07 Advanced Programming

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **3 Weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

This full year honors course continues to emphasize the application of integrated STEM (Science, Technology, Engineering and Mathematics) principles and the design method to invent solutions to real world problems through robotic applications. Students will identify problems, research, design and fabricate solutions. Problem solving, critical thinking and design skills are taught through a variety of activities. Hands-on themes include structural and robotic systems, as well as system control technology. This course provides all students with valuable skills such as: problem solving, design, creative thinking, systems thinking, team work, documentation, programming and computer applications.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students have previously learned about the basic elements of robotic hardware/software systems. This unit will shift the focus of programming from user controlled programming to autonomous robotics problem solving. Color and distance sensors can be utilized with "while loops" and "for loops" in order to solve complex problems when incorporated with sophisticated mechanical designs.

CONTENT AREA STANDARDS

TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.

LA.RH.11-12.8	Evaluate an author's claims, reasoning, and evidence by corroborating or challenging them with other sources.
MA.K-12.7	Look for and make use of structure.
LA.RH.11-12.9	Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
MA.K-12.8	Look for and express regularity in repeated reasoning.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Designing, building and programming an autonomous robot is a complex task; programmers must plan with engineers and are limited by the mechanical capabilities of the robot.
- The design process is an integral aspect of writing a program.
- PID loops should be incorporated in order to make the use of motors more effective, efficient and to prevent damage to components and hardware.
- Robot control software can only guess the state of the real world based on measurements returned by its sensors; utilizing time or distance measurements within an autonomous program can be more efficient when repeatedly solving the same problem in the same environment.
- When using time and distance measurements in autonomous programs, course elements can interfere with operations, and course correction safeguards can be planned and programmed.
- An effective autonomous program cannot be created without thoughtful planning and communication between programmers and mechanical engineers.

Procedural Knowledge

Students will be able to:

- Demonstrate creative thinking,
- Construct knowledge.
- Develop innovative products and process using technology.
- The design process is a systematic approach to solving problems.
- Explain and identify interdependent systems and their functions.
- Work productively in teams while using cultural global competence.
- Communicate clearly and effectively and with reason.

- Utilize critical thinking to make sense of problems and persevere in solving them.
- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text.
- Verify data when possible.
- Corroborate or challenge conclusions with other sources of information.
- Synthesize information from a range of sources
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.Make sense of problems.
- Persevere in solving problems.
- Construct viable arguments.
- Critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for structure.
- Make use of structure.
- Look for regularity in repeated reasoning.
- Express regularity in repeated reasoning.

EVIDENCE OF LEARNING

Formative Assessments
Observation, weekly engineering logs, autonomous programming and hardware quiz.

Summative Assessments
Written autonomous programming test, autonomous robot skills test, autonomous robot programming test.

RESOURCES (Instructional, Supplemental, Intervention Materials)
VEX Coding Studio Software

https://help.vexcodingstudio.com/ - VEX Coding Studio Software API

Robot Mesh Studio Programming and Modeling Software

www.VEXForum.com

Teacher made handouts and tutorials available through Google Classroom/Suite

INTERDISCIPLINARY CONNECTIONS

Mathematics and ELA as listed in related standards.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.