

**Amphitheater School District  
COURSE REQUEST FORM**

**I. RATIONALE – justification of need, citing data**

Students need this Engineering Physics course to cover the missing standards from the Engineering program, not covered in Introduction to Engineering Design (first of three courses) and Engineering 102 (third of three courses). The current Engineering program is missing the middle course. This course focuses on the understanding and application physics content encompassed in standard 4.0 of the Engineering standards and the Arizona Physical Science State Standards.

**II. DESCRIPTION – course goals and objectives, pre-requisites, format**

Engineering Physics explores a broad range of engineering and technology topics with their relationship to physics and mathematics by solving real world problems. This hands-on course is designed to provide students interested in applied physics engineering and technology career opportunities to explore applications related to specialized fields such as civil, mechanical, and materials engineering, among others. Students will engage in research, development, planning, design, production, and project management. Classroom activities are organized to allow students to work in teams and use modern technological processes, software, and production systems to develop and present solutions to engineering problems based on presented physics concepts.

**III. ARTICULATION – reference to state standards, specific skills sets, and articulation with other courses**

The following standards are not currently covered in Introduction to Engineering Design and Engineering 102, but would be covered in Engineering Physics:

STANDARD 4.0 APPLY SCIENTIFIC LAWS AND PRINCIPLES RELEVANT TO ENGINEERING TECHNOLOGY

4.1 Use the relationship among energy, work, and power to solve a variety of problems involving mechanical, fluid, electrical, and thermal systems

4.2 Use Newton's Laws of Motion to analyze static and dynamic systems with and without the presence of external forces  
4.3 Use the laws of conservation of energy, charge, and momentum to solve a variety of problems involving mechanical, fluid, electrical, and thermal systems

4.4 Analyze relevant properties of materials used in engineering projects [i.e., chemical, environmental, mechanical (tension, compression, torque), electrical, physical, etc.]

Engineering Physics will cover the following state science standards in Physics.

HS.P2U1.5 Construct an explanation for a field's strength and influence on an object (electric, gravitational, magnetic).

HS+Phy.P2U1.1 Plan and carry out investigations to design, build, and refine a device that works within given constraints to demonstrate that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

HS.P3U1.6 Collect, analyze, and interpret data regarding the change in motion of an object or system in one dimension, to construct an explanation using Newton's Laws.

HS+Phy.P3U1.3 Develop a mathematical model, using Newton's laws, to predict the motion of an object or system in two dimensions (projectile and circular motion).

HS+Phy.P3U1.4 Engage in argument from evidence regarding the claim that the total momentum of a system is conserved when there is no net force on the system.

HS.P3U2.7 Use mathematics and computational thinking to explain how Newton's laws are used in engineering and technologies to create products to serve human ends.

HS.P4U1.8 Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings.

HS.P4U3.9 Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.

HS+Phy.P4U1.6 Analyze and interpret data to quantitatively describe changes in energy within a system and/or energy flows in and out of a system.

HS+Phy.P4U2.7 Design, evaluate, and refine a device that works within given constraints to transfer energy within a system.

HS+Phy.P4U1.8 Use mathematics and computational thinking to explain the relationships between power, current, voltage, and resistance.

HS.P4U1.10 Construct an explanation about the relationships among the frequency, wavelength, and speed of waves traveling in various media, and their applications to modern technology.

**IV. AUDIENCE – student group (school, grade, discipline) to be served**

All students with the appropriate prerequisites will have access to this course. The prerequisite for the course is the successful completion of Geometry. The main audience are students who have successfully completed Introduction to Engineering Design. Engineering Physics will be their second Engineering course of the three required for program completion. For students not completing the Engineering program, Engineering Physics will be viewed as a Physics lab course.

**V. RESOURCES – specific texts, materials, equipment needed**

[CIM Custom Kits](#)

[CIM Custom Upgrade Kits](#)

[Engineering Consumables](#)

[VEX V5 POE/CIM Custom Kit](#)

**VI. OUTCOME – evaluation of course effectiveness**

Engineering Physics would provide increased Technical Skills Assessment (TSA) scores for the Engineering program, due to the standards that will be covered, which were previously missed in the other two courses. This course would also provide a wider range of students with exposure to various disciplines of engineering. This class would provide equitable exposure to a diverse population of students.

**VII. IMPLEMENTATION – timeline to include pilot phase and annual evaluation of proposed course**

Pilot Phase of Engineering Physics:

One period of Engineering Physics at each school consisting of students from Introduction to Engineering Design and students interested in project-based physics.


Annual Evaluation:

An annual evaluation of Engineering Physics will take place through Technical Skills Assessment data analysis.

**VIII. PROCESS – how teachers, parents, and students (when appropriate) were included in the decision making process**

Parents, students, and teachers have requested this course for several years because they want students to have access to engineering for a full three years, in preparation for college coursework.

Students have advocated for an engineering honors option and have expressed they will enroll if this is available.

APPROVAL: \_\_\_\_\_ -  \_\_\_\_\_  
Principal                      date                      Superintendent Designee                      date

(NOTE: Must be submitted for Governing Board approval prior to the end of the current school year for implementation during the following school year.)