STRANDS AND STANDARDS

UAS LAB: DESIGN, BUILD, AND MAINTAIN

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CTE®

Course Description

UAS Lab: Design, Build, and Maintain course explores aviation principles while building and testing a drone in flight. It combines engineering processes and aviation principles into a hands-on course specifically created for the explosion of Unmanned Aerial Systems in a variety of industries. Unmanned Aerial Systems 1 is a prerequisite.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.11.00.00.054
Concurrent Enrollment Core Code	N/A
Prerequisite	Unmanned Aerial Systems (UAS)
Skill Certification Test Number	672
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation - Flight
Endorsement 2	Unmanned Aerial Systems
Endorsement 3	N/A

STRAND 1

Students will understand the main components and construction of multi-rotor and fixed-wing drones.

Standard 1

Students will build a fixed wing or multi-rotor drone from a kit.

- Students will demonstrate the airworthiness of the constructed drone by performing specific maneuvers or completing a flight test course.

Standard 2

Students will discover principles of flight and practice activities to demonstrate principles of flight.

- Aerodynamic forces (drag, lift, thrust, weight)
- Center of gravity
- Stall speed
- Bernoulli's principle
- Propwash

Standard 3

Students will manipulate and understand basic electronic circuits and components used in RC flight.

- Brushed v. Brushless Motors
- Servos
- Battery types and connectors
- Flight Controllers
- Electronic Speed Controllers
- Transmitters and Receivers

Performance Skills

Demonstrate flight principles using a student-constructed drone.

STRAND 2

Students will design and install modifications with an intended purpose in mind.
Students will understand the Engineering Design Process and use it to make modifications to a drone.

Standard 1

Students will examine the steps of the Engineering Design Process
Define the problem

1. Conduct research
2. Specify requirements
3. Brainstorm and choose a solution
4. Build a prototype
5. Test solution & iterate
6. Communicate Results

Standard 2

Students will determine a goal of increased efficiency in one or more metrics of drone use.

Standard 3

Students will design or make modifications to the drone with the intended purpose of reaching their determined goal.

Standard 4

Students will employ materials science and engineering principles to construct the modifications and be able to justify their methods, materials choices, and cost.

Standard 5

Students will justify their methods, material choices, and cost.

Performance Skills

Demonstrate a modification to the drone that achieves the student's intended goal.

STRAND 3

Students will understand drone maintenance, repair, and associated documentation.

Standard 1

Students will maintain and replace drone parts and equipment. (This is a list of possible parts to be experienced.)

- Propellers
- Motors
- Flight control board
- Landing gear
- Camera
- Etc.

Standard 2

Students will manage logbooks to track repairs, physical maintenance, battery maintenance, and equipment flight hours.

Standard 3

Students will be able to diagnose and perform simple repairs on a drone, safely using appropriate tools.

- Drivers (philips, flathead, robertson, torque, hex)
- Solder iron and solder
- Needle-nose pliers
- Wire strippers
- Adjustable/crescent wrench
- Heat gun
- Voltmeter

Performance Skills

Maintain appropriate logbooks. Install replacement parts.

STRAND 4

Students will understand the differences between categories of drones and the industrial application of those drones.

Standard 1

Students will explore differences in aircraft that allow it to perform specialized tasks.

- Quad or Multi-Rotor Vertical Takeoff
- Racing (First Person View)
- Fixed-Wing
- Mini
- Emerging technology drones
- Other Unmanned Systems

Standard 2

Students will apply acquired knowledge and critical thinking skills to solve a real-world problem. Examples might include but are not limited to the following:

- Search and rescue
- Photogrammetry
- Real Estate and other promotional photography
- Live events
- Construction sites
- Mining / Quarrying
- Inspections (Towers, Solar, Bridge, etc.)
- Transportation of goods

Performance Skills

Present results of your experience in solving a real-world problem.

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		