GEOG 5373- Introduction to LIDAR, and Radar Applications

3 Credit Hours: Lecture

Professor*:* Dr. Samuel Adu-Prah
Office: LDB Room 324
Phone: 936-294-2478

Class Room: The Woodland Center –TWC 209
Class Time: W: 11:00 am-01:50 am
Office Hours: Wednesday 9:00am -10:00pm or 2.00 pm-3.00 pm OR by appointment

E-Mail: sxa054@shsu.edu
Course Website: SHSU Blackboard

COURSE DESCRIPTION

This course provides the practical skills, knowledge, and understanding of quantitative measurement tools in the field of environmental and geospatial applications. It focuses on the concepts and applications of GPS (Global Positioning System), LIDAR (Light Detection and Ranging), and Radar systems. It introduces fundamental concepts of accuracy assessment and appropriate use of these data products. Students will also master the basic skills needed to leverage these data sources and information products in diverse application domains including, topographic mapping, flood inundation studies, vegetation analysis, and 3D modeling of urban infrastructure. Course component includes lectures and labs.

OBJECTIVES

Upon completion of this course, students will be able to:

- Analyze and interprete data from GPS, LIDAR and Radar.
- Assess the capabilities and limitations of GPS, LIDAR, and Radar instruments and processing systems.
- Properly georeference and process data and products of the systems.
- Integrate and solve real world problems with multiple data platforms.

REQUIRED COURSE MATERIAL

Required: Renslow, Michael, 2012. Manual of Airborne Topographic Lidar. Bethesda, MD. American Society for Photogrammetry and Remote Sensing (ASPRS) publishers.

COURSE PREREQUISITES

Required: Geog 5361, or Instructor's consent.

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 Open source and vendor specific 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 project presentation in class. 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:

Table 1: Assessment/Evaluation points

Project presentation	150	15%
Midterm Exams	250	25%
Quizzes	100	10%
Lab reports, assignments and Exercises	200	20%
Participation and Attendance	50	5%
Final Exams	250	25%
Total Score	**1000**	**100%**

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 disability@shsu.edu). 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:
Lecture and Lab: **W** 11:00 am - 1:50 pm, TWC 00209

Topical Outline: ***Subject to change/revised***

Week	Lecture Topic	Labs
Week 1: Jan 17	Course Outline and Introduction	
Week 2: Jan 22	Basic GPS Operations: Navigation, Positioning, Map Reading	Downloading GPS APP: GPS Status
Week 3: Jan 29	Fundamentals of the Global Positioning System: Error Sources and Differential Positioning	GPS Lab 1: Identification of GPS available
Week 4: Feb 5	GPS Project Planning and Data collection, Map projections & coordinate systems *Quiz 1*	GPS Lab 2: Application of GPS for data collection and Mapping: **Review Article I**: Smartphone GPS tracking—Inexpensive and efficient data collection on recreational movement **Due: 2/21/2018** Use of ITN Converter
Week 5: Feb 12	LIDAR Sensors	LIDAR Exercise 1
Week 6: Feb 19	Georeferencing of LiDAR Data *Quiz 2*	LIDAR Exercise 2
Week 7: Feb 26	LIDAR Platforms and Data Acquisition	LIDAR Exercise 3 **Review Article II:** Estimation of LAI using LIDAR Remote sensing in Forest **Due 3/21/2018**
Week 8: March 7	***Midterm Exams-Wednesday, March 7***	LIDAR Exercise 4
Week 9: March 12-16	***Spring Recess (Monday – Friday)***	
Week 10: March 19	LIDAR Data processing, Part 1	LIDAR Exercise 5
Week 11: March 26	LIDAR Data Processing, Part 2	LIDAR Exercise 6
Week 12: April 2	LIDAR Applications *Quiz 3*	LIDAR Exercise 7 **Review Article III:** A fully-automated approach to land cover mapping with airborne LiDAR and high resolution multispectral imagery in a forested suburban landscape **Due 4/18/2018**
Week 13:April 9	**Conference**	LIDAR Exercise 8
Week 14: April 16	Radar systems concepts, technologies, and application	LIDAR Exercise 9 Final Project
Week 15: April 23	Language, terminology and metrics used by the radar community	Final Project
Week 16: April 30	***Students project presentation***	
Week 17: May 7- 10	**Final Exams: Wednesday May 9, 2018**	

Course Web site: Blackboard