

SYLLABUS

SCOPE Advanced techniques and applications of remote sensing and image processing.

GRADING

688	50% - Seminar Presentations and Participation
	20% - Research Project Presentation
	30% - Research Project Paper
688L	100% - Laboratory Exercises

READING ASSIGNMENTS

Required: Jensen, J. R., 2005. *Introductory Digital Image Processing - A Remote Sensing Perspective*, 3rd Edition, Prentice-Hall: Englewood Cliffs, New Jersey.

Avail in lab: ERDAS, Inc. *Field Guide*, Atlanta, Georgia. (Found on the bookshelves of the CESAR Lab)

Articles: Journal articles will also be assigned (see below). You will need to make copies at your expense or distribute electronic copies to your classmates.

SEMINAR PRESENTATIONS

There will be weekly seminar discussions following an overview lecture on that week's topic by the instructor. Each student will be responsible for leading one discussion session during the semester. Prior to leading a discussion, the student will be responsible for finding and reading five to eight key journal articles or book chapters that pertain to their topic. From those, three (3) of these articles will be selected for seminar discussions. Two of these three articles will be orally summarized to the class and one will be discussed in an open forum by the whole class (about 20 minutes for each article). The student in charge is the facilitator and should lead but not dominate discussion.

Two or more weeks prior to presentation:

- Students will search for articles pertinent to the discussion topic and select five to eight candidate refereed journal articles or book chapters for discussion.
- Students will send Prof. Stow the bibliographic citations for these articles, as well as the abstracts for the three that they would prefer to discuss.
- Prof. Stow will provide feedback and assist students in finalizing the focus article that all students will read and two others that will be discussed.

One week prior to presentation:

- The presenter will provide an electronic copy of one article to all students and Stow. All students are responsible for reading the assigned article(s) prior to the class meeting during which it will be discussed. For this key article, the student presenter for that week will primarily serve as a leader of discussion, rather than the sole discussant.
- Copies of bibliographic information for all four articles should be emailed to everyone a week prior to the class period in which it will be discussed.

Just prior to or at the time of the presentation:

- Citation information, abstracts (your written summaries of the articles) and pertinent graphics (not too many) should be distributed by the presenter to the students and instructor.
- The presenter is responsible for leading (i.e., facilitating) the discussion of the focus paper.
- Other seminar participants are responsible for participating in the discussion and should ask questions pertaining to the other articles.

RESEARCH PROJECT

The objective is to perform an analytical study that involves remote sensing (RS) and/or image processing (IP). The emphasis is on conducting an analysis; either of some spatial relationship(s) or distribution(s) by applying RS/IP, or on the reliability, accuracy, and/or efficiency of specific methods or techniques.

- An outline covering the topic and procedures for the study is due on October 14.
- Each student will summarize the procedures and results of the study in a 25-30 minute presentation on one of the last two class meetings.
- A 7-10 page, double-space write-up of background, procedures and results (including at least one graphical product) is due in the instructor's mailbox by 4:30 PM Dec. 18.

GEOG 688 LECTURE/SEMINAR SCHEDULE

Week/Date	Lecture/Seminar Topics	Presenter	Jensen Text
1/Sep-2	Course Introduction	Stow	Chs. 1 & 3
2/Sep-9	Radiometric Processing (<i>missing data, calibration, normalization, atmospheric correction</i>)	Stow	Ch. 6
3/Sep-16	Georeferencing, Registration, Mosaicking (<i>softcopy photogrammetry, GPS automation, auto-matching</i>)	Nunley	Ch. 7
4/Sep-23	Advanced Classification Approaches (<i>neural networks, genetic classifiers, fuzzy classifiers</i>)	Cook	Chs. 9 & 10
5/Sep-30	Advanced Classification Approaches (<i>machine learning classifiers, classification trees, expert classifiers</i>)	Caldwell	Chs. 9 & 10
6//Oct-7	Spectral Transforms & Biophysical Mapping (<i>vegetation state/rates, energy balance, water properties</i>)	Samarin	Ch. 8 pp. 274-310
7/Oct-14	GIS Updating (<i>land use, roads, buildings</i>) and Land Cover/Land Use Change (<i>change detection, change identification</i>)	Tsai & Gaudette	Ch. 12
8/Oct-21	Hyperspectral Image Data Analysis (<i>data visualization, atmospheric corrections, geologic applications, vegetation applications</i>)	Koehler	Ch. 11
9/Oct-28	Spectral Mixture Analysis (<i>Theory, end-member selection, linear vs. non-linear</i>)	Scully	Ch. 11, pp. 445-456
10/Nov-4	Image Texture (<i>first-order, second-order, classification input</i>)	Hickox	Ch. 8, pp. 322-329
11/Nov-11	No class – Veterans Day Holiday	-----	
12/Nov-18	Semi-automated Feature/Object Detection (<i>delineation & identification of trees, roads, buildings, etc.</i>)	Perkins	Ch. 9
13/Nov-25	No class – furlough day/Thanksgiving week	-----	
14/Dec-2	Object-based Classification (segmentation, region growing, multi-pixel classification)	Toure	Ch. 9
15/Dec-9	Research Project Presentations	Students	
16/Dec-16	Research Project Presentations	Students	

GEOG 688L LABORATORY

LAB INSTRUCTORS

Caitlin Chason (chason@rohan.sdsu.edu) & Yuki Hamada (yhamada@rohan.sdsu.edu)

LAB EXERCISES

Students will perform hands-on lab exercises involving image processing techniques. The labs will be performed by pairs of students, based on a hard copy exercise passed out during the 688 portion of the class. One copy of a brief (1 - 2 page) summary of the lab results, with any supporting documentation attached, will be required from each student team two weeks after the last laboratory period dedicated to a particular exercise. The lab exercises are the sole basis of the 688L grade.

SCHEDULE

Week	Lab Activity	TA
1/Sep-3	Introduction ERDAS Imagine or ENVI*	Yuki
2/Sep-10	Introduction ERDAS Imagine or ENVI* (cont.)	Caitlin
3/Sep-17	Georeferencing and Registration (Imagine)	Yuki
4/Sep-24	Land Cover Classification (Imagine)	Yuki
5/Oct-1	Expert Classifier (Imagine)	Yuki
6//Oct-8	NOAA-AVHRR NDVI Composites (Imagine)	Yuki
7/Oct-15	Land Use/Cover Updating and Change Analysis (Imagine & ArcGIS)	Yuki
8/Oct-22	Hyperspectral Processing: Geological Applications (ENVI)	Caitlin
9/Oct-29	Spectral Mixture Analysis (ENVI)	Caitlin
10/Nov-5	Image Texture (ENVI)	Caitlin
11/Nov-12	Spatial Modeler (Imagine)	Caitlin
12/Nov-19	Semi-automated Linear Feature Extraction (Feature Analyst-Windows)	Caitlin
13/Nov-26	None - Thanksgiving	
14/Dec-3	Demos: OBIA (Definiens Professional-Windows); MESMA (ENVI/VIPER)	C. Lippitt & Yuki
15/Dec-10	Research Projects	
16/Dec-17	Research Projects	

* Students who have not taken GEOG 588 and do not have experience with ERDAS Imagine will work on at least the first two lab exercises from 588. Students who have taken GEOG 588 may begin to get familiar with ENVI by completing the first part of the Hyperspectral Processing exercise.