NC 112: ENVIRONMENTAL SCIENCE APPLICATIONS IN DRONES

Citrus College Course Outline of Record

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

Catalog Course Description

Introduction to the scientific, environmental, non-profit and research applications of drone technology in solving global issues and environmental problems. Instructions includes how drones assist to the field surveying of animals and plants, study of pollution and toxic sites, measure and map research locations and field data collection of Thermal images, 3D models and aerial photos/video. Students will acquire knowledge in current global environmental issues as well as solutions drones can provide to those issues along with drone mapping, flight skills, advanced hands-on drone flight training and flight operations specific to Environmental Sciences. 24 lecture hours.

Course Objectives

- Gain knowledge of major global and environmental issues and the possibilities drones provide in solving these issues along with the hands-on flight training necessary for gaining employment in scientific, non-profit and humanitarian organizations using drones.
- Demonstrate proficiency in field collection methods related to environmental data, drone piloting and the use of industry specific equipment and software for data collection and processing.
- Acquire knowledge of environmental issues, drone piloting, mapping software, field collection methods, realistic working conditions and methods specific to jobs that utilize drones to solve environmental and humanitarian issues.

Major Course Content

1. Introduction to environmental issues
    a. Air, water, soil, ocean and plastic pollution
    b. Issues of clean drinking water and food accessibility
    c. Environmental hazards and natural disasters
    d. Global humanitarian issues and conflicts
    e. Use of drones in biology, geology and environmental sciences
    f. Non-profits using drones
    g. Drones for water testing and clean-up efforts
2. Drone Operations
    a. Flight skills and hands-on training in GPS enabled, FPV, quadcopter and autonomous drones
    b. Mission planning, safety checks and crew management for environmental drone applications
    c. Use of pay-loads and use of thermal camera operations
    d. BVLOS operations
    e. Software programs for drone mapping
    f. Career fields, salary expectations and typical duties of the jobs
3. Participation in advanced scenario based hands-on flight training exercises
    a. Performance of per-determined mission using drones and industry standard software
    b. 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).
    c. Completion of pay-load challenge, thermal camera challenge, FPV obstacle course and GPS enabled flight
    d. Utilizing visual observers and night operations procedures
    e. Operational safety and emergency procedures
    f. Crew resource management
    g. Current UAS regulations

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
FAA Remote Pilot Knowledge Test Guide 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

Examples of Required Writing Assignments

Environmental Research Drone Application Assignment Students will be required to choose an organization participating in the field of the drone industry using drones to address environmental, non=profit, humanitarian or social issues. 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 in the environmental, non-profit or humanitarian fields with drones. Students will begin by choosing 3 organizations in the field and write a brief summary of what the companies use the drones 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 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

Environmental Research Assignment This assignment requires students to work as a group to complete a drone flight scenario on campus to address an environmental question/issue they research and use the drone to solve. 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 appropriate type of 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 and measure the field site to address the environmental issue that is being researched. 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