## COURSE SYLLABUS & OUTLINE . GEOGRAPHY 5361. GEOGRAPHIC INFORMATION. Fall 2017 (CRN 82306) <u>GENERAL INFORMATION:</u>

<u>COURSE DESCRIPTION</u>: Geographic information systems and science related concepts will be presented at an advanced and searching level of inquiry. In particular, the nature of spatial information, its application and issues of accuracy, modeling, analysis, referencing and management will be stressed. The class is a 3 unit **Graduate** level course with a 3 hour per week lecture.

Meets: Lecture (CRN 82306) Monday's 6:00 pm - 8:50 pm The Woodlands Center Room 209.

Instructor: Dr. Mark Leipnik. Office Hours: M. 9-9:50 (in LDB 328, or in my office (LDB 323) or Tuesday between 5:30-6:00 or after 9:00 pm in Woodlands Center room 209 (or by arrangement elsewhere). Phone: Ex. 3698, email <u>GEO\_MRL@SHSU.EDU</u>. Lectures and Midterm and Final Reviews will be available as PDF files prior to exams. These Lectures are being revised to add new material and may be updated periodically during the semester. <u>TEXT:</u> "Geographic Information: Systems & Science" by Longley, Goodchild, Maguire & Rhind. 3rd Edition, 2011 Wiley. ISBN 978-0-470-72144-5. NOTE: There is a 4<sup>th</sup> edition that came out in 2016 but is \$173 new. You might want to try to find it used or rent it. However the 3<sup>rd</sup> edition is more easily available and less expensive. The assigned reading is based on 3<sup>rd</sup> edition, but I would expect students to read the text book cover to cover whichever edition they obtain.

## **POLICIES:**

<u>GENERAL</u>: Attendance in class is vital it will be taken at the beginning of each class. Students that are more than 5 minutes late will be considered absent. The first three absences will not result in any loss of points, but for each absence thereafter, 25 points will be deducted. The exception is for professional work and/or exceptionally long commute related absences or delays which may be accommodated with consent of the instructor.

EXAMS & GRADING: There will be one midterm and one cumulative final. The midterm will have matching or true/false, multiple choice and short answer and an essay question and the final will have in addition to these question types a longer essay question. Both exams will have bonus questions that require use of the Internet outside of class time to research answers. Students will receive the essay question and bonus question topic in advance of the exams. The Midterm will worth 300 points; it will be on, Monday October 23. The Final will be on Monday, December 4 from 830-1030 pm. (Note it may be possible to schedule the final exam from 6 pm to 8 pm depending on room availability and mutual agreement). This exam is worth **350 points.** There will be a written individual research project/presentation that will typically involve creating a GIS database (mostly from existing layers plus attribute data that may need to be linked to geocoded points and or polygonal features) then it will involve conducting spatial and/or statistical analysis and a power point presentation made in class either November 20 or November 27. The research project writes up will be due by December 4 (or can be turned earlier in Class November 27). Selection of a topic from the list of potential topics (or based on one you submit) will be made by Monday September 18. An outline and list of references for the project paper should be prepared and submitted by Nov. 13. The submission of a topic is worth 25 points, the outline is worth 75 points, the presentation is worth

up to 125 points and the written report with 2-5 pages of writing and which will also in most cases consist of at least 10-15 maps generated using ArcGIS will be worth up to 125 points (thus the research project is worth up to 350 points). Some topics may also include maps or images from other sources. The subject of the research project may be one suggested by the student if approved by the instructor or one selected from the following list of potential topics.

## POTENTIAL RESEARCH PAPER/PRESENTATION TOPICS:

- Examples of fake maps and false data supplied to Google, Apple maps (Tom Tom), Navteq or to on-line social media sites like Yelp. This will require both obtaining examples of such fake geospatial data (for example the non-existent park in the shape of the Android Robot urinating on the Apple Logo in Rawalpindi, Pakistan or the location of "Ed's Snow Den" in the White House oval office).
- 2) Look at methods used for mapping the location of IP addresses, IP address data set availability and cost and particularly the number, cause and magnitude of errors in IP addresses.
- 3) Examine the Volkswagen diesel car scandal in terms of number of cars with defeat devices by country and if possible by State in the USA, also look at air pollution issues in areas with concentrations of Volkswagen cars with respect to Ozone and NOx and the potential impact of the cars on areas with impaired air quality. Might also include location of factories making the cars and numbers from each factory.
- 4) Look at flooding in Houston and possibly other areas of Texas in recent years and also update of FEMA DFIRM flood zone maps in response. Note that there are job solicitations for this issue as well as a recent graduate of the Undergraduate program who was hired by Harris County Flood Control District in summer 2016 who could be of assistance on this project.
- 5) Examine how precise geospatial data derived from laser total station and survey grade RTK GPS is being used to make legally binding determinations such as for property lines, zoning, pipeline safety, jurisdictional boundaries and in other cases. In particular look at the acceptable standards for locational precision and how these standards have evolved.
- 6) Analyze the use of various types of aerial imagery in management of large scale construction projects. The feasibility of tracking construction progress, movement of equipment using various platforms including drones, piloted aircraft and imaging satellites.
- 7) Analyze the impact of using the web-based surveys to conduct the 2020 Decennial Census and the potential to use these methods for the American Community survey. Focus on the decrease in response to snail mail and land line phone contacts also the potential for hackers to disable the census, to access census responses, for false information to be submitted, and for fake web sites gathering personal data to be created. Also investigate the likelihood of undercounts and over counts.

- 8) Examine the 2016 Australian on-line population census failure due to hackers instigating three denial of service attacks. Note this could be combined with #9 as a team project.
- 9) Use the Harris county appraisal district web site GIS data to determine the location of forests and pastures inside Harris County and make an estimate of the losses in tax revenue due to valuable near term commercial or residential real estate being classified as another land use with a low assessed valuation pending actual development.
- 10) Map conflict in West Africa. This could be as specific as MEND activities in Niger Delta, or Boko Haram or other conflicts in the region. Attack locations, military bases, resources, population, impact of borders, forests, and swamps, ethnic, tribal and religious affiliations are all possible issues.
- 11) Map and analyze cities within cities and cities crossing county lines or ones crossing State Lines. Look at both the spatial aspects, historical development (most got surrounded or grew up against or over boundaries) and problems and solutions (such as joint ownership of Infrastructure or joint authority).
- 12) Map and analyze the migration crisis in Europe with respect to the Mediterranean route and numbers of immigrants.
- 13) Map and analyze the feasibility, cost and design of a wall along the Mexican border. Also examination of existing border fence and other border control infrastructure.
- 14) Map and analyze the number of high rise fires in the United Arab Emirates, Russia, China, France, England and Australia and discuss the issue of cladding, fire standards, climate, design (balconies) and potential for more fires. Also examine high rise fires in other places in buildings without cladding and factors that caused them or stopped them.

The presentations will be Nov. 20 and Nov 27.

<u>MAKE-UPS</u>: If the midterm exam is missed for a valid reason, it can be taken later with permission of the instructor or replaced by an extra credit book report of at least 20 pages. The final cannot be made-up. Missed classes can be made up by doing an extra credit report of five pages. All extra credit/make-up work must be approved by permission of the instructor and on a topic assigned or approved by the instructor.

## **GRADING SUMMARY:**

900-1,000 points = A	750-900 points = B	600-750  points = C
500-600 points = D	less than 500 points =	F (&/or being sent work as a janitor in a zoo
on an alien planet).		

#### ADDITIONAL INFORMATION: ACADEMIC DISHONESTY:

All students are expected to engage in all academic pursuits in a manner that is above reproach. Students are expected to maintain complete honesty and integrity in academic experiences 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. The University and its official representatives may initiate disciplinary proceedings against a student accused of academic dishonesty including, but not limited to, cheating on examinations or other academic work which is to be submitted, plagiarism, collusion and the abuse of resource materials. Penalties may include but are not limited to receiving no points on the assignment with which the academic dishonesty was associated, reduction of one or more levels in the ultimate course grade (say from a B to a C or D), or in serious cases receiving a failing grade.

PLAGIARISM POLICY: This is writing enhanced class. The individual project will be conducted independently and all writing in the required report will be the work of the individual student. The student may site sentences and quote whole paragraphs of material written by others as long as properly referenced. Students may also turn it maps graphics and other materials created by others using GIS for partial credit. Students may not simply download articles from the internet and reformat them. A significant reduction in the grade awarded for the individual project will result from this form or any other form of plagiarism.

CLASSROOM RULES OF CONDUCT: Students are expected assist in maintaining a classroom environment that is conducive to learning. Students will refrain from behavior in the classroom that intentionally or unintentionally disrupts the learning process and, thus, impedes the mission of the university. Cellular telephones and pagers must be turned off before class begins. Students are prohibited from eating or drinking in class, using tobacco products, making offensive remarks, reading newspapers, sleeping, talking at inappropriate times, wearing inappropriate clothing, or engaging in any other form of distraction. Inappropriate behavior in the classroom shall result in a directive to leave class. Students who are especially disruptive also may be reported to the Dean of Students. 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:**

Unannounced visitors to the classroom 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. This policy is not intended to discourage occasional visiting of classes by responsible persons.

### **RELIGIOUS HOLIDAYS:**

Students that are absent from class for the observance of a religious holy day are allowed to take an examination or complete an assignment scheduled for that day within reasonable time after the absence. The period of time during which assignments and exams will be excused includes travel time associated with the observance of the religious holy day. A student who wishes to be excused for a religious holy day must present the instructor of each scheduled class that he/she will be absent from class for religious reasons with a written statement concerning the holy day(s) and the travel involved. The instructor should provide the student with a written description of the deadline for the completion of missed exams or assignments. . In such cases, the student will be required to take the test or submit the assignment early—unless there are good reasons for not being able to do so and the instructor has agreed to those reasons.

NOTE: There are many other official policies so the SHSU web site should be consulted to confirm the existence of other policies not discussed above.

### **COURSE OUTLINE & READING ASSIGNMENTS:**

In order to be well prepared for class students should read the chapters in the text

# **LECTURE 1:**

Week 1. Lec. 1A. First Class Meeting. (Handout syllabus, go over policies, provide general overview).
Lec. 1B. History of GIS.
Lec. 1C. Raster Based GIS.
M. Aug. 28.
READ: Chapter 1, Chapter 2.

NOTE: MONDAY SEPT. 4, is Labor Day and a holiday so class will not meet

#### LECTURES 2-5:

- Week 3. Lec. 2A. Discrete and Continuous Data & Generalization. Lec. 2B. Vector Based GIS. Lec. 2C. Scale and Sampling. M. Sept. 11.
  READ: Chapter 3 & 4.
- Week 4. Lec. 3A. Geocoding. Lec. 3B. Geo-referencing & Coordinate systems. Lec. 3C. Projections. M. Sept. 18. SELECT TOPIC FOR RESEARCH PROJECT/PAPER READ: Chapter 5.
- Week 5. Lec. 4A. Accuracy and Precision. Lec. 4B. Data Capture & Editing. M. Sept. 25.
  EXTRA TIME FOR DISCUSSION OF AND WORK ON RESEARCH PROJECT READ: Chapter 6.
- Week 6. Lec. 5A. GIS Software & Industry. Lec. 5B. Availability of Data, Review for Midterm. EXTRA TIME FOR DISCUSSION OF AND WORK ON RESEARCH M. Oct. 2. READ Chapter 7.
- Week 7. Meeting 6: MIDTERM EXAM: M. Oct. 9. REVIEW: Notes, any Handouts and Book Chapters 1-7.

Part II. SPATIAL ANALYSIS & VISUALIZATION, Etc.

Lectures 7-11.

- Week 8. Lec. 7A. Return and go over midterm, Discuss progress on research projects Lec. 7B. Data Variability Around the World. Lec. 7C. Attribute Data & its Management M. Oct. 16. READ: Chapter 8 & 9.
- Week 9. Lec. 8A. Classification of Data. Lec. 8B. Map Design & Symbolization. M. Oct. 23. READ Chapters 10.
- Week 10. Lec. 9. Visualization. Work on Project. M. Oct. 30. READ: Chapter 11.
- Week 11. Lec. 10. Spatial Analysis. Work on project. M. Nov. 6. READ Chapter 12.

## Week 12.

M. Nov. 13. OUTLINE/REFERENCES FOR PROJECT DUE (M. Nov. 13)

Week 13. Nov. 20-24. Thanksgiving Break No lectures this week. ...Gobble, Gobble, Gobble... something to do with the map below...



Week 14. Meeting 28. Project Presentations (Tu. Nov. 29). Meeting 29. Project Presentations (Review for Final) (Th. Dec. 1). READ Chapters 18-19.

NOTE given the enrollment presentations should be limited to 10-12 minutes each. If a presentation takes longer or less than 6-7 presentations are made on Tuesday then it is possible that one or more presentations will be made on December 6. Week 15. STUDENT PRESENTATIONS. 6 pm until finished hopefully before 8:50 but could last longer...

Week 16. Class meeting 30: FINAL. Monday Dec. 4: two hours in the evening either starting at 6, or somewhat later...

KEY DATES & ASSIGNMENTS AND POINTS:			
ASSIGNMENT	DATE	POINTS	
Select individual project topic	Sept. 18.	25	
MIDTERM	Oct. 9.	300	
Outline Due	Nov. 13.	75	
Student Presentations	Nov. 30	125	
Project paper due	Dec. 4.	125	
FINAL	Dec. 4, 8:30 pm-10:30 pm	350	