Palomar College – Graphic Communications
GCIP 268 Digital Imaging with Drones II
Six hours lecture/laboratory (3 units)

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Office Hours: MD-119 M 2:30PM-5:30PM, every 1st/3rd/5th W 2:30-5:30PM

Catalog Description
Intermediate uses of unmanned vehicles for digital imaging. This hands-on course covers high resolution video, aerial imaging, and intelligent mission planning for image capture, editing, mapping and related uses.

Student Learning Outcomes
Mission Planning: Use intelligent mission planning modes to script out flight paths for image capture.

Agriculture Mapping: Use NDVI payload and mission planning to acquire images and post-process to create a map for precision agriculture..

Prerequisite
GCIP 168: The student must have earned a letter grade of A, B, C or P(Pass) in the prerequisite course, unless otherwise stated.

Requirement or Elective for the Following Certificates and/or Degrees
Drone Technology A.S. Degree
https://palomar.curricunet.com/Report/Program/GetReport/1330?reportId=147

Unmanned Aircraft System (UAS) Certificate of Achievement
https://palomar.curricunet.com/Report/Program/GetReport/1329?reportId=147

Website
http://www2.palomar.edu/users/mbealo/
Follow the GCIP 268 link. The site contains the syllabus, a calendar detailing the content covered each week, and grading requirements. Supplemental material may be found on the page as well.

Resources
Aerial Photography and Videography Using Drones, by Eric Cheng. Peachpit Press, 2015. ISBN: 9780134122779
http://proquest.safaribooksonline.com/book/photography/9780134122847

Required Reading
Agisoft Metashape Manual
https://www.agisoft.com/pdf/metashape-pro_1_6_en.pdf

Agisoft Support
http://www.agisoft.com/support/tutorials/beginner-level/

DJI Inspire 2, downloads
https://www.dji.com/inspire-2/downloads

DJI Inspire 1, downloads
https://www.dji.com/support/product/inspire-1-v2

Yuneec Typhoon H w/ Intel RealSense, downloads
http://us.yuneec.com/downloads-typhoon-h

BirdsEyeView FireFLY6 Pro:
https://www.birdseyeview.aero/pages/manuals
https://www.birdseyeview.aero/pages/downloads
https://www.birdseyeview.aero/pages/training

Software
Agisoft MetashapePro, AvA Mission Planning, Adobe Photoshop, video editing (iMovie/FCPX/Premiere), Compressor.

Materials
The professor will provide instructions on how to gather and create images needed to complete projects. Instructor will also provide information on obtaining additional material that may be required.

Required Supplies
USB3 thumb drives or a Thunderbolt HD help out. A big smile and a healthy dose of enthusiasm goes a long way as well.

Open Lab Access
Open lab hours are subject to change - check lab schedules for updates.

Course Objectives
Successful students will be able to do the following by the end of the course:

1. Plan a dynamic scripted sequence that fits the clients needs;

2. Capture an accurate number of images in order to create detailed visualization;

3. Capture and process images and generate relevant data for agriculture;

4. Use intelligent mission planning modes to script out flight paths for image capture.

Additional Program Content

Introduction	Safety issues and regulations
Data Aquisition	Intelligent mission planning modes
Automated flight path planning	Mission planning a scripted sequence
Content creation	UAV imaging for remote sensing
Post-Processing	Processing imagery for 3D export
Editing aerial images for agriculture	
Flight planning for geospatial data aquisition	
Generating images and data for GIS related uses	
Editing UAV and ROV generated images and video	
Planning for digital imaging acquisition for agriculture	

Outside Assignments

Students are expected to spend a **minimum of three hours per unit per week** in class and on outside assignments. Students are to read text, study lecture/lab notes, research and write required paper(s), and complete lab assignments. Keep notebook of all project storyboards, and finished videos. Reading articles and journals to maintain currency in new and emerging technology. Sketching and designing shots to capture intended views.

Policies

1. Any student with a verified disability may be entitled to appropriate academic accommodations. Please contact Disabled Student Services for more information.

2. The GC Lab is available for your convenience in practicing and completing course assignments. Lab hours are posted.

3. Your classroom participation counts as part of your final grade. Because this course requires extensive hands-on application, attendance is imperative. If you choose to drop this class, it is your responsibility to do so, not the responsibility of the instructor. To drop the course use eServices otherwise, an F or FW will be recorded on your permanent record.

4. Students should be aware of Palomar's Student Rights and Responsibilities in the 2019-2020 Catalog. Please pay particular attention to the sections on Academic Integrity, Drugs and Alcohol Policy, Smoking Policy, Sexual Harassment Policy, Student Behavior Rules and Regulations, and the Student Conduct Code. [Also Class Schedule]

5. Meeting deadlines is critical. All projects must be properly completed and submitted by the assigned due date. If a project is turned in late, it is dropped a minimum of one full letter grade per week.

Evaluation

Evaluation for this course will consist of a series of projects, assignments, lessons and class participation. Assignments are evaluated on demonstration of concept assigned, use of media, handling of techniques, and completion by due date. These include but are not limited to the following:

Precision Agriculture: Use of proper Mission Planning techniques to create 100 acrea (about 2,000x2,000 feet) agriculture/RGB/Thermal maps. Location may be provided or the student team may choose their own. Focus will be on the capabilities of the MicaSense Altum for precision agriculture.

Grading - Precision Agriculture (100 pts. total)
MicaSense Altum NDVI map: 10 pts.
MicaSense Altum RGB: 10 pts.
MicaSense Altum Thermal: 10 pts.
Process NDVI Map: 10 pts.
Process RGB Map: 10 pts.
Process Thermal Map: 10 pts.
Orthomosaics (3 total): 10 pts.

DEM (3 total): 10 pts.
Report (3 total): 10 pts.
PDF 3d model (3 total): 10 pts.

Terrain Aware Map: Use of proper Mission Planning techniques to create a 100 acrea (about 2,000x2,000 feet) survey map. Location may be provided or the student team may choose their own. Focus will be on the capabilities of the DJI Inspire 1 or 2 for mapping with terrain awareness.

[Project requires an understanding of proper ooperation of various DJI drones and documentation as well as the MapsMadeEasy App.]

Grading - Survey Map (100 pts. total)
Incorporate Ground Controll Points: 10 pts.
Mission Planning (screen shot flight paths - 0 & 90 degrees): 10 pts.
Process RGB Map: 20 pts.
Export Ortho Tiff from Metashape with KML and World files: 20 pts
    (BealoM Ortho.tif, BealoM Ortho.kml, BealoM Ortho.tfw)
Export DEM Tiff from Metashape with KML and World files: 20 pts
    (BealoM DEM.tif, BealoM DEM.kml, BealoM DEM.tfw)
Use Metashape to create a pdf of the 3D Model: 10 pts.
    (BealoM 3D.pdf)
Export Report in pdf: 10 pts.
    (BealoM Report.pdf)

Scripted Sequence: Utilize Intelligent Flight Modes to create a 3 to 7 minute scripted video.

[Project requires an understanding of DJI Inspire 2 manuals and documentation as well as the DJI Go4 App.]

Grading - Scripted Sequence (100 pts. possible)
Script and Pre-Viz: 20 pts.
Spotlight Pro: 10 pts. "BealoM spotlight.xxx" https://www.youtube.com/watch?v=Tsu0dEi2wts
Course Lock: 10 pts. https://youtu.be/ZQXQvm2q6ZA?t=948
Active Track: 10 pts. https://youtu.be/ZQXQvm2q6ZA?t=261
Waypoint (at least 5): 10 pts. https://www.youtube.com/watch?v=t2WF6fZ8FyI
Point of Interest: 10 pts. https://youtu.be/ZQXQvm2q6ZA?t=601
Use at least 3 different lenses: 10 pts.
Video Edits: 20 pts.

Dual-Dual Op: Scripted Sequence utilizing 2 UAVs in the air at the same time get multiple perspectives of the subject matter to create a 30 sec to 2 minute scripted video edit.

Grading - Dual-Dual Op (100 pts. possible)
Script and Pre-Viz: 25 pts.
Work as a team: 25 pts.
Video Edits: 50 pts.
Incorrect video and audio edits will be -1 pt for each occurrence.

These projects will account for approximately 67% of your final grade, whereas classroom participation will account for 33%. Each project will reflect specific UAV mission techniques and may have special output properties. Details will be given defining the parameters of each project. The grading scale for the course is as follows:

90-100% = A   80-90% = B   70-80% = C 60-70% = D < 60% = F

Important Dates
All outstanding fees must be paid within 10 days of registration to avoid being dropped from classes. If you need $$ for college, apply for a BOGW fee waiver. Questions? Call 760-744-1150 x8116. If students are not sure about their fee balances, they can check them through eServices at www.palomar.edu.

Last day to qualify for a semester class refund	Saturday, Feb 8
Last day to add with a code or drop with no notation on record	Monday, Feb 10
Last day to drop with a "W" on record	Saturday, March 21
Final Project Due	Friday, May 22

Excerpts from Palomar's Educational Philosophy
from the 2000-2001 Catalog, p. 13
The educational philosophy of Palomar College is based upon belief in the value of the individual and belief in the individual's potential for intellectual, ethical, personal, and social growth. Only through growth in these areas can a citizen come to understand personal rights…

Excerpt From Teaching to Learning – A New Paradigm for Undergraduate Education
By Robert B. Barr and John Tagg
In the Learning Paradigm… a college's purpose is not to transfer knowledge but to create environments and experiences that bring students to discover and construct knowledge for themselves, to make students members of communities of learners that make discoveries and solve problems. The college aims, in fact, to create a series of ever more powerful learning environments…

Selected Excerpts from Student Code of Conduct
II. Standards of conduct. Here is a list of examples of conduct inappropriate and unacceptable for which students should expect to be held accountable.
  A. Students are expected to avoid any type of dishonesty, including, but not limited to cheating, plagiarism, forgery, fabrication or counterfeiting documents, furnishing false information to the College, alteration or misuse of college documents or records, duplication of assignments, or aiding another in an act of dishonesty. As noted in the Statement of Academic Integrity, honesty is of utmost importance in all endeavors related to the College. A detailed discussion of academic dishonesty and related consequences are addressed in Section II.
  I. Continued disruptive behavior, profanity or vulgarity, or defiance of the authority of, or abuse of College personnel.
  L. Misuse of District computers, telephone, or telecommunications devices.

Also refer to : https://www2.palomar.edu/pages/studentaffairs/home/policies/

Final Note
The instructor reserves the right to make any needed and appropriate adjustments to this syllabus.