APT A131: INTRODUCTION TO UNMANNED AIRCRAFT SYSTEMS

Item	Value
Curriculum Committee Approval Date	12/09/2020
Top Code	302000 - Aviation and Airport Management and Services
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

This course provides an overview of Unmanned Aircraft Systems (UAS). Topics include the development and history of UAS, current and upcoming operational regulations, airspace classifications, sources of weather, loading and performance, radio communications, airport operations, maintenance and inspection procedures, industry and societal implications, career outlooks, ethical considerations, and basic components required to operate a UAS. The course will also introduce hands-on UAS flight and operation principles through PC-based simulation. All training is conducted in accordance with Federal Aviation Regulations (FAR) Part 107. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Pass the Federal Aviation Administration (FAA) Knowledge Test for Remote pilot - Small Unmanned Aircraft Systems (FAR Part 107) with a score of 70% or better.

Course Objectives

- 1. State operating rules of 14 CFR part 107, registration rules of of UAS, and remote pilot certification with an sUAS rating.
- 2. Define airpace classification and airspace operational requirements for UAS.
- 3. State various sources of weather information and the effects of weather on performance.
- 4. Calculate weight loading and performance of an sUAS.
- 5. Demonstrate proficiency in radio communication procedures.
- 6. Define regulations and standard operating procedures near/on airport environments.
- 7. Demonstrate proficiency in decision making during sUAS emergency situations.
- 8. Define human factors regarding physiological effects and aeronautical decision-making.
- 9. States applicable regulations in sUAS maintenance and inspections.

Lecture Content

Regulations General The applicability of 14 CFR part 107 to small unmanned aircraft operations. Definitions used in 14 CFR part 107. The ramification of falsification, reproduction, or alteration of a certificate, rating, authorization, record, or report. Accident Reporting. Inspection, testing, and demonstration of compliance. Operating Rules Registration requirements for sUAS. The requirement for the sUAS to be in a condition for safe operation. Medical condition(s) that would interfere with safe operation of an sUAS. The responsibility and authority of the remote PIC. Allowing a person other than the remote PIC to manipulate the flight controls. Regulatory deviation and reporting requirements for in-flight emergencies. Hazardous operations. Careless or reckless. Dropping an object. Operating from a moving aircraft or moving land- or water-borne vehicle. Alcohol or drugs and the provisions on prohibition of use. Daylight operation. Visual line of sight (VLOS) aircraft operations. The requirements when a visual observer is used. The prohibition of operating multiple sUAS. The prohibition of carrying hazardous material. Staying safely away from other aircraft and right-of-way rules. See and avoid other aircraft and other potential hazard considerations of the remote PIC. Operations over human beings. Prior authorization required for operation in certain airspace. Operating in the vicinity of airports. Operating in prohibited or restricted areas. Flight restrictions in the proximity of certain areas designated by notice to airmen (NOTAM). Preflight familiarization, inspection, and actions for aircraft operations. Operating limitations for sUAS. Maximum groundspeed. Altitude limitations. Minimum visibility. Cloud clearance requirements. The requirements for a Remote Pilot Certificate with an sUAS rating. Airpace Classification and Operating Requirements Airspace Classification General Airspace Special-use airspace, such as prohibited, restricted, warning areas, military operation areas, alert areas, and controlled firing areas. Other airspace areas, such as Airport Advisory Services, Military Training Routes (MTRs), Temporary Flight Restrictions (TFRs), Parachute Jump Operations, Terminal Radar Service Areas (TRSAs), National Security Areas (NSA) and Visual Flight Rules (VFR) routes. Air Traffic Control (ATC) and the NAS. Airspace Operational Requirements Basic weather minimums. ATC authorizations and related operating limitations. Operations near airports. Potential flight hazards. Common aircraft accident causal factors. Avoid flight beneath unmanned balloons. Emergency airborne inspection of other aircraft. Precipitation static. Light amplification by stimulated emission of radiation (laser) operations and reporting illumination of aircraft. Avoiding flight in the vicinity of thermal plumes, such as smoke stacks and cooling towers. Flying in the wire environment. The NOTAM system including how to obtain an established NOTAM through Flight Service. Weather Sources of Weather Internet weather briefing and sources of weather available for flight planning purposes. Aviation routine weather reports (METAR). > Terminal aerodrome forecasts (TAF). Weather charts. Automated surface observing systems (ASOS) and automated weather observing systems (AWOS). Effects of Weather on Performance Weather factors and their effects on performance. Density altitude. Wind and currents. Atmospheric stability, pressure, and temperature. Air masses and fronts. Thunderstorms and microbursts. Tornadoes. Icing. Hail. Fog. Ceiling and visibility. Lightning. Loading and Performance General loading and performance. Effects of loading changes. Balance, stability, and center of gravity. The importance and use of performance data to predict the effect on the aircrafts performance of an sUAS. Operations Radio Communication Procedures Airport operations with and without an operating control tower. The description and use of a Common Traffic Advisory Frequency (CTAF) to monitor manned aircraft communications. Recommended traffic advisory procedures used by manned aircraft pilots, such as selfannouncing

of position and intentions. Aeronautical advisory communications station (UNICOM) and associated communication procedures used by manned aircraft pilots. Automatic Terminal Information Service (ATIS). Aircraft call signs and registration numbers. The phonetic alphabet. Phraseology: altitudes, directions, speed, and time. Airport Operations The types of airports, such as towered, uncontrolled towered, heliport, and seaplane bases. ATC towers, such as ensuring the remote pilot can monitor and interpret ATC communications to improve situational awareness. Runway markings and s ignage. Traffic patterns used by manned aircraft pilots. Security Identification Display Areas (SIDA). Sources for airport data. Aeronautical charts. Chart Supplements. Avoiding bird and wildlife hazards and reporting collisions between aircraft and wildlife. Emergency Procedures Emergency planning and communication. The characteristics and potential hazards of lithium batteries. Safe transportation, such as proper inspection and handling. Safe charging. Safe usage. Risks of fires involving lithium batteries. Loss of aircraft control link and fly-aways. Loss of Global Positioning System (GPS) signal during flight and potential consequences. Frequency spectrums and associated limitations. Aeronautical Decision-Making (ADM) Effective team communication. Task management. Crew Resource Management (CRM). Situational awareness. Hazardous attitudes. Hazard identification and risk assessment Physiology Physiological considerations and their effects on safety, such as dehydration and heatstroke. Drug and alcohol use. Prescription and over-the-counter medication. Hyperventilation. Stress and fatigue. Factors affecting vision. Fitness for flight. Maintenance and Inspection Procedures Basic maintenance. Preflight inspection. Techniques to mitigate mechanical failures of all elements used in sUAS operations, such as the battery and/or any device(s) used to operate the sUAS. Appropriate record keeping. Persons that may perform maintenance on an sUAS.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

Instructional Techniques

#NAME.

Reading Assignments

Reading assignments from course textbooks and supplemental notes are required for each class period. Recommended ouside class hours for Reading and Written assignments will be approximately 108 hours during during the semester.

Writing Assignments

Completion of student project - UAS flight profile planning. Short answer written homework assignments and navigational exercises. Recommended ouside class hours for Reading and Written assignments will be approximately 108 hours during during the semester.

Out-of-class Assignments

Students will spend six hours per week on written homework, reading assignments, and UAS flight profile planning. Student project and exam preparation. Recommended ouside class hours for Reading and Written assignments will be approximately 108 hours during during the semester.

Demonstration of Critical Thinking

- Written exams/quizzes based on FAA Remote Pilot - Small Unmanned Aircraft Systems (FAR) Part 107. - Homework and Projects based learning to provide detailed flight profiles for UAS and individual missions. - Verbal Quizzing and Problem Solving exercises

Required Writing, Problem Solving, Skills Demonstration

Homework and Projects based learning to provide detailed flight profiles for UAS and individual missions. Implementing airspace regulations, operational limitations, and weather factors into planning UAS flight profiles for each mission.

Eligible Disciplines

Aviation (flight, navigation, ground school, air traffic control): Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Federal Aviation Administration. Pilots Handbook of Aeronautical Knowledge, ed. Federal Aviation Administration, 2016

Manuals Resources

1. Federal Aviation Administration. Part 107 Advisory Circular, Federal Aviation Administration , 06-21-2016 2. Federal Aviation Administration. Remote Pilot - Small Unmanned Aircraft Systems Study Guide, Federal Aviation Administration , 08-01-2016