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

Learning that works for Colorado CTE®

# Colorado CTE Course – Scope and Sequence

| Course Name | Introduction to Aviation and Aerospace | Course Details<br>Course = 0.50 Carnegie Unit Credit | Credit = 1.0<br>Prerequisites- None<br>Credential Required: CTE Transportation (Aviation); CTE Transportation Operations (Aviation); CTE STEM |
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| **Course Description** | This course will provide an introduction to the aviation and aerospace industry and provide an entry level examination of Aviation career opportunities. Students will explore the concepts and principles of Aviation and delve into general practices of the aerospace field. Areas of study are aviation history, pilot training, airplane structure, engines, basic aerodynamics, flight environment, airports, aviation weather, and navigation. In addition, the course exposes the student to the history of manned space flight. | | |
| **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 |
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| **Career Exploration** | | Evaluate a wide range of career pathway opportunities for success in Aviation. | Investigate the various career pathways in the aviation industry. The student is expected to:<br><br>(A) investigate an area of interest in aviation;<br><br>(B) describe the functions of engineers, pilots, aircraft control, and mechanical technicians in the industry; and | Interview a professional working in an occupation that is of interest to them. Research aerospace career opportunities of interest by participating in career exploration activities.<br>• Explore the requirements, skills, wages, education, and geographic opportunities in one career associated with aerospace. | |

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| | | | (C) select and report on career opportunities, requirements, and expectations in the aviation technology industry. | • Identify employability skills preferred by different aviation occupations.<br>• Compare and contrast career opportunities related to different fields of aviation.<br>• List the requirements for industry certification for pilots and mechanics. | |
| **Aviation and Society** | | Understand the key events in the history of flight and the impact of technological advancements on the aviation industry.<br>Understand the role that aviation technology places in society.<br>Understand the role of the Federal Aviation Administration. | Assess the impact of aviation on society. Student will be able to:<br>(A) describe the history of aviation and significant technology milestones;<br>(B) interpret the aviation engineering design process;<br>(C) understand the role of federal agencies in the regulatory and safety of air travel;<br>(D) analyze ethics in the aviation industry;<br>(E) understand current trends in flight including unmanned systems; and<br>(F) Understand the impacts that space and military applications have on the aviation industry. | Research technological advances in the aviation industry. Report on the significant impact the innovation made on the industry and to society.<br>Analyze a case study on a consumer interaction or accident incident in the aviation industry. Describe the event and the impact on regulations, safety, technology, or customer relations within the industry.<br>Evaluate the challenges that arise with emerging flight technologies including flight design, economic impact, and regulations.<br>Analyze the influences of military, commercial, and space flight on the design of aircraft. | |

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| | | | | Explore the impact of space travel initiatives. Create an artifact that summarizes the information. (Examples: Write a biographical article of spaceflight pioneers; write an article on the scientific purposes of unmanned space explorations; analyze the stages of development and importance of the International Space Station; summarize the development and impact of the Hubble Space Telescope. ) Investigate regulatory agencies, governing bodies, and professional organizations related to the aviation industry, such as the Federal Aviation Administration (FAA), National Transportation Safety Board (NTSB), and National Aeronautics and Space Administration (NASA). Gather information from their websites and available publications to produce a coherent explanation of their functions, jurisdictions, and importance within the industry. | |
| **Workplace Safety** | | Understand and apply practices and procedures required to maintain jobsite safety. | Demonstrate General Lab Safety Rules and Procedures. Student is expected to: | Identify and explain the intended use of safety equipment available in the | |

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| | | Understand the major compliance and regulatory considerations within the aviation industry. | (A) follow and adhere to basic safety precautions.<br>(B) apply relevant safety information based on OSHA and FAA guidelines and principles.<br>Identify the basic safety issues from a pilot's perspective:<br>(A) mental condition<br>(B) physical condition<br>(C) weather related<br>(D) other environmental considerations.<br>The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:<br><br>(A) identify federal laws and rules applicable to the workplace and enforcement agencies such as the Equal Employment Opportunity Commission and the Occupational Safety and Health Administration (OSHA)<br><br>(B) identify safety precautions under Federal Aviation Regulations. | classroom. For example, demonstrate how to properly inspect, use, store, and maintain safe operating procedures with tools and equipment.<br><br>Describe the procedures for basic first aid and CPR.<br>Describe basic flight safety considerations from the pilot perspective. Citing course materials such as textbooks and published guidelines including the Federal Aviation Regulations (FARs), identify the basic safety issues a pilot must be aware of before, during, and after each flight, including but not limited to: pilot's mental and physical condition, collision avoidance, weather conditions, maintaining minimum safe altitudes, visual scanning, right-of-way rules, flight over hazardous terrain, positive exchange of flight controls, and operating within the Federal Aviation Regulations (FARs).<br>Citing appropriate textual evidence, identify the basic safety issues relating to the aircraft, including but not limited to: aircraft | |

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| | | | | airworthiness, taxiing in wind, operating within the aircraft's approved weight and balance, and airspeed limitations. | |
| **Aerodynamics and flight principles** | | | Understand the principles of flight and aerodynamics.<br>Student is expected to:<br>(A) investigate the basic parts and control surfaces on the aircraft;<br>(B) investigate material properties;<br>(C) demonstrate scaling techniques and measuring for aviation design;<br>(D) understand the scientific principles of physics that impact flight operations and aircraft design (weight versus drag, Newton's Laws of Motion, Bernoulli Effect and Venturi Effect);<br>(E) analyze flight aerodynamics including force and stability; and<br><br>(F) explore aircraft propulsion and engine systems. | Create a report explaining the interaction between Microprocessor, Sensors, Intelligent Controls, and Motors.<br>Examine the utilization of the airfoil, wings, tails and the propeller. Explore the concept of pitch, roll, and yaw.<br>Compare static versus dynamic pressure.<br>Analyze data to support the claim that Newton's Second Law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. | |
| **Aviation Environments** | | Understand the flight environment and the systems that create safe air travel.<br>Understand and apply appropriate language | Comprehend air safety.<br>Student is expected to:<br>(A) understand the elements of radio communications in flight safety;<br>(B) comprehend airspace control; | Present a report on air safety concerns. Present a report on the Federal Aeronautics Administration (FAA) regulations. | |

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| | | and terminology for the aviation industry.<br>Understand aerospace science and technology. | (C) identify causes of runway incidents; and<br>(D) understand the airport layout and the elements that contribute to safe air travel<br><br>Understand key concepts related to space exploration. Student is expected to:<br>(A) understand basic rocket theory and place flight; and<br>(B) identify the effect of zero gravity, lack of atmosphere, and friction on flight. | Demonstrate procedures of radio communications during conduct of a flight.<br>Research types of airports. Design a safe and effective airport layout including runways; state how the type of airport contributes to the design.<br>Given a model airport layout, identify the safety concerns and plan of action to rectify hazards. Write a report to present to the airport officials communicating these conclusions. | |
| **Flight navigation and physiology** | | Understand aircraft systems and performance including basic aircraft instruments and systems.<br><br>Understand the physiological impacts on the human body during flight.<br><br>Apply mathematical constructs to the aviation industry to predict aircraft performance. | Student understands the basic principles of flight navigation. Student is expected to:<br>(A) investigate and apply the principles of flight planning and navigation;<br>(B) understand the use of flight charts<br>(C) identify basic aircraft instrumentation:<br>• Airspeed indicator<br>• Attitude indicator (artificial horizon)<br>• Altimeter<br>• Turn coordinator<br>• Heading indicator<br>• Vertical speed indicator<br>• Magnetic Compass | Calculate weight and balance. Calculate the speed and direction of wind and its effect on the flight.<br>Describe the latest innovations in fly-by-wire flight control systems.<br>Interpret the reading of each instrument to confirm an accurate 'instrument scan'.<br>List the basic flight control systems (mechanical, hydromechanical and fly-by-wire).<br>Draw on aviation handbooks and other course materials to outline the specific functions of each aircraft's flight control. Describe the purpose of the aircraft's ailerons, | |

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| | | | (D) identify navigational systems and their components.<br>Understand the physiological effects of flight on the human body and identify potential hazards on the body during flight.<br>Perform basic calculations.<br>Student is expected to:<br>(A) calculate aircraft weight and balance during flight<br>(B) solve percentage problems (percent of power for turbine engines, flap position percent indicators)<br>Solve ratio and proportion problems (compression ratios of an aircraft, glide ratios). | elevators, rudder, and flaps, and explain the effect that each of these controls has on the aircraft's controllability.<br>In a graphic illustration such as an annotated diagram or electronic presentation, explain the typical application and operation of the basic electrical system, including but not limited to:<br>a. Battery<br>b. Alternator / Generator<br>c. Circuit Breakers<br>d. Master Switch(es)<br>Determine the weight and the balance of the flying object.<br>Design a wind and project plan. Calculate the effect of environment of the flight.<br>Predict an unmanned flight performance.<br>List and describe the safety procedures to prevent aviation accidents due to physical distress. | |
| **Flight and weather considerations** | | Understand the relationship between flight and weather. | Student demonstrates understanding of flight and weather considerations in the aviation industry. Student is expected to:<br>(A) explain basic weather theory;<br>(B) identify the types of clouds (stratus, cumulonimbus, and cirrus) at | Create a simple weather device to measure humidity, dew point, wind directions, weather pressures.<br>Interpret current weather conditions using a weather map.<br>Collect and analyze local weather data. | |

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| | | | different elevations and the potential hazards that may exist.<br>(C) interpret weather data; and<br>(D) identify sources of weather information. | Understand Significant Meteorological Information Service (SIGMET) and define the role of the Aviation Data Service (ADDS).<br>Compare and contrast the common weather hazards when flying Identify safe and corrective actions for common weather hazards as suggested by the Federal Aeronautics Administration (FAA).<br>Given a weather scenario, calculate an optimal flying elevation based upon velocity and weather limitations. | |
| **Flight communications** | | Define and understand the terminology used in flight communications. | Understand how aeronautical charts and flight computers are used in flight communication. The student is expected to:<br>(A) explain the role of computerized flight systems in flight communications;<br>(B) understand the basics of radio communications in flight control;<br>(C) apply flight communication procedures;<br>(D) distinguish between the types of Radio Navigation: Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME), | List and describe the essential navigational information a pilot needs to know (starting point, ending point, direction, distance, speed, fuel capacity, and weight and balance.)<br>Consult FAA guidelines to synthesize understanding of air traffic control (ATC) procedures related to visual flight rules (VFR) and instrument flight rules (IFR) operations. Explain the circumstances and conditions of operation regarding:<br>a. Airport operations<br>b. Local area procedures | |

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| | | | Instrument Landing System (ILS), Global Positioning System (GPS), Inertial Navigations Systems (INS);<br>(E) define airspace and how regulation defines its control; | c. List the advantages and disadvantages of Visual Flight Rules (VFR) flying.<br>Plot a course using an aeronautical chart. Evaluate flight plans for improved efficiency.<br>Research and develop illustrative models that compare and contrast characteristics of the two basic types of airspace:<br>a. Controlled<br>b. Uncontrolled | |
| **Flight Mechanics and Maintenance** | | Understand the mechanical role in flight safety and design. | Understand and apply technical knowledge of the mechanical systems of an aircraft. Student is expected to:<br>(A) list equipment that makes up the landing gear, hydraulic, and pneumatic systems of the aircraft;<br>(C) identify relevant mathematical and scientific principles that a pilot or mechanic uses to evaluate the safety of aircraft equipment;<br>(D) identify fuel and fluid line equipment and concerns from the mechanical perspective; and<br>(E) identify basic electrical system of an aircraft; and<br>(F) identify the basic ignition system of an aircraft. | Explain the specific functions of various aircraft structures. (For example, be able to understand and communicate the purpose for the aircraft's wings, tail, cabin, and other structures. Incorporate relevant design and mathematics concepts as appropriate when explaining how specific aircraft structures function. For example, relate how the design of an aircraft's wings leverage the principles of aerodynamics.)<br>Create a preflight checklist that a mechanic or pilot would use.<br>Describe the operational principles of aircraft power generation and distributions systems. | |

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| | | | | Explain how fuel systems operate on a typical aircraft, and cite specific dangers and associated precautions that aircraft personnel should take when inspecting, filling, and draining fuel systems. Given a scenario or diagram assigned by the instructor, demonstrate the ability to identify and describe the characteristics of the fuel system, including but not limited to:<br>a. Fuel tanks<br>b. Fuel selector valves<br>c. Fuel filters and drains<br>Explain the typical application and operation of the basic ignition system, including but not limited to:<br>a. Magnetos<br>b. Spark plug wires<br>c. Spark plugs | |
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