

**Virginia Community College System (VCCS)
Unmanned Systems (UMS) Courses
Approved February 2017**

**UMS 107 Small Unmanned Aircraft System (sUAS) Remote Pilot Ground
School**

Course Description:

Presents the aeronautical knowledge required for FAA approved commercial operations as a Remote Pilot with small Unmanned Aircraft Systems (sUAS) rating. Covers the regulations applicable to small UAS operations, loading and performance, emergency procedures, crew resource management, determining the performance of the small unmanned aircraft, and maintenance/inspection procedures. Prepares students for the FAA written examination required to obtain the Remote Pilot certificate.

Lecture 2-3 hours per week. 2-3 credits

Course Prerequisites/Corequisites

General Course Purpose

This course is intended to prepare those interested in becoming sUAS certificated. It prepares the student with in-depth coverage and understanding of the current FAA certification topics.

Course Objectives

Upon completion of this course, the student will:

- Have sufficient knowledge to successfully complete the FAA requirements to obtain a remote pilot certificate with a small unmanned aircraft system (sUAS) rating.
- Understand the limitations and responsibilities of operating a sUAS in FAA controlled airspace.

Major Topics to be Included

- Applicable regulations relating to small unmanned aircraft system rating privileges, limitations, and flight operations.
- Requirements for small UAS registration, markings, and condition
- United States airspace classification, operating requirements, and flight restrictions affecting small unmanned aircraft operation.
- Procedures for requesting a waiver for eligible requirements in sUAS
- Aviation weather sources and effects of weather on small unmanned aircraft performance.

- Performance of small unmanned aircraft
- Small unmanned aircraft loading.
- Emergency procedures
- Crew resource management
- Radio communication procedures
- FAA aeromedical factors
- Aeronautical decision making and judgment.
- Airport operations.
- Certifying as sUAS pilot and crew members.
- Maintenance and preflight inspection procedures.
- Recording and reporting required FAA documents pertinent to accidents, maintenance, flight paths, and other situations as required.

UMS 111 Small Unmanned Aircraft Systems (sUAS) I

Course Description:

Introduces students to the history of small Unmanned Aircraft Systems (sUAS), surveys current platforms, applications, components, and sensors. Topics include the theory of flight, operations, manual flight, maintenance, and required record keeping. Introduces mission planning, crew management, and autonomous control. Emphasizes the ethical, legal, and safe use of sUAS.

Lecture 3 hours per week, 3 credits.

Course Prerequisites/Corequisites

General Course Purpose

This course is intended to provide beginning operational mission related concepts to those interested in becoming sUAS remote pilots. It provides introductory coverage of the operational requirements needed to complete simple missions and meet FAA regulations covering the operation of sUAS.

Course Objectives

Upon completion of this course, the student will be able to:

- Plan and implement simple sUAS missions to collect and analyze data.
- Perform the operations required to support simple missions e.g. plan, fly, collect data, maintain, repair, select sensors and analyze data.
- Understand the requirements of operating a sUAS in FAA controlled airspace.

Major Topics to be Included

Introduction to the small unmanned Aircraft System

- Historical evolution of the sUAS, civilian and defense contribution, and current state of the UAS development
- Use of sUAS

Small unmanned Aircraft System Elements

- Elements and functionality of an Small unmanned Aircraft System (sUAS)
- Aircraft vehicle design and payloads

Operation and Risk Assessment for sUAS

- Design strategies and risk assessment for sUAS missions

Small UAS Mission Planning and Control

- Basic requirements for mission planning
- Factors that affect flight plans

Introductory small Unmanned Aircraft System Operations

- Pilot responsibilities.
- Modes of operating a sUAS
- Classes of airspace
- Small UAS personnel qualifications
- Small UAS products
- Types of sUAS products and sensors
- Small UAS data processing workflows

Civilian and Commercial Applications of the small Unmanned Aircraft Systems

- Applications of sUAS for civilian and commercial use

Strategy for Selecting a sUAS-based Geospatial Mapping System

- Considerations for selecting a sUAS for geospatial application
- Providers of sUAS, sensors, and data processing
- Techniques and software for creating mapping products such as orthographic photos and digital elevation models (DEM)

Small UAS Safety, Security and Privacy Issues

- sUAS and Cybersecurity

UMS 211 Small Unmanned Aircraft Systems (sUAS) II

Course Description:

Advanced UAS mission planning and operation of small Unmanned Aircraft Systems (sUAS). Topics include mission planning, operations, communications, autonomous flights, ground control station operations, crew management, emergency procedures, safety/air vehicle pilot checklist procedures, sensor selection, data collection, and analysis. Also includes advanced coverage of maintenance, operations support, and introduces geospatial product workflow. Emphasizes the ethical, legal, and safe use of sUAS.

Lecture 2 hours per week. Lab 2-3 hours per week. Total 4-5 hours. 3 credits

Course Prerequisites/Corequisites

Prerequisite: UMS XX1 Small Unmanned Aircraft Systems (sUAS) I

General Course Purpose

This course builds on the introductory operational concepts provided in UMS XX1 Small Unmanned Aircraft Systems (sUAS) I. It provides in-depth coverage of the operational requirements needed to plan and complete advanced manual and autonomous missions while meeting FAA regulations covering the operation of sUAS. It adds additional coverage in all areas including piloting, crew management, maintenance, cyber security, data processing, and risk management.

Course Objectives

Upon completion of this course, the student will be able to:

- Plan and implement advanced UAS missions, both manual and autonomous, to collect and analyze data.
- Perform the operations required to support advanced missions, e.g. plan, fly, collect data, maintain, repair, select sensors, collect/analyze data, and report results.
- Recognize the requirements of completing advanced missions in controlled airspace.
- Perform risk assessment and produce operational procedures to address issues.
- Provide customers with products based on their requirements.

Major Topics to be Included:

- Planning and completing advanced manual and autonomous missions including small unmanned aircraft system rating privileges, limitations, and complex flight operations, both fixed wing and multi-rotor.
- Use and limitations of the United States airspace classification, operating requirements, and flight restrictions affecting small unmanned aircraft operation in advanced mission planning.
- Multiple aviation weather sources and effects of weather on small unmanned aircraft performance.
- Sensor selection and processing requirements for intermediate autonomous missions.
- Determining the performance of small unmanned aircraft with modified sensor platforms.
- Application of knowledge of risk assessment and emergency procedures.
- Application of crew resource management during completion of an advanced mission.
- Radio communication procedures and use in the completion of advanced missions.
- Performance evaluation of small unmanned aircraft with modified platforms.
- Knowledge and application of advanced maintenance and preflight inspection procedures.
- Recording and reporting required FAA documents pertinent to accidents, maintenance, flight paths, and other situations as required.
- Application of safety and security procedures as applies to physical aircraft and wireless communication.

UMS 177 Small Unmanned Aircraft System (sUAS) Components and Maintenance

Course Description:

Provides an introduction to the basic equipment and techniques used in maintaining, repairing, and upgrading sUAS to assure airworthiness and proper operation of the other components. Emphasizes safe practices in repair and handling of components. Will develop fundamental skills in troubleshooting/repair of the circuits, subsystems, and components typically found in the complete sUAS. Payload sensor mounting, power management, and security threat management will also be covered.

Lecture 2 hours per week. Lab 2-3 hours per week. Total 4-5 hours. 3 credits.

Course Prerequisites/Corequisites

General Course Purpose

This course is intended to prepare those interested in becoming sUAS maintenance technicians or to support those interested in becoming sUAS mission operations technicians. This course provides coverage of the maintenance, repair, performance measurement, and upgrade of sUAS platforms needed to support advanced missions across diverse sUAS platforms.

Course Objectives

Upon completion of this course, the student will be able to perform the advanced maintenance and upgrade operations required to support advanced missions, meet FAA requirements and assure sUAS airworthiness.

Major Topics to be Included

- Comprehensive components and subcomponents of a sUAS system.
- Small unmanned aircraft loading as related to sensor packages and other payloads.
- Importance of and means for identifying cyber security attacks on the sUAS.
- Installation of upgrades to sUAS propulsion, navigation, stability, and all other components and sub-components.
- Troubleshoot and repair all sUAS sub-components.
- Determine performance of small unmanned aircraft with modified platforms.
- Advanced maintenance and preflight inspection procedures to assure airworthiness.
- Recording and reporting required FAA documents pertinent to maintenance, flight paths, accidents and other situations as required.