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 ISD

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

Contact person: Donna Carpenter

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

Contact person's phone number, area code first: 214-496-6415

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:

Name of innovative course(s): Engineering Systems

(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: 1

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

Students will learn how to apply the engineering design process as they work in small groups on multiple short-term design problems and one long-term project.

Students will engage in projects that will demonstrate the integration of different systems. One such project will involve the manufacture and distribution of electrical power. This is a demonstration of the integration of mechanical and electrical systems. Students will also begin working on introductory projects and programs that will lead to their senior engineering project.

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.)

1. Teamwork. The student will work on projects with at least one other student in a team environment. The student is expected to:
    a. Share responsibility for project duties;
    b. Communicate effectively with team member
2. Problem solving – The student solves problems, thinks critically, and makes decisions related to given projects. The student is expected to:
    a. Use specified problem-solving strategies;
    b. Apply critical-thinking strategies;
    c. Apply decision-making techniques to the selection of solutions;
    d. Use the engineering design algorithm to create solutions to problems
3. Communication - Communication is paramount to engineering. Students must be able to communicate effectively with peers, teachers, and others. The student is expected to:
    a. Keep a daily journal of daily activities and goals for the next day;
    b. Work with peers in a cooperative, productive manner;
    c. Give oral presentations about major projects to the class. These presentations should be clear, concise and stay on the topic
4. Data Acquisition – The student will carefully and accurately take data measurements. The student is expected to:
    a. Demonstrate safe practices during field and laboratory investigations;
    b. Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
    c. Collect data and make measurements with precision;
    d. Read the scale on measurement devices with precision
5. Data Analysis – The student will carefully and thoughtfully analyze data collected. The student is expected to:
    a. Organize, analyze, evaluate, make inferences, and predict trends from data;
    b. Communicate valid conclusions;

c. Graph data to observe and identify relationships between variables

6. Technology – The student will use various technologies in the acquisition of data. The student is expected to:
    a. Use analog tools to collect data;
    b. Use digital collection tools to collect data;
    c. Compare the results of data collected using analog and digital collection tools;
    d. Identify benefits and drawbacks of different data collection tools;
    e. Use technology, such as robots, to collect data from difficult sources (such as simulated hazardous environments or closed environments)
7. Technology – the student will use various technologies in the analysis of data. The student is expected to:
    a. Use hand drawings and paper to create analysis tools, such as graphs and charts;
    b. Use Microsoft excel to create analysis tools, such as graphs and charts;
    c. Use engineering industry computer based tools, such as 3-D solid modeling software, to create analysis tools, such as graphs and charts.
8. Science – The student will utilize the techniques and knowledge gained to supplement the Chemistry curriculum. The student is expected to:
    a. Use data acquisition and analysis techniques in the selection of materials based on chemical properties;
    b. Use knowledge of the chemical properties of materials to explain analysis results from testing
9. Systems – The student will use a systems approach to investigate mechanical, fluid, electrical, and thermal systems. The student is expected to:
    a. Apply the universal systems model to technological activities;
    b. Identify the inputs, processes, outputs, and feedback associated with each of the systems.
10. Systems – The student will use a systems approach to investigate the integration of different systems. The student is expected to:
    a. Apply the universal systems model to technological activates;
    b. Identify the inputs, processes, outputs, and feedback associated with each of the systems.

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

In this course, students will transfer the knowledge they have gained in chemistry, physics, and the previous engineering course, Data Acquisition and Analysis. Students will work with the integration of different types of sub-systems into a single system. In the Suborbital Aeroscience Systems course, students must design and build a working suborbital rocket. This is a real world application of the integration of many systems. The rocket itself is a system comprised of several sub-systems. The design, analysis, control, and execution of the rocket is a system made up of many sub-systems as well. This course will help ensure students have a safe and successful program.

Since the course works closely with the science department, students will be gaining real world experience using techniques and procedures learned in the science curriculum.

Communication is vital to the engineering field. This course will directly work on student's communication in many different formats. Students will work on written communication where an audience (known or unknown) will review work. Students will also give oral presentations to audiences of both peers and industry professionals with review sessions after. Due to the

increasing use of digital technology, students will also create web presentations of major projects.

Major resources and materials to be used in the course:

This course will utilize a number of data collection devices such as Vernier probes, National Insturments data collection software (LabView), analog measurement tools such as stopwatches and rulers. For analysis, the course will use standard drawing tools along with a computer lab equipped with Microsoft Excel and a 3-D solid modeling program, such as SolidWorks. The course will work in conjunction with the science department for experiments and equipment.

Required activities and sample optional activities to be used:

Course Activities:

1. Data Acquisition such as length, time, force, thrust, acceleration, flow rate, frequency, pressure, power, etc.

2. Data Analysis such as using graphs to predict trends and outcomes, using solid modeling to do thermal and stress analysis, etc.

3. Design, test, analyze, and improve integrated systems such as a small-scale power generation system. This system will built in the classroom and use water power as the initial source of power that is converted into electrical power.

4. Work with the physics department on the Suborbital rocket project.

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. In each part, students will be evaluated on data collection technique, cooperation with team, safe work practices, analysis, and communication. Rubrics will be presented to students for analysis projects and presentations.

Required qualifications of teachers:

Teacher will be certified in Technology Education 8-12. The teacher will be an instructor in the school's engineering program which is a defined Career and Technology pathway.

Additional information (optional):

This curriculum and material for this course is being developed with the TCU Education Department - Math, Science & Technology Institute, and the TCU Engineering Department


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