CareerClusters™ PATHWAYS TO COLLEGE & CAREER READINESS
Transportation, Distribution & Logistics

Learning that works for Colorado CTE®

Colorado CTE Course – Scope and Sequence

Course Name	Special Industrial Applications of Drone Technology	Course Details Course = 0.50 Carnegie Unit Credit	Credit = 0.5 CTE Credential: CTE Transportation Operations; CTE STEM; CTE Transportation
Course Description	This course would be an applied applications course and could include instruction in aerial photography for commercial purposes, recording instrumentation, topics in inspection for industrial purposes, and data analytics. This course covers all competencies in AVT 256.)		
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
Overview of Industrial Applications of Drones		Understand the use of drone technology in multiple industry applications.	Student is expected to: A) Identify commercial applications of drone technology; and B) Discuss legal and ethical considerations for drone technology use.		
UAS Mission Planning: **A. UAS / Aircraft Airworthiness** **B. Pilot preparation and Fitness to Fly** **C. Operational regulatory considerations** **D. Environmental factors** **a. Weather Briefing** **i. Winds and wind layers**		Demonstrate an understanding and apply UAS regulations for a given operation.	Student is expected to: A) Demonstrate proper flight preparation procedures for UAS systems; B) Evaluate environmental factors of flight operations; C) Determine UAS weight and balance, and		

ii. Temperatures **iii. Thermals and turbulence** **iv. Low Visibility and other hazards** **b. Sun location and lighting** **c. Obstacles, wires, and terrain** **d. Air traffic and congestion** **E. Calculating Weight and Balance** **F. Performance Factors and Planning** **G. Power Source: Battery Management and Flight time** **H. Operational Risk Assessment and Mitigation** **a. Crew Resource Management: personnel required** **I. Flight Planning:** **a. Autonomous Flight Control (CIC: Computer-In-Command)** **i. Software** **ii. Operational requirements: flight profile / height and scope** **iii. Route planning** **iv. VLOS (Visual Line of Sight)**			consider the implications on operations; D) Evaluate UAS performance for multiple commercial scenario;s E) Develop a risk management plan for a commercial UAS operation; F) Build a UAS operational plan to meet specific mission objectives; and G) Apply Risk Management and Crew Resource Management skills to ensure operational safety.		

v. Flight Specifications: programming equipment b. PIC (Pilot-In-Command) i. Efficient use of flight time ii. Area of Operation iii. Flight Profile iv. Programming equipment J. Aircraft Launch K. Managing the Operation L. Aircraft Recovery and Retrieval M. Post-flight Analysis N. Data Management uses					
GIS (Geographic Information Systems) **A. Location referenced information** **B. Components of a GIS** **C. GIS Database** **D. GIS Models and UAS**		Explore geospatial technologies and how they are used in unmanned aircraft system navigation.	Understand how GIS systems are used with UAS systems. Student is expected to: A) Define GIS and apply basic GIS terminology; B) Identify GIS components; C) Describe how location can be described (geographic & projected coordinate systems, range & township, survey plats); D) Understand how to access GIS databases, web maps and mobile services; and E) Demonstrate the knowledge and		

			techniques required to execute UAS missions using GIS technology.		
Aerial Film and Photography **A. Photogrammetry and Geo-referencing** **B. Environmental considerations** **C. Intervalometers** **D. Resolution**		Understand how UAS systems are used in aerial film and photography.	Explore how unmanned aircraft systems are used in aerial photography and film applications. Student is expected to: A) Identify common tools and equipment for capturing aerial film and photography; B) Explain the basic geometry of vertical, near-vertical, and stereo aerial imagery; C) Discuss the fundamental quantities associated with photography, such as scale, distortions and errors; and D) Explain data accuracy, including ground control points, topographic maps, DEMs (Digital Elevation Models), DTMs (Digital Terrain Models), and DSMs (Digital Surface Models).		
Multi-Spectral and LiDAR **A. NIR (Near- Infrared) light** **B. LiDAR scanning** **C. UAS commercial**		Identify the value and common applications of remotely sensed data using multi-spectral and LIDAR.	Student is expected to: A) Define LIDAR; B) Understand terminology related to multi-spectral and LIDAR scanning; and		

			C) Discuss laser measurement systems such as LiDAR (airborne and terrestrial) and how they are used for commercial purposes.		
Agricultural UAS applications		Explore how UAS systems are used in agriculture applications.	Student is expected to: A) Identify common agricultural application using UAS technology; and B) Discuss how UAS is used in scientific applications related to conservation, resource planning, wildlife, and forestry.		
Data Validation		Explore the process of data validation for information collected by UAS systems.	Explore how to validate aircraft flight data in the field, including ground truthing, verification of elevation accuracies, and accuracy of ground control points. Student is expected to: A) Evaluate data samples to determine unnecessary and extraneous data, data accuracies, and data completeness.		
