

## UAS Certification Assessment

The Unmanned Aerial System (UAS) Certificate Assessment covers the UAS Certificate taught at USU Eastern and includes all of the courses that are being taught in the certificate. This is a new assessment plan which coincides with the creation and implementation of the UAS Cert, officially started and taught beginning Fall 2021. Note: A “drone” is considered an Unmanned Aerial System (UAS) and may be used interchangeably.

This assessment will answer the following areas of interest:

- Assessable Outcomes
- Assessment Planning
- Assessment Implementation
- Results used to enhance program

The UAS Certification Program is a program specifically developed to train students in the basics of UAS to make them industry ready. This certificate was developed as the need for UAS pilots, operators, designers, maintainers, and other UAS-related jobs were starting to show up in several technical and other specialized industries. Through Utah State University, several UAS classes were created to meet the initial demand of the skillsets needed, but it was soon discovered that there wasn't enough focus on the entry-level jobs that a student could get after graduation. Hence, the UAS Certificate was created in early 2021 and we started to teach it Fall '21 semester at USU Eastern. This certificate program is the solution to industry's call for qualified UAS operators and maintainers.

The UAS Certificate courses were designed to enhance the basic skills required to become UAS industry ready. The courses in the certificate focus on learning the fundamental rules and regulations to earn your commercial UAS license, basic design and building of multiple airframes, flight rules and increasing practical flight time, basic drone operation management techniques, and UAS internship applications. Each student will complete all of the requirements and testing to receive their commercial UAS certificate.

The UAS Certification consists of the following classes split between two semesters:

- AV1130 – Flight Principles
- AV1900 – Drones: History, Rules and Remote Pilot License Preparation
- AV1910 – Drones: Introductory Flight Lab
- AV1920 – Drones: Intermediate Flight Lab
- AV1930 – Drones: Pilot in Command
- AV1940 – Drones: Basic Design and Construction
- AV1950 – Drones: sUAS Maintenance
- AV1960 – Drones: Aerial Photography
- AV1970 – Drones for Hire
- BUSN2320 – Small Business Management – CTE (HR)
- BUSN2988 – Aviation Weather

## List of course objectives and outcomes (Planning Phase)

The overall objective of the UAS Certificate is “to create a socially-responsible small UAS (sUAS) operator who has the basic skillset to enter the ever-expanding UAS field and contribute to its’ continuing technical advancement.”

The UAS Certification Program will be divided up into two separate semesters, each containing several classes that focus on UAS technology and other classes to enhance the student’s understanding of how aviation-related subjects can add to their UAS knowledge and skills. The first semester focuses on the introduction to the UAS world and all of the basic skills needed to become a socially-responsible sUAS operator. The first semester also introduces the student to the basic practices of designing and building different styles of sUAS’s. The first semester culminates in the student testing to receive their Federal Aviation Administration (FAA) Commercial UAS Certificate. The second semester focuses on those skills previously developed and deepens the understanding of the fundamentals of flying, designing and building sUAS’s. The second semester then introduces the student to other skills needed to become a better operator and Pilot in Command. Finally, the second semester will give the student the chance to apply for an internship and complete several sUAS projects for an outside agency, company, or industry partner.

Table -1 contains all of the individual courses and lists their objectives and outcomes.

Course	Objectives	Outcomes
AV 1130 Flight Principles	<ul style="list-style-type: none"> <li>a. This course reviews the four forces of flight and emphasizes to the students how an aircraft is affected by them.</li> <li>b. Students will associate the four forces of flight with aircraft performance, with a focus on wing design.</li> <li>c. Students will review aerodynamic testing procedures.</li> </ul>	<ul style="list-style-type: none"> <li>a. Students will build a glider aircraft and then put that aircraft through a series of aerodynamic tests.</li> <li>b. Students will display their knowledge about the four forces of flight by completing a comprehensive final test.</li> </ul>
AV 1900 Drones: Rules/License	<ul style="list-style-type: none"> <li>a. Students will be exposed to all of the rules and regulations of the FAA commercial drone certification.</li> <li>b. Students will be made aware of how to find the resources available to them as an UAS pilot.</li> <li>c. This course introduces the student to the many different types of sUAS’s available in the industry and the many different jobs available to them as an UAS operator/user.</li> </ul>	<ul style="list-style-type: none"> <li>a. Students will complete the FAA UAS Part 107 test at a score of 70% or better.</li> </ul>
AV 1910 Drones: Introductory Flight Lab & UAS History	<ul style="list-style-type: none"> <li>a. Students are introduced to safety checklists.</li> <li>b. This course introduces the basic flight maneuvers required to fly a fixed-wing and a multi-rotor aircraft.</li> <li>c. Students will be exposed to a brief history of UAS and its’ role in the advances of aviation.</li> </ul>	<ul style="list-style-type: none"> <li>a. Each student will create a safety checklist to fly a fixed-wing or multi-rotor aircraft.</li> <li>b. Students will demonstrate the parts of a traffic pattern while flying a sUAS while maintaining control of the sUAS in all phases of flight.</li> </ul>
AV 1920 Drones: Intermediate Flight Lab	<ul style="list-style-type: none"> <li>a. This course introduces advanced flight maneuvers needed to control a fixed-wing drone</li> <li>b. Students are required to fly 15 hours</li> <li>c. This course emphasizes flight logs and other written flight records that are needed to legally track flight time.</li> </ul>	<ul style="list-style-type: none"> <li>a. Upon completion of this course, students will provide a written (digital) copy of their logged flight time.</li> <li>b. Students will demonstrate the ability to manipulate the flight controls of a fixed-wing drone to complete basic flight maneuvers.</li> </ul>
AV 1930 Drones: Pilot in Command	<ul style="list-style-type: none"> <li>a. Students are assigned a group and then apply previously introduce concepts of Aeronautical Decision Making and Crew Resource Management (ADM/CRM) to an UAS operation.</li> <li>b. This course introduces UAS operations and the different management techniques to ensure that the appropriate deliverables are achieved for the client.</li> </ul>	<ul style="list-style-type: none"> <li>a. Students will complete an UAS operation as the Pilot in Command, Visual Observer, and additional crew member, providing the contracted deliverables to a company.</li> <li>b. Students will validate their knowledge of ADM/CRM concepts via a formal presentation to the class.</li> </ul>

	c. Students are exposed to a more in-depth look at the rules surrounding sUAS and apply them in practical situations.	
AV 1940 Drones: Basic Design & Construction	a. Students will be introduced to the special tools and techniques that are specific to the UAS world. b. Students will have to take a kit and build a fixed-wing UAS, including the programming functions of the autopilot. c. Students will then have to modify their previous build, applying scientific rules of flight, and then test their modifications for proper flight.	a. Students will demonstrate their knowledge of flight characteristics by flying their built fixed-wing UAS. b. Students will be tested verbally and through demonstrations on their ability to find design flaws and then solve issues of flight.
AV 1950 Drones: UAS Maintenance	a. This course will focus on Federally mandated record keeping rules and introduce common maintenance practices. b. The students will build a multi-rotorcraft UAS from a kit c. Students will take their completed multi-rotor kits and learn basic flight-stabilization programming procedures.	a. Students will prove they know proper maintenance procedures by producing a maintenance checklist and maintenance schedule for a sUAS or large UAS platform. b. Students will demonstrate their ability to build a multi-rotor sUAS and then their ability to troubleshoot the errors in programming predetermined by the instructor.
AV 1960 Drones: Aerial Photography	a. This class will review the basics of photography. b. Students will be introduced to the variations to common photographs by using a sUAS, focusing on 'drone specific' photo shots. c. Students will be exposed to different types of filming techniques, focusing on marketing, story-telling, and other types of cinematic movies using a UAS.	a. Students will demonstrate proof of concepts by filming and producing a video recording, using their UAS, and then presenting that video to the class as their final project.
AV 1970 Drones for Hire	a. This course will identify different UAS programming techniques and software to achieve different deliverables to potential clients. b. Students will be introduced to collection and analysis techniques using industry-grade software c. Students will be presented the different ways to become credible sUAS pilot/operators to apply for future jobs and internships.	a. Each student will be required to apply for a UAS job or internship. b. The student will showcase their newly found skills by presenting to a company a UAS project based on the company's needs and wants.
BUSN 2320 Small Business Management	(course taught outside of our department - unknown objectives or outcomes)	Unknown.
BUSN 2988 Aviation Weather	a. The student will advance their knowledge of weather-related phenomena by researching the different aspects of weather patterns. b. The course will identify the different sources of weather reports and how to decipher them. c. Each student will test weather pattern theory by taking their own weather observations.	a. The student will demonstrate their ability to interpret weather patterns by completing individually gathered weather reports and then summarizing their findings in a final report to the class. b. Students will define how weather affects UAS's with a written report highlighting the different categories of weather and how it affects pilots.

(Table -1)

### Assessment criteria (Assessment Phase)

The UAS Certificate was approved in early 2021 with the first classes being taught Fall 2021. The assessment phase will begin Spring of 2022. This will allow the instructors to gather data from the first semester being taught and begin our assessment of how the students have met the objectives and outcomes set forth. Once the second semester classes finish in Spring 2022, the assessment of the completed certificate will commence. The assessment period will continue over the summer months and proposed changes will be implemented Fall 2022. The same pattern will continue for the next school year.

At the completion of the assessment phase, each course will be assigned an assessment completion code of "changes proposed", "changes completed and implemented", or "no change required".

Each course will be assessed based on the following criteria:

- a. Were the course objectives and outcomes clear and concise and assessable?
  - i. Were the students able to complete the course objectives?
  - ii. Did the students demonstrate the ability to meet course outcomes at a level commensurate with current industry?
- b. Did the assessments provide the needed data to plan out future actions and possible changes to fulfill the objectives and outcomes listed?
  - i. Students will provide a reflection of the course and what were the main items that they learned.
  - ii. There will be a course survey sent out to each student after the completion of the certificate to gauge if they have all of the required skills to meet industry standards.
- c. Were the actions or changes implemented in a timely manner?
  - i. After each semester, instructors will take the feedback gathered and propose each change to the Drone Cadre. The Drone Cadre will meet twice a year to review the feedback and address issues that need to be changed.
  - ii. Several of the Drone Cadre members will be visiting industry conferences to keep abreast of the changes with UAS due to an extreme rate of technical advances.
  - iii. Both i. and ii. will be used to validate the proposed changes to be implemented for the following semester the courses will be taught to the students.
- d. Were the actions or changes used to enhance the program?
  - i. After a change has been implemented, and the course taught with those changes, the assessment will focus on the changes made to validate that the courses are being taught in the most efficient and industry applicable manner.

The following table (Table -2) represents the basic flow of the assessment. The assessment planning phase began as the certification was being developed and continues as we refine current and future courses. The assessment phase will begin as soon as the first courses are taught and continue as the students complete the certificate. The Action phase begins as changes to the courses are approved for future courses.

Course	Planning Phase Fall'21	Assessment Phase Su'22	Action Phase Fall'22
	Are student objectives and outcomes clearly defined and assessable?	Based on assessment criteria as defined.	List of changes to classes based on assessment.
AV 1130 Flight Principles			
AV 1900 Drones: Rules/License			
AV 1910 Drones: Introductory Flight Lab & UAS History			
AV 1920 Drones: Intermediate Flight Lab			
AV 1930 Drones: Pilot in Command			

AV 1940 Drones: Basic Design & Construction			
AV 1950 Drones: UAS Maintenance			
AV 1960 Drones: Aerial Photography			
AV 1970 Drones for Hire			
BUSN 2320 Small Business Management			
BUSN 2988 Aviation Weather			

(Table -2)

### List of changes based on assessment (Action Phase)

The course assessment table (Table -3) below is a live document that tracks all changes made to each course in the UAS Certificate. This is how all changes will be proposed, recorded, and tracked for future reference. Proposed changes in each course are based on several sources of feedback, listed below.

- Instructor:
  - o Did the quizzes and verbal testing meet the objectives and outcomes of the course?
  - o Were the course projects (ex. UAS design and build fixed-wing drone) completed in an efficient manner in a reasonable amount of time compared with the majority of other UAS students?
  - o Were practical application tests completed with a pass/fail?
- Student
  - o Students can give direct feedback, verbal or written at any time during the course.
  - o Did the student demonstrate the application of skills needed for the projects?
- Post class surveys
  - o A simple survey will be sent to each student after graduation.
  - o Each survey will ask specific 'skills related to industry wants' questions.
- Class assigned reflection papers
  - o A class reflection paper is required for each course.
  - o Each reflection paper should include at a minimum: objective view of class, personal journey from start of projects to finish, and recommendations for improvement.
  - o Reflection papers are graded on completion of assignment, not content. Students are aware that their grade will not 'suffer' for honest feedback.
- Industry feedback
  - o There are several companies that maintain communication with us on a regular basis. These companies give us direct feedback of what their clients are looking for in our graduates.
  - o UAS conferences are growing and are a great resource for us to see where the industry is going. We take that feedback and discuss it within our UAS Cadre.

Course	Proposed Change	Evaluation if change needed	Action taken	Date implemented
AV 1130 Flight Principles	(ex. Add a hands-on test flight project)	(A project would enhance the student's ability to apply knowledge learned)	(Inst added a glider project. The student has to build and then manipulate wing to change flight characteristics.)	(02 Nov 21)
AV 1900 Drones: Rules/License				
AV 1910 Drones: Introductory Flight Lab & UAS History				
AV 1920 Drones: Intermediate Flight Lab				
AV 1930 Drones: Pilot in Command				
AV 1940 Drones: Basic Design & Construction				
AV 1950 Drones: UAS Maintenance				
AV 1960 Drones: Aerial Photography				
AV 1970 Drones for Hire				
BUSN 2320 Small Business Management				

(Table -3)

## Appendix A: Post-Graduation Survey Example

Here are a few of the sample questions used for a post-graduation survey. Most surveys will be in an online format with the option to add their name and basic demographic information.

### UAS Certificate Post-Graduate Survey

1. Are you currently employed?
2. Are you self-employed?
3. Which industry best describes your position?
  - a. Education
  - b. Engineering
  - c. Mining
  - d. Mechanics
  - e. UAS (PIC or Pilot)
  - f. Manned Aviation
  - g. GIS
  - h. Agriculture
  - i. Energy
  - j. Utilities
  - k. Public Service Agencies
4. What topics/skills do you wish were taught as part of the UAS Certificate Program?
5. Which class(es) in the UAS Certificate Program helped prepare you the most for your position?
6. Which class(es) in the UAS Certificate Program prepared you the least for your position?
7. Did you require additional on-the-job training? If so, what did that include?
8. (Optional) What is your current salary?
  - a. \$20,000 – \$29,999
  - b. \$30,000 - \$39,999
  - c. \$40,000 - \$49,999
  - d. \$50,000 - \$59,999
  - e. \$60,000 - \$69,999
  - f. \$70,000 - \$79,999
  - g. \$80,000 - \$89,999
  - h. \$90,000 - \$99,999
  - i. > \$100,000
9. Was the UAS Certificate Program worth it to you? Why or why not?