08 Systems Integration

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **8 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 learned and gained experience in many different aspects of robotics technology: drivetrains, lifts/mechanisms, power transmission and programming. They will now be tasked with utilizing their knowledge and experience to develop solutions to a complex real-world problem or task.

CONTENT AREA STANDARDS

TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
TECH.8.2.12.D.CS1	Apply the design process.

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

LA.RH.11-12.8	Evaluate an author’s claims, reasoning, and evidence by corroborating or challenging them with other sources.
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.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.WHST.11-12.6	Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information.

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.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Managing time and resources and designating leaders for sub-systems will allow for a better designed and more effective final solution.
- Clearly communicating with group members is necessary to complete tasks on time and successfully.
- The design loop is an important process to follow; completing independent research, logging work, testing, evaluating and redesigning need to happen consistently throughout the project.
- Application of previously learned knowledge will lead to effective solutions.
- Completing a detailed engineering logbook can demonstrate learning in despite unsuccessful final solution/products or sub-systems.
- Planning is instrumental if all sub-systems (chassis, drivetrain, lift/flywheel/claw, intake, etc.) are to function together effectively as one system.

Procedural Knowledge

Students will be able to:

- Systemically solve problems utilizing the design process.
- Design and create a prototype to solve a real world problem using a design process.
- Identify constraints addressed during the creation of the prototype.
- Identify trade-offs made.
- Present the solution for peer review.
- Apply the design process.
- Communicate clearly and effectively and with reason.
- Demonstrate creativity and innovation.
- Employ valid and reliable research strategies.
- 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 technology, including the Internet, to produce, share, and update writing products.
- Respond to ongoing feedback, including new arguments or information.

EVIDENCE OF LEARNING

Formative Assessments

Observation, daily testing evaluation and redesign, daily engineering log (graded weekly)

Summative Assessments

Tests associated with sub systems (drivetrain, lifts/mechanisms, basic hardware/user control programming, autonomous programming)

Final engineering log

Autonomous Skills Test, User control skills test (both hands-on)

Competition Autonomous Test, Competition Head-to-Head Test

RESOURCES (Instructional, Supplemental, Intervention Materials)

INTERDISCIPLINARY CONNECTIONS

ELA and Math as listed in related standards.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.