#### GEOGRAPHIC INFORMATION SYSTEMS

Geography 363 (GEOG 363), Spring Semester 2019

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Lecture: Monday/Wednesday 9:40 AM – 10:55 AM

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**Course Description:** Geographic Information Systems (GIS) represent a major advancement in computer handling of geographical data. These systems are used extensively throughout all levels of government, private industry, and academia to provide support for spatial decision making and problem solving. Principles and methods of Geographic Information Systems are presented with an emphasis on modelling the Earth and abstracting geographical data, collection of geographical data using modern techniques such as GPS, and analyzing patterns and spatial relationships. Both human, physical, and environmental problems and their study using GIS are presented.

Material will be presented through lectures and laboratories (hands-on exercises, field labs, and compressive labs. Hands-on exercises will be accompanied with most lectures to 1) help students gain practical experience with GIS using ArcGIS, a state-of-the-art GI System; as well as 2) enhance the understanding of the concepts/techniques. Much of the lecture material will come from the lecture slides and textbook. Lecture slides, hands-on exercises, readings and other learning materials will be put on Blackboard. Homework assignments will be distributed, reviewed and graded through Blackboard.

**Learning Outcomes:** The purpose of the course is to provide an introduction to geographical information system (GIS) concepts and practical laboratory experience with state-of-the-art GIS software and hardware. By the end of the semester, students will be able to:

* Understand the uniqueness of a GIS compared to other mapping sciences and information systems.
* Understand/select coordinate Systems, map projections, datums, geographic data models and cartographic generalization
* Collect and transform geographic data into a GIS, and understand basic principles of mapping/survey GPS
* Understand, compute, and interpret fundamental spatial statistics and spatial error
* Derive descriptive and cause-effect relationships in geographically distributed data
* Communicate geographic data and distributions through statistical and map form

**Textbook:** Chang, Kang-tsung, 2015. Introduction to Geographic Information Systems, 8th edition. ISBN-13: 978-0078095139. (Note: If you have previous editions, they will still work but you need to follow class notes in conjunction with these closely.)

**Grading Policy:** All of the exercises and tests should be completed for a final grade, including: seven homework assignments (240 points), two mid-term exams (160 points), final exam (80 points), and class participation (20 points).

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| --- | --- | --- |
| Item | Point | Percentage |
| Eight homework assignments | 240 points (30 points each) | 48% |
| Exam 1 | 80 points | 16% |
| Exam 2 | 80 points | 16% |
| Final Exam | 80 points | 16% |
| Class activity and participation | 20 points | 4% |
| Total | 500 points | 100% |

**A reference scale under the USC Plus grading system*:***

Grade Score

A (4.0) 90-100

B+ (3.5) 85-90

B (3.0) 80-85

C+ (2.5) 75-80

C (2.0) 70-75

D+ (1.5) 65-70

D (1.0) 60-65

F (0.0) <60

You are expected to finish all homework assignments individually. Each late assignment will be deducted 5% for each day late, up to 5 weekdays. Assignments turned in more than 5 weekdays late will not be accepted for grading.

There are 3 exams in the course. Exam 1 covers the material from Lecture 1 to Lecture 8, Exam 2 covers the material from Lecture 9 to Lecture 19. The Final Exam is comprehensive covering all material in the course (1-23).

**Attendance:** I will adhere to university attendance policy. According to this policy, “Students are obligated to complete all assigned work promptly, to attend class regularly, and to participate in whatever class discussion may occur. Absence from more than 10 percent of the scheduled class sessions (> 4 in this course), whether excused or unexcused, is excessive and the instructor may choose to exact a grade penalty for such absences.”

**Students with Disabilities:** The University of South Carolina provides high-quality services to students with disabilities. Students with disabilities are encouraged to take advantage of them. According to the university policy, “Students with disabilities needing academic accommodations should: (1) Register with and provide documentation to the Office of Student Disability Services in LeConte College Room 112A, and (2) Discuss with the instructor the type of academic or physical accommodations you need. Please do this as soon as possible.”

**Academic Responsibility:** In the Academic Responsibility Code found in the Carolina Community: USC Columbia Student Handbook and Policy Guide, misrepresentation of your own work either through plagiarism, collusion, or data distortion is a serious breech of this code. Plagiarism is the taking of ideas, concepts, and written (published) words and representing them as your own. This includes materials that are published in hard copy form such as books and journals (or someone else’s term paper) as well as material downloaded from the Internet, without appropriate attribution and referencing of the copied passages (e.g. placing the copied material in quotation marks and providing the reference including the exact page number of the copied material). Plagiarism infringes on copyright protections and also is considered theft of intellectual property. In addition to being illegal, plagiarism is morally wrong. If you have any questions on what constitutes plagiarism, get a copy of the Carolina Community and/or talk to me. Collusion occurs when someone else writes (or dictates) portions of the assignment for you and you represent this as your own work. Data distortion is the intentional misrepresentation of data either through falsification, fabrication, or omission. If it is discovered that you have committed plagiarism, collusion, or data distortion on any assignment in this class, you may fail the course.

**GEOG 363 Course schedule (subject to change):**

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| --- | --- | --- | --- | --- |
| **Lecture** | **Date** | **Topic** | **Assignment** | **Due day** |
| **1** | M, 1/14 | Course overview and important concepts in GIS  Hands-on #1 | Homework 1 |  |
| **2** | W, 1/16 | Coordinate systems |  | Homework 1 |
|  |  | Martin Luther King Day |  |  |
| **3** | W, 1/23 | Map projections 1 |  |  |
| **4** | M, 1/28 | Map projections 2  Hands-on#2: map projections | Homework 2 |  |
| **5** | W, 1/30 | GIS data structure 1: vector data model |  |  |
| **6** | M, 2/04 | GIS data structure 2: raster data model  Hands-on#3: vector/raster data | Homework 3 | Homework 2 |
| **7** | W, 2/06 | Attribute data management  GIS data sources/collection  Hands-on#4: attribute data |  |  |
| **8** | M, 2/11 | Image/Map georeferencing  Hands-on#5: georeferencing |  | Homework 3 |
|  | **W, 2/13** | **Exam 1** |  |  |
| **9** | M, 2/18 | Exam summary  Data display and maps  Hands-on#6: creating maps |  |  |
| **10** | W, 2/20 | Spatial data errors  Hands-on#7: computing RMSE  Triangulation, Trilateration, and GPS | Homework 4 |  |
| **11** | M, 2/25 | Geocoding |  |  |
| **12** | W, 2/27 | Attribute Query 1 | Homework 5 | Homework 4 |
| **13** | M, 3/04 | Attribute Query 2  Hands-on#8: querying attributes |  |  |
| **14** | W, 3/06 | Spatial Query 1 |  | Homework 5 |
|  |  | Spring Break |  |  |
| **15** | M, 3/18 | Spatial Query 2  Hands-on#9: querying spatial attributes | Homework 6 |  |
| **16** | W, 3/20 | Spatial Analysis 1: concept |  |  |
| **17** | M, 3/25 | Spatial Analysis 2: spatial buffering and heat map  Hands-on#10: buffer maps |  | Homework 6 |
| **18** | W, 3/27 | Spatial Analysis 3: distance mapping and spatial interpolation  Hands-on#11: mapping distance and interpolation | Homework 7 |  |
| **19** | M, 4/01 | Spatial Analysis 4: site selection  Hands-on#12: location for school |  |  |
|  |  | AAG annual meeting (no class) |  |  |
|  | W, 4/10 | **Exam 2** |  | Homework 7 |
| **20** | M, 4/15 | Exam 2 summary  Advance topics in GIS |  |  |
| **21** | W, 4/17 | Raster operations  Hands-on#13 | Homework 8 |  |
| **22** | M, 4/22 | GIS models and modelling  Hands-on#14 |  |  |
| **23** | W, 4/24 | Course review |  | Homework 8 |
|  | **M, 5/06** | **Final Exam 9:00 AM – 12:00 AM** |  |  |