Unit 3 Control Systems: Machine Control

Content Area: **Science**
Course(s): **Prin of Enginee**
Time Period: **Semester 2**
Length: **7 weeks**
Status: **Published**

Standards

	A computing system involves interaction among the user, hardware, application software, and system software.
8.1.12.CS.2	Model interactions between application software, system software, and hardware.
8.1.12.CS.3	Compare the functions of application software, system software, and hardware.
	The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.
8.2.12.ED.1	Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
8.2.12.ED.2	Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
8.2.12.ITH.1	Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.
8.2.12.NT.1	Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2	Redesign an existing product to improve form or function.

Enduring Understandings

Students will understand that:

1. Control systems are designed to provide consistent process control, reliability, and automation.
2. Control system algorithms are a sequence of instructions, often involving conditional statements and iterative loops.
3. Machines can use open-loop or closed-loop control systems; closed-loop control systems can use digital and/or analog sensor feedback to make decisions.
4. Complex algorithms are created by decomposing the algorithm into simple pieces, and complex machine behavior can similarly be decomposed into simple component behavior.
5. Documentation – in the form of pseudocode, comments, and other documentation – can be an important part of creating and maintaining a computer program.
6. Version control can be an important part of creating and maintaining a computer program.
7. Design problems can be solved by individuals or in teams. (Same as U1 in Lesson 1.4)
8. Engineers use a design process to create solutions to existing problems. (Same as U2 in Lesson 1.4)
9. Engineers and engineering technologists apply math, science, and discipline-specific skills to solve problems. (Same as U1 of Lesson 1.1.)
10. Engineering and engineering technology careers offer creative job opportunities for individuals with a wide variety of backgrounds and goals. (Same as U2 of Lesson 1.1.)

Essential Questions

1. What are the advantages and disadvantages of using programmable logic to control machines versus monitoring and adjusting processes manually?
2. What are some everyday seemingly simple devices that contain microprocessors, and what function do

the devices serve?

3. What questions must designers ask when solving problems in order to decide between digital or analog systems and between open or closed loop systems?

Knowledge and Skills

Students will:

1. Distinguish between digital and analog data, and between the inputs and outputs of a computational system.
2. Distinguish open and closed loop systems based on whether decisions are made using time delays or sensor feedback.
3. Identify the relative advantage of an open-loop or closed-loop control system for a given technological problem.
4. Describe the market demand and salary range for one type of engineer or engineering technician, and understand the education path that leads to that career.

Resources

Instructional Resources

3.1.1.A.FT InputsOutputs.doc
3.1.1.A.FT InterfaceSetup.doc
3.1.2.A.FT Flowcharting.doc
3.1.2.A.FT FlowchartGuide.doc
3.1.2.A CreatingFlowcharts.ppt
3.1.3.A.FT BasicProgramming.doc
3.1.3.FT RoboProIntroduction.ppt
3.1.3.VEX ProgrammingDesign.pptx
3.1.4.A.FT BranchFunctions.doc
3.1.5.A.FT VariableFunctions.doc
3.1.6.A.FT OpenClosedLoopSystems.doc
3.1.7.P.FT MachineControlDesign.doc
3.1.7.P.RU.FT MachineControlDesignRubric.doc

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit