



Course Syllabus for:

GST 100

Exploring Our World: Fundamentals of Geospatial Science

Instructor and Contact Information

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Course Description

Introduces fundamental concepts of geospatial analysis and map interpretation. Technologies include geographic information systems (GIS), global positioning systems (GPS), cartography, remote sensing, geovisualization and interpretation, Internet mapping, and spatial statistics. Explores how geospatial technologies and tools are used in data collection, analysis, presentation, and problem solving.

The goals of this course are threefold: 1) To help you to think spatially, analytically, and critically; 2) To help you become better problem solvers; and 3) To teach you the fundamentals of Geographic Information Science and Technology. In this class, you will learn the fundamentals of mapping, GPS, GIS theory, spatial analysis, cartography, and remote sensing. Geographic Information Science and Technology integrates innovative tools (such as software and hardware) and techniques (such as data capture, display, and analysis) that allows users to view, question, interpret, visualize, and analyze temporal *and* spatial relationships. GIS technology can be used for scientific investigations, resource management, asset management, environmental impact assessment, urban planning, cartography, criminology, geographic history, marketing, and logistics, to name a few. In fact, whenever (and wherever) there is a spatial and/or temporal component, geospatial technology can serve as a tool for problem solving. For example, a GIS might allow emergency planners to easily calculate emergency response times in the event of a natural disaster. Or, geospatial technology might be used to find wetlands that need protection from pollution, or help track the spread of a disease, or be used by a company to site a new business location to take advantage of a previously underserved market. Ultimately, geospatial technology helps you answer questions and solve problems.



This material is based on work supported by the National Science Foundation (DUE #1304591). Any opinions, findings, and conclusions expressed in this material are those of the author(s) and not necessarily those of the National Science Foundation.

Course Prerequisites

A desire to learn.

Course Outcomes

By the end of this program, students are expected to:

- Describe the fundamental concepts and applications of geographic information science and technology and their use in collecting, analyzing, and displaying geospatial data.
- Describe and explain the principles of mapping and spatial data modeling.
- Describe different sources of spatial data and demonstrate how to acquire spatial data, including the fundamental concepts and use of Global Positioning Systems (GPS).
- Discuss and describe the varying methods of spatial analysis and modeling.
- Discuss the fundamental principles of remote sensing and image analysis.
- Identify remote sensing platforms and their respective functions.
- Discuss and demonstrate fundamental cartographic concepts and principles.
- Discuss and debate the future of geospatial technologies, ethical questions related to the field, and societal implications.

Textbooks (All of the books noted below are free, open-share, and online)

1. DiBiase, D. (continually updated). *Nature of Geographic Information*. Penn State: <https://www.e-education.psu.edu/natureofgeoinfo/>
2. Schmandt, M (continually updated). *GIS Commons: An Introductory Textbook on Geographic Information Systems*: <http://giscommons.org>
3. *Fundamentals of Remote Sensing*, published by Natural Resources Canada: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf
4. Sutton, T., Dassau, O., Sutton, M. (2009) *A Gentle Introduction to GIS*, Eastern Cape, South Africa: http://download.osgeo.org/qgis/doc/manual/qgis-1.0.0_a-gentle-gis-introduction_en.pdf

Course Deliverables

Examinations: There will be 4 exams covering the textual readings as well as assignments. If it is necessary for you to miss an exam, *you must make arrangements prior to the regular exam date to take the make-up exam*. Please see the Course Outline for exam dates.

Internet Exercises: There are a number of Web based exercises for you to complete. Each exercise provides you the opportunity to increase your spatial analysis skill-set. The Web-based tools (such as ArcGIS Online and Google Earth) are free and readily available.

YouTube Videos, TED Lectures, and Khan Academy Lectures: This class has a number of video assignments. The content of the videos include both conceptual and practical information. Periodically, you will be asked to complete (and turn-in) a questionnaire based upon the video you watched. The videos range in time from 1 min to 30 minutes.

Discussion Board: There will be a number of Discussion Board prompts that will require your participation.



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Grades

The following is a breakdown of each grade component for the class:

Exams (4 of them @ 15% each) =	60%
Internet Exercises (total) =	20%
Discussion Board Assignments =	10%
<u>Video Questionnaires =</u>	<u>10%</u>
TOTAL	100%

The following is the grading table used for this class:

90 to 100% =	A
80 to 89% =	B
70 to 79% =	C
60 to 69% =	D
< 59% =	F

Policy Regarding the Submission of Late Assignments

Late work is not accepted.

Instructor Access

If you have troubles or difficulties, please **do not** hesitate to speak with me. Don't be afraid to ask questions if you are confused (either with the material, how to study it, or even your grade). Certainly, use the Discussion Board and email frequently.

Attendance

Official attendance policies are listed in the current College Catalog with the following caveat: students who wish to drop the course should do so...Good attendance is *strongly* encouraged. In the online world, this means you need to be checking into the class *at least* 2 times per week.

Statement Regarding Netiquette

Netiquette refers to Online Etiquette, and it is the expectation of the College that all students will use appropriate online etiquette for interaction in online courses and using online communication tools, such as email and instant messaging. Common guidelines include:

- Avoid using strong or offensive language;
- Be forgiving. If something offends you, work with the instructor regarding the incident, rather than engaging in further enflamed discussion;
- Remember that your online messages and course postings live forever, so proof-read your work before you press Send.
- Avoid typing ALL IN CAPS. This is considered "shouting" online.
- Be concise; your points may be lost in a lengthy text;
- Give credit where credit is due: Use citations as appropriate;
- Avoid using Reply All in email messages.



Disability Support Services (DSS)

DSS offers special counseling, courses, and specialized assessment for learning and speech/language disabilities, sign language interpreters, note takes, test proctoring, equipment loans, liaison with campus personnel, and other disability services based on students' needs. Students with disabilities who may need academic accommodations should discuss options with their professors during the *first two* weeks of class (*Americans with Disabilities Act of 1990*).

Cheating or Plagiarism

Cheating and plagiarism are not acceptable and may result in an F for the exam, an F for the course, or expulsion from Southwestern College.



Course Outline

(Note: This Outline is Subject to Change)

Unit I: An Introduction to Geospatial Science and Mapping

<p>Topic: What is Geospatial Science and Technology?</p> <p>PowerPoint Lectures:</p> <ul style="list-style-type: none"> • What is Geospatial Science and Technology? <p>Videos to watch:</p> <ul style="list-style-type: none"> • Geospatial Revolution_Trailer (5 min) • Geospatial Revolution Episode 1 (13 min) • TED Lecture: Your Health Depends on Where you Live (10min) • TED Lecture: A Guided Tour of the Ghost Map (11 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • Exploring the World: Google Earth • Geospatial Revolution: Episode 1 Questionnaire
<p>Topic: Principles of Mapping and Spatial Data</p> <p>PowerPoint Lectures:</p> <ul style="list-style-type: none"> • Scales, Transformations, and Earth Representation • Principles of Spatial Data (Spatial Data Modeling) <p>Videos to watch:</p> <ul style="list-style-type: none"> • TED Lecture: Weird, or Just Different? (3 min) • Latitude & Longitude: Parts I and II (31 min each) • Map Projections and Distortions (5 videos for a total of 6 min) • What is Sea Level (3 min) • Geospatial Revolution Episode 2 (14 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • Map Projection and Direction Finding • Geospatial Revolution: Episode 2 Questionnaire
<p>Exam 1 will cover the content of Weeks 1 and 2</p>	

Unit II: Sources of Spatial Data, GPS (Global Position Systems), and Spatial Analysis

<p>Topic: Sources of Spatial Data and GPS</p> <p>PowerPoint Lectures:</p> <ul style="list-style-type: none"> • Sources of Spatial Data (including Geospatial Data Quality) • Introduction to GPS and Location Based Services (LBS) <p>Videos to watch:</p> <ul style="list-style-type: none"> • Geospatial Revolution Episode 3 (14 min) • How Does GPS Work? (4 min) • How GPS Works -- Upgrade (4 min) • TED Lecture: Making Maps to Fight Disaster (5 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • Mapping the Earth: ArcGIS Online • Geospatial Revolution: Episode 3 Questionnaire
<p>Topic: Spatial Analysis and Modeling</p> <p>PowerPoint Lecture:</p> <ul style="list-style-type: none"> • Spatial Analysis and Modeling <p>Videos to Watch:</p> <ul style="list-style-type: none"> • Geospatial Revolution: Episode 4 (18 min) • What's New in Modeling and Analysis (4 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • ArcGIS Online: Hazards Project Part I • Geospatial Revolution: Episode 4 Questionnaire
<p>Exam 2 will cover the content of Weeks 3 and 4</p>	



Unit III: Remote Sensing

and Image Analysis

<p>Topic: Remote Sensing PowerPoint Lectures:</p> <ul style="list-style-type: none"> • Introduction to Remote Sensing (RS) and RS Platforms <p>Videos to watch:</p> <ul style="list-style-type: none"> • NASA's Video Tour of the EM Spectrum (30 min) • Why is the Sky Blue? (3 min) • Satellites 101 (7 min) • NASA Earth Observing Fleet (2013) (2 min) • NOVA: Earth from Space HD (2 hours) 	<p>Exercises:</p> <ul style="list-style-type: none"> • ArcGIS Online Hazards Project Part II
<p>Topic: Image Analysis PowerPoint Lectures:</p> <ul style="list-style-type: none"> • Introduction to Image Analysis <p>Videos to watch:</p> <ul style="list-style-type: none"> • How a Pixel Gets its Color (6 min) • Basics of Image Processing Tutorial (15 min) • TED Lecture: Ecology from the Air (14 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • Intro to Remote Sensing and Image Analysis
<p>Exam 3 will cover the content of Weeks 5 and 6</p>	

Unit IV: Principles of Cartography, Visualization, and the Future of Geospatial Technology

<p>Topic: Cartographic Principles PowerPoint Lectures:</p> <ul style="list-style-type: none"> • Principles of Cartography and Visualization <p>Videos to watch:</p> <ul style="list-style-type: none"> • TEDEd Lecture: How We See Color (4 min) • Design Principles for Maps (42 min) • 25 Maps That Will Change the Way You See the World (4 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • ArcGIS Online: Exploring Vineyards of the World
<p>Topic: GIS and Society PowerPoint Lectures:</p> <ul style="list-style-type: none"> • The Future of Geospatial Technologies (including GIS and Society) <p>Videos to watch:</p> <ul style="list-style-type: none"> • TED Lecture: History and Future of Mapping (14 min) • Responsive Design – The Future of Mapping (10 min) • Jack Dangermond Discusses the Future of GIS (10 min) 	<p>Exercises:</p> <ul style="list-style-type: none"> • National Atlas
<p>Exam 4 will cover the content of Weeks 7 and 8</p>	



Links to Videos

Week 1:

Geospatial Revolution_Trailer (5 min): <http://www.youtube.com/watch?v=ZdQjc30YPOk>
Geospatial Revolution Episode 1 (13 min): <http://www.youtube.com/watch?v=poMGRbfgp38>
Richard Feynman: Knowing Something (3 min): <https://www.youtube.com/watch?v=05WS0WN7zMQ>
TED Lecture: Your Health Depends on Where you Live: <http://www.youtube.com/watch?v=62cNtvx6P8E>
TED Lecture: A Guided Tour of the Ghost Map (11 min): <http://www.youtube.com/watch?v=KvHL0dHj3RM>

Week 2:

TED Lecture: Weird, or Just Different? (3 min): <http://www.youtube.com/watch?v=1K5SycZjGhI>
Latitude & Longitude: Part I (31 min): http://www.youtube.com/watch?v=9vfQM_M1Pec
Latitude & Longitude: Part II (31 min): <http://www.youtube.com/watch?v=OXuc84bP90k>
Map Projections (1 min): https://www.youtube.com/watch?v=pZ1z4IW8f_E&list=TLbImQJSnkHRR9EwF9xT1SrZYGm5z9cuLK
Map Distortions (1 min): <https://www.youtube.com/watch?v=e2jHvu1sKiI>
Geospatial Revolution Episode 2 (14 min): <http://www.youtube.com/watch?v=GXS0bsR0e7w>

Week 3:

Geospatial Revolution Episode 3 (14 min): <http://www.youtube.com/watch?v=OePOK6nzcaY>
How Does GPS Work? (4 min): <http://www.youtube.com/watch?v=0n0T992ccik>
How GPS Works -- Upgrade (4 min): <http://www.youtube.com/watch?v=IoRQiNFzT0k>
TED Lecture: Making Maps to Fight Disaster (5 min): http://www.youtube.com/watch?v=p_p-Ex5KR4g

Week 4:

Geospatial Revolution: Episode 4 (18 min): <http://www.youtube.com/watch?v=9F7z9LLYxf8>
What's New in Modeling and Analysis (4 min): http://www.youtube.com/watch?v=jkaf16-u_V4

Week 5:

NASA's Video Tour of the EMS (32 min): <http://www.youtube.com/watch?v=HPcAWNIVI-8>
Why is the Sky Blue? (3 min): <http://www.spitzer.caltech.edu/video-audio/163-ask2008-007-Why-Is-the-Sky-Blue>
Satellites 101 (7 min): <https://www.youtube.com/watch?v=mbDQSxUXefk>
NASA Earth Observing Fleet (2013) (2 min): <http://www.youtube.com/watch?v=V0hsCD4qZMk>
Earth from Space (2 hours): <https://www.youtube.com/watch?v=38peWm76l-U>

Week 6:

How a Pixel Gets its Color (6 min): <http://www.youtube.com/watch?v=2-stCNB8jT8>
Basics of Image Processing Tutorial (15 min): <http://www.youtube.com/watch?v=8RbD4X8y65A>
TED Lecture: Ecology from the Air (14 min): <https://www.youtube.com/watch?v=qCrVpRBBSvY>

Week 7:

Design Principles for Maps (42 min): <http://www.youtube.com/watch?v=2ox-tauraxc>
25 Maps That Will Change the Way You See the World (4 min): http://www.youtube.com/watch?v=SXB1Z_CxBK0
TEDEd Lecture: How We See Color (4 min): http://www.youtube.com/watch?v=l8_fZPHasdo

Week 8:

TED Lecture: History and Future of Mapping (14 min): <http://www.youtube.com/watch?v=qtv69GRizl4>
Responsive Design – The Future of Mapping (10 min): <http://www.youtube.com/watch?v=rNBj5wffYXU>
Jack Dangermond Discusses the Future of GIS (10 min): <http://www.youtube.com/watch?v=PqZf9ByLXSw>

