Virginia CTE

# Unmanned Aircraft Systems, Advanced (2023)


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| Demonstrating Personal Qualities and Abilities | 1 | Demonstrate creativity and innovation. 1 |
| | 2 | Demonstrate critical thinking and problem solving. 2 |
| | 3 | Demonstrate initiative and self-direction. 3 |
| | 4 | Demonstrate integrity. 4 |
| | 5 | Demonstrate work ethic. 5 |
| Demonstrating Interpersonal Skills | 6 | Demonstrate conflict-resolution skills. 6 |
| | 7 | Demonstrate listening and speaking skills. 7 |
| | 8 | Demonstrate respect for diversity. 8 |
| | 9 | Demonstrate customer service skills. 9 |
| | 10 | Collaborate with team members. 10 |
| Demonstrating Professional Competencies | 11 | Demonstrate big-picture thinking. 11 |
| | 12 | Demonstrate career- and life-management skills. 12 |
| | 13 | Demonstrate continuous learning and adaptability. 13 |
| | 14 | Manage time and resources. 14 |
| | 15 | Demonstrate information-literacy skills. 15 |
| | 16 | Demonstrate an understanding of information security. 16 |
| | 17 | Maintain working knowledge of current information-technology (IT) systems. 17 |
| | 18 | Demonstrate proficiency with technologies, tools, and machines common to a specific occupation. 18 |
| | | Apply mathematical skills to job-specific tasks. 19 |


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| | 20 **Demonstrate professionalism.** 20 |
| | 21 **Demonstrate reading and writing skills.** 21 |
| | 22 **Demonstrate workplace safety.** 22 |
| **Examining All Aspects of an Industry** | 23 **Examine aspects of planning within an industry/organization.** 23 |
| | 24 **Examine aspects of management within an industry/organization.** 24 |
| | 25 **Examine aspects of financial responsibility within an industry/organization.** 25 |
| | 26 **Examine technical and production skills required of workers within an industry/organization.** 26 |
| | 27 **Examine principles of technology that underlie an industry/organization.** 27 |
| | 28 **Examine labor issues related to an industry/organization.** 28 |
| | 29 **Examine community issues related to an industry/organization.** 29 |
| | 30 **Examine health, safety, and environmental issues related to an industry/organization.** 30 |
| **Addressing Elements of Student Life** | 31 **Identify the purposes and goals of the student organization.** 31 |
| | 32 **Explain the benefits and responsibilities of membership in the student organization as a student and in professional/civic organizations as an adult.** 32 |
| | 33 **Demonstrate leadership skills through participation in student organization activities, such as meetings, programs, and projects.** 33 |
| | 34 **Identify Internet safety issues and procedures for complying with acceptable use standards.** 34 |
| **Exploring Work-Based Learning** | 35 **Identify the types of work-based learning (WBL) opportunities.** 35 |
| | 36 **Reflect on lessons learned during the WBL experience.** 36 |
| | 37 **Explore career opportunities related to the WBL experience.** 37 |
| | 38 **Participate in a WBL experience, when appropriate.** 38 |
| **Introduction to Unmanned Systems** | 39 **Describe the goals of an unmanned system.** 39 |
| | 40 **Describe the types of UxS.** 40 |
| | **Research careers related to UxS.** 41 |

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| **Introducing Unmanned Aircraft Systems (UAS)** | **42** | **Explain the design of UAS.** 42 |
| | **43** | **Identify elements of UAS.** 43 |
| | **44** | **Research careers related to UAS.** 44 |
| | **45** | **Identify milestones in the history of UAS.** 45 |
| **Flying a UAS** | **46** | **Devise a UAS flight plan.** 46 |
| | **47** | **Demonstrate a safe UAS flight.** 47 |
| | **48** | **Explain how flight planning prevents flight problems.** 48 |
| | **49** | **Describe UAS registration.** 49 |
| | **50** | **Identify appropriate UAS credentials.** 50 |
| | **51** | **Identify support technology for UAS flight.** 51 |
| **Understanding the Subsystems of UAS** | **52** | **Identify the subsystems of a UAS.** 52 |
| | **53** | **Identify types of air vehicles.** 53 |
| | **54** | **Describe the essential elements needed to maintain vehicle control.** 54 |
| **Identify the Components and Subcomponents of UAS** | **55** | **Describe the powerplant components of UAS.** 55 |
| | **56** | **Describe the avionics components of UAS.** 56 |
| | **57** | **Describe the function of the powerplant components.** 57 |
| | **58** | **Describe the function of the avionics components.** 58 |
| | **59** | **Identify the airframe and landing gear.** 59 |
| | **60** | **Examine different airframe configurations.** 60 |
| **Understanding the Basics of National Airspace** | **61** | **Describe the role of the FAA.** 61 |
| | **62** | **Use Low Altitude Authorization and Notification Capability (LAANC) to identify controlled airspace.** 62 |
| | **63** | **Describe waivers.** 63 |
| | **64** | **Explain the requirements and process for registering sUAS vehicles with the FAA.** 64 |

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| | 65 Identify penalties for a drone operator for failure to adhere to P art 107 regulations. 65 |
| | 66 Identify the three classifications of flying in airspace. 66 |
| Understanding the Basics of Weather | 67 Demonstrate how to interpret a current weather report when planning UAS flight. 67 |
| | 68 Explain the weather's effect on flight performance. 68 |
| Understanding the Basics of UAS Sensors | 69 Define sensors. 69 |
| | 70 Research sensor types. 70 |
| | 71 Infer sensor requirements from scenarios. 71 |
| Collecting, Analyzing, and Editing Data | 72 Capture data using a UAS platform. 72 |
| | 73 Edit data collected from a UAS platform. 73 |
| | 74 Demonstrate how to download data from sensors. 74 |
| | 75 Analyze data from sensors. 75 |
| | 76 Create a defined deliverable. 76 |
| Exploring Solutions for Flight Problems | 77 Create solutions for common flight problems. 77 |
| | 78 Perform mission planning. 78 |
| Identifying Motors and Batteries | 79 Describe the motors used on UAS. 79 |
| | 80 Describe the use of battery connector and wires. 80 |
| | 81 Describe lithium polymer (LiPo) batteries. 81 |
| | 82 Describe how to safely use LiPo batteries. 82 |
| Soldering and Building a Drone | 83 Explain the need for soldering. 83 |
| | 84 Demonstrate the proper use of soldering tools. 84 |
| Troubleshooting and Repairing | 85 Describe safe practices in repair and handling of UAS components. 85 |
| | 86 Repair circuits. 86 |


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| **Designing and Building UAS** | **87** Compute the thrust-to-weight ratio goal of the UAS. 87 |
| | **88** Design a UAS. 88 |
| | **89** Build a UAS. 89 |
| **Mounting Payload and Sensors** | **90** Select a UAS to meet objectives. 90 |
| | **91** Identify necessary sensors for a mission. 91 |
| | **92** Describe the payload sensor's effect on performance. 92 |
| | **93** Demonstrate the attachment of a sensor. 93 |
| | **94** Describe advanced payload deployment. 94 |
| **Recordkeeping and Maintaining Logs** | **95** Document configuration changes in a maintenance log. 95 |
| | **96** Document the mission in the flight log. 96 |
| **Managing Security Threats** | **97** Describe the importance of identifying cybersecurity threats on sUAS. 97 |
| | **98** Maintain proper storage of all components. 98 |
| **Demonstrating Autonomous Flight** | **99** Identify the benefits of using autonomous flight modes. 99 |
| | **100** Meet with stakeholders/clients. 100 |
| | **101** Determine what software will be used. 101 |
| | **102** Update the software and firmware, if necessary. 102 |
| | **103** Perform autonomous flight. 103 |
| | **104** Process data. 104 |
| | **105** Create a model from data. 105 |
| | **106** Provide customer with deliverables. 106 |
| **Analyzing Advanced Data Products** | **107** Analyze red, green, blue (RGB) sensor data. 107 |
| | **108** Analyze near-infrared (NIR) sensor data. 108 |
| | **109** Analyze multispectral sensor data. 109 |
| | Analyze thermal sensor data. 110 |
| | Analyze LIDAR, radar, or sonar sensor data. 111 |


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**112** **Review processed maps and data.** 112

**113** **Prepare technical report.** 113