Course Title: Advanced STEAM

Course #: 1507-1508

Course Description:
Students will expand on concepts and skills developed in the Introduction to STEAM course. This is a fast-paced course that will take a more comprehensive look into JAVA programming, CAD designing, metal fabrication, mechanical and electrical engineering, and real-world applications. Students will complete the STEAM program by competing in a two-month robotics competition during the spring semester. During the competition, the students utilize the skills they have developed to strategize, design, build, program, and compete in a rigorous robotics competition. The competition will require after school and Saturday meeting times.

UC/CSU Approval: “d” approved

Grade Level: 10-12

Estimated Homework Per Week: 1-3 hours

Prerequisite: Completion of Introduction to STEAM with a grade of “C” or higher both semesters.

Recommended Prerequisite Skills: Good analytical skills and attention to detail.

Course Grade Categories:
- Homework: 15%
- Tests/Quizzes: 15%
- Projects: 50%
- Final Project: 20%

Major Assessments/Units/Topics:
Advanced STEAM is a very project based class that builds on concept and skill development first learned in Intro to STEAM. In addition to identifying problems and creating solutions, students will document their process in an Engineering Design Notebook. There will also be 4-6 quizzes per semester.
Unit 1: Prototyping and Testing

- In this unit students learn the importance and techniques to developing prototypes and testing models during the design process of solving problems. Students continue to enhance the CAD skills with 3D models and 2D drawings. The unit includes a quiz and culminates in a small project.

Unit 2: Conceptual Physics

- In this unit, students learn about the applications of projectile motion and kinematic equations. There are multiple quizzes and the unit wraps up with an extensive projectile project where students engage in team competition making siege machines launching projectiles at various targets.

Unit 3: Introduction to Robotics:

- In this large unit students will create projects in each area of robotics identified below. There will also be quizzes to assess content in each area.
  - 3.1 Programming: Students will be introduced to the LabView programming language
  - 3.2 Electrical: Students will learn how to identify, calculate, and fabricate optimal, functioning circuits used in robotic capacities.
  - 3.3 Pneumatics: Students will learn the numbers and the manufacturing of how pneumatic systems operate.
  - 3.4 Sensors: Students will learn the different types and importance of various sensors used to help advance robotic functions.
  - 3.5 Motors: Students will learn the different options of motors to use and what motors work best in different situations.

Semester 1 Final Project: Students will design robotic mechanisms that are represented by the different areas of robotics. They will select simple tasks to perform and design a robotic element to perform said task.

Unit 4: Robotic Projects:

- The second semester of Advanced STEAM consists of problem solving using the concepts and skills learned in the previous semester. Students will be given tasks and must work in groups to create efficient mechanisms to complete the tasks. Students will go through the entire design process thoroughly, documenting along the way their ideas, calculations, design, testing, results, modifications, and solution.
  - There will be 3 large projects that make up the semester:
    1 - Robotics simple tasks
    2 - Environmental Challenge
    3 - Final project - Complex robotic task

Semester 2 Final Project: This will encompass all the skills and concepts attained throughout the year to complete complex solution to an identified problem.