**COURSE DESCRIPTION**

**Course Title:** STEM 8

**Course Number:** 00796

**Course Prerequisites:** None

**Course Description:** This eighth grade STEM class is designed to introduce students to the exciting world of robotics, drones, and motion measurement. Through hands-on activities and experiments, students will learn about the design and construction of robots and drones, as well as the principles of motion and measurement. Throughout the course, students will have the opportunity to design and build their own robots and drones. They will learn about programming languages and coding principles and will use these skills to program their machines to complete various tasks. In addition to robotics and drones, the course will cover the principles of motion and measurement, including speed, velocity, acceleration, and force. Students will use Vernier sensors to collect and analyze their data. By the end of the course, students will have a strong foundation in robotics, drones, and motion measurement, as well as the skills and knowledge needed to design and build their own machines. They will also have a deeper understanding of the principles of STEM and how these principles can be applied to solve real-world problems.

**Suggested Grade Level**: Grade 8

**Length of Course:** One Semester

**Units of Credit:** .5

**PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:**

CSPG 32 Biology, CSPG 34 Chemistry, CSPG 40 Earth and Space Science, CSPG 41 Elementary Education K – 6, CSPG 45 Environmental Science, CSPG 46 General Science, CSPG 54 Middle Level Science, CSPG 56 Physics, CSPG 65 Technology Education, CSPG 70 Grades 4 – 8, CSPG 71 Computer Science 7 - 12

To find the CSPG information, go to [CSPG](https://www.education.pa.gov/Educators/Certification/Staffing%20Guidelines/Pages/default.aspx)

**Certification verified by the WCSD Human Resources Department:** Yes No

**WCSD STUDENT DATA SYSTEM INFORMATION**

**Course Level:** Academic

**Mark Types:** Check all that apply.

F – Final Average MP – Marking Period EXM – Final Exam

**GPA Type**:  GPAEL-GPA Elementary  GPAML-GPA for Middle Level  NHS-National Honor Society

UGPA-Non-Weighted Grade Point Average  GPA-Weighted Grade Point Average

**State Course Code**: 03153

To find the State Course Code, go to [State Course Code](https://nces.ed.gov/forum/sced.asp), download the Excel file for *SCED*, click on SCED 6.0 tab, and choose the correct code that corresponds with the course.

**TEXTBOOKS AND SUPPLEMENTAL MATERIALS**

**Board Approved Textbooks, Software, and Materials:**

**Title:**  Middle School SmartLab Learning Hub

**Publisher:** Creative Learning Systems

**ISBN #:**  Click or tap here to enter text.

**Copyright Date:** 2023

**WCSD Board Approval Date:** 01/09/2023

**Supplemental Materials:** Click or tap here to enter text.

**Curriculum Document**

**WCSD Board Approval:**

**Date Finalized:** 5/22/2023

**Date Approved:**  6/12/2023

**Implementation Year:** 2023 - 2024

**SPECIAL EDUCATION, 504, and GIFTED REQUIREMENTS**

The teacher shall make appropriate modifications to instruction and assessment based on a student’s Individual Education Plan (IEP), Chapter 15 Section 504 Plan (504), and/or Gifted Individual Education Plan (GIEP).

**SCOPE AND SEQUENCE OF CONTENT AND CONCEPTS**

**Marking Period 1**

* IQ Key
  + Geared for Speed and Power
* Tello Drone
  + Programming with DroneBlocks
* Vernier Secondary Sensing Science
  + Measuring Motion
* VEXcode VR
  + Conquering the Wall Maze
* Vex IQ
  + Basics
  + Clawbot

**Marking Period 2**

* IQ Key
  + Geared for Speed and Power
* Tello Drone
  + Programming with DroneBlocks
* Vernier Secondary Sensing Science
  + Measuring Motion
* VEXcode VR
  + Conquering the Wall Maze
* Vex IQ
  + Basics
  + Clawbot

**Marking Period 3**

* IQ Key
  + Geared for Speed and Power
* Tello Drone
  + Programming with DroneBlocks
* Vernier Secondary Sensing Science
  + Measuring Motion
* VEXcode VR
  + Conquering the Wall Maze
* Vex IQ
  + Basics
  + Clawbot

**Marking Period 4**

* IQ Key
  + Geared for Speed and Power
* Tello Drone
  + Programming with DroneBlocks
* Vernier Secondary Sensing Science
  + Measuring Motion
* VEXcode VR
  + Conquering the Wall Maze
* Vex IQ
  + Basics
  + Clawbot

**Standards/Eligible Content and Skills**

| **Performance Indicator** | **PA Core Standard and/or Eligible Content** | **Marking Period Taught** |
| --- | --- | --- |
| Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects. | 3.2.6-8.G | MP1, MP2, MP3, MP4 |
| Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object. | 3.2.6-8.H | MP1, MP2, MP3, MP4 |
| Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. | 3.2.6-8.J | MP1, MP2, MP3, MP4 |
| Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. | 3.2.6-8.K | MP1, MP2, MP3, MP4 |
| Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass and speed of an object. | 3.2.6-8.L | MP1, MP2, MP3, MP4 |
| Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. | 3.2.6-8.Q | MP1, MP2, MP3, MP4 |
| Research information from various sources to use and maintain technological products or systems. | 3.5.6-8.A | MP1, MP2, MP3, MP4 |
| Use instruments to gather data on the performance of everyday products. | 3.5.6-8.B | MP1, MP2, MP3, MP4 |
| Hypothesize what alternative outcomes (individual, cultural, and/or environmental) might have resulted had a different technological solution been selected. | 3.5.6-8.C | MP1, MP2, MP3, MP4 |
| Analyze examples of technologies that have changed the way people think, interact, live, and communicate. | 3.5.6-8.F | MP1, MP2, MP3, MP4 |
| Evaluate trade-offs based on various perspectives as part of a decision process that recognizes the need for careful compromises among competing factors. | 3.5.6-8.H | MP1, MP2, MP3, MP4 |
| Examine the ways that technology can have both positive and negative effects at the same time. | 3.5.6-8.I | MP1, MP2, MP3, MP4 |
| Use tools, materials, and machines to safely diagnose, adjust, and repair systems. | 3.5.6-8.J | MP1, MP2, MP3, MP4 |
| Use devices to control technological systems. | 3.5.6-8.K | MP1, MP2, MP3, MP4 |
| Design methods to gather data about technological systems. | 3.5.6-8.L | MP1, MP2, MP3, MP4 |
| Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. | 3.5.6-8.M (ETS) | MP1, MP2, MP3, MP4 |
| Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. | 3.5.6-8.N (ETS) | MP1, MP2, MP3, MP4 |
| Interpret the accuracy of information collected. | 3.5.6-8.O | MP1, MP2, MP3, MP4 |
| Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. | 3.5.6-8.P (ETS) | MP1, MP2, MP3, MP4 |
| Apply a technology and engineering design thinking process. | 3.5.6-8.Q | MP1, MP2, MP3, MP4 |
| Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants. | 3.5.6-8.R | MP1, MP2, MP3, MP4 |
| Illustrate the benefits and opportunities associated with different approaches to design. | 3.5.6-8.S | MP1, MP2, MP3, MP4 |
| Create solutions to problems by identifying and applying human factors in design. | 3.5.6-8.T | MP1, MP2, MP3, MP4 |
| Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design. | 3.5.6-8.U | MP1, MP2, MP3, MP4 |
| Refine design solutions to address criteria and constraints. | 3.5.6-8.V | MP1, MP2, MP3, MP4 |
| Defend decisions related to a design problem. | 3.5.6-8.X | MP1, MP2, MP3, MP4 |
| Compare, contrast, and identify overlap between the contributions of science, technology, engineering, and mathematics in the development of technological systems. | 3.5.6-8.Y | MP1, MP2, MP3, MP4 |
| Analyze how different technological systems often interact with economic, environmental, and social systems. | 3.5.6-8.Z | MP1, MP2, MP3, MP4 |
| Adapt and apply an existing product, system, or process to solve a problem in a different setting. | 3.5.6-8.AA | MP1, MP2, MP3, MP4 |
| Demonstrate how knowledge gained from other content areas affects the development of technological products and systems. | 3.5.6-8.BB | MP1, MP2, MP3, MP4 |
| Consider historical factors that have contributed to the development of technologies and human progress. | 3.5.6-8CC | MP1, MP2, MP3, MP4 |
| Engage in a research and development process to simulate how inventions and innovations have evolved through systematic tests and refinements. | 3.5.6-8.DD | MP1, MP2, MP3, MP4 |
| Differentiate between inputs, processes, outputs, and feedback in technological systems. | 3.5.6-8.EE | MP1, MP2, MP3, MP4 |
| Demonstrate how systems thinking involves considering relationships between every part, as well as how the systems interact with the environment in which it is used. | 3.5.6-8.FF | MP1, MP2, MP3, MP4 |
| Create an open-loop system that has no feedback path and requires human intervention. | 3.5.6-8.GG | MP1, MP2, MP3, MP4 |
| Create a closed-loop system that has a feedback path and requires no human intervention. | 3.5.6-8.HH | MP1, MP2, MP3, MP4 |
| Predict outcomes of a future product or system at the beginning of the design process. | 3.5.6-8.II | MP1, MP2, MP3, MP4 |
| Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches. | 3.5.6-8.JJ | MP1, MP2, MP3, MP4 |
| Explain how technology and engineering are closely linked to creativity, which can result in both intended and unintended innovations. | 3.5.6-8.KK | MP1, MP2, MP3, MP4 |
| Compare how different technologies involve different sets of processes. | 3.5.6-8.LL | MP1, MP2, MP3, MP4 |
| Cite specific textual evidence to support analysis of science and technical texts. | CC.3.5.6-8.A | MP1, MP2, MP3, MP4 |
| Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. | CC.3.5.6-8.C | MP1, MP2, MP3, MP4 |
| Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. | CC.3.5.6-8.D | MP1, MP2, MP3, MP4 |
| Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). | CC.3.5.6-8.G | MP1, MP2, MP3, MP4 |
| Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. | CC.3.5.6-8.H | MP1, MP2, MP3, MP4 |
| Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. | CC.3.5.6-8.I | MP1, MP2, MP3, MP4 |
| Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. • Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. • Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Establish and maintain a formal style and objective tone. • Provide a concluding statement or section that follows from and supports the information or explanation presented. Note: Students’ narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. | CC.3.6.6-8.B | MP1, MP2, MP3, MP4 |
| Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | CC.3.6.6-8.C | MP1, MP2, MP3, MP4 |
| Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. | CC.3.6.6-8.E | MP1, MP2, MP3, MP4 |
| Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. | CC.3.6.6-8.F | MP1, MP2, MP3, MP4 |

**ASSESSMENTS**

**PDE Academic Standards, Assessment Anchors, and Eligible Content: The** teacher must be knowledgeable of the PDE Academic Standards, Assessment Anchors, and Eligible Content and incorporate them regularly into planned instruction.

**Formative Assessments:** The teacher will utilize a variety of assessment methods to conduct in-process evaluations of student learning.

**Effective formative assessments for this course include:** Bell ringers, exit tickets, worksheets, quizzes, lab assignments, practice tests, writing prompts, teacher questioning, class discussions, individual and team based projects

**Summative Assessments: The** teacher will utilize a variety of assessment methods to evaluate student learning at the end of an instructional task, lesson, and/or unit.

**Effective summative assessments for this course include:** Projects, performance tasks, tests