

Spanish Fork High 2014-2015

Don Learning Targets for

Robotics & Automation

I CAN identify the definition and historical impact of technology.

- I CAN contrast the positive and negative social, economic, and environmental impacts of a technological process, product, or system.
- I CAN Explain the influence of technology on history and the shaping of contemporary issues.

I CAN identify the definition and historical impact of engineering within global, economic, environmental, and societal needs.

- I CAN define engineering as it applies to the robotic and automation industry.
- I CAN identify 4 engineering fields that impact the robotic and automation industry.

I CAN identify the definition and historical impact of robotic and automated systems and their benefit to society.

- I CAN define automated manufacturing/systems.
- I CAN describe the history and early beginnings of automated manufacturing & robotics.
- I CAN explain how automation and robotic systems have improved the quality of life, increased production, precision, and safety a variety of applications.

I CAN follow general laboratory safety practices.

- I CAN assess workplace conditions with regard to safety and health.
- I CAN align safety issues with appropriate safety standards to ensure a safe workplace/jobsite.

I CAN follow specific equipment safety practices.

- I CAN use personal protective equipment according to manufacturer rules

and regulations.

I CAN identify potential safety hazards.

- I CAN identify safety precautions to maintain a safe worksite.
- I CAN select appropriate personal protective equipment as needed for a safe workplace/jobsite.

I CAN demonstrate the ability to clearly formulate a problem statement.

- I CAN identify that a problem exists.
- I CAN state or write the problem clearly.

I CAN demonstrate the ability to identify and analyze design constraints.

- I CAN analyze typical constraints: time, energy, space or area, tools, people, materials, capital and information.
- I CAN document constraints that have a positive or negative effect on the design problem.

I CAN demonstrate the ability to investigate and research information pertaining to the design brief and choose the best solution

- I CAN brainstorm and research information that is currently available.
- I CAN identify conditions or factors which may affect the solution such as appearance, durability, simplicity and safety.
- I CAN use sketches and notes in the process of generating alternative design solutions.
- I CAN select the best solution or design using a decision matrix.

I CAN develop a detailed working drawing for their solution.

- I CAN be familiar with CAD software and/or hand drawing.
- I CAN understand and use the alphabet of lines, orthographic views and dimensioning.
- I CAN create a detailed drawing.
- I CAN generate a parts list.

I CAN implement the design by building a model or prototype.

- I CAN create a chart that shows the build schedule and the team work assignments.
- I CAN students will use their parts list to obtain needed material.
- I CAN using safety procedures construct the prototype.
- I CAN students will demonstrate the use of simple machines and show how they are used in structural design of complex devices and machines.

I CAN demonstrate the ability to test, analyze and optimize their design

- I CAN test the prototype, apply math calculations, and document the results.
- I CAN re-design and improve the prototype.

I CAN demonstrate the ability to document, evaluate, and report on the final design.

- I CAN summarize the design process use in the product development.
- I CAN defend the final prototype.
- I CAN make a formal presentation to the class.

I CAN identify the six simple machines and apply their use to a structural design.

The six simple machines defined by Renaissance scientists are:

- Levers
- Wheel and axle
- Pulley
- Inclined plane
- Wedge
- Screw

I CAN analyze the effects of various forces on a mechanical device. (Every force is a vector and has two components, magnitude and direction.)

- I CAN discuss and demonstrate the following forces in English and Metric units:
 - Gravitational forces
 - Friction or drag forces
 - Normal force
 - Horizontal and vertical forces
 - Rotational forces called torque

I CAN calculate and demonstrate mechanical advantage of gears, pulleys, and levers.

I CAN calculate and measure mechanical rates, including linear velocity, linear acceleration, angular speed, and angular acceleration.

- I CAN discuss the difference between speed, velocity and acceleration
- I CAN calculate and measure linear velocity in both English and Metric units
- I CAN calculate and measure angular speed in English and metric units
- I CAN calculate and measure linear and angular acceleration in both English and Metric units

I CAN describe the effects of friction.

- I CAN discuss the advantages and disadvantages of friction.
- I CAN calculate friction applying the coefficient of friction and normal force
- I CAN demonstrate rolling friction and explain why it reduces friction

I CAN describe power and efficiency.

- I CAN calculate mechanical power:
 - Horse power
 - Watts
- I CAN define and calculate power efficiency
- I CAN apply and calculate power efficiency by using an electric motor, pneumatics, or hydraulics to lift a payload.

I CAN compare and contrast energy sources and their ability to change to other forms of energy.

- I CAN describe and contrast energy sources.
- I CAN identify and contrast sources of electrical energy including AC and DC.
- I CAN describe energy ratings such as amp/hour and kilowatt/hour.

I CAN explain how energy in a robotic system is converted and used (chemical, electrical, magnetic, mechanical, heat, etc.).

I CAN use a batteries, solar cells or generator to provide energy for the operation of small motors and other mechanical devices.

- I CAN identify batteries and describe their uses and hazards.
- I CAN properly connect and disconnect batteries and power supplies.
- I CAN define and calculate increase performance through series and parallel connections.

I CAN calculate voltage, amperage, and resistance using Ohms Law.

I CAN use a multi-meter to measure voltage, amperage, and resistance.

I CAN define series, parallel, and series/parallel circuits.

I CAN apply binary devices which operate in on or off states.

I CAN apply digital logic to a problem solving situation.

I CAN create a device control flow chart.

- I CAN identify the input, process, output, and feedback of a system.

I CAN define a Closed-Loop and Open-Loop systems.

I CAN apply sensors to obtain feedback.

I CAN apply switches and sensors to control robot movement.

I CAN be able to identify and explain control flow statements (loop, if, then, else, etc.) and how they are used in a program to operate a robot.

I CAN be able to create an algorithm and flow chart to write a program.

I CAN be able to interpret and identify the difference between logic and syntax.

I CAN be able to compile and utilize a personal library of commands.

I CAN be able to identify and use variables in programming.

I CAN be able to create and explain a program that utilizes input and output commands

I CAN describe the advantages and disadvantages for each of the following industrial robotic systems:

- Stepper motors
- Hydraulics
- Pneumatics

I CAN identify the uses of robotics in industry and how it impacts manufacturing and production.

- I CAN identify the advantages and disadvantages of automated assembly lines.
- I CAN describe how robotics can improve manufacturing safety.
- I CAN identify five or more industries that utilize robotic applications.

I CAN contrast the social benefits and the negative consequences of robotics and automation.

I CAN describe the ethical impact of robotics and automation.

Example discussion points:

- Discuss military and political use of robots; e.g. spy bugs and drones.
- Discuss who is responsible for a robot's intended use; e.g. a robot made to search a mine v/s the same technology used to invade someone's privacy.
- Discuss ethical and professional behavior in the development and use of technology.

I CAN explain the application of copyright and patent laws.

I CAN be able to identify and report on educational pathways and career opportunities in robotics and automation.