GEOG 5365: Fall 2017 Digital Image Processing (3 Credit Hours: Lecture and Computer Lab)

CONTACT INFORMATION

Instructor: Dr. Samuel Adu-Prah E-mail: <u>SXA054@shsu.edu</u> Office: Lee Drain Building Room 00324 Lecture: M 02:00 pm - 04:50 pm, TWC 00209 Office Hours: M-10.00 am -1.00 pm (TWC 209); or by appointment

COURSE DESCRIPTION

This course emphasizes on the general principles of digital image processing to extract information from remotely sensed data. Some of the remotely sensed data to be investigated include Landsat ETM, SPOT, Hyperspectral Images, LiDAR, and Radar. Throughout the course, emphasis would be placed on image processing, image analysis, image classification, and integrating information extracted from remotely sensed data into a GIS. Some of the digital image processing techniques to be covered include: image acquisition, image enhancement, image restoration, color image processing, image segmentation, image compression, image recognition, image quality assessment and statistical, evaluation and change detection. Students will learn to use an industry standard digital image processing software- ERDAS Imagine. This course is composed of lectures, laboratory exercises and student presentations.

OBJECTIVES:

The lecture and laboratory components of the course will enable students to:

- 1. Understand the fundamentals and applications of digital image processing
- 2. Use digital image processing techniques to extract information from remotely sensed data.
- 3. Use ERDAS Imagine, an industry standard image processing and analysis software to accomplish tasks.
- 4. To apply knowledge gained to specific area of interest.

COURSE MATERIALS

Required:

Introductory Digital Image Processing: A Remote Sensing Perspective, Jensen, J.R. 4th Edition. ISBN 0-13-145361-0. Pearson Prentice Hall.

ERDAS Imagine Tour Guide and Field Guide (provided by instructor). Required for labs (Digital version will be provided with lab materials by the instructor).

Reference:

Digital Image Processing, Gonzalez, R.C., Woods, R.E. 3rd Edition. ISBN 0-13-168728-8. Pearson Prentice Hall

COURSE PREREQUISITES

Required: None

LABORATORY AND HOMEWORK ASSIGNMENTS:

Students are expected to attend class (both lecture and laboratory) regularly, take exams, complete lab assignments, course project, and quizzes. The laboratory component of this course will make extensive use of the ERDAS Imagine software. The labs will use datasets at local, national, and international levels. Detailed instructions for the labs will be provided to students. A course project will be completed in groups. Students are required to use the knowledge and skills acquired during the course to complete the project. All work will be due on the date specified. Late assignments will not be tolerated

ASSESSMENT/EVALUATION

To achieve the course objectives students will be evaluated on the basis of 2 exams (midterm, finals), 4 quizzes, 9 lab exercises, and a group project presentation. All lab reports and assignments must be received on time. Attendance and participation in class activities are very important and will account for part of the total grades.

Grades will be based on the following:

Group Project presentation	150	15%
Midterm Exams	250	20%
Quizzes (1, 2, 3, and 4)	100	10%
Lab reports, assignments and Exercises	200	20%
Participation and Attendance	50	5%
Final Exams	250	20%
Total Score	1000	100%

Table 1: Assessment/Evaluation points

Grading will be on the scale:	90 - 100%	- A Range
	80 - 89%	- B Range
	70 - 79%	- C Range
	60 - 69%	- D Range
	0 - 59%	- F Range

ADDITIONAL COMMENTS:

This class represents a commitment of time and energy for both the faculty and student. It is expected that the student put in an additional 2-3 hours of work for this course. This number represents an average and not an absolute maximum threshold. This means that some students will have to put in even more time to learn the material presented in this course. Work schedules or other responsibilities do not represent acceptable exceptions to this obligation.

Office hours have been listed above. Other hours can be arranged if necessary. If you have problems, please see me as soon as possible. Waiting until the end of the semester may be too late.

Absences: In accordance with University Policy, regular attendance is required; however, no point will be awarded or subtracted based on your attendance. You are responsible for all material covered in every class, regardless of whether you attended or not. It is your responsibility to obtain notes, assignments, etc., from fellow class members if you miss a class. Absences for religious holy days must be scheduled with the instructor in accordance with official university policy. University policy states that a student who is absent from class for the observance of a religious holy day must be allowed to take an examination or complete an assignment scheduled for that day within a reasonable amount of time after the absence. Students must be excused to travel for observance of a religious holy day. A student who wishes to be excused for a religious holy day must present the instructor with a written statement describing the holy day(s) and the travel involved. The instructor will provide the student with a written description of the deadline for the completion of missed exams or assignments.

Academic Integrity: The Student Code of Conduct (*section 5.3*) states that the University expects all students to engage in all academic pursuits in a manner that is above reproach. Students are expected to maintain complete honesty and integrity both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Furthermore, the University and its official representatives may initiate disciplinary proceedings against a student accused of any form of academic dishonesty including, but not limited to cheating on an examinations or other academic work which is to be submitted, plagiarism, unauthorized collusion, and the abuse of resource materials. All students must fully develop their own solutions. You are not allowed to work together on any assignment. Do not copy anyone else's assignment and do not allow your assignments to be copied. Cheating on any portion of an assignment will result in a grade of zero for the entire assignment.

Proper Classroom Demeanor: In compliance with the University Code of Conduct, students will refrain from behavior in the classroom that intentionally or unintentionally disrupts the learning process and, thus, impedes the mission of the university. Please turn off or mute your cellular phone and/or pager before class begins. Students are prohibited from eating in class, using tobacco products, making offensive remarks, using inappropriate language, reading newspapers, sleeping, talking among each other at inappropriate times, wearing inappropriate clothing, or engaging in any other form of distraction. Inappropriate behavior in the classroom shall result in, minimally, a directive to leave class or being reported to the Dean of Students for disciplinary action in accordance with university policy.

STUDENTS WITH DISABILITIES POLICY:

It is the policy of Sam Houston State University that individuals otherwise qualified shall not be excluded, solely by reason of their disability, from participation in any academic program of the university. Further, they shall not be denied the benefits of these programs nor shall they be subjected to discrimination. Students with disabilities that might affect their academic performance should register with the Office of Services for Students with Disabilities located in the Lee Drain Annex (telephone 936-294-3512, TDD 936-294-3786, and e-mail <u>disability@shsu.edu</u>). They should then make arrangements with their individual instructors so that appropriate strategies can be considered and helpful procedures can be developed to ensure that participation and achievement opportunities are not impaired.

SHSU adheres to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations for students with disabilities. If you have a disability that may affect adversely your work in this class, then I encourage you to register with the SHSU Services for Students with Disabilities and to talk with me about how I can best help you. All disclosures of disabilities will be kept strictly confidential. NOTE: No accommodation can be made until you register with the Services for Students with Disabilities. For a complete listing of the university policy, see:

http://www.shsu.edu/dept/academic-affairs/documents/aps/students/811006.pdf

Visitors in the Classroom: Occasion visiting of classes by responsible persons is allowed with prior arrangement with the instructor, as long as it does not interfere with the registered members of the class or the educational process. Unannounced visitors to class must present a current, official SHSU identification card to be permitted in the classroom. They must not present a disruption to the class by their attendance. If the visitor is not a registered student, it is at the instructor's discretion whether or not the visitor will be allowed to remain in the classroom.

COURSE SCHEDULE: <u>Lecture</u>: **M** 02:00 pm - 04:50 pm, TWC 00209, <u>Computer Lab</u>: **M** 02:00 pm - 04:50 pm, TWC 00209

Topical Outline: Subject to change/revised

Week	Lecture Topic	Readings
Week 1: August 23	Course Introduction & Overview**	
Week 2: Aug 28	Course Introduction & Overview** Digital Image Processing: Remote Sensing Perspective Lab 1: Introduction to ERDAS Imagine	Jensen Ch 1, 2
Week 3: Sept. 4	Labor Day Holiday Monday, Sept 4Digital Image Processing Hardware andSoftware ConsiderationsQuiz 1Lab 2: Map composition in ERDAS	Jensen Ch 3
Week 4: Sept. 11	Image Quality Assessment and StatisticalEvaluationLab 3: Geometric Correction Part 1	Jensen Ch 4
Week 5: Sept: 18	Image resolutions, geometric and radiometriccorrectionQuiz 2Lab 4: Geometric Correction Part 2	Jensen Ch 7 Handouts <i>Article Review</i>
Week 6: Sept. 25	Image enhancement and transformation <u>Lab 5:</u> Subset, mosaic, layer stack images, and data acquisition	Jensen Ch 8
Week 7: Oct 2	Pattern Recognition Principles: Thematic Information Extraction <i>Quiz 3</i> Lab 6: Image classification 1	Jensen Ch 9 Article Review
Week 8: Oct 9	Midterm Exams-Wednesday, Oct 9	
Week 9: Oct 16	Digital Image processing: Classification methods Lab 7: Image classification 2	Jensen Ch 9, 10, 11
Week 10: Oct. 23	Digital Change Detection Quiz 4 Lab 8: Change Detection	Jensen Ch 12 Article Review
Week 11: Oct 30	Digital Map Accuracy Assessment <u>Lab 9:</u> Accuracy Assessment	Jensen Ch 13
Week 12: Nov 6	Digital Image Processing Project	
Week 13: Nov 13	Digital Image Processing Project	
Week 14: Nov 20	Thanksgiving Vacation WRF, Nov. 22, 23, 24	
Week15: Nov 27	Final Project Presentations	
Week 16: Dec 4-7	Final Exams	Monday, December 04, 2017 03:30 p.m 05:30 p.m.

Course Website: Blackboard