A - New Course Proposal V. 7.2022 : Entry # 2606

DEAN Decision

Approved

Date

02/08/2023

Is this course intracollegiate or intercollegiate?

Intracollegiate

DEAN Comments

This is an outstanding example of a General Education science course and should be of interest to our student body

SCHOOL EPC Decision

Approved

Date

04/02/2023

GEC Decision

Approved

Date

03/02/2023

APIRC Decision

Approved

Date

03/31/2023

Begin Form

Today's Date

02/01/2023

Your Name:

Jeffrey Regester

Your Email:

jregeste@highpoint.edu

Are you a Department Chair?

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No

Department Chair Name

Briana Fiser

Email address of your Department Chair

bfiser@highpoint.edu

By checking below I am certifying that my department chair has seen and approved the new course that is in this proposal

Yes

Please select the appropriate school overseeing this proposal:

Natural Sciences

Which semester is this course to be taught for the first time?

Spring 2024

Information for the Registrar

Choose the department designator for your proposed course from the list below.

PHY

Proposed Course Number

1701

Is this course cross listed?

No

Does this course replace a current course?

No

Enter the title of your proposed course

The Physics and Practice of Rocket Science

Enter the catalog description of your proposed course

An introduction to the physics, history and practice of rocketry. Rockets are tools that allow the launch of satellites for commercial and scientific purposes, as well as probes that go past Earth orbit into the solar system and even beyond. In this course students will learn the physics behind rocket flight, the history of rocketry, and learn to use various tools in the Physics Shop to actually build both low-power and high-power rockets. This course satisfies the Natural Sciences and Experiential Learning general education requirements and consists of 3 lecture hours and 2 lab hours.

Choose your proposed course's number of credits from the list below

4

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How will the course be graded?

Letter grade

Please select the course repeat option for your proposed course:

Not repeatable for credit

Offering cycle for your proposed course:

Spring semester

Does your course have any prerequisites?

No

Is this new course being proposed because of a proposal for a new or revised major or minor?

No.

Gen Ed and Academic Programs

Is this course part of Gen Ed?

- Yes

Does your course count in the general education core (one of the core classes that cannot be double-dipped in your major or minor)?

Natural Sciences

Does your course count in any general education categories that can be double-dipped in the core or in a major/minor?

- Experiential Learning

Does this course count towards a major or a minor?

Yes

Please list the major / minor and whether it is required or an elective

Major	Required / Elective	Minor
	Elective	An Applied Physics

Will this course fulfill any of the below University academic program requirements?

- This course does not fulfill academic program requirements

Does this course include any community engagement?

No

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Does this course participate in the GoGlobal Program?

No

Has it been reviewed and approved by the Global Experience Committee?

No

Information for Curriculum Review

Rationale for new course & consistency with departmental mission

The Department of Physics aims to provide the general population of students at High Point University with a more diverse selection of general education courses that meet the new general education requirements for both core courses in the natural sciences and experiential learning. Because of the increasing commercial and government resources being devoted to space travel, this new course on rocketry provides our students with a timely, relevant, and exciting learning opportunity. This course will utilize the project-based learning paradigm to introduce students to introductory physics concepts such as Newton's laws of motion, impulse and momentum, air resistance, and energy. In addition to "theory", the course will give students experience with the "practice" of physics through computation (numerical modeling, a.k.a. computer simulation), measurement, experimental design and instrumentation (through the measurement of solid rocket motor thrust curves), and engineering. Student projects will include designing and constructing two rockets (low-power and high-power), taking into account criteria for flight stability, with the potential for flying the high-power rockets to earn Level 1 certification from the Tripoli Rocketry Association. Additionally, the course will include a significant historical component, tracing the development of rocketry from its invention in ancient China to the ongoing programs of NASA, SpaceX and others.

The Department of Physics has two mission statements: one for faculty and one for students. The Physics Department's core values for faculty are: undergraduate research with faculty; engaging and effective teaching; interdisciplinary collaborations; theory, experiment, and computation; mentoring; and outreach. The Physics Department's mission for students includes teaching the tools required for discovery, such as problem solving, fundamental physics, experimental methods, computational modeling, mathematics, and communication. This course in particular addresses the experimental, computational modeling, fundamental physics, problem solving, and mentoring goals of our mission statements. Throughout the semester, students will learn to use and have access to many of the tools and supplies in the Physics Undergraduate Research Laboratory (PURL) and associated Physics Shop, which are multi-purpose spaces used for the construction of student-designed apparatuses, faculty research and classroom needs, and outreach demonstration equipment. Major equipment pieces include 3D printers, drill presses, vertical and horizontal bandsaws, table saw, scroll saw, router table, chop saw, bench grinder, combined belt- and disc-sander, CNC router (ShopBot), 60W laser cutter/engraver, CNC milling maching, lathe and sewing machine. Through this course experience, students will thus gain a facility with standard hand tools and power tools, which are a valuable life skill, promoting independence and confidence.

The habits of mind promoted by studying physics – such as curiosity, problem-solving, quantitative reasoning, objective testing of ideas and unambiguous communication – are of benefit to all. We hope this course increases the number of students enrolled in a physics natural sciences course, by meeting more students where their interests lie, while providing them with valuable technical and interpersonal skills. Additionally, we hope this course increases interest in our physics program across campus, perhaps drawing more students to take additional physics courses.

Please list all student learning outcomes for this course

SLO-1: Demonstrate an understanding of Newton's Laws of Motion and how they apply to rocket propulsion.
SLO-2: Using either a spreadsheet or programming language, create a simulation of a rocket's flight.
SLO-3: Safely and effectively use hand- and power tools.
SLO-4: Demonstrate an understanding of the history of rocketry.
SLO-5: Demonstrate an understanding of the operation of an unguided solid-fuel rocket, including criteria for stable flight and the physics and chemistry of solid-fuel motors.

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SLO-6: Demonstrate a knowledge of laws and regulations governing high-power rockets in the United States.
SLO-7: Use various quantitative methods to solve problems in a variety of contexts, including real world applications. (QR #3)
SLO-8: Engage team members in ways that facilitate their contributions to meetings by constructively building upon or synthesizing the contributions of others. (IIS #1)
SLO-9: Foster a constructive team climate through polite communication, a positive and confident attitude, and helpfulness. (IIS #2)
SLO-10: Delineate a detailed problem statement and identify the most relevant contextual factors (i.e., constraints, resources, attitudes, and additional knowledge needed to solve the problem). (CPS #1)
SLO-11: Identify multiple approaches to solving the problem. (CPS #2)
SLO-12: Propose solutions or hypotheses that register an accurate comprehension of the problem and that are sensitive to the contextual factors. (CPS #3)

Please list any units or content areas that will be required for all sections of this course

The Physics of Rocket Flight (Newton's laws; impulse and momentum; the rocket equation; air resistance, and criteria for stable flight).
The History of Rocketry.
Safe and effective operation of relevant fabrication tools in the Physics Shop.
Computational modeling of projectile motion and rocket flight.
Physics and chemistry of solid-fuel rocket motors.
Laws and regulations governing rocket flights in the United States.

Please list any assignments, tests, or other assessments that will be required for all sections of this course

Students must pass a training program in the safe and effective usage of power tools located in the Physics Shop and Physics Undergraduate Research Laboratory.
Students must build and launch at least two rockets, the second of which will be a significant level of sophistication above the first, and whose design parameters were determined by the student.
Students must measure the thrust curve of a rocket motor using a ground test stand.
Students must create a numerical model (either in a spreadsheet, or using a computer programing language) of a rocket's flight, including the effects of air resistance.
Students must pass a written test covering requirements of legal and safe rocket flights.

Please list any readings or other materials that will be required for all sections of this course

N/A

Please list any course policies that will be required for all sections of this course

No power tool in the Physics Shop may be used by a student until they have received training and authorization from the Physics Shop Manager. Power tools may not be used if the student is alone in the Shop or Physics Undergraduate Research Laboratory.

If you would like to specify anything about how requirements for contact hours must be met for all sections of this course, please indicate below (e.g., if any experiential learning activities will replace seat time)

Contact hours include three lecture hours and two lab hours each week. Participation in a Tripoli Rocketry Association-sanctioned launch, typically held on weekends, may be necessary for the high-power flights. Currently the closest of these launches is held near Charlotte; another is in Bayboro, NC. If so, two class meetings may be cancelled.

Is there anything else the reviewing parties should know about this new course proposal that hasn't already been asked/addressed?

The rockets that students in the course build and fly will follow safety guidelines specified by the Tripoli Rocketry Association, one of the two bodies governing amateur high-power rocketry in the United States.

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Sample Syllabus

- PHY1701-proposedsyllabus.docx