ENGR 180 – Fall 2017

Lecture & Lab, 4 Units

Lectures: Monday & Wednesday 3:00 - 4:15 pm

Lecture Location: COB1 113

Instructor:

Professor Joshua Viers (jviers@ucmerced.edu) Office: 375 SE2 & online Hours: TBA & by appt.

Teaching Assistant:

Brandi McKuin (<u>bmckuin@ucmerced.edu</u>) Office: online

Course Description:

This course will provide an overview to:

• Geographic Information Systems

Introduction to modern spatial data processing, development, implementation, and functions of geographic information systems; relations between GIS and remote sensing; and applications of geographic information systems to a variety of environmental issues. Study of the underlying theory in Geographic Information Systems, including coordinate systems and analytic geometry, database models and structures, algorithms and analytical procedures.

Hours: TBA

- Technical Applications in Spatial Analysis and Modeling Laboratory analysis of digital geographic information from physical and social sources, emphasizing the use of standard geographic information system software to illustrate techniques of spatial analysis, map digitizing, digital map display and decision support. Applying GIS theory and techniques to solve spatial problems in land and resource management, utilities and municipal government.
- Cartographic Design and Visualization
 Cartographic design and data visualization all stages of a GIS project, e.g. planning, design, and analysis, and presentation of results.

Prerequisites:

Upper division standing with proven interest in spatial analysis and modeling. Graduate students by exception.

Course Objectives:

- 1) To introduce students to spatial analysis and modeling methods and techniques;
- 2) To develop a basic understanding of geographical information systems;
- 3) To instill a basic understanding of technological application of geographic information systems;
- 4) To expand conceptual bases for cartographic design and effective data visualization.

Course Learning Outcomes:

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

1) Understand basic concepts in spatial analysis and modeling, data structures and elements, and methods of geospatial data inquiry;

- 2) Address pertinent problems in contemporary engineering problem solving using applied analytical techniques;
- 3) Develop cogent, representative works displaying relevant base data, derived data, and design elements.

Course Requirements and Grading

General Policies:

- Academic honesty is fundamental. Students will be held to the UC Standards of Conduct. It is up to you to know the contents of these standards and policies. Presume that all work in this course is to be conducted and completed independently unless told otherwise for a specific assignment.
- Modern society is deadline driven and there are no make-ups or do-overs or baby-bounces. As such, make-up exams will not be scheduled unless due to extreme hardship and as prior approved by instructor. Further, no project or assignment will be accepted for grading after its due date. Partial credit is better than none.
- Effective written and spoken communication is fundamental to solving global water problems. Hence, as a general rule, you will be down-graded for poor writing and poor grammar. Do it correctly and you will be doing it right.
- Email is the preferred form of communication. If you need to call me, please use 209-591-8423 and leave a voicemail. If you really feel the need to text me, use the same number, but keep in mind that I usually have my ringer turned off. I will, however, try to respond to you in a timely fashion (< 24 hrs). Please keep in mind that I travel frequently and often do not have cell/internet access when I am away.
- Guest lecturers are an important part of the learning experience; they should be treated with the utmost respect as they are donating their time and expertise to enrich your learning opportunity in this class. Absenteeism and poor behavior (e.g., sleeping) will be reflected in class scores.

Reading:

There is one recommended text for this class.

Recommended Textbook:

 Bolstad, Paul. <u>GIS Fundamentals: A First Text on Geographic Information Systems</u>. 5th Ed. XanEdu.

Throughout the semester, electronic readings will be distributed to the class as pdfs, links to websites, digital news, and emails. This will be on quizzes and exams. Everything mentioned in class, however brief, is fair game.

Credit:

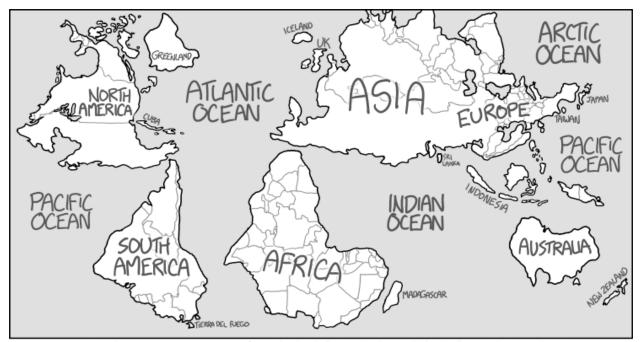
Students will receive 4 units for this course and must complete all labs to pass.

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Grading:

Grading will be handled on a curved basis, but skewed toward A's if everyone does well.

Graded Elements	Points	
Lab 1	20	
Lab 2	30	
Lab 3	30	
Lab 4	30	
Lab 5	50	
Mid Term	40	
Final Exam	70	
Quizzes (3 x 10)	30	
Total	300	



THIS UPSIDE-DOWN MAP WILL CHANGE YOUR PERSPECTIVE ON THE WORLD: gratuitous syllabus filler from <u>xkcd.com/1500</u>

Course Topics & Schedule (subject to change):

Date	Meeting	Торіс	
23-Aug	1	Intro & Overview of Class	
28-Aug	2	History & Philosophy	
30-Aug	3	Data & Models	
6-Sep	4	Spatial Primitives	
11-Sep	5	Spatial Projections	
13-Sep	6	Basic Vector Operations	
18-Sep	7	Advanced Vector Operations	
20-Sep	8	Applied GIS Example	
25-Sep	9	Applied GIS Example	
27-Sep	10	Basic Raster Math	
2-Oct	11	Basic Raster Operations	
4-Oct	12	Advanced Raster Operations	
9-Oct	13	Basic Terrain Analysis	
11-Oct	14	Advanced Terrain Analysis	
16-Oct	15	Applied GIS Example	
18-Oct		MIDTERM	
23-Oct	16	Basic Remote Sensing	
25-Oct	17	Advanced Remote Sensing	
30-Oct	18	Hydrospatial Analysis	
1-Nov	19	Network Analysis	
6-Nov	20	Suitability Analysis	
8-Nov	21	Applied GIS Example	
13-Nov	22	Pattern Analysis & Spatial Stats	

15-Nov	23	Interpolation & Prediction
20-Nov	24	Error & Uncertainty
22-Nov		NO CLASS
27-Nov	25	Cartography
29-Nov	26	Elements of Style & GeoViz
4-Dec	27	GIS&T Professional Design
6-Dec	28	Future Earth
13-Dec (0800-1100)		FINAL EXAM







YOU'RE NOT REALLY INTO MAPS.





YOU HAVE A COMFORTABLE PAIR OF RUNNING SHOES THAT YOU WEAR EVERYWHERE. YOU LIKE COFFEE AND ENJOY THE BEATLES. YOU THINK THE ROBINSON IS THE BEST-LOOKING PROJECTION, HANDS DOWN.



VAN DER GRINTEN

YOU'RE NOT A COMPLICATED PERSON. YOU LOVE THE MERCATOR PROJECTION; YOU JUST WISH IT WEREN'T SQUARE. THE EARTH'S NOT A SQUARE, IT'S A CIRCLE. YOU LIKE CIRCLES. TODAY IS GONNA BE A GOOD DAY!



YOU LIKE ISAAC ASIMOV, XML, AND SHOES WITH TOES. YOU THINK THE SEGWAY GOT A BAD RAP. YOU OWN 3D GOGGLES, WHICH YOU USE TO VIEW ROTATING MODELS OF BETTER 3D GOGGLES. YOU TYPE IN DVORAK.

more gratuitous syllabus filler from xkcd.com/977

UC STANDARD TERMS AND CONDITIONS

Academic Integrity:

- a. Each student in this course is expected to abide by all University of California Codes of Conduct. Any work submitted by a student in this course for academic credit will be the student's own work.
- b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.
- c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Accommodations for Students with Disabilities:

The University of California is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

Counseling and Psychological Services

The mission of UC Merced Counseling and Psychological Services (CAPS) is to support the mental health and well-being of our students. It is the intention of all CAPS staff to provide a safe, confidential atmosphere of acceptance and accessibility to professionals in the field of psychology. Contact Information (Confidential Help) <u>counseling@ucmerced.edu</u> Phone: (209) 228-4266

Discrimination & Sexual Violence Prevention

The University of California is committed to creating and maintaining a community where all individuals who participate in university programs and activities can work and learn together in an environment free of harassment, exploitation or intimidation.

Michael Salvador, Director of Compliance (msalvador2@ucmerced.edu) (209) 285-9510

CARE Office

Campus Advocacy, Resources, & Education (CARE) provides prevention education for the UC Merced community to achieve an environment free from the threat of sexual violence, dating/domestic violence, and stalking. They provides free and confidential assistance for all UC Merced affiliates (including Undergraduate students, Graduate students, Staff and Faculty. Stop by KL 107. Contact Information (Confidential Help) Campus Advocate: Val (209) 386-2051 or Valley Crisis Center 24/7 Hotline (209) 722-4357

Food Assistance (HEROES)

CalFresh is a monthly stipend system that allows you to purchase food for no cost at all on your part. If you qualify for work-study you most likely qualify for CalFresh.

Phone: 209-228-4187 heroes@ucmerced.edu

Laboratory Sections

Labs:

Labs will follow a Friday-Monday pairing.

2L → 3:30 pm - 5:20 pm	F	Social Sciences and Management 154
3L → 10:30 am - 12:20 pm	Μ	Classroom and Office 1 Bldg 281

Dates	Lab	Торіс	Due Date
25-28 Aug	1.1	Google Earth Pro Intro	
Lab 1			6-Sep
8-11 Sep	2.1	Points, Lines, Polys, & Projections	
15-18 Sep	2.2	Vector Data Wrangling	
22-25 Sep	2.3	Proximity Analysis	
Lab 2			27-Sep
29-2 S-O	3.1	Vector to Raster Conversion	
6-9 Oct	3.2	Watershed & Terrain	
13-16 Oct	3.3	Land Use Conflict Planning	
Lab 3			18-Oct
20-23 Oct	4.1	Fire Mapping	
27-30 Oct	4.2	RS Classification	
3-6 Nov	4.3	Error Analysis	
Lab 4			8-Nov
17-20 Nov	5.1	Bathymetry & Design Problem	
1-4 Dec	5.2	Cartography & Design	
Lab 5			6-Dec

Software:

We will be using ArcGIS Desktop 10.5 (ArcMap) for almost everything we do in lab. SpARC has student versions of the software for free, so please contact them. Reference the help files often (<u>http://desktop.arcgis.com/en/arcmap/</u>).

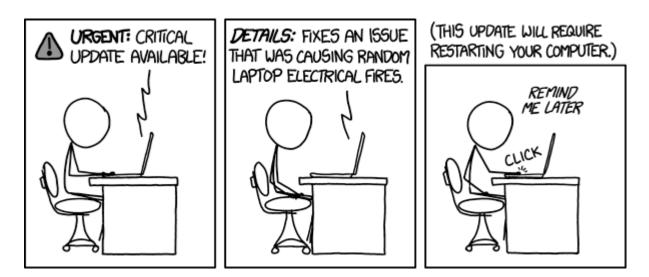
Electronic GIS Community Resources

- GIS StackExchange a GIS Q&A community: <u>http://gis.stackexchange.com</u>
- GeoNet Esri's GIS Q&A community: <u>https://geonet.esri.com/welcome</u>
- Reddit GIS A community for GIS enthusiasts of all types: <u>http://reddit.com/r/gis</u>
- Nick Santo's newsletter on GIS: <u>http://spatialreader.nicksantos.com</u>

 and his list of GIS blogs: http://feedly.com/nickrsan
- Public Lab a community of open source hardware and data projects and people, often with spatial components: <u>https://publiclab.org/</u>
- GIS Lounge a GIS news site: <u>https://www.gislounge.com/</u>
- Digital Geography a GIS news and blogging site: <u>http://www.digital-geography.com/</u>

Web Publishing Resources

- MapBox: <u>https://www.mapbox.com/</u> Primarily for software developers
- CartoDB: <u>https://cartodb.com/</u> Make your own online maps
- ArcGIS Online: <u>https://www.arcgis.com</u>
 Web mapping platform tied in to ArcGIS Desktop
- AppSheet: <u>https://www.appsheet.com/</u> A free tool to create simple data collection apps



Don't stare at the sun, and don't play with fire... xkcd.com/1328