PRINCIPLES OF ENGINEERING

Prerequisite: Concurrent enrollment in Math 3 and completion of IS2 with a C or better
This is a full year college preparatory course that partially fulfills the UC/CSU "g" elective requirement. Does not fulfill the "d" lab science requirement.

Class focuses on problems that engage and challenge. Students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation. The curriculum is aligned to the CA TE Model Curriculum Standards and Career Ready Standards for the Engineering and Architecture industry sector and Engineering Technology career pathway.

Understanding and Knowledge

- Engineers and engineering technologists apply math, science, and discipline-specific skills to solve problems.
- Design teams conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.
- Technical communication can be accomplished in oral, written and visual forms and must be organized in a clear and concise manner.
- Energy systems can include multiple energy sources that can be combined to convert energy into useful forms.
- Structural member properties including centroid location, moment of inertia, and modulus of elasticity are important considerations for structure design.
- Material properties including recyclability and cost are important considerations for engineers when choosing appropriate materials for a design.
- Material testing aids in determining a product's reliability, safety, and predictability in function.
- Control systems are designed to provide consentient process control and reliability.
- Fluid power systems are designed to transmit force over great distances, multiply an input force, and increase the distance that an output will move.
- Engineers use statistics to make informed decisions based upon established principles.
- When working with bodies in motion, engineers must be able to differentiate and calculate distance, displacement, speed, velocity, and acceleration.

Skills

Students will be able to:

- Present a workable design solution.
- Design, create, test and evaluate a compound machine design.
- Test and apply the relationship between voltage, current, and resistance relating to a photovoltaic cell and a hydrogen fuel cell.
- Design, construct, and test recyclable insulation materials.
- Use the method of joints strategy to determine forces in the members of a statically determinate truss.
- Investigate specific material properties related to a common household product.
- Identify and calculate test sample material properties using a stress strain curve.
- Design and create a control system based on given needs and constraints.
- Design, create, and test hydraulic and pneumatic devices.
- Design, build, and test a vehicle that stores and releases potential energy for propulsion.

Assessment & ESLRs

Students will:

- Complete design projects utilizing all steps of a design process, and find solutions that meet specific design requirements.
- Clearly justify and validate a selected solution path.
- Construct testable prototypes of problem solutions.
- Analyze the performance of a design during testing and judge the solution and viable or non-viable with respect to meeting the design requirements.
- Demonstrate positive team behaviors and contribute to a positive team dynamic.