

Colorado CTE Course – Scope and Sequence

Course Name	Aviation of UAS and Drone Technology	Course Details		Credit = 1.0	
		Course = 0.50 Carnegie Unit Credit		Prerequisite: Introduction to Aviation and Aerospace CTE Credential=CTE Transportation Operations	
Course Description	This course will cover advanced flight topics from area Aviation experts. Students will be exposed to new concepts in UAS and drone technology as well as expanding topics covered in Aviation I to an advanced level. Students will be preparing to pass the Federal Aviation Administration (FAA) private pilot written exam. Successful completion of Introduction to Aviation and Aerospace is a prerequisite. (This course covers all competencies of AVT 160 and AVT 155.)				
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.				
SCED Identification #	20053	Schedule calculation based on 60 calendar days of a 90-day semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.			
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at https://www.cde.state.co.us/standardsandinstruction/essentialskills					
Instructional Unit Topic	Suggested Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Introduction to UAS I. Pilot In Command / UAS Operator: Acting The Role A. Situational Awareness B. Risk Management C. Automation Management D. Task Management E. Collision Avoidance F. Positive aircraft control G. Crew Resource Management		Understand the planning, regulatory, administrative, and operational processes and knowledge required for facilitating an unmanned aircraft systems (UAS).	Understand the planning, regulatory, administrative, and operational processes and knowledge required for facilitating an unmanned aircraft systems (UAS). Student is expected to: (A) Identify key milestones in the operation of unmanned aircraft systems; (B) Identify the regulatory body and governance procedures that apply to		

			unmanned aircraft systems; (C) Understand the process for obtaining the necessary qualifications and licenses to operate unmanned aircraft systems in the US; (D) Understand the role of the pilot/UAS operator.		
UAS System Elements		Examine UAS systems and components. Describe the different systems in a variety of UAS that allow them to function.	Student is expected to: A) Identify components of unmanned aircraft vehicles; B) Explain battery theory and electronics as they pertain to UAS; C) Describe the different systems in a variety of UAS that allow them to function; D) Compare and contrast fixed and rotary systems and components; and E) Examine different levels of autonomy in UAS; and F) Identify weather conditions and their impact of UAV/UAS flight operation;		
National Airspace Regulatory System- FAA		Understand the role of the Federal Aviation Authority and the National	Understand and apply knowledge of the National Airspace Regulatory System. Student is expected to:		

		Airspace Regulatory System.	A) Demonstrate understanding of UAS specific regulations, and other regulations that impact UAS operations; and B) Identify airspace designations in the National Airspace System.		
Creation of authorization		Understand the process to create authorization for aircraft operations.	Understand the process to create authorization for aircraft operations. Student is expected to: A) Understand operator certification and requirements; B) Evaluate multiple UAS ground stations and their capabilities; and C) Demonstrate understanding of the importance of proper maintenance of UAS and ways to prevent malfunctions.		
UAS research sites and applications		Understand how research facilities are using unmanned aircraft systems.	Understand how research facilities are using unmanned aircraft systems. Student is expected to: A) Evaluate various near-term developing UAS capabilities and their applications.		

UAS operations: I. Fixed Wing UAS- A. Preflight Preparations i. Ground Station Set-up B. Preflight Procedures i. Preflight Inspection C. Departure Operations i. Motor startup ii. Take-off/ Launch D. Pattern Operations i. Automation Level ii. Programming iii. Orbits iv. Survey Patterns E. Performance Maneuvers F. Ground Reference Maneuvers II. Rotary Wing UAS- A. Preflight Preparations v. Ground Station Set B. Preflight Procedures i. Preflight Inspection C. Departure Operations i. Motor startup ii. Avoiding “Fly-ways” iii. Vertical Takeoff to a hover iv. Vertical descent and landing		Examine the technologies associated with small, medium, and large unmanned aeronautical vehicles (UAVs), ground control stations (GCS), remote split operations, and line-of-site operations.	Examine the technologies associated with small, medium, and large unmanned aeronautical vehicles (UAVs), ground control stations (GCS), remote split operations, and line-of-site operations. Student is expected to: A) Describe the structure and operation of the UAS to include the UAV, GCS, line-of-sight, and remote split operations; B) Define and apply UAS capabilities and limitations to operational applications; Develop and exhibit aeronautical decision making during all operations of UAS with special emphasis on situational awareness, risk and task management, and aircraft control. C) Demonstrate a basic level of proficiency in UAS Flight Operations and control in the areas of preflight preparations and procedures, departure and flight operations, various maneuvers and		
--	--	--	---	--	--

v. Directional Orientation D. Pattern Operations i. Nose-in Box pattern ii. Tail-in Box pattern iii. Automation Level iv. Programming E. Performance Maneuvers i. Quick Stop ii. Yaw Turns F. Ground Reference Maneuvers i. Orbits			navigation, instrumentation and post-flight procedures.		
UAS and geospatial operations I. Navigation A. GPS B. Simulated Commercial Scenario		Understand the application of geospatial technology for unmanned aircraft systems.	Understand the application of geospatial technology for unmanned aircraft systems. Student is expected to: A) Understand GPS navigation as it relates to the operation of UAV/UAS systems; B) Apply operations of UAV and ground control stations within various commercial contexts; and C) Recognize various payload capabilities and their appropriate applications.		
UAS automation and man in the loop		Identify automated controls for	Student is expected to: A) Identify basic automated instrumentation		

		Unmanned Aircraft Systems.	features of UAS systems; and B) Identify, analyze, and evaluate various UAS failures with focus on loss of link.		
Safety and the UAS Slow flight / Stalls If autopilot allows ix. Basic Instruments x. Emergency Ops xi. Post-flight Procedures xii. Simulated Commercial Scenario Emergency Ops 1. Go-Home x. Post-flight Procedures 1. Battery Recharging Procedures and Safety		Identify safe operation and emergency procedures for UAS Systems.	Identify safe operation and emergency procedures for UAS Systems. Student is expected to: A) Understand safe operation and emergency procedures for UAS Systems. Student is expected to: B) Identify safe operation procedures for UAV/UAS systems; C) Understand preflight inspect procedures; D) Identify emergency procedures for UAV/UAS systems; and E) Identify accident reporting procedures.		
Human challenges and the UAS		Understand the human challenges associated with the operation of unmanned aircraft systems.	Understand the human challenges associated with the operation of unmanned aircraft systems. Student is expected to: A) Identify pilot abilities and considerations in UAV/UAS system operation; B) Identify risk factors and corrective action or mitigation of risks.		
UAS going forward		Discuss future implications related	Discuss future implications related to UAV/UAS in		

		to UAV/UAS in commercial and government settings.	commercial and government settings. Student is expected to: A) Discuss current and emerging trends for the application of UAS system technology; B) Discuss regulatory impacts; and C) Discuss ethical and legal considerations of expanded UAS system applications.		
--	--	---	---	--	--

Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc) [CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

Reading, Writing, & Communicating

Standard 1: Oral Expression and Listening

- **Prepared Graduate 1:** Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.
- **Prepared Graduate 2:** Deliver effective oral presentations for varied audiences and varied purposes.

Standard 2: Reading for All Purposes

- **Prepared Graduate 3:** Read a wide range of literary texts to build knowledge and to better understand the human experience.
- **Prepared Graduate 4:** Read a wide range of informational texts to build knowledge and to better understand the human experience.
- **Prepared Graduate 5:** Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.

Standard 3: Writing and Composition

- **Prepared Graduate 6:** Craft arguments using techniques specific to the genre.
- **Prepared Graduate 7:** Craft informational/explanatory texts using techniques specific to the genre.
- **Prepared Graduate 8:** Craft narratives using techniques specific to the genre.
- **Prepared Graduate 9:** Demonstrate mastery of their own writing process with clear, coherent, and error-free polished products.

Standard 4: Research Inquiry and Design

- **Prepared Graduate 10:** Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.

Note: Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.