WARREN COUNTY SCHOOL DISTRICT

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Engineering and Technology STEM Pathway
Course Number: 00798
Course Prerequisites: None

Course Description: The WCSD Engineering and Industrial Technology Pathway will explore various systems of technology. Students have access to experiments with circuitry, computer graphics, digital communications, mechanics and structures, robotics and control technology, scientific data analysis, software engineering, sustainability, and more options as they develop. Students will utilize a variety of systems to design, build, and program in order to solve relevant challenges. It will also allow students to explore other engineering and industrial aspects such as 3D Design, fabrication, coding and programming, as well as drone technology. This pathway is specifically designed to build upon the skills developed in the STEM Academy classroom and to allow students to explore potential career interests.

Suggested Grade Level: Grades 9-12
Length of Course: Two Semesters
Units of Credit: 1
PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:
CSPG65 – Technology Education
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: 21003
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:	No text used within this course.
Publisher:	N/A
ISBN #:	N/A
Copyright Date:	N/A
WCSD Board Approval Date:	N/A

Supplemental Materials: Creative Learning Systems Kits and equipment, drone technology, CNC Machine, 3D Printer, and STEM resources including but not limited to the items within the task grid below

Curriculum Document

WCSD Board Approval:

Date Finalized:	7/26/2023
Date Approved:	10/9/2023
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

Students may approach course content in different directions and at different speeds. Background knowledge and skills may determine different areas of interest and ability.

Course content is not limited to task grid items, as new and changing technology creates new opportunities to learn.

Standards/Eligible Content and Skills

Performance Indicator	PA Core Standard and/or Eligible Content	
Competency Task List		
ORIENTATION AND SAFETY		
Complete record keeping, updating ePortfolio in a frequent and timely fashion.	15.4.8.C	
Proficiently operate computers with different operating systems: Windows and Mac OS.	15.4.12.E	
Perform housekeeping duties daily, cable management, physical memory, tool replacement.		
Follow verbal instructions to complete work assignments and rules.		
Follow written instructions to complete work assignments and rules.		
Follow emergency action plan (all inclusive).		
CIRCUITRY		
Basic understanding of electricity	ISTE 6a	
Basic understanding of a circuit	ISTE 6b	
Basic understanding of the flow of electricity and possible problems	ISTE 4b	
Comparing conductors and insulators.	ISTE 3c	
AC vs. DC Current	ISTE 7c	
Elements of a circuit: power source, path, flow control, load	ISTE 5a	
Build a simple circuit with LEDs, switches, potentiometer	ISTE 4a	
COMPUTER GRAPHICS		
Capturing content through screenshots	ISTE 1b	
Appropriate tool selection for 2D graphics or 3D graphics.	ISTE 6b	
Adobe program constants: toolbar, workspace, file manipulation	ISTE 4b	
2D Graphics manipulation: Photoshop: Layers, Selection, Combining Elements	ISTE 6a	
3D Graphics manipulation: CAD: placing shapes, measuring, cutting, combining	ISTE 4c	
Carbide Create: designing a project for CNC milling	ISTE 5b	
TinkerCAD: designing a project for 3D printing	ISTE 2b	
LaserGRBL: designing a project for laser engraving	ISTE 6b	
Digital attribution and respecting rights and intellectual property	ISTE 3a	
DIGITAL COMMUNICATIONS		
Sound Engineering: Basic Elements - Tempo, Key	ISTE 6b	
Sound Engineering: Remix Music	ISTE 6a	
Sound Engineering: Create an original piece of music using premade sound clips	ISTE 6d	
Website Creation: Personalizing a Premade Template	ISTE 2b	

Performance Indicator	**PA Core Standard and/or Eligible Content**	
Website Creation: Adding Pages and Customizing for Target Audience	ISTE 3d	
Animation: Stop Motion with Physical Objects	ISTE 6c	
Animation: Digital Animation with Adobe or FireAlpaca	ISTE 6a	
Digital Design: Procreate use for original illustration	ISTE 6b	
MECHANICS AND STRUCTURES		
FischerTechnik Mechanics and Statics Simple machines in action	ISTE 6a	
FischerTechnik Mechanics and Statics Build stable bridges, cranes, high seats	ISTE 4b	
FischerTechnik Mechanics and Statics Explain how multiple forces act on a static structure	ISTE 3b	
FischerTechnik Optics Properties of light: reflection, refraction, propagation, bundling	ISTE 6c	
FischerTechnik Optics Spectral decomposition of light. light, color and vision.	ISTE 6d	
Engino: Stable structures under force	ISTE 2d	
Engino: Solve an original problem with an original design	ISTE 4d	
Bridge Designer: structural integrity in bridge design	ISTE 5a	
Bridge Designer: using trusses to support structural weight	ISTE 4c	
Bridge Designer: reducing the cost of a successful bridge	ISTE 1c	
ROBOTICS AND CONTROL TECHNOLOGY		
Vex: robot construction - choosing a chassis type and purpose	ISTE 4a	
Vex: robot construction - choosing wheel type based on desired movementy type	ISTE 4a	
Vex: robot construction - solving original problems with an original design	ISTE 4d	
Vex: robot construction - modifying prototypes for better design	ISTE 4d	
Vex: robot programming - writing a simple program to control movement	ISTE 5b	
FischerTechnik - Programming to run motors based on timers	ISTE 5a	
FischerTechnik - Programming perform action based on temperature sensor	ISTE 5b	
FischerTechnik - Programming perform action based on light sensor	ISTE 5b	
FischerTechnik - Programming change action based on a sensor reading (turn around, stop, back up)	ISTE 5b	
CNC Milling - machine setup for milling	ISTE 4a	
CNC Milling - jig setup for milling	ISTE 4a	
CNC Milling - programming for multicut and mill swap	ISTE 5c	
Laser Engraving - Programming a design for engraving	ISTE 5c	
Laser Engraving - Alter settings to engrave on different materials	ISTE 5b	

Performance Indicator	**PA Core Standard and/or Eligible Content**	
Laser Engraving - Alter settings for laser intensity and speed to cut materials	ISTE 5b	
Drone Flight - physical components of aircraft	ISTE 6a	
Drone Flight - physical components of controller	ISTE 6a	
Drone Flight - Complying with basic FAA regulations	ISTE 2b	
Drone Flight - Inspecting batteries and blades for damage and wear	ISTE 6b	
Drone Flight - Safe flight in different conditions - altitude	ISTE 6c	
Drone Flight - Safe flight in different conditions - wind	ISTE 6c	
Drone Flight - Safe flight in different conditions - speed	ISTE 6c	
Drone Flight - capturing still imagery	ISTE 4c	
Drone Flight - capturing video while moving	ISTE 4c	
Lego Mindstorms - building and wiring a robot	ISTE 4a	
Lego Mindstorms - writing a simple program to include movement	ISTE 5b	
Lego Mindstorms - writing a program to perform actions based on sensor readings	ISTE 5b	
Lego Mindstorms - programming sounds based on inputs	ISTE 5b	
SCIENTIFIC DATA ANALYSIS		
ArcGIS - Using geographic information systems	ISTE 6d	
ArcGIS - Finding and interpreting maps	ISTE 6d	
ArcGIS - Adding modifying properties to basemaps	ISTE 6d	
ArcGIS - Sharing maps through email or social media	ISTE 6c	
AcrGIS - Creating original maps with interactive features	ISTE 4b	
Flight Simulator - Use the forces of lift, thrust, drag, and gravity of a plane in flight.	ISTE 6a	
Flight Simulator - Principles of flight takeoff and landing	ISTE 6a	
Google Earth - How to create a custom map	ISTE 6d	
Google Earth - Locating with latitude and longitude	IST 6d	
Google Earth - Creating a custom tour	ISTE 6d	
Google Earth - Measuring distances	ISTE 6d	
Stellarium - Bookmark objects in the sky	ISTE 6b	
Stellarium - Constellation locations in the celestial sphere	ISTE 6b	
Stellarium - Astronomical distances and brightness	ISTE 6b	
Stellarium - Using tools to predict and plan for outdoor observations	ISTE 6b	
Vernier - Light Sensors in test models	ISTE 3b	
Vernier - Force Sensors in test models	ISTE 3b	
Vernier - Temperature Sensors in test models	ISTE 3b	
SOFTWARE ENGINEERING		
Scratch for animation - vectors vs bitmaps	ISTE 6d	
Scratch for animation - simulating movement	ISTE 4d	
Scratch for animation - changing backdrops based on conditions	ISTE 5b	
Scratch for game design - programming sprites with logic	ISTE 5b	
Scratch for game design - creating an original game	ISTE 4a	
Dreamweaver for Website Design	ISTE 1a	

Performance Indicator	**PA Core Standard and/or Eligible Content**	
Google Sites for Website Design from Templates	ISTE 1a	
RPG Paper Maker - Sprites and Logic programming	ISTE 5b	
App Maker Jotform for Android and iOS	ISTE 5a	
Coding: Python	ISTE 5a	
Stencyl Game Design	ISTE 4a	
SUSTAINABILITY		
Energy Efficiency Infrared Camera	HS-PS3-4	
Energy Efficiency Watt Meter	HS-PS3-4	
Energy Efficiency Energy Audit	HS-ETS1-1	
Solar Photovoltaics with Vernier	HS-ETS1-1	
Solar Water Pasteurization	HS-PS3-3	
Solar Energy: Designing a Solar Box Oven	HS-PS3-3	
Solar Energy: Generating Power and Doing Work with Solar Panels	HS-PS3-3	
Wind Power: Blade Designs	HS-PS3-3	
Wind Power: Calculating and Testing Output	HS-PS3-3	
FischerTechnik: Hydro Energy - Water energy to electricity	HS-PS3-3	
FischerTechnik: Hydro Energy - Water energy to mechanical energy	HS-PS3-3	
FischerTechnik: Wind Energy - Wind energy to electricity	HS-PS3-3	
FischerTechnik: Wind Energy - Wind energy to mechanical energy	HS-PS3-3	
FischerTechnik: Solar Energy - Solar energy to mechanical energy	HS-PS3-3	
FischerTechnik: Solar Energy - measuring energy output	HS-PS3-3	
FischerTechnik: Storing energy from renewable sources	HS-ESS3-4	
GENERAL STEM PERFORMANCE MEASURES		
Hardware Knowledge: Cables (USB, Lightning, Ethernet, Audio)	15.4.12.C	
Software Knowledge: Operating Systems (Windows, MacOS, ChromeOS)	15.4.12.E	
Software Knowledge: Mobile Operating Systems (Android, iOS)	15.4.12.E	
Software Knowledge: file types for images (jpg, png, svg, converting)	15.4.12.G	
Software Knowledge: file types for audio (wav, mp3, converting)	15.4.12.G	
Software Knowledge: file types for video (mp4, mov, converting)	15.4.12.G	
Software Knowledge: file types for office work (docx, pdf, converting)	15.4.12.G	
Tool Knowledge: hand tools (screwdriver types, wrench types, pliers)	3.4.12.A3	
Hardware Knowledge: Displays (FPS levels, Refresh Rates, Resolutions (1080p vs. 4k))	15.4.12.C	
Hardware Knowledge: Removable Media (SD cards, USB drives, transfer speeds)	15.4.12.C	
Hardware Knowledge: Mobile Devices (Cell Phone Distinctions, SIM cards, removable media)	15.4.12.C	
Performance Measure: Touch Type at least 50 WPM	3.4.12.A3	
Performance Measure: Track Data with Excel	3.4.12.A3	

Performance Indicator	**PA Core Standard and/or Eligible Content**	
Performance Measure: Microsoft Office Organization (tabs, ribbon, ruler, saving)	3.4.12.A3	
Performance Measure: Digital Organization (folders, files, File Explorer vs. Finder	3.4.12.A3	
Performance Measure: Keyboard Shortcuts (app switching, tab switching, opening, closing)	3.4.12.A3	
Performance Measure: Sending a professional email	3.4.12.A3	

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:

Teacher will use standards-based assessment throughout the course.

- Discussions
- Teacher Observation/Questioning
- Summarizing
- Outlining
- Oral Presentations
- Journaling
- Presentation/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:

- Task Grid Utilization and Portfolio