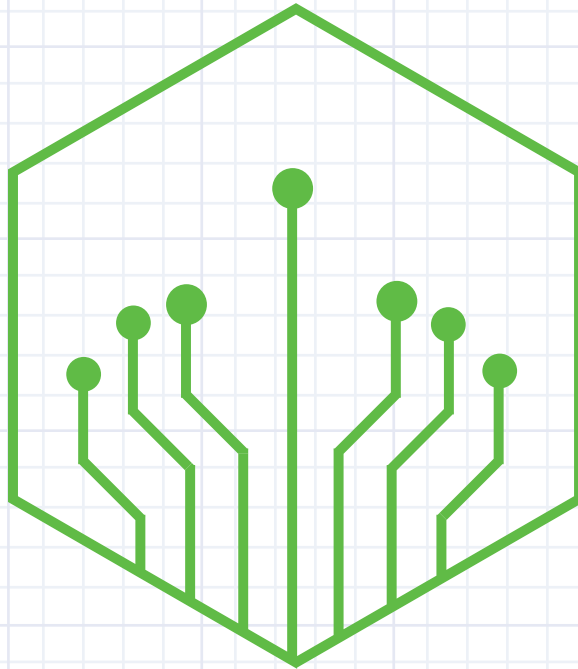




ENGINEERING DESIGN NOTEBOOK

BOOK 1 | CIRCUITRY



NAME:



VOCABULARY

Bow Project

battery - stores electrical energy

circuit - a path for electrical current to flow through

conductive path - in a circuit, the path in which electric charge is carried

conductor - materials that electricity can flow through easily

electrical load - an electrical component that consumes electric power

electricity - a form of energy that is produced by the flow of electrons

engineering design process - a series of steps that engineers use in creating functional products and processes. The process is iterative.

insulator - materials that electricity does not flow through easily

iteration (iterate v.) - the act of repeating a process with the aim of approaching a desired goal, target or result

LED - stands for light emitting diode, a component that produces light

power source - a source of power; in WearTec produced by batteries

simple circuit - includes the *minimum* things needed to have a functioning circuit

solution - a way to solve a problem

wearable technology - clothing and accessories incorporating computer and electronic technologies

Badge Project

button - a “button” is a binary device, having only two options, with a momentary “on” position, reverting to an “off” position (or vice versa) when released

closed circuit - a circuit that is a continuous or complete path for electricity (current) to flow through (electricity begins at the power source and returns to the power source)

negative - the negative pin or side of the battery or component is shown by using a - sign

open circuit - an electrical circuit that is not complete

positive - the positive pin or side of the battery or

component is shown by using a + sign

reverse engineering - the process of extracting knowledge or design information from anything man-made

short circuit - an electrical circuit in which a path of very low resistance has been created, usually accidentally; can cause dangerously large amounts of current to flow

switch - a “switch” is a binary device, having only two options, with an “on” and “off” position

Card Project

esthetics - a set of principles concerned with visual appeal, how good something looks

Ohm's law - a mathematical relationship between voltage and current in a circuit: voltage difference across a resistor is equal to the resistance value (in Ohms) times the current (in amps), or $V = IR$

parallel circuit - a circuit in which the loads are each in a unique circuit path (a different “partial current” flows through each one); voltage is the same across each component of the parallel circuit; the sum of the currents through each path is equal to the total current that flows from the source

series circuit - a circuit in which all the loads appear sequentially (they are all in the same circuit path) the voltage across the circuit is the sum of the voltages across each component.

Culminating Project

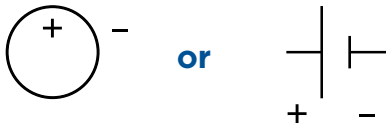
creative reuse - is the process of taking materials or products that are unwanted for their original function and through creativity, transforming them into pieces of art, home decoration, or other useful items.

design thinking - a methodology used by designers to solve complex problems, and find desirable solutions for clients. Design Thinking draws upon logic, imagination, intuition, and systemic reasoning, to explore possibilities of what could be, and to create desired outcomes that benefit the end user

invention - a new, useful process, machine, improvement, etc., that did not exist previously and that is recognized as the product of some unique intuition or genius, as distinguished from ordinary mechanical skill or craftsmanship

EXAMPLES

Battery:



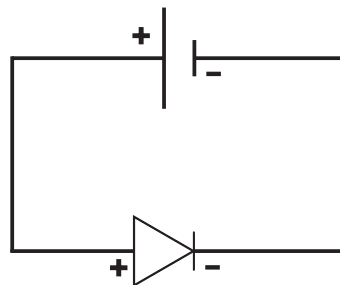
Positive / Negative:



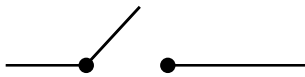
LED:



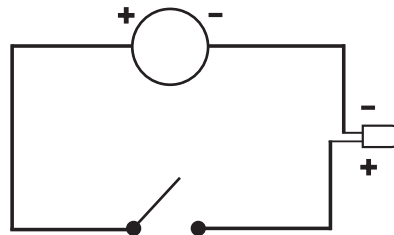
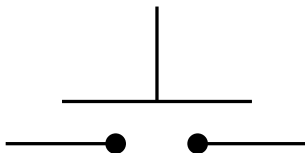
End Result:



Switch:



Button:



ENGINEERING DESIGN PROCESS KEY



Ask | What is the problem? What have others done?



Brainstorm | What are some solutions? Draw your ideas



Compare | What are the pros and cons of each idea?



Choose | Which idea do you think is best?



Create | Build my design. What works well? What needs to be improved?



Communicate | How will you share your solution with others?

ENGINEERING DESIGN PROCESS

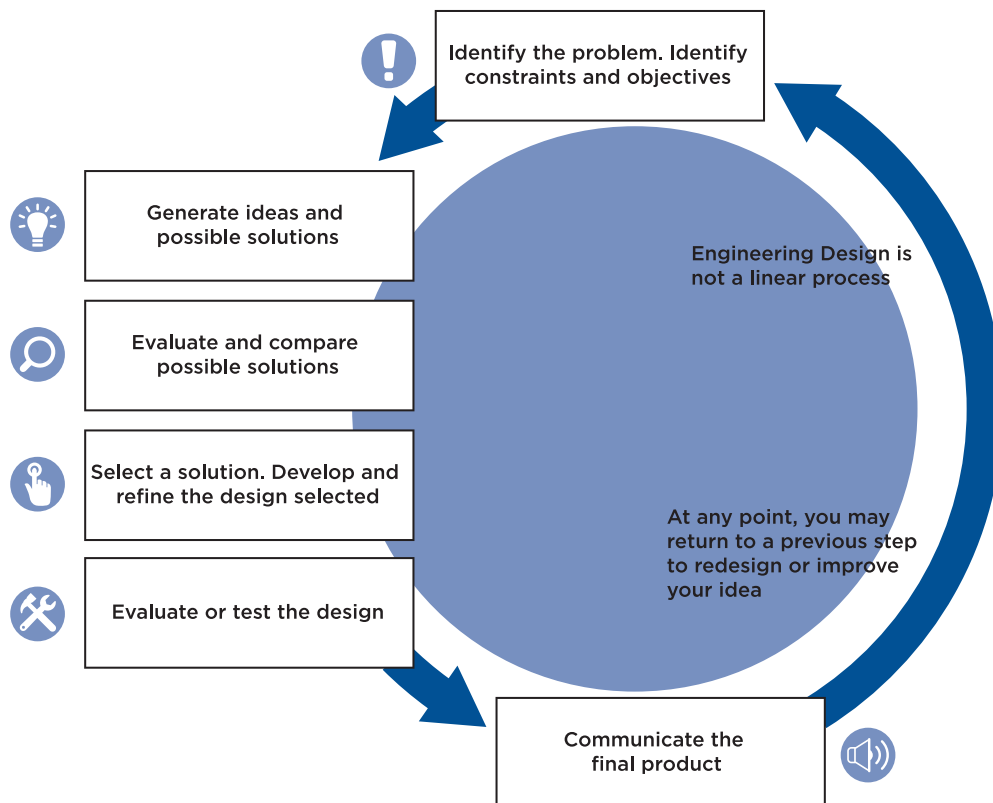
Engineering Design Process (EDP) Overview

The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times the solution involves designing a product that meets certain criteria and/or accomplishes a certain task. This process is different from the steps of the scientific method. While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences. Because engineers and scientists have different objectives, they follow different processes in their work. Scientists perform experiments using the scientific method; whereas, engineers follow the creativity-based engineering design process.

It's important to note that the EDP is flexible. There are as many variations of the model as there are engineers. With WearTec, students work through all six steps, but in real life, engineers often work on just one or two steps, then pass their work to another team.

Note that the EDP is non-linear. At any point, you may return to a previous step to redesign or improve your idea. The EDP is reliant on the iterative process. For example, after you improve your design once, you may want to begin all over again to refine your technology. You can use the EDP again and again!

In the WearTec curriculum you will notice symbols to represent a step. These symbols are intended to help you identify the steps of the EDP and bring about the thinking associated with that step. The symbols can be used for short-hand inclusion in the engineering journal.



STUDENT INSTRUCTIONS

Engineers spend time writing and drawing daily in order to document their ideas and their work. This Engineering Design Notebook will provide you with a similar experience.

Write in this notebook daily to keep a record of your progress and next steps on WearTec projects. You, as the WearTec engineer in charge of your project, will make decisions regarding the writing and drawing that goes into this notebook.

This page describes how engineers complete each page of their engineering notebooks using both words and images.

Along the top:

- Write today's date
- Write your name on each page used
- Indicate the WearTec Book number (1, 2, 3, or 4)
- Indicate the WearTec Project name
- Indicate the number of this page, out of the total number of pages used this day.

For example, page one of three used this day would look like this: 1/3

6/5/16	Tony Stark	1	Bow	1/3
Date	Name	Book	Project	Page
<p>Circle each step of the Engineering Design Process that is used.</p> <p>Indicate the step(s) of the design process you are working on today by circling the appropriate icon(s). See page 4 for an explanation of each step of the Engineering Design Process.</p> <p>What did I do and/or learn today? (Use vocabulary & images from the inside cover)</p> <p>Write and draw to document your work and your thinking about your work. Label your drawings with words to provide more information when possible. Turn to either inside cover of this notebook for a list of words and their meanings that might be used when writing and labeling your images.</p>				

6/5/16	Tony Stark	1	Bow	2/3
Date	Name	Book	Project	Page
<p>My plan for next time</p> <p>Write a sentence or two that will remind you where you left off today, and where you will begin next time you work on your project.</p>				

Draw a simple circuit below.

Draw a circuit after completing the final project.

Circle each step of the Engineering Design Process that is used.



What did I do and/or learn today? (Use vocabulary & images from the inside cover)

Date

Name

Book

Project

Page

My plan for next time:
