WARREN COUNTY SCHOOL DISTRICT

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: STEM 9
Course Number: 00767
Course Prerequisites: None

Course Description: STEM (Science, Technology, Engineering, and Math) education is an integrated, interdisciplinary, and student-centered approach to learning that encourages curiosity, creativity, artistic expression, collaboration, computational thinking, communication, problem solving, critical thinking, and design thinking.

Suggested Grade Level: Grade 9
Length of Course: One Semester
Units of Credit: .5
PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:
CSPG 65 Technology Education; CSPG 71 Computer Science 7-12; CSPG 50 Mathematics 7-12; CSPG 53 Middle Level Mathematics; CSPG 54 Middle Level Science; CSPG 69 Grades PK-4; CSPG 70 Grades 4-8; CSPG 46 General Science; CSPG 104 Expansion of Secondary Certification to Sixth Grade; CSPG 56 Physics
To find the CSPG information, go to CSPG
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: Instructional Technology 19155; Computer Science Principals 10011
To find the State Course Code, go to State Course Code, 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:	SmartLab Learning Hub
Publisher:	Creative Learning Systems
ISBN #:	N/A
Copyright Date:	2023
WCSD Board Approval Date:	July 31, 2023

Supplemental Materials: ArcGIS Online Educational Program, Esri Global Online Educational Program, Fischertechniks Mechanics 2.0 Set, Vernier Go Direct Structures and Materials Tester, FlexClip Online, Scratch, MIT App Inventor, Creo Parametric, Flashprint, Afinia Studio, MakeCode Arcade, RealFlight 9.5, RC Controller, Free Flight Mini, Parrot Drones, Audacity, Audio Director, CorelDraw, ULS Engraver, Epilog Dashboard, MeshCAM, UGS for CNC Controller

Curriculum Document

WCSD Board Approval:

Date Finalized:	1/12/2024
Date Approved:	5/6/2024
Implementation Year:	2024-2025

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

- ArcGIS (1 week required)
    - Getting Started with ArcGIS Online
    - Geographic Inquiry Process
    - Creating an Original GIS Map
- Bridge Design (5 weeks required)
    - Bridge Designer (Software)
        - Exploring Virtual Bridge Design
        - Design Decisions with Estimation
        - Design Decisions with Graphs and Charts
        - Designing from Scratch with Bridge Designer
        - The Time and Money Challenge
    - Engino
        - Building Bridges
    - Fischertechnik Mechanics 2.0
        - Building Bridges
    - Vernier Structures and Materials Testing
        - Design, Build, Crush
        - Build a Better Bridge
- Video Production (5-week project option)
    - Padcaster, Premiere Elements (Adobe PhotoShop), Flex Clip Online, Stop Motion Studio, Frames
- App Development (5-week project option)
    - Kodu, MakeCode Arcade, Scratch, or MIT App Inventor
- Engineering Design and 3D Printing (5-week project option)
    - Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, and/or Afinia Studio
- Hummingbird Bit Robotics (5-week project option)
    - MakeCode Arcade, VexIQ, micro:bit
- Flight Simulator (1 week project option)
    - RealFlight 9.5 with RC Controller
- Drones (1 week project option)
    - Free Flight Mini and FTW Code, Tello Drone, or Parrot
- Photography (1 week project option)
    - Flex Clip Online, Premier Elements (Adobe Photoshop)
- Video Production (1 week project option)

  - Padcaster, Premiere Elements (Adobe PhotoShop), Flex Clip Online, Stop Motion Studio, Frames
- Audio Production (1 week project option)
  - Audacity, Garage Band, Audio Director
- Laser Engraving (1 week project option)
  - CorelDraw, ULS Engraver, or Epilog Dashboard
- Engineering Design and 3D Printing (1 week project option)
  - Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, Afinia Studio
- CNC Carving (1 week project option)
  - MeshCAM and UGS for CNC Controller
- VEX VR (1 week project option)
  - VEX VR Coding app online

Marking Period 2

- ArcGIS (1 week required)
  - Getting Started with ArcGIS Online
  - Geographic Inquiry Process
  - Creating an Original GIS Map
- Bridge Design (5 weeks required)
  - Bridge Designer (Software)
    - Exploring Virtual Bridge Design
    - Design Decisions with Estimation
    - Design Decisions with Graphs and Charts
    - Designing from Scratch with Bridge Designer
    - The Time and Money Challenge
  - Engino
    - Building Bridges
  - Fischertechnik Mechanics 2.0
    - Building Bridges
  - Vernier Structures and Materials Testing
    - Design, Build, Crush
    - Build a Better Bridge
- Video Production (5-week project option)
  - Padcaster, Premiere Elements (Adobe Photo Shop), Flex Clip Online, Stop Motion Studio, Frames
- App Development (5-week project option)
  - Kodu, Make Code Arcade, Scratch, or MIT App Inventor
- Engineering Design and 3D Printing (5-week project option)

  - Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, Afinia Studio
- Hummingbird Bit Robotics (5-week project option)
  - MakeCode, VexIQ, micro:bit
- Flight Simulator (1 week project option)
  - RealFlight 9.5 with RC Controller
- Drones (1 week project option)
  - Free Flight Mini and FTW Code, Tello Drone, or Parrot
- Photography (1 week project option)
  - Flex Clip Online, Premiere Elements (Adobe Photoshop)
- Video Production (1 week project option)
  - Padcaster, Premiere Elements, Flex Clip Online, Stop Motion Studio, Frames, or Premiere Elements (Adobe Photoshop)
- Audio Production (1 week project option)
  - Audacity, Garage Band, Audio Director
- Laser Engraving (1 week project option)
  - CorelDraw, ULS Engraver, or Epilog Dashboard
- Engineering Design and 3D Printing (1 week project option)
  - Tinkercad, Dremel 3D, Creo Parametrics, FlashPrint, Fusion 360, Afinia Studio
- CNC Carving (1 week project option)
  - MeshCAM and UGS for CNC Controller
- VEX VR (1 week project option)
  - VEX VR Coding app online

Marking Period 3

- ArcGIS (1 week required)
  - Getting Started with ArcGIS Online
  - Geographic Inquiry Process
  - Creating an Original GIS Map
- Bridge Design (5 weeks required)
  - Bridge Designer (Software)
    - Exploring Virtual Bridge Design
    - Design Decisions with Estimation
    - Design Decisions with Graphs and Charts
    - Designing from Scratch with Bridge Designer
    - The Time and Money Challenge
  - Engino
    - Building Bridges
  - Fischertechnik Mechanics 2.0

        - Building Bridges
    - Vernier Structures and Materials Testing
        - Design, Build, Crush
        - Build a Better Bridge
- Video Production (5-week project option)
    - Padcaster, Premiere Elements (Adobe PhotoShop), Flex Clip Online, Stop Motion Studio, Frames
- App Development (5-week project option)
    - Kodu, MakeCode Arcade, Scratch, or MIT App Inventor
- Engineering Design and 3D Printing (5-week project option)
    - Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, and/or Afinia Studio
- Hummingbird Bit Robotics (5-week project option)
    - MakeCode Arcade, VexIQ, micro:bit
- Flight Simulator (1 week project option)
    - RealFlight 9.5 with RC Controller
- Drones (1 week project option)
    - Free Flight Mini and FTW Code, Tello Drone, or Parrot
- Photography (1 week project option)
    - Flex Clip Online, Premier Elements (Adobe Photoshop)
- Video Production (1 week project option)
    - Padcaster, Premiere Elements (Adobe PhotoShop), Flex Clip Online, Stop Motion Studio, Frames
- Audio Production (1 week project option)
    - Audacity, Garage Band, Audio Director
- Laser Engraving (1 week project option)
    - CorelDraw, ULS Engraver, or Epilog Dashboard
- Engineering Design and 3D Printing (1 week project option)
    - Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, Afinia Studio
- CNC Carving (1 week project option)
    - MeshCAM and UGS for CNC Controller
- VEX VR (1 week project option)
    - VEX VR Coding app online

Marking Period 4

- ArcGIS (1 week required)
    - Getting Started with ArcGIS Online
    - Geographic Inquiry Process

    - Creating an Original GIS Map
- Bridge Design (5 weeks required)
    - Bridge Designer (Software)
        - Exploring Virtual Bridge Design
        - Design Decisions with Estimation
        - Design Decisions with Graphs and Charts
        - Designing from Scratch with Bridge Designer
        - The Time and Money Challenge
    - Engino
        - Building Bridges
    - Fischertechnik Mechanics 2.0
        - Building Bridges
    - Vernier Structures and Materials Testing
        - Design, Build, Crush
        - Build a Better Bridge
- Video Production (5-week project option)
    - Padcaster, Premiere Elements (Adobe PhotoShop), Flex Clip Online, Stop Motion Studio, Frames
- App Development (5-week project option)
    - Kodu, MakeCode Arcade, Scratch, or MIT App Inventor
- Engineering Design and 3D Printing (5-week project option)
    - Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, and/or Afinia Studio
- Hummingbird Bit Robotics (5-week project option)
    - MakeCode Arcade, VexIQ, micro:bit
- Flight Simulator (1 week project option)
    - RealFlight 9.5 with RC Controller
- Drones (1 week project option)
    - Free Flight Mini and FTW Code, Tello Drone, or Parrot
- Photography (1 week project option)
    - Flex Clip Online, Premier Elements (Adobe Photoshop)
- Video Production (1 week project option)
    - Padcaster, Premiere Elements (Adobe PhotoShop), Flex Clip Online, Stop Motion Studio, Frames
- Audio Production (1 week project option)
    - Audacity, Garage Band, Audio Director
- Laser Engraving (1 week project option)
    - CorelDraw, ULS Engraver, or Epilog Dashboard
- Engineering Design and 3D Printing (1 week project option)

- Tinkercad, Dremel 3D, Creo Parametric, FlashPrint, Fusion 360, Afinia Studio

- CNC Carving (1 week project option)
  - MeshCAM and UGS for CNC Controller
- VEX VR (1 week project option)
  - VEX VR Coding app online

Standards/Eligible Content and Skills

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.	3.5.9-12.A	MP1, MP2, MP3, MP4
Critically assess and evaluate a technology that minimizes resource use and resulting waste to achieve a goal.	3.5.9-12.B	MP1, MP2, MP3, MP4
Develop a solution to a technological problem that has the least negative environmental and social impact.	3.5.9-12.C	MP1, MP2, MP3, MP4
Critique whether existing or proposed technologies use resources sustainably.	3.5.9-12.D	MP1, MP2, MP3, MP4
Evaluate how technology and engineering advancements alter human health and capabilities.	3.5.9-12.E	MP1, MP2, MP3, MP4
Evaluate a technological innovation that arose from a specific society's unique need or want.	3.5.9-12.F	MP1, MP2, MP3, MP4
Evaluate a technological innovation that was met with societal resistance impacting its development.	3.5.9-12.G	MP1, MP2, MP3, MP4
Evaluate ways that technology and engineering can impact individuals, society, and the environment.	3.5.9-12.H	MP1, MP2, MP3, MP4
Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts	3.5.9-12.I	MP1, MP2, MP3, MP4
Synthesize data and analyze trends to make decisions about technological products, systems, or processes.	3.5.9-12.J	MP1, MP2, MP3, MP4
Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	3.5.9-12.K	MP1, MP2, MP3, MP4
Interpret laws, regulations, policies, and other factors that impact the development and use of technology.	3.5.9-12.L	MP1, MP2, MP3, MP4
Develop a device or system for the marketplace.	3.5.9-12.M	MP1, MP2, MP3, MP4
Analyze and use relevant and appropriate design thinking processes to solve technological and engineering problems.	3.5.9-12.N	MP1, MP2, MP3, MP4
Apply appropriate design thinking processes to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.	3.5.9-12.O	MP1, MP2, MP3, MP4
Apply a broad range of design skills to a design thinking process.	3.5.9-12.P	MP1, MP2, MP3, MP4
Implement and critique principles, elements, and factors of design.	3.5.9-12.Q	MP1, MP2, MP3, MP4
Use a design thinking process to design an appropriate technology for use in a different culture.	3.5.9-12.R	MP1, MP2, MP3, MP4
Conduct research to inform intentional inventions and innovations that address specific needs and wants.	3.5.9-12.S	MP1, MP2, MP3, MP4

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	3.5.9-12.T	MP1, MP2, MP3, MP4
Evaluate and define the purpose of a design.	3.5.9-12.U	MP1, MP2, MP3, MP4
Apply principles of human-centered design.	3.5.9-12.V	MP1, MP2, MP3, MP4
Optimize a design by addressing desired qualities within criteria and constraints while considering trade-offs.	3.5.9-12.W	MP1, MP2, MP3, MP4
Implement the best possible solution to a design using an explicit process.	3.5.9-12.X	MP1, MP2, MP3, MP4
Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	3.5.9-12.Y	MP1, MP2, MP3, MP4
Recognize and explain how their community and the world around them informs technological development and engineering design.	3.5.9-12.Z	MP1, MP2, MP3, MP4
Safely apply an appropriate range of making skills to a design thinking process.	3.5.9-12.AA	MP1, MP2, MP3, MP4
Assess how similarities and differences among scientific, technological, engineering, and mathematical knowledge and skills contributed to the design of a product or system.	3.5.9-12.BB	MP1, MP2, MP3, MP4
Analyze how technology transfer occurs when a user applies an existing innovation developed for one function for a different purpose.	3.5.9-12.CC	MP1, MP2, MP3, MP4
Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system.	3.5.9-12.DD	MP1, MP2, MP3, MP4
Connect technological and engineering progress to the advancement of other areas of knowledge and vice versa.	3.5.9-12.EE	MP1, MP2, MP3, MP4
Evaluate how technology enhances opportunities for new products and services through globalization.	3.5.9-12.FF	MP1, MP2, MP3, MP4
Evaluate how technology and engineering have been powerful forces in reshaping the social, cultural, political, and economic landscapes throughout history.	3.5.9-12.GG	MP1, MP2, MP3, MP4
Analyze how the Industrial Revolution resulted in the development of mass production, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.	3.5.9-12.HH	MP1, MP2, MP3, MP4
Investigate the widespread changes that have resulted from the Information Age, which has placed emphasis on the processing and exchange of information.	3.5.9-12.II	MP1, MP2, MP3, MP4
Identify and explain how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools, materials, and processes.	3.5.9-12.JJ	MP1, MP2, MP3, MP4

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Relate how technological and engineering developments have been evolutionary, often the result of a series of refinements to basic inventions or technological knowledge.	3.5.9-12.KK	MP1, MP2, MP3, MP4
Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop.	3.5.9-12.LL	MP1, MP2, MP3, MP4
Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.	3.5.9-12.MM	MP1, MP2, MP3, MP4
Analyze the rate of technological and engineering development and predict future diffusion and adoption of new innovations and technologies.	3.5.9-12.NN	MP1, MP2, MP3, MP4
Use project management tools, strategies, and processes in planning, organizing, and controlling work.	3.5.9-12.OO	MP1, MP2, MP3, MP4
Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.	3.5.9-12.PP	MP1, MP2, MP3, MP4
Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.	3.5.9-12.QQ	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 use various assessment methods to conduct in-process evaluations of student learning.

Effective formative assessments for this course include: (not limited to) 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 including, but not limited to a CER paragraph.

Effective summative assessments for this course include: Projects, performance tasks, project-based assessments