UAS Lab: Design, Build, Maintain

*This exam is in pilot status. No certificate is available.

Exam Information

Exam number
672

Items
21

Points
37

Prerequisites
Unmanned Aerial Systems

Recommended course length
One semester

National Career Cluster
Transportation, Distribution & Logistics

Performance standards
Included (Optional)

Certificate available
No

Description

The UAS Lab: Design, Build, and Maintain industry certification exam assesses learners' understanding of aviation principles through the building and testing of a drone in flight. It combines engineering processes and aviation principles into a hands-on experience, specifically designed for the rapid growth of Unmanned Aerial Systems across various industries.

Exam Blueprint

Standard	Percentage of exam
1. Multi-Rotor and Fixed-Wing Drones	27%
2. Engineering Design Process	22%
3. Drone Maintenance and Repair	27%
4. Drone Categories and Applications	24%

Standard 1

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

Objective 1 Students will build a fixed wing or multi-rotor drone from a kit.

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

Objective 2 Students will discover principles of flight and practice activities to demonstrate principles of flight.

1. Aerodynamic forces (drag, lift, thrust, weight)
2. Center of gravity
3. Stall speed
4. Bernoulli's principle
5. Propwash

Objective 3 Students will manipulate and understand basic electronic circuits and components used in RC flight.

1. Brushed v. Brushless Motors
2. Servos
3. Battery types and connectors
4. Flight Controllers
5. Electronic Speed Controllers
6. Transmitters and Receivers

Standard 1 Performance Evaluation included below (Optional)

Standard 2

Students will understand the Engineering Design Process and use it to make modifications to a drone.

Objective 1 Students will examine the steps of the Engineering Design Process.

1. Define the problem
    a. Conduct research
    b. Specify requirements
    c. Brainstorm and choose a solution
    d. Build a prototype
    e. Test solution & iterate
    f. Communicate Results

Objective 2 Students will determine a goal of increased efficiency in one or more metrics of drone use.

Objective 3 Students will design or make modifications to the drone with the intended purpose of reaching their determined goal.

Objective 4 Students will employ materials science and engineering principles to construct the modifications and be able to justify their methods, materials choices, and cost.

Objective 5 Students will justify their methods, material choices, and cost.

Standard 2 Performance Evaluation included below (Optional)

Standard 3
Students will understand drone maintenance, repair, and associated documentation.

Objective 1 Students will maintain and replace drone parts and equipment. (This is a list of possible parts to be experienced.)

1. Propellers
2. Motors
3. Flight control board
4. Landing gear
5. Camera
6. Etc.

Objective 2 Students will manage logbooks to track repairs, physical maintenance, battery maintenance, and equipment flight hours.

Objective 3 Students will be able to diagnose and perform simple repairs on a drone.

Standard 3 Performance Evaluation included below (Optional)

Standard 4
Students will understand the differences between categories of drones and the industrial application of those drones.

Objective 1 Students will explore differences in aircraft that allow it to perform specialized tasks.

1. Quad or Multi-Rotor Vertical Takeoff
2. Racing (First Person View)
3. Fixed-Wing
4. Mini
5. Emerging technology drones

6. Other Unmanned Systems

Objective 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:

1. Search and rescue
2. Photogrammetry
3. Real Estate and other promotional photography
4. Live events
5. Construction sites
6. Mining / Quarrying
7. Inspections (Towers, Solar, Bridge, etc.)
8. Transportation of goods

Standard 4 Performance Evaluation included below (Optional)

UAS Lab: Design, Build, Maintain

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of 8 or higher on the rating scale. Students may be encouraged to repeat the objectives until they average 8 or higher.

Student's Name: _____

Class: _____

Performance standards rating scale

0	Limited skills	2	→	4	Moderate skills	6	→	8	High skills	10

Standard 1 – Multi-Rotor and Fixed-Wing Drones   Score:
- Demonstrate flight principles using constructed drone.

Standard 2 – Engineering Design Process   Score:
- Demonstrate a modification to the drone that achieves the student's intended goal.

Standard 3 – Drone Maintenance and Repair   Score:
- Maintain appropriate logbooks.
- Install replacement parts.

Standard 4 – Drone Categories and Applications   Score:
- Present results of your experience in solving a real-world problem.

Performance standard average score:

Evaluator Name: _____

Evaluator Title: _____

Evaluator Signature: _____

Date: _____