

# NC 111: AUTONOMOUS APPLICATIONS IN DRONES

## Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2024
Credits:	0
Total Contact Hours:	24
Lecture Hours :	24
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	48
Total Student Learning Hours:	72
Strongly Recommended:	NC 107.
Transferable to CSU:	No
Transferable to UC:	No
Grading Method:	Non-Credit Course

## Catalog Course Description

Introduction to autonomous drone applications, advanced hands-on drone flight training, current regulations and autonomous flight operations. Students will acquire knowledge in autonomous drone systems, mission planning, pay-load operations, flight crew operations and safety. Instruction on pre-flight safety checks, manual and autonomous flight control, current applications for autonomous flight, current sUAS regulations for BVLOS, drone delivery and current employment opportunities in autonomous systems. 24 lecture hours.

## Course Objectives

- Gain knowledge of autonomous flight procedures, pay-loads, crew management and fundamental flight skills necessary for gaining employment in industries utilizing autonomous drone systems.
- Demonstrate proficiency in autonomous drone flight, pay loads, use of various autonomous drone systems and accessories specific to BVLOS operations.
- Acquire knowledge of current industry best-practices, applications, salaries, customer service considerations, working conditions and methods specific to jobs that utilize autonomous drones.

## Major Course Content

1. Introduction to drones and autonomous applications
  - a. Applications of autonomous drones in science, commercial and industrial jobs
  - b. Mission planning, safety checks and crew management for pre-determined flight plans
  - c. Use of pay-loads
  - d. BVLOS operations
  - e. Software programs for autonomous flight
  - f. Career fields, salary expectations and typical duties of the jobs
2. Participation in advanced hands-on flight training exercises
  - a. Performance of pre-determined mission using autonomous drone and industry standard software

- b. Performance of both manual flight and pre-planned flights with drones systems such as the Skydio 2 using remotes, beacons to examine how to use the drones follow moving objects, perform independent movement
- c. Basic drone flight movements including hover, hover+yaw, flying square pattern with no yaw, square pattern with yaw, target practice with marked spots, flying in a circle no yaw, changing directions no yaw, changing directions with yaw, out-back-land, landing, avoiding obstacles and using inverted controls (orientated backwards flying).
- d. Completion of pay-load challenge
- e. Utilizing visual observers and night operations procedures
- f. Operational safety and emergency procedures
- g. Crew resource management
- h. Current UAS regulations for BVLOS

3. Outside field performance and obstacle course completion

## Suggested Reading Other Than Required Textbook

U.S Department of Transportation and Federal Aviation Administration Part-107 Exam Manual

U.S Department of Transportation and Federal Aviation Administration Part-107 Exam Manual [https://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aviation/media/remote\\_pilot\\_study\\_guide.pdf](https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/remote_pilot_study_guide.pdf)  
 FAA Remote Pilot Knowledge Test Guide [https://www.faa.gov/training\\_testing/testing/test\\_guides/media/remote\\_pilot\\_ktg.pdf](https://www.faa.gov/training_testing/testing/test_guides/media/remote_pilot_ktg.pdf)  
 Making Great Maps:The Complete Guide to Professional Mapping with DroneDeploy by Adam Carp [https://connexicore.com/wp-content/uploads/2020/05/Drone\\_Deploy\\_-\\_Making\\_Great\\_Maps\\_ebook.pdf](https://connexicore.com/wp-content/uploads/2020/05/Drone_Deploy_-_Making_Great_Maps_ebook.pdf)

## Examples of Required Writing Assignments

Autonomous Drone Application Research Assignment Students will be required to choose a company participating in the field of the drone industry using autonomous drone to perform tasks. Students will be required to research and write a 3-5 page, double space, 12 font, MLA or APA formatted report that includes a 1 page bibliography with at least 10 sources one of which must be a phone/email interview with professionals in the field of study currently working with autonomous drones. Students will begin by choosing 3 organizations in the field and write a brief summary of what the companies use the autonomous drone to do and their operations in the organization. Next, perform an interview with someone working at one of the chosen organizations to determine what the function of autonomous drones serve the organization and what education in drones was necessary for hire. Next, students will write a report on what jobs are currently available based on job searches for at least five employment sites and research the average salary of those in the chosen field and discuss what the potential salary may be after further education in the field. Included in the report: - A brief history of the autonomous field or use of drones chosen - List of current companies or organizations that are hiring in the field - Description or map showing where the most openings in the field are located geographically both nationally and internationally - Discussion of typical duties and responsibilities for a chosen career in the field - Phone/E-mail interview with person in the field: Example questions may include what is a typical day in your job? what education or training helped you get your job or helps you perform your duties? How did you first get interested in drones/UAVs? Reports will be graded based on students meeting

the required format for length, use of sources, use of detail and clear descriptions of the career path, job search results, interview questions/ answers and description of typical job duties

## **Examples of Outside Assignments**

**Autonomous Mission Project** This assignment requires students to work as a group to complete a autonomous drone flight scenario on campus. Students will be required to observe weather data and conditions for the planned collection days and judge appropriate conditions for flights. Students will participate by using an autonomous drone, mission planning software while monitoring the flight as visual observers always maintaining line-of-sight on the drone and communicating with each other over two-way radios. Students will participate during the scenario to complete activities and accomplish goals to achieve the objectives of the operation. Students will be required to write a detailed report discussing the process of setting up and completing the autonomous mission operation. Students must write a minimum of 3-5 pages double spaced at 12font and include weather information, procedures, crew resource management, activities completed and the outcome of the operation. Students must include in their reports a discussion of "best practices" and what would be done differently if the project could be repeated.

## **Instruction Type(s)**

Lecture, Online Education Lecture