

## General Studies Request Form

---

Please see the [General Studies Request Overview and FAQ](#) for information and quick answers.

New permanent numbered courses must be submitted to the workflow in [Kuali CM](#) before a General Studies request is submitted here. The General Studies Council will not review requests ahead of a new course proposal being reviewed by the Senate.

### Proposal Contact Information

---

Submitter Name	Submitter Email	Submitter Phone Number
Morgan Texeira	Texeira@asu.edu	480-965-9075
College/School	Department/School	
The College of Liberal Arts and Sciences (CLA)	Department of Physics (CPHYSICS)	

### Submission Information

---

Type of submission:

New Request (Course or topic does not currently hold this designation)

Requested Effective Date

Fall 2023

### ASU Request

---

Is this request for a permanent course or a topic?

Topic

Subject Code	Course Number	Units/Credit Hours
PHY	194	4

#### Topic Information

If your request is approved:

1. Topics on [omnibus courses](#) only carry designations for three consecutive semesters (excluding summer), *whether or not they are scheduled*. Once expired, a new request must be submitted.
2. Topics on **permanent courses** require mandatory review every five years.

Topic Title

Energy Matters

Topic Description

This course covers the basic concepts of energy usage, storage, and transmission, and serves as an introduction/bridge to the study of Physics. Energy usage impacts our environment in multiple ways and knowing how can inform the choices we make. Global warming and other climate change issues are front and center right now. Understanding the science that impacts how effective proposed solutions will be is key to finding equitable solutions. The lectures will be supplemented by experimental/project work the

students will undertake to learn about how science works and how using scientific principles helps with everyday decisions.

If this topic exists on any other courses and the sections will be combined in the schedule, please list those courses here.

---

## General Studies

---

### Requested Designation

---

SQ - Natural Sciences - Quantitative

SG: Natural Sciences - General and SQ: Natural Sciences - Quantitative

### **Rationale and Objectives**

Public scientific literacy, critical for sound decisions on scientifically infused issues such as climate change, includes understanding of basic science concepts, such as the fundamental behavior of matter and energy. It also includes the understanding that "science" is not an encyclopedic collection of facts. Rather, it is a process of exploration that embraces curiosity, inquiry, testing, and communication, to reduce uncertainty about nature. Absent understanding of scientific concepts and of the nature of science, science and pseudoscience are difficult to distinguish, and normal scientific disagreements may be misinterpreted as ideological or political disputes. The goal of the natural sciences (SQ/SG) requirement, including the laboratory requirement, is to instill understanding of basic science content and of the nature of science in every ASU graduate.

[Revised April 2014]

---

Note: "SG" and "SQ" requirements **cannot** be met by courses:

1. Presenting a qualitative survey of a discipline.
2. Focusing on the impact of science on social, economic, or environmental issues.
3. Focusing on a specific or limiting but in-depth theme suitable for upper-division majors.

For all Natural Science "SG" and "SQ" core area courses, the following are critical criteria and must be met:

#### "SG" and "SQ" Criteria 1

Course emphasizes the mastery of basic scientific principles and concepts.

Identify the submitted documentation that provides evidence.

---

#### Syllabus

How does this course meet the spirit of this criteria?

---

This course introduces basic physics concepts (energy, work, power, heat transfer) and builds on them so that the students can apply them to real world problems. For example, starting from conservation of energy and how that principle can be used to solve basic problems in mechanics the students then learn about friction. The students also learn about the laws of thermodynamics and how the efficiency of heat engines depends on the temperature range they operate between. This leads to a discussion of how air conditioners work and how removing heat from inside a house ends up adding even more heat to the outside. Similarly, the course starts from a discussion of black body radiation and proceeds to explain the greenhouse effect and how the Earth may warm up before a new equilibrium is reached between input and output of thermal energy.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Course Learning Outcomes

Syllabus: Weekly Topics/Course Table - Week 1 Energy Basics, Week 3 Conservation of Energy and Work, Week 5 Heat Basics, Week 6 Thermodynamics, Week 11 Nuclear Energy and Understanding Risk

The syllabus lays out what will be covered and shows how the initial weeks tend to cover the basic physics and later weeks go into broader discussions of more complex situations. Towards the end of the course (weeks 10 onwards) the focus is on applying what has been learnt to understand global patterns of energy usage (for example) and to look at how scientists can predict the exhaustion of fossil fuels. The course will also discuss the limits to estimating and help people better understand exponential growth (compound interest, experimenting to replicate the classic chessboard problem (week 12)).

"SG" and "SQ" Criteria 2

Addresses knowledge of scientific method.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

The course addresses this both in lectures and by encouraging the students to work out for themselves how a pendulum works and how much power they can generate.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Course Learning Outcomes

Syllabus: Weekly Topics/Course Table: Week 1, Week 2, Week 3, Week 4, Week 5, Week 7

Syllabus: Labs: Week 2 Lab Pendulum, Week 4 Lab Energy Usage, Week 5 Lab Heat Transfer, Week 8 Lab Power and Electricity

The course starts by discussing this (week 1 topics) and returns to the topic several times. In particular in week 2 it talks about how to use graphical information in the context of looking at differences in patterns of energy usage. Week 3 talks about the difference between the "ideal" case and the real world. Week 4 discusses how to spots scams like perpetual motion machines. Week 5 has them check their understanding of heat transfer using ice and liquids. Week 7 discusses ways to look for bias in information presented on the web.

"SG" and "SQ" Criteria 3

Includes coverage of the methods of scientific inquiry that characterize the particular discipline.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

This course is rooted in showing how physicists start from basic concepts and use them to help understand complex phenomena. They get to do experiments – not as cookie cutter labs but with limited guidance and encouragement to work things out for themselves.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Course Learning Outcomes

Syllabus: Labs: Week 2 Lab Pendulum, Week 5 Lab Heat Transfer, Week 8 Lab Power and Electricity

The pendulum lab in week 2 will encourage them to decide for themselves what can impact the period of a pendulum and devise ways to test their ideas. They will be encouraged to repeat experiments to start to develop their understanding of accuracy of measurements/repeatability. Similarly in week 5 they will be encouraged to experiment with ways to keep the ice solid for longer and estimate/predict what will happen when they change the volume of ice/liquid in the cup before they do the experiment.

#### "SG" and "SQ" Criteria 4

Addresses potential for uncertainty in scientific inquiry.

Identify the submitted documentation that provides evidence.

---

#### Syllabus

How does this course meet the spirit of this criteria?

---

The lecturer will discuss how some concepts developed (like Newton's laws of motion) even if they didn't fit casual observations. They will get the chance to look at if they can make reproducible measurements. Later lectures on concepts such as "Hubbert's peak (week 12) will talk about how estimates are impacted by changes in consumer behaviors.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

#### Syllabus: Learning Outcomes

Syllabus: Weekly Topics/Course Table - Week 2, Week 5, Week 10, Week 11

Week 2, 5 have simple experimental problems for the students to look at. Week 10 has a basic probability exercise and week 11 has a discussion about expert and non-expert perceptions of risk. Week 11 also has an activity designed around the difference between correlation and causality.

#### "SG" and "SQ" Criteria 5

Illustrates the usefulness of mathematics in scientific description and reasoning.

Identify the submitted documentation that provides evidence.

---

#### syllabus

How does this course meet the spirit of this criteria?

---

Math is interweaved throughout this course and is used both in basic calculations and also in helping to make quantitative arguments around energy usage. Students will use math to describe the results of their experiments and to look at things like why electric cars are more practical than electric planes.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

#### Syllabus: Course Learning Outcomes

Syllabus: Weekly Topics/Course Table - Weeks 10, Week 11, Week 12, Week 13

Syllabus: Labs: Week 10 Lab Coin Tossing, Week 12 Lab Exponentials

Weeks 10,11,12,13 in particular pull together basic concepts and show the power of simple math calculations (for example looking at the weight of a battery and its range)

#### "SG" and "SQ" Criteria 6

Includes **weekly** laboratory and/or field sessions that provide hands-on exposure to scientific phenomena and methodology in the discipline, and enhance the learning of course material.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

Students are encouraged to check what they are being told in class by doing related simple experiments with easily available materials. A mixture of labs and field sessions will be conducted.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Weekly Topics/Weekly Course Table, Labs: Week 2 activities, week 4 activities, week 5 activities, week 10 activities, week 12 activities in particular involve students doing their own checks. Other weeks (like week 7, week 11) have activities that encourage critical engagement. Week 8's activities relate energy usage to their day to day lives.

"SG" and "SQ" Criteria 7

Students submit written reports of laboratory experiments for constructive evaluation by the instructor.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

The students will document their experimental activities and be graded by a rubric. They will be encouraged to discuss their work on the discussion board and the faculty member often participates/guides these discussions.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Weekly Topics/ Weekly Course Table - All activities

Syllabus: Grading Procedure

"SG" and "SQ" Criteria 8

Course is general or introductory in nature, ordinarily at lower-division level; not a course with great depth or specificity.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

Survey course that integrates several disciplines to allow students to build understanding of energy usage through broad exploration of physical phenomenon.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

"SG" and "SQ" Criteria 9

At least one of these additional criteria must be met within the context of the course:

---

A. Stresses understanding of the nature of basic scientific issues.

"SG" and "SQ" Criteria 9A Information

Stresses understanding of the nature of basic scientific issues.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

This course connects basic physics topics (energy, thermodynamics) to real world problems (fossil fuel depletion, climate) and develops science literacy skills (scientific method, interpreting graphs, critical thinking). The course discusses energy usage, storage, and transmission, and serves as an introduction/bridge to more advanced courses in Physics. Energy usage impacts our environment in multiple ways and knowing how can inform the choices we make. Global warming and other climate change issues are front and center right now. Passion for activism is critical; understanding the science beneath our decisions is equally important. The lectures are supplemented by experimental/project work the students will undertake to learn about how science works and how using scientific principles helps with everyday decisions.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Weekly Topics Schedule: All

Syllabus: Labs :All

"SQ" Criteria 10

Provides a substantial, quantitative introduction to fundamental principles governing behavior of matter and energy, in physical or biological systems.

Identify the submitted documentation that provides evidence.

---

Syllabus

How does this course meet the spirit of this criteria?

---

The course covers Newton's laws, nuclear energy, and thermodynamics. The coverage is both qualitative and quantitative.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

---

Syllabus: Course Learning Outcomes

Syllabus: Weekly Topics/Course Table - Weeks 1-6

"SQ" Criteria 11

Includes a college-level treatment of some of the following topics (check all that apply below):

d. Elementary thermodynamics

f. Dynamics and mechanics

"SQ" Criteria 11D Information

Includes a college-level treatment of elementary thermodynamics.

Identify the submitted documentation that provides evidence.

syllabus

How does this course meet the spirit of this criteria?

The course connects thermodynamics to energy/climate concerns.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

Syllabus: Weekly Topics/Course Table: Weeks 4,5,6 in particular give an introduction to the laws of thermodynamics.

"SQ" Criteria 11F Information

Includes a college-level treatment of dynamics and mechanics.

Identify the submitted documentation that provides evidence.

syllabus

How does this course meet the spirit of this criteria?

The course includes Newton's laws, energy, work, and friction.

Provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

Syllabus: Weekly Topics/Course Table - Weeks 1,2,3,4 in particular cover topics of dynamics and mechanics.

Attach a sample syllabus for this course or topic, including the list of any required readings.

[Syllabus194 \(002\).docx](#)

Attach the table of contents from any required textbook(s).

No Response

Attach any other materials that would be relevant or helpful in the review of this request.

No Response

## Form Submission - Proposer

Submitted for Approval | Proposer

Morgan Texeira - February 9, 2023 at 10:32 AM (America/Phoenix)

---

## Department Approval

Approved

Patricia Rankin - February 9, 2023 at 11:15 AM (America/Phoenix)

This course seeks to provide a pathway into physics for students by introducing basic concepts, developing math proficiency and motivating the study of physics by showing how it can be used to address societal problems.

---

## Provost's Office Review

Approved

April Randall

Joni Lochtefeld - February 15, 2023 at 11:39 AM (America/Phoenix)

---

## Natural Sciences Committee Review

Acknowledgement Requested

Steve Semken - February 27, 2023 at 4:57 PM (America/Phoenix)

The Natural Sciences subcommittee recommendation for PHY 194 is Revise. With the resubmitted application and revised course syllabus please also include the following:

In the syllabus be sure to respond to these questions and requests:

- (1) Are lab assignments done in class or at home, and if at home, are students responsible for lab materials?
- (2) Some weeks of the class apparently do not have labs, but Critical Thinking-Reasoning-Reflections assignments. Do these assignments qualify for the weekly lab and/or field sessions? (SQ Criterion 6)
- (3) Please provide the rubric or rubrics used to grade students' laboratory assignments. (SQ Criterion 7)

Please also provide at least 2 different salient examples of actual lecture materials and complete lab assignments. These may be provided as links to curated online content but please ensure that they can be accessed freely. (SQ Criteria 8, 10, 11)

Tamiko Azuma

Darryl Morrell

Ashli Morgan

---

## General Studies Council Meeting

Waiting for Approval

April Randall



Joni Lochtefeld

---

## Registrar Notification

Notification

Courses Implementation

---

## Implementation

Approval

Rebecca Klein

Lauren Bates

Alisha Von Kampen

---

## Proposer Notification

Notification

Morgan Texeira

---

## Topic Notification

Notification

Leticia Mayer

Peggy Boivin

---