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DESCRIPTION OF THE GEOSPATIAL ANALYSIS LAB (GSAL)

Geospatial Analysis Lab (GsAL) provides education and support for all GIS based learning at the University of San Francisco. The aim of the GsAL is to provide members of our community with a comprehensive understanding of geographic technologies and techniques including, but not limited to ESRI's ArcGIS, Google's Earth Engine, web mapping applications, and remote sensing. In addition, the GsAL provides GIS consultations and project management for students, staff, faculty and external parties pursuing independent projects and research programs. Development of the USF's GsAL is composed of four main elements that are being cultivated using a phased approach. The four elements include Education, Research, Internal Presence, and External Presence.

- **Education** includes the development of classes that can be utilized by current degree-seeking students from several departments both at the graduate and undergraduate level. ***This is to be complemented by a certificate program that can be utilized by nondegree students.*** The certificate program offers courses for industry specific topics such as ESRI's ArcGIS, LiDAR and Google's Earth Engine.
- **Research** focuses on the disciplines that utilize geospatial analytics and aims to reach out to disciplines that can be integrated into existing efforts.
- **Internal Presence** incorporates building a geospatial community of practice within and between departments at USF.
- **External Presence** focuses on leveraging existing external relationships to position USF as a premier GIS research and training institution within specific disciplines.

GSAL GIS CERTIFICATION PROGRAM ASSESSMENT

IDENTIFICATION INFORMATION

1: Name of Program: **GIS Certification**

2: Type of Program: **Form A Certification**

3: College of Arts and Science Division: **Sciences**

4: Name/Title/E-Mail Address of Submitter:

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5: Name/Title/E-Mail Address of Additional Individuals Who Should Receive Feedback:

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GSAL GIS CERTIFICATION MISSION STATEMENT

The Geospatial Certification program provides students with a project-based curriculum teaching the latest geospatial technologies and applications that allow certificate recipients to pursue cutting edge geospatial technology jobs.

PROGRAM LEARNING OUTCOMES (PLOs)

PLO 1: Demonstrate mastery of concepts in geospatial science

PLO 2: Demonstrate proficiency in multiple geospatial science technologies

PLO 3: Apply scientific methodology to a geospatial based question and/or issue

PLO 4: Skillfully communicate geospatial topics through written reports, oral presentations and/or multimedia displays

CURRICULUM MAPS



	Status	PLO 1: Demonstrate a mastery of concepts in geospatial science	PLO 2: Demonstrate proficiency in multiple geospatial science technologies	PLO 3: Apply scientific methodology to a geospatial based question and/or issue	PLO 4: Skillfully communicate geospatial topics through written reports, oral presentations and/or multimedia displays
GIS 1	Active	I			
GIS 2	Active	D		D	M
GIS 3	Active	M		M	M
1: Geotechnologies	Active	I	I		D
2: Google Earth Engine	Active	D	D	D	D
3: Web Mapping	Active	D	D	D	D
4: GeoHydrology	Planned	D	D	D	D
5: Urban Planning	Planned	D	D		D
6: LiDAR	Active	D	D	D	D
7: Google Geo Tools	Retired	D	D		D
8: Geostatistics	Active	D	D	D	D
9: Public Health	Planned	D	D	D	D
10: Intro Remote Sensing	Active	D	D	D	D
11: GIS Practicum	Active	M	M	M	M
12: Drone Technologies	Active	D	D	D	D

	PLO 1: Demonstrate a mastery of concepts in geospatial science	PLO 2: Demonstrate proficiency in multiple geospatial science technologies	PLO 3: Apply scientific methodology to a geospatial based question and/or issue	PLO 4: Skillfully communicate geospatial topics through written reports, oral presentations and/or multimedia displays
ILO 1—Students reflect on and analyze their attitudes, beliefs, values, and assumptions about diverse communities and cultures and contribute to the common good.			X	X
ILO 2—Students explain and apply disciplinary concepts, practices, and ethics of their chosen academic discipline in diverse communities.	X	X	X	X
ILO 3—Students construct, interpret, analyze, and evaluate information and ideas derived from a multitude of sources.		X	X	X
ILO 4— Students communicate effectively in written and oral forms to interact with their personal and professional communities.			X	X
ILO 5— Students use technology to access and communicate information in their personal and professional lives.	X	X	X	X
ILO 6— Students use multiple methods of inquiry and research processes to answer questions and solve problems.		X	X	X
ILO 7— Students describe, analyze, and evaluate global interconnectedness in social, economic, environmental and political systems that shape diverse groups within the San Francisco Bay Area and the world.			X	X

15: Which of your Program Learning Outcomes did you assess during 2019-2020?

During the 2019-2020 Academic year, the Geospatial Analysis Laboratory assessed PLO #1: Develop a mastery of concepts in geospatial science

16. What student work products did you use to assess your PLO(s)? Pick one or more direct methods from the list below and briefly describe below what specific work product(s) you used.

Other: Course exam questions

17. Brief description of student work products used to assess PLOs

Student responses to specific multiple choice exam questions that demonstrate a mastery in concepts in geospatial science.

18. What tools did you use to evaluate the student work product(s) (e.g. rubric, test score)?

Test score

19. Please upload any tools used to evaluate student work product(s) here in PDF format only. Please use descriptive file names (e.g. "SociologyAssessmentRubric.PDF").

Multiple exam questions and answers are attached below from a pre-COVID year and COVID based class. These questions originate from in-class quiz or exams recorded in Canvas for two courses taught by three different instructors: ENVS 375 & ENVM 673 (2).

20. Who evaluated the student work product? Check all that apply.

FT faculty members who were instructor(s) of the course(s)

21. Describe the calibration procedure you employed, if any (i.e., how did you assure that faculty raters were consistent with each other in how they rated the student work products):

We used multiple-choice and true/false questions to remove any type of faculty bias.

22. What indirect methods did you employ, if any?

NA

23. Please indicate and briefly describe what indirect methods you used (and/or attach the survey/script/interview below).

NA

24. Files submitted:

NA

25. What were the direct data results? *



Each figure below demonstrates student performance for a variety of multiple choice and true / false questions. Course information is provided at the start of each section.

Semester/Year: Fall 2020 (COVID Caused Remote Learning)
Course: ENVS 375 Intro to Geospatial Technology with Lab
Instructor: AJ PURDY


Coordinate Systems

Attempts: 20 out of 20

The SPCS is used only for data from the _____.

-0
Discrimination Index ?

100% answered correctly



European Union		0 %	
polar regions		0 %	
United Kingdom		0 %	
United States	<u>20</u> respondents	100 %	

Attempts: 20 out of 20

What unit of measure does the UTM system use?

+0.7
Discrimination Index ?


80% answered correctly





decimal degrees		0 %	
degrees	<u>4</u> respondents	20 %	
feet		0 %	
meters	<u>16</u> respondents	80 %	

Attempts: 20 out of 20

+0.63

Which of these map projections is best suited for east–west trending areas like the continental United States?

Discrimination Index 


Azimuthal Equidistant projection		0 %	
Lambert Conformal Conic projection	<u>14</u> respondents	70 %	
Mercator projection	<u>2</u> respondents	10 %	
Transverse Mercator projection	<u>4</u> respondents	20 %	




70% answered correctly

Attempts: 20 out of 20

-0

A datum represents _____.

Discrimination Index 

a reference surface used in computing coordinates	<u>20</u> respondents	100 %	
a zero point from which to calculate elevations		0 %	
the origin point for longitude measurements		0 %	





100% answered correctly

Attempts: 20 out of 20

-0.03

Where can the WGS84 datum be used for measurements?

Discrimination Index [?](#)

the whole world except for the North and South Poles	<u>3</u> respondents	15 %	
at all points across the world	<u>17</u> respondents	85 %	
only in North America		0 %	
only the entire northern hemisphere		0 %	




85% answered correctly

Attempts: 20 out of 20

-0.01

Latitude and longitude are used as the measurement system for which of these?

Discrimination Index [?](#)

Geographic Coordinate System	<u>19</u> respondents	95 %	
State Plane Coordinate System	<u>1</u> respondents	5 %	
Universal Transverse Mercator Coordinate System		0 %	

95% answered correctly




Map projections

Attempts: 20 out of 20

-0

What does the location of the line or lines of tangency indicate about a map projection?


Discrimination Index [?](#)

where all properties are preserved		0 %	
where distortion is at its least	<u>20</u> respondents	100 %	
where great circle routes can be calculated		0 %	

100% answered correctly





Attempts: 20 out of 20

-0.16

Discrimination Index 


A map projection is a _____.

85% answered correctly

model of the Earth based on the size and shape of objects on the Earth's surface	<u>3</u> respondents	15 %	
representation of how time zones are distributed with respect to geographic boundaries		0 %	
system used in translating decimal degrees to other forms of measurement		0 %	
translation of locations on the Earth's surface to their corresponding locations on a flat surface	<u>17</u> respondents	85 %	 ✓





Attempts: 20 out of 20

-0

Discrimination Index 

What is an unavoidable consequence of translating a 3D object to a 2D surface?

100% answered correctly

classification		0 %	
distortion	<u>20</u> respondents	100 %	 ✓
generalization		0 %	
selection		0 %	



Attempts: 10 out of 10

-0

Discrimination Index ?

Projected Coordinate Systems have the following characteristics:

- Cartesian coordinates
- Examples include State Plane System or UTM
- Way to represent the curved surface of the earth on the flat surface of a map

True	<u>10</u> respondents	100 %		✓
False		0 %		

100% answered correctly



Attempts: 9 out of 9

+0.35

Discrimination Index ?

Projected Coordinate Systems have the following characteristics:

- Angles of rotation of a radius anchored at Earth's center
- **Latitude** and longitude
- Datum

True	<u>3</u> respondents	33 %		
False	<u>6</u> respondents	67 %		✓

67% answered correctly



Attempts: 11 out of 11

-0.03

Discrimination Index ?

Geographic Coordinate System (GCS) have the following characteristics:

- Angles of rotation of a radius anchored at Earth's center
- **Latitude** and longitude
- Datum

True	<u>10</u> respondents	91 %		✓
False	<u>1</u> respondents	9 %		

91% answered correctly

26. What were the indirect data results? (If applicable)

All the elements of the syllabus were recoded and assessed in the class with an average of B or higher for each specific element.

27. How do you interpret these results? What do they mean? *

The results demonstrate that students completing ENV5 375: Introduction to Geospatial Technology and GIS during the remote COVID caused modality to approach a mastery of concepts in geospatial science i. Each course is the first component of the core curriculum meant to introduce a foundational knowledge in the subject in a similar fashion as students before remote learning was mandated. The questions surveyed above evaluate student knowledge in 2 areas: coordinate systems, and census data properties. These two areas were identified from the second GsAL assessment as a focus for improvement. Results have clearly improved for both elements compared to the previous assessment and there is no marked difference in student performance on these topics between the pre and post COVID delivered classes. In summary, The responses indicate that the majority of students achieve mastery in a variety of geospatial concepts surveyed here.

CLOSING THE LOOP

28. Which of the following actions did you take as a result of the assessment results? Pick one or more and briefly describe below.

Other: Reflection and review of results in a GsAL faculty meeting.

29. Please elaborate on your potential course(s) of action, related to any/all items you checked above. *

We have identified key areas to improve on remote course instruction and curriculum. Specifically, we found that a flipped class room and increased student interaction improves academic performance in a remote environment. A foundational knowledge in this topic should lead to improved performance in more advanced GIS courses. Furthermore, we will dedicate future assessment to core concepts that span courses as offered through the GIS certificate program.