Effective Term: Fall 2018
Status: Pre Launched

PALOMAR COLLEGE
COURSE OUTLINE FOR CREDIT COURSE

Courses numbered 1 - 49 are remedial or college preparatory courses which do not apply toward an A. A. Degree and are not intended for transfer.
Courses numbered 50-99 apply toward an AA Degree, but are not intended for transfer.
Courses numbered 100 and higher apply toward an AA Degree and/or are intended for transfer to a four-year college or university.

Course Number and Title: GEOG 140 Introduction to Remote Sensing and Drone Data Processing

Unit Value: 3

Total Lecture Hours: 48-54

Lecture Hours Per Week: 3

Total Lab Hours:

Lab Hours Per Week:

Grading Basis: Grade/Pass/No Pass

Basic Skills Requirements: Appropriate Language and/or Computational Skills.

Requisite(s)
To satisfy a prerequisite, the student must have earned a letter grade of A, B, C or P(Pass) in the prerequisite course, unless otherwise stated.

Prerequisite:
None
Corequisite:
None
Prerequisite: Completion of, or concurrent enrollment in
None
Recommended Preparation:
None
Limitation on Enrollment:
None

Catalog Description:

Provides students with a basic understanding of theories and techniques used in the processing and analysis of satellite and drone (i.e. Unmanned aircraft systems) data. Topics include image and sensor characteristics, information derived from satellite and drone data , and image interpretation and analysis.

Specific Course Objectives:
Upon successful completion of the course the student will be able to:

1. Distinguish between different types of remote sensing systems and unmanned aircraft systems (UAS);
2. Identify the appropriate satellite and UAS sensors for the application under consideration;
3. Specify the strengths and limitations of various remote sensing systems and UAS;
4. Explain the basics of the electromagnetic spectrum;
5. Preprocess and analyze remote sensing and UAS data;
6. Implement and interpret the results from unsupervised classification, supervised classification, and other object based classification techniques;
7. Assess and document the spatial and attribute accuracy of remote sensing and UAS data;
8. Construct and analyze 3D terrain and building models created with Light Detection and Ranging (LiDAR) and UAS data.

Methods of Instruction:
Methods of Instruction may include, but are not limited to, the following:

1. Lecture
2. Demonstration
3. Guest Speakers
4. Learning Modules
5. Discussion
6. Group Projects/Activities
7. Other (Specify): Student presentations of real-world applications of remote sensing and drones in environmental research will be required.

Content in Terms of Specific Body of Knowledge:

I. Electromagnetic Radiation Principles
  A. Insolation and irradiance
  B. Electromagnetic spectrum
    1. Ultraviolet
    2. Visible
    3. Near infrared and thermal infrared
    4. Microwave and radio waves
  C. Radiation
    1. Emission
    2. Reflection
    3. Transmission
    4. Absorption
II. Satellite Sensors and Unmanned Aircraft Systems (UAS) Sensors
  A. Active and passive systems
    1. Multispectral sensors
    2. Hyperspectral sensors
    3. Infrared sensors

        4. Visible light sensors
        5. Laser scanners (LiDAR)
III. Processing of remote sensing and UAS data
    A. Geometric correction
    B. Radiometric correction
    C. Examples of output
        1. Orthorectified images
        2. Stereoscopic images
        3. 3D models
IV. Image Enhancement
    A. High pass filter
    B. Low pass filter
    C. Edge enhancement filter
    D. Directional filter
    E. Histogram equalization stretch
V. Image Classification
    A. Supervised classification
        1. Strengths
        2. Limitations
    B. Object based classification
        1. Strengths
        2. Limitations
    C. Unsupervised classification
        1. Strengths
        2. Limitations
VI. Change Detection
    A. Image differencing
    B. Multi-date visual change detection
VII. Accuracy Assessment
    A. Spatial accuracy
    B. Attribute accuracy

Textbooks/Resources:
May Include Textbooks, Manuals, Periodicals, Software, and Other Resources

1. Terwilliger, Brent. Small Unmanned Aircraft Systems Guide: Exploring Designs, Operations, Regulations, and Economics. Newcastle: Aviation Supplies and Academics, 2017.ISBN: 978-1619543942
2. and/or Jensen, John. Introductory Digital Image Processing: A Remote Sensing Perspective. 4th ed. Upper Saddle River: Prentice Hall, 2015.ISBN: 978-0134058160
3. or Keranen, Kathryn; Kolvoord, Robert. Making Spatial Decisions Using GIS and Remote Sensing: A Workbook. Esri Press, 2013.ISBN: 978-1589483361
4. and/or Course reader/Handouts

Required Reading:
Students are required to research online articles and read trade publications in order to learn about new applications of UAS and remote sensing.

Suggested Reading:

Outside Assignments:
Students are expected to spend a minimum of three hours per unit per week in class and on outside

assignments, prorated for short-term classes.

Students are required to complete homework problems and weekly learning modules, as well as conduct online research on a variety of class topics (e.g. hardware, software, data processing algorithms). Students are also expected to present case studies on emerging applications of UAS and remote sensing.

Critical Thinking:
Student are expected to apply deductive reasoning to complete examinations, learning modules, and homework problems. They will also be trained to troubleshoot technical problems and seek out relevant resources in an independent manner.

Required Writing:
Students will complete approximately 12 learning modules (2-3 pages each) throughout the course. They will be required to produce concise and well-written responses.

Methods of Assessment:
Methods of Assessment may include, but are not limited to, the following:
Exams/Tests
Oral Presentation
Class Participation
Class Work
Homework
Demonstration

Open Entry/Open Exit:
No, course is not offered as open entry/open exit.

Is Course Repeatable for Reason(s) Other Than Deficient Grade? No

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