UAS 125: APPLICATIONS IN AERIAL, LAND AND SUBMERSIBLE DRONE/ROV SYSTEMS

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2025
Credits:	3
Total Contact Hours:	54
Lecture Hours :	54
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	108
Total Student Learning Hours:	162
Transferable to CSU:	No
Transferable to UC:	No
Grading Method:	Standard Letter

Catalog Course Description

This course offers an in-depth exploration of the rapidly evolving field of Uncrewed Aerial systems (UAS) and land/submersible Remotely Operated Vehicles (ROV). Students will delve into the principles, technologies, and diverse applications of drones and ROVs across various industries as well as commercial, governmental and scientific applications. Instruction on the operation and professional crew management of aerial, land based and water based ROV operations. Proficiency in the techniques of commercial photography, cinematography, photogrammetry and media editing. 54 lecture hours.

Course Objectives

- Understand the fundamental principles and components of drones and ROVs.
- Explore the technological advancements driving the evolution of UAVs and ROVs.
- Examine the regulatory frameworks and ethical considerations governing the operation of drones and ROVs.
- Analyze real-world applications of drones and ROVs across industries such as agriculture, forestry, theater arts, public safety, environmental monitoring, film making, infrastructure inspection, search and rescue, and scientific research.
- Develop proficiency in operating and maneuvering drones and ROVs through practical exercises and simulations.
- Learn about the integration of sensors, cameras, and other payloads for specialized applications.
- Explore emerging trends and future directions in drone and ROV technology.

Major Course Content

- Introduction to Drones and ROVs
  - History, evolution, and classification
  - Basic components and functionalities
  - Comparison of different types and models
- Technologies and Innovations
  - Sensor technologies
  - Communication systems
  - Autonomous navigation and control algorithms
- Regulatory Landscape and Ethical Considerations
  - FAA regulations (or relevant regulatory bodies)
  - Privacy, safety, and ethical dilemmas
  - Liability issues and insurance considerations
- Applications Across Industries
  - Agriculture and crop monitoring
  - Environmental conservation and wildlife tracking
  - Cinematography and aerial photography
  - Infrastructure inspection and maintenance
  - Disaster response and emergency services
  - Oceanography and marine exploration
  - Archaeology and cultural heritage preservation
- Practical Training and Hands-on Experience
  - Flight simulation exercises
  - Operation and maintenance of drones and ROVs
  - Field trips and demonstrations
- Specialized Payloads and Sensor Integration
  - Thermal imaging cameras
  - LiDAR systems
  - Multispectral and hyperspectral sensors
- Emerging Trends and Future Directions
  - Advances in battery technology
  - Swarming and collaborative robotics
  - Integration with artificial intelligence and machine learning

1. Introduction to commercial drone applications and techniques
   a. Real estate photography
   b. Aerial photography and cinematography
   c. Home inspection
   d. Agricultural inspection
   e. Firefighting/Search-and-Rescue operations
   f. Construction/Mining inspection
   g. Thermal inspection
   h. Orthomoasic photography and 3-D modeling
2. Participation in advanced hands-on flight training exercises
   a. Basic drone flight movements
   b. Advanced aerial photography training exercises
   c. Completion of drone obstacle courses and accident avoidance
   d. Utilizing visual observers and night operations procedures
   e. Operational safety and emergency procedures

3. Multi-media editing of video/image files and drone mapping software
    a. Effects, adjusting color, lighting and white-balance
    b. Sound and video editing
    c. Student skills demonstration; create video sample reel
    d. Data processing and development of site reports and 3D models
    e. Post-processing of data and quality control

Suggested Reading Other Than Required Textbook

2019U.S Department of Transportation and Federal Aviation Administration Part-107 Exam ManualU.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.pdfFAA Remote Pilot Knowledge Test Guidehttps://www.faa.gov/training_testing/testing/test_guides/media/remote_pilot_ktg.pdfMaking Great Maps:The Complete Guide to Professional Mapping with DroneDeploy by Adam Carphttps://connexicore.com/wp-content/uploads/2020/05/Drone_Deploy-_Making_Great_Maps_ebook.pdf

Examples of Required Writing Assignments

Commercial Drone Application Research Assignment Students will be required to choose a commercial field of the drone industry 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 drones. Students will begin by choosing 3 companies in their chosen field and write a brief summary of what the companies use drone to do and their operations in the company. Next, perform an interview with someone working at one of the chosen companies to determine what the function of drones serve the company and what education in drones was necessary for hire. Next, students will write a report on what jobs are currently available basedon 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 commercial 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

Exploring the Role of Drones and ROVs in Environmental Conservation Objective: The objective of this assignment is to research and analyze the various ways in which drones and ROVs are utilized in environmental conservation efforts. Students will investigate specific case studies, technological innovations, and challenges associated with employing these unmanned vehicles in protecting and preserving natural ecosystems.

Assignment Instructions:
Select a specific environmental conservation project or initiative where drones or ROVs have been employed. This could include but is not limited to: Monitoring wildlife populations and habitats Tracking deforestation or illegal logging activities Assessing water quality and pollution levels in rivers, lakes, or oceans Conducting surveys of coral reefs or marine biodiversity Monitoring illegal fishing activities or poaching Assessing the impact of climate change on ecosystems
Conduct thorough research on your chosen topic. Utilize academic journals, industry reports, news articles, and reputable websites to gather information.
Write a research paper that includes the following components:
Introduction: Provide background information on the environmental issue being addressed and explain the significance of employing drones or ROVs in conservation efforts. Literature Review: Summarize existing research and case studies related to your chosen topic. Discuss how drones or ROVs have been utilized in similar projects and the outcomes achieved. Methodology: Describe the specific technologies and methodologies used in the conservation project you selected. Include details about the types of drones or ROVs employed, the sensors or cameras utilized, and the data collection and analysis methods. Results and Findings: Present the results of the conservation project and discuss any significant findings or insights gained through the use of drones or ROVs. Discussion: Analyze the strengths and limitations of using unmanned vehicles in environmental conservation. Consider factors such as cost-effectiveness, efficiency, accuracy, and environmental impact. Discuss any challenges or obstacles faced during the project and propose potential solutions or improvements. Conclusion: Summarize the key findings of your research and reflect on the overall effectiveness of using drones or ROVs in the context of environmental conservation. References: Provide a list of all sources cited in your paper using appropriate citation style (e.g., APA, MLA).
The paper should be well-organized, clearly written, and supported by evidence from reliable sources.
The length of the paper should be approximately 1500-2000 words.
Submission Guidelines:
Submit your paper electronically through the designated course platform or email it to the instructor. Include your name, student ID, and the title of the assignment on the cover page. Ensure that your paper is formatted according to the guidelines provided by the instructor.
Evaluation Criteria:
Depth of research and analysis Clarity and coherence of writing Use of evidence to support arguments Critical thinking and originality Adherence to assignment instructions and formatting guidelines

Instruction Type(s)

Lecture