CATALOG DESCRIPTION: Unmanned Aircraft Systems (UAS) are developing, and many government and non-government agencies are considering acquiring such systems. The acquisition of a system is the easy part of the entire process of running a UAS. Emergent information is becoming available on the geo-spatial utilization of a UAS. Students will confront realistic problem scenarios that incorporate such skills and concepts as the definition of acquisition system needs, data formats and types, analysis methods, and how spatial accuracy requirements emerge. Students will learn how to develop maps using the tools DataMapper INFLIGHT or Pix4D. UAS selection, project and data planning and specifications such as accuracy requirements and mission planning, software selection and data processing will be experienced.

PREREQUISITE(S):   UAS 101 - Unmanned Systems

COREQUISITE(S):   Part 107 Pilot's License for Small Unmanned Aircraft

CREDITS: 3   **HOURS**:   3

REQUIRED TEXT(S):   Price, M. (2019). *Mastering ArcGIS Pro* (1st ed.). McGraw Hill.

ISBN: ISBN-13 : 978-1260587371

Price approx. $35   Kindle Version recommended

SUPPLEMENTAL MATERIALS:

INSTRUCTOR INFORMATION:

OFFICE HOURS:

CORE COMPETENCIES: The following core competencies are embedded in this curriculum: Communicate effectively in both speech and writing; Use computer systems or other appropriate forms of technology to achieve educational and personal goals; Understand ethical issues and situations; Address an information need by locating, evaluating and effectively using information.	
LEARNING ASSESSMENT	
Student Learning Outcomes:	*Suggested Means of Assessment:*
Assess commercially available UAS and its suitability for each application.	Research Paper
Assess commercially available data processing software and its suitability for each application.	Research Paper
Design a UAS-based aerial imagery operation.	Project Summary & Plan
Design a UAS-based flight mission.	Project Summary & Plan
Recognize and recommend potential applications of the UAS for GIS operations.	Project Summary & Plan
Apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate UAS acquisition and data processing and analysis methods.	Major UAS Project
Produce geospatial products such as ortho photos and digital terrain models.	Major UAS Project

GRADING SYSTEM:			C+	=	77 < 80
A	=	90 < 100	C	=	70 < 77
B+	=	87 < 90	D	=	60< 70
B	=	80 < 87	F	=	Below 60

DISABILITY SERVICES STATEMENT: Warren County Community College is committed to providing all students equal access to learning opportunities. Student Services is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations. Students who have, or think they may have, a disability (e.g. mental health, learning, vision, hearing, physical or systemic), are invited to contact Student Services to arrange a confidential discussion at (908) 835-2300 or by email at StudentServices@warren.edu as soon as possible. Students registered for Disability Services with Student Services, who have requested accommodations for the current semester will be provided with an electronic letter detailing individual accommodations and are encouraged to contact the instructor early in the semester to discuss accommodations outlined in their letter.

INSTRUCTIONAL SUPPORT CENTER: The Instructional Support Center (ISC), located in Room 105 across from the library, provides academic support at no cost to WCCC students and

is available for courses in which they are currently enrolled. The ISC is staffed with trained professional and peer tutors who are ready to help you understand and succeed. For scheduling or further information, visit the ISC in person, online at http://www.warren.edu/tutoring/ or by telephone at (908)835-2354.

STATEMENT AND POLICY ON CHEATING, PLAGIARISM AND ACADEMIC DISHONESTY: Students are required to perform all the work specified by the instructor and are responsible for the content and integrity of all academic work submitted. A violation of academic integrity will occur if a student: (1) knowingly represents work of others as one's own, (2) uses or obtains unauthorized assistance in any academic work, (3) gives fraudulent assistance to another student, or (4) furnishes false information or other misuse of college documents.

In cases of suspected violation of academic integrity, the incident is to be reported to the Office of Academics. A student found guilty of violating the rule of academic integrity by the Vice President of Academics will be considered to have failed in personal obligation to the College; such failure will be subject to disciplinary action by the College. Unless otherwise notified, the instructor will allow students who are pending disciplinary action to attend class.

REQUIRED FORMAT FOR RESEARCH PAPERS: Research papers written for any Warren County Community College class must conform to the required documentation style. Papers written for humanities (and some social science) classes will follow the most recent edition of the Modern Language Association (MLA) in-text citation and bibliographic methods. Social science and science papers will require the use of the most recent edition of the American Psychological Association (APA) in-text citation and bibliographic methods.

Please consult with your instructor regarding the correct documentation style to use in his/her class.

ATTENDANCE POLICY: Students are expected to attend all class sessions of courses in which they are enrolled and are responsible for all material presented in class and all homework assignments.

Grades are based on the quality of work completed in meeting the requirements for a particular course, as stated in the course syllabus and catalog description.

Excessive absence may be considered sufficient cause for dismissal from class by an instructor or other appropriate college staff member. Any decision to exclude a student from class or the College due to excessive absence shall be subject to review by the President in accordance with established procedures. Students who have not attended class are not entitled to a refund of tuition.

WCCC HAYTAIAN & MAIER LIBRARY

Text: 908-652-4445   Email: lstoll@warren.edu

http://warren.libguides.com

Please see the library's website above for current semester hours.

The WCCC Library offers a wide range of services to students specific to the information literacy goals of the College which includes suggesting research strategies, facilitating the use of both digital and print resources, as well as assisting students with citations to avoid plagiarism.

The library also serves as the College's computer space, with computers for students to use when the library is open. Students also have free, unlimited printing from the College's computers, as well as space to study.

The library is where students can get their college student ID cards. All students are required to get a student ID card and carry it while on campus for security purposes. To get a student ID card, you must bring another form of ID to the library. You may also be asked to bring a printed copy of your current class schedule. You can get a student ID card any time that the library is open. These cards do not expire and can be used for your duration at WCCC.

Additionally, the library participates in a national inter-library loan program which is available free to all students and faculty. You can submit ILL requests by emailing the librarian or by stopping by the library's circulation desk.

TOPICAL OUTLINE:

1. Describe the historical evolution of the Unmanned Aircraft System (UAS)
2. Recognize the defense & civilian contributions to the UAS development
3. Understand the current state of the UAS development
4. Classify different UAS according to their make and characteristics
5. Describe the different classes of the UAS
6. Describe and identify the different elements of an Unmanned Aircraft System (UAS)
7. Understand the functionality of each element making the UAS
8. Identify the different miniaturized sensors used for remote sensing
9. Understand the fundamentals of digital cameras and LiDAR
10. Understand the basics principals of GPS and IMU
11. Understand the concept of operation design strategy
12. Understand risk assessment
13. Design a CONOP and Risk assessment for a UAS mission
14. Understand basic requirements for mission planning
15. Understand sensor internal geometry

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16. Describe factors affecting flight plans such as way points, product resolution and accuracy, aircraft speed, etc.
17. Practice flight planning for a UAS mission
18. Understand calibration requirements for imaging sensors and auxiliary systems
19. Understand the concept of sensor and product geo-location
20. Understand the concept of direct geo-referencing
21. Understand the concept of aerial triangulation
22. Outline complete UAS data processing workflow
23. Distinguish between different products obtainable from different UAS payload sensors
24. Recognize different applications of the UAS for civilian use
25. Understand the major considerations in selecting a UAS for geospatial business
26. Recognize the main providers of software for UAS data processing
27. Create mapping products using the data processing software DataMapper INFLIGHT or Pix4D
28. Completed final project presentation

GRADING METHODS:

ITINERARY: