GEOG 4103/5103
INTRODUCTION TO GEOGRAPHIC INFORMATION SCIENCE

LECTURES: T/R 12:30–1:45pm GUGG 205 LABS : T 3:30-6:20pm & W 11am-1:50pm, KESDA Lab (GUGG 6)

INSTRUCTOR: Stefan Leyk stefan.leyk@colorado.edu
ASSISTANT: Georgios Charisoulis gech8478@colorado.edu

OFFICE HOURS: T 11am-12:15pm, or by appt. OFFICE HOURS: R 1-3pm, or by appt.
GUGG 201F KESDA Lab

UNDERGRADUATE LAB ASSISTANTS: Gabi Murillo, Maxwell Roland, Scott Wappes, Evan Miller

OVERVIEW: This course introduces the theoretical concepts and use of Geographic Information Systems (GIS). It focuses on the nature of geographic information, the management of geospatial data and available methods for geographic analysis and modeling provided by a GIS. Lectures focus on the theoretical basis of GIS. During lab sessions students will be able to apply the concepts and techniques presented in lectures. The aim of this course is that students understand elementary GIS theory, have a working knowledge of ArcGIS, and be able to develop GIS-based solutions for spatial problems. Class Homepage can be found here: http://www.colorado.edu/geography/leyk/GIS1/Introduction.html

PREREQUISITES: GEOG 2053, 3053 or similar, a course in Introductory Statistics (such as GEOG 3023); familiarity with file management tasks in Windows.

LECTURES: Lectures emphasize concepts, present some case studies as well as instructions for specific lab exercises, and will include room for discussion. Attendance to lecture is highly recommended – you will see why! Attendance is REQUIRED for student presentations! Please turn off your cell phone during class.


LABS: You must register for one lab session, meeting every week, and attend full lab periods to pass the class. Four points will be taken off your final course grade for each missed lab, unless you have written permission in advance from the professor. Lab assignments are due at the beginning of the following lab session. Late lab assignments will be downgraded 20% per (working) day beginning on the due date. Students must hand in all lab assignments by 8pm Friday 11 December 2015 to receive a passing grade, even if they are submitted too late to receive any points. Please turn off cell phones during labs.

Students are required to back up their own data and assignments; we do not have backup facilities available in KESDA (but online). It is recommended to purchase at least one 4 GB flash drive and dedicate it to this class.

READING DISCUSSION & SHORT ESSAYS: Each student has to submit two short essays on two out of FOUR topics covered during Reading Discussions of no more than 750 words length each (excluding references). Graduate students have to submit on topics other than the one they present. See instructions on the homepage for more details.

READING DISCUSSION LEAD AND FINAL PAPER (GRAD STUDENTS ONLY): Groups of grad students will lead one out of four reading discussions and present the topic to the class. They will meet with Stefan before the session to discuss topics, strategies and material to be used. Each group will also submit a final paper on the chosen topic. See instructions on the class homepage for more details.

GRADING: The class grade is based on 270 (undergraduate) / 340 (graduate) points in total.
- 2 submitted short essays (out of 4 topics covered in reading discussions) - (40 points, NO late submission; essays to be submitted on paper BEFORE the reading discussion)
- 4 quizzes (60 points)
- 10 lab assignments (160 points; attendance required, lab submissions due at the beginning of next lab session; points are 20% docked per day for late submissions beginning on the due date)
- Class participation and attendance (10 points)

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- 4 quizzes (60 points)
- 10 lab assignments (160 points; attendance required, lab submissions due at the beginning of next lab session; points are 20% docked per day for late submissions beginning on the due date)
- Class participation and attendance (10 points)

- Graduate presentations and final essays (70 points; presentation on reading topic of their choice and leading a discussion (35), final paper (35)).

Please Note: Make-up exams will be given only for documented medical emergencies! No incompletes!
**Schedule Spring 2017**

<table>
<thead>
<tr>
<th>W Day</th>
<th>Lecture</th>
<th>Reading (B# = Bolstad Ch.)</th>
<th>Lab Exercise</th>
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</thead>
<tbody>
<tr>
<td>1 17 J</td>
<td>Introduction</td>
<td>B1; Goodchild</td>
<td>Lab 0: ArcGIS Review Demo webfiles &amp; file backup</td>
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<td>19</td>
<td>GIS Components</td>
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<td>2 24</td>
<td>Spatial Data Representation</td>
<td>B2 (29-39); B4 (147-55)</td>
<td>Lab 1: Modeling Timber (15)</td>
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<td>26</td>
<td>Scale &amp; Resolution 1</td>
<td>Mandelbrot, Good. &amp; Proct.</td>
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<td>3 31</td>
<td>Projections 1</td>
<td>B3 (85-115)</td>
<td>Lab 2: Vector / Raster Query (15)</td>
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<td>02 F</td>
<td>GPS and GIS</td>
<td>B5 (203-21; 227-48)</td>
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<tr>
<td>4 07</td>
<td>Projections 2</td>
<td>B3 (116-146)</td>
<td>Lab 2 (con’t.) --- GPS Data Collection ---</td>
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<tr>
<td>09</td>
<td>Read. Disc. 1 (20): GIS Applications</td>
<td>See announced readings</td>
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<td>5 14</td>
<td>Vector data models 1</td>
<td>B2 (40-53); Theobald</td>
<td>Lab 3: Projections (Tissot) (10)</td>
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<td>16</td>
<td>Quiz 1 (15)</td>
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<td>6 21</td>
<td>Vector data models 2</td>
<td>B2 (63-8); B9 (420-25)</td>
<td>Lab 4: Build and Edit Data (15)</td>
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<td>23</td>
<td>Vector operations 1</td>
<td>B9 (373-98)</td>
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<td>7 28</td>
<td>Vector operations 2</td>
<td>B9 (398-419)</td>
<td>Lab 5: GIS Scenarios (15)</td>
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<td>02 M</td>
<td>Vector operations 3 (Demos)</td>
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<td>8 07</td>
<td>Online data sources &amp; Data access</td>
<td>B7 (297-330)</td>
<td>Lab 6: ModelBuilder (10)</td>
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<td>09</td>
<td>Read. Disc. 2 (20): Geoslavery</td>
<td>Dob &amp; Fish, Klink., Fish.Hon.</td>
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<td>9 14</td>
<td>Spatial models</td>
<td>B13 (571-616), Tsou</td>
<td>Lab 7: Scenario Building (20)</td>
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<td>16</td>
<td>Review/Guest lecture</td>
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<td>10 21</td>
<td>Read. Disc. 3 (20): Uncertainty</td>
<td>Fisher, Beard, Comber</td>
<td>Lab 7 (con’t.)</td>
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<td>23</td>
<td>Quiz 2 (15)</td>
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<td>11 28</td>
<td>Spring Break, no classes</td>
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<td>12 04 A</td>
<td>Database Management Systems</td>
<td>B8 (331-72), Healey</td>
<td>Lab 8: Greenspace Modeling (20)</td>
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<td>06</td>
<td>Raster Data/Tesselations 1</td>
<td>B2 (54-60)</td>
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<tr>
<td>13 11</td>
<td>Raster Data/Tesselations 2</td>
<td>B2, 4 (69-84; 180-82)</td>
<td>Lab 9: Coastal Flooding (20)</td>
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<td>13</td>
<td>Quiz 3 (15)</td>
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<td>14 18</td>
<td>Read. Disc. 4 (20): Scale in GIScience</td>
<td>Good.; Marceau; Montello</td>
<td>Lab 9 (con’t.)</td>
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<td>20</td>
<td>Uncertainty / Raster operations 1</td>
<td>B10 (443-60)</td>
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<td>15 25</td>
<td>Raster operations 2</td>
<td>B10 (460-82)</td>
<td>Lab 10: Envir. Justice (20)</td>
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<td>27</td>
<td>Remote Sensing/Satellite imagery</td>
<td>B6 (249-96)</td>
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<tr>
<td>16 02 M</td>
<td>Quiz 4 (15)</td>
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<td>Lab 10 (con’t.) (All labs due Fri 05 May 8pm)</td>
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<td>04</td>
<td>Terrain analysis, outlook, final disc.</td>
<td>B11 (483-518)</td>
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**Note:**
B10 (33-35) refers to pages 33-35 in Bolstad’s chapter 10.
Readings indicated in italics are the papers you have to read for the reading discussions.
Other author names in non-italics refer to additional readings on specific topics.

**READING DISCUSSIONS – TOPICS, READINGS AND GUIDELINES**

**A. FOR ALL STUDENTS**

There will be four reading discussions during the semester, which provides a forum for students to exchange and discuss ideas, opinions and experiences focused on specific topics. Attendance is required for reading discussions, for everyone. I expect that students participate actively in the discussion part, respond to questions and ask questions themselves.

Read all articles provided for each reading discussion. Choose TWO of the four topics we cover in our reading discussions and write a short essay of no more than 750 words (excluding references) on each of these two topics. Below you find some example questions for each reading discussion to give you some guidance. Pick up one or more of these questions or create your own question that you would like to elaborate on and write about what you have learned, develop your own opinion and argue for or against points made in the readings. Cite the articles you use in your essay, appropriately, and identify additional sources of information, build them in to strengthen your arguments and cite them. The use of references and how you cite them will show me if you understood what kind of information you have to look for, whether you understood the context and how to explore the topic.

Take this writing very serious; it’s important for you to learn how to correctly use terms in the context of GIS and the geospatial sciences in general. You will have to write in a very concise form. Do not simply summarize the articles for the chosen reading discussion but use them as information sources. These essay guidelines are rather open and leave some flexibility regarding your writing style. Be inspired! Essays must be submitted on paper BEFORE the reading discussion starts. No late submissions. Remember that you have to write two such essays so do not wait too long.
B. FOR GRADUATE STUDENTS: PRESENTATIONS & FINAL PAPER

Graduate students are required to choose one reading topic (as a group of 3 to 4 students). The groups will present the topic to the class and lead the following discussion. Each group will write up a critical essay (12 - 15 pages; double spaced, excluding graphics) about the topic they presented based on some general guiding points such as:

- Identify the topic and main questions of concern and use them as guiding routes for your essay;
- Search for additional literature to provide an overview of the topic and cite and list references correctly;
- Identify ongoing debates to strengthen your argumentations – write about the “topic”, not the articles;
- Be critical! Try to identify strengths, weaknesses and gaps in the argumentations made by the authors;
- Be sure you justify statements made in your write-up using external sources;
- Refer to and build-in relevant examples related to your own research or of general interest.

Each group is asked to meet with the instructor before the discussion for direct feedback on the material they are going to use and is welcome to ask for suggestions and directions regarding the final essay. The essay is to be submitted by the last day of classes.

Questions that you can use as guidance when writing your essay:

READING DISCUSSION 1 “GIS APPLICATIONS” - 09 Feb 2017
(readings TBD. Suitable readings will be identified and provided once graduate presenters have signed up)

- What is the potential gain and benefit for society in using GIS in general and in the fields described?
- How has the use of GIS changed our capabilities to explore, understand and manage our world?
- What’s so special about spatial?
- What are the possible risks and limitations in using spatial technologies, methods and spatial data?

READING DISCUSSION 2 “GEOSLAVERY, FEAR AND HOPE WITH GIS” – 09 Mar 2017

- What does the term geoslavery imply, and what broader societal problems does it refer to?
- Can you provide reasonable (often subtle) examples where the use of geospatial technologies is already questionable?
- How do benefits of geospatial technologies for society relate to potential risks for misuse?
- Do geospatial technologies make our world safer?

READING DISCUSSION 3 “UNCERTAINTY IN GISCIENCE”- 21 Mar 2017

- How would you, in a nutshell, characterize uncertainty in GIScience in general?
- Why is there so much discussion about this topic also in relation to spatial data quality?
- What makes uncertainty in spatial information so complex?
- How applicable and understandable are existing concepts and definitions with regard to real-world examples?

READING DISCUSSION 4 “SCALE IN GISCIENCE” - 18 Apr 2017
Goodchild (2011), Marceau (1999) and Montello (2001)

- What are the meanings of “scale” in Geographical Analysis?
- Why is scale such a complex phenomenon?
- What are the implications of scale effects for the analysis?
- How is scale handled (or not handled) in the natural and social sciences differently?
Readings (available on class homepage; *reading discussion material)


Disability
If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with your professor.

Religious observances
Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please let the instructor know about such conflicts as soon as you studied the schedule for this semester in particular the exam dates.

Policy on Classroom Behavior
Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at http://www.colorado.edu/policies/classbehavior.html and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

Policy on Discrimination and Harassment
The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. The University of Colorado does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10, amended 11/8/2001). CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, or veteran status. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://www.colorado.edu/odh

Policy on Plagiarism
All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at http://www.colorado.edu/policies/honor.html and at http://www.colorado.edu/academics/honorcode/

Department of Geography Code of Conduct
In the Department of Geography, instructors strive to create an atmosphere of mutual trust and respect in which learning, debate, and intellectual growth can thrive. Creating this atmosphere requires that instructors and students work to achieve a classroom in which learning is not disrupted. At the most basic level, this means that everyone attend class, be prepared with readings and assignments completed, and that students pay attention. This means no conversations with friends, reading the newspaper, coming late, or leaving early. Such behavior is disruptive to the instructor and to your fellow classmates.

These basics of classroom etiquette are an important means of building and showing mutual respect. Inevitably, however, disagreements will arise. Sometimes these disagreements will be about content, sometimes about grades or course procedures, and sometimes they will be about the treatment of participants in the class. In order to facilitate the resolution of these disagreements, the following guidelines should be followed by everyone:

- All interactions must be guided by mutual respect and trust.
- If you are bothered by some aspect of the class, identify what it is that is bothering you and center the discussion on that issue.
- Address issues that concern you early. Problems are easier to resolve before they fester.
- Consider whether it is best to address your concerns in class or in a separate appointment with the instructor. Remember, behavior that disrupts your fellow classmates is not acceptable.
- Abusive speech or behavior will not be tolerated in any interaction between students or between student and instructor. If an instructor feels that your speech or behavior is abusive, you will be asked to leave the room. If you believe an instructor has become abusive, you may leave the room and talk with the department chairperson. Debate and discussion can continue when all parties proceed with mutual respect.
- If mutual respect cannot be restored, either you or the instructor may take the issue to the department chairperson or the Campus Ombuds Office.
NAME_________________________________    YEAR _________

MAJOR______________________    CONCENTRATION  _________________

WHAT OTHER COURSEWORK have you taken related to Cartography / GIS? (map use, map making, remote sensing, landscape architecture, surveying, environmental design, civil engineering, planning)

1. ___________________________  2. ___________________________

3.___________________________    4.  ___________________________

WHAT DO YOU EXPECT TO LEARN BY TAKING THIS COURSE?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

WHAT CONCERNS DO YOU HAVE ABOUT TAKING THIS COURSE?

____________________________________________________________________________________

____________________________________________________________________________________

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Thanks for filling this out. This will help us to understand more about you.