Innovative Course Application 2007-2008

Instructions:

1. Complete this application with care, remembering that if the course earns state approval, this application will be made available on the internet and may be accessed and referenced by the public.

2. Obtain the approval of your local board of trustees prior to submitting your application.

3. Submit your application via email as an attachment. Use "Innovative Course Application" as your subject line, and address the email to curriculum@tea.state.tx.us. **Submit your 2007-2008 application no later than February 27, 2007**. Expect a receipt confirmation within 5 business days.

Name of applying district or organization: Coppell Independent School District

Complete mailing address: Coppell High School; 185 West Parkway Blvd.; Coppell, TX 75019

Contact person: Tabitha Branum, Associate Principal

Contact person's email address: tbranum@coppellisd.com

Contact person's phone number, area code first: (214) 496-6100

County District Number (if applicant is a Texas school district): 057922

Superintendent (if applicant is a Texas school district): Dr. Jeff Turner

Date of local board of trustees' approval of this innovative course application: Feb. 26, 2007

Name of innovative course(s): Suborbital Aeroscience Studies I and II

(Only if this is an application for multiple levels of the same course may multiple course names be listed here. For example, an applicant may apply for approval of Latin Literature I and Latin Literature II with one submission.)

Number of credits that may be earned: 2

Brief description of the course (150 words or less):

This is a two-year, junior-senior program in which students design and develop remotely operated vehicles and unmanned aerial vehicles for research or work application. The curriculum is physics-based and includes technological applications of mechanical, fluid, electrical and thermal energy systems. Through a problem-based learning format, the course is designed to increase critical thinking and analysis skills.

Essential Knowledge and Skills of the course:

(These should be presented in the same format as the State Board of Education approved Texas Essential Knowledge and Skills (TEKS). You may find samples of this format in Chapters 110 – 128 of 19 Texas Administrative Code (TAC) at http://www.tea.state.tx.us/rules/tac/index.html.)

The course will include the physics TEKS:

(b) Introduction.

(1) In Physics, students conduct field and laboratory investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students study a variety of topics that include: laws of motion; changes within physical systems and conservation of energy and momentum; force; thermodynamics; characteristics and behavior of waves; and quantum physics. This course provides students with a conceptual framework, factual knowledge, and analytical and scientific skills.

(2) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.

(3) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.

(4) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods,

models, and conclusions built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the natural world.

(c) Knowledge and skills.

(1) Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations; and

(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) plan and implement experimental procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;

(B) make quantitative observations and measurements with precision;

(C) organize, analyze, evaluate, make inferences, and predict trends from data;

(D) communicate valid conclusions;

(E) graph data to observe and identify relationships between variables; and

(F) read the scale on scientific instruments with precision.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;

(B) express laws symbolically and employ mathematical procedures including vector addition and right-triangle geometry to solve physical problems;

(C) evaluate the impact of research on scientific thought, society, and the environment;

(D) describe the connection between physics and future careers; and

(E) research and describe the history of physics and contributions of scientists.

(4) Science concepts. The student knows the laws governing motion. The student is expected to:

(A) generate and interpret graphs describing motion including the use of real-time technology;

(B) analyze examples of uniform and accelerated motion including linear, projectile, and circular;

(C) demonstrate the effects of forces on the motion of objects;

(D) develop and interpret a free-body diagram for force analysis; and

(E) identify and describe motion relative to different frames of reference.

(5) Science concepts. The student knows that changes occur within a physical system and recognizes that energy and momentum are conserved. The student is expected to:

(A) interpret evidence for the work-energy theorem;

(B) observe and describe examples of kinetic and potential energy and their transformations;

(C) calculate the mechanical energy and momentum in a physical system such as billiards, cars, and trains; and

(D) demonstrate the conservation of energy and momentum.

(6) Science concepts. The student knows forces in nature. The student is expected to:

(A) identify the influence of mass and distance on gravitational forces;

(B) research and describe the historical development of the concepts of gravitational, electrical, and magnetic force;

(C) identify and analyze the influences of charge and distance on electric forces;

(D) demonstrate the relationship between electricity and magnetism;

(E) design and analyze electric circuits; and

(F) identify examples of electrical and magnetic forces in everyday life.

(7) Science concepts. The student knows the laws of thermodynamics. The student is expected to:

(A) analyze and explain everyday examples that illustrate the laws of thermodynamics; and

(B) evaluate different methods of heat energy transfer that result in an increasing amount of disorder.

(8) Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:

(A) examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction, and interference;

(B) identify the characteristics and behaviors of sound and electromagnetic waves; and

(C) interpret the role of wave characteristics and behaviors found in medicinal and industrial applications.

(9) Science concepts. The student knows simple examples of quantum physics. The student is expected to:

(A) describe the photoelectric effect; and

(B) explain the line spectra from different gas-discharge tubes.

Description of the specific student needs this course is designed to meet:

This course is designed to make physics concepts more relevant through practical application to aeroscience problems. Pre-engineering students as well as kinesthetic learners would benefit from this format.

Major resources and materials to be used in the course:

In addition to traditional physics lab materials, there are several items needed for this course. They include a hanging digital scale, Dremel tool and bit set, one or more multimeters, calipers, portable wind meter, 12-volt power supply, common hand tools, drill press, mouse sander, hand drill and bits, Rocksim Model Rocket Design and Simulation Software, rocket motors, other rocket-building materials, altimeter, and motor.

Required activities and sample optional activities to be used:

Students will be involved in applying physics concepts in order to design, test, build, and launch a rocket into the atmosphere. The design phase allows students to apply physics theory. Students will test their design in hands-on, controlled trials. Students will then build and launch the rocket.

Methods for evaluating student outcomes:

Students will be continually evaluated on each portion of the program. Evaluation will be based on how well students meet the objectives. Standard tests and quizzes will also be used. In each part, students will be evaluated on data collection technique, cooperation with team, safe work practices, analysis, and communication. Rubrics will be used for performance-based evaluation.

Required qualifications of teachers:

Certification in Composite Science, Physics or Physical Science

Additional information (optional):