Wind	Classroom Activity Deadline 2
5	June 30	Hydroelectric	
6	July 7	Ocean Tides, Current and Temperature	Classroom Activity Deadline 3
7	July 14	Nuclear	Lesson Plan 2
8	July 21	Geothermal	Classroom Activity Deadline 4
9	July 28	Biomass	
10	August 4	Storage	Classroom Activity Deadline 5
11	August 11	End Users	Lesson Plan 3
12	August 18	Wrap Up	Classroom Activity Deadline 6 Reflective Paper Classroom Demonstration