SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Machine Automation	Length of Course: 15 cycles
Grade Level(s): 11-12	Periods Per Cycle: 6
Units of Credit: .5	Length of Period: 43 minutes
Classification: Elective	Total Instructional Time: 64.5 hours

Course Description

This course will provide students with hands-on activities in the areas of Computer Numerical Control (CNC) operations and Robotics. The students will design and manufacture a variety of parts from wood, plastic and metal. This course is recommended for students interested in machine manufacturing careers.

Instructional Strategies, Learning Practices, Activities, and Experiences

Classroom Discussion Followed up with Demonstrations	Posted Objectives and Agenda	Flexible Groups
Teacher/Student Discussion	Bell Ringers	Formal Assessments
	Guided Practice	

Assessments

Unit Projects	Study Guides	Slide Show Presentations
Constructed Response Questions	Final Exam	

Materials/Resources

Automation and Robotics Labs	Computer Numerical Control (CNC) Laser and Router	CNC Mill and CNC Lathe
Basic Hand Tools	Mill and Lathe Software Level-4	Robotic Arm and Accessories

Adopted: 8/17/05

Revised: 5/21/18

Robotics in an Automated System	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Basic robotic operations B. Create a running program C. Linking robotics with other automated equipment <u>Related Vocabulary</u>: articulation actual position axis base coordinate system closed-loop cartesian manipulator carousel	3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.12.A3 ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). 3.4.10.A2 ~ Interpret how systems thinking applies logic and creativity with appropriate comp complex real-life problems. 3.4.10.A3 ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C2 ~ Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. 3.4.12.C3 ~ Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, productivity of a final product. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. 3.4.12.E6 ~ Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world.

Artificial Intelligence	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Computers and artificial intelligence B. Machine learning and smart robots C. Humans working with machines <u>Related Vocabulary</u>: assertion ambiguity active image automated reasoning base-level activity back-up value axiom default reasoning knowledge acquisition	3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.12.A3 ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). 3.4.10.A3 ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C2 ~ Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. 3.4.12.C3 ~ Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, productivity of a final product. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. 3.4.12.E6 ~ Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world.

Safe CNC Mill and Lathe Operations	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Safe operating techniques B. Writing and entering a program C. Executing a program D. Editing a program <u>Related Vocabulary</u>: spindle collect workpiece origin reference position numerical control program G and M codes fixture	3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.10.A2 ~ Interpret how systems thinking applies logic and creativity with appropriate comp complex real-life problems. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.12.C2 ~ Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, productivity of a final product. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. 3.4.12.E6 ~ Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world.

CNC Design and Programing	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Safe operating techniques B. Computer and machine tooling C. CNC program codes D. Advanced design E. Advanced manufacturing <u>Related Vocabulary</u>: feed rate spindle speed depth of cut tool sequence tool path three axis programming absolute zero	3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.12.A3 ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C3 ~ Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, productivity of a final product. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.