GsAL Certification 2021-2022 Assessment

Univeristy of San Francisco

This document contains the most current description of USF's GsAL GIS Certification Assessment. These offerings will change over time, so the most current version of this document has precedence. Please Check the Date.

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Date: 1/1/2023

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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 levels. 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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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

PLO to Course Curriculum | *I= Introduced, D = Developed, M = Mastered*

	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
Accelerated Introduction to GIS	Active	I			
Accelerated Intermediate GIS	Active	D		D	M
Advanced GIS	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: GIS and Watershed Systems	Active	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: Advanced Data Analysis	Active	D	D	D	D
9: Public Health	Planned	D	D	D	D
10: Remote Sensing with GIS	Active	D	D	D	D
11: Drone Technologies	Active	D	D	D	D
Undergraduate GIS 1	Active	D		D	M
Undergraduate GIS 2	Active	M		**M**	M

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	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

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Assessment Schedule & Past Results

Year	PLO Assessed	Method	Result
2022	PLO #3: *Apply the scientific method*	Planned Method will include a rubric for class projects. Planned classes include: LiDAR, GIS 2, & Advanced GIS	The results suggest that students are able to apply the scientific method to research questions in geospatial studies at both the developing and mastery levels.
2021	PLO #2 *Demonstrate proficiency in multiple geospatial technologies*	Quantify how many students do we have that have taken classes in multiple technologies Weight analysis by grade	Results from our evaluation indicate that technology transfer rates are similar to our core class offerings. Across these technologies, students earn 80% or higher at rates ranging from 88.5% to 100% within the course. Additionally, average grades range from 85.9 to 94.3%. The 80% or higher rate and average course grades overlap with the ranges for our core class offerings.
2020	PLO #1: *Develop a mastery of concepts in geospatial science* *Impact of remote modality	Course exam questions	The responses indicate that the majority of students achieve mastery in a variety of geospatial concepts surveyed here.
2019	PLO #1: *Develop a mastery of concepts in geospatial science*	Course exam questions	The results demonstrate that students completing ENVM 673: Accelerated Introduction GIS or ENVS 375: Introduction to Geospatial Technology and GIS approach a mastery of concepts in geospatial science.
2017	PLO 4 *Skillfully communicate geospatial topics through written reports, oral presentations and/or multimedia displays*	Final Video Presentation	The results clearly demonstrate that students completing Advanced GIS can skillfully communicate complex geospatial scientific topics in an accessible format based on a majority score of four or above on six defined criteria (see table above).

Assessment Method

15: Which of your Program Learning Outcomes did you assess during 2020-2021?

During the 2021-2022 Academic year, the Geospatial Analysis Laboratory assessed PLO 3: Apply scientific methodology to a geospatial-based question and/or issue

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 final project criteria

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

The elements of the scientific methodology from several courses' final project rubrics were evaluated in multiple course assignments from students. Aggregated scores on specific questions will be used to determine how well students have mastered applying the scientific method in the program.

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

Specific rubric scores from final projects from multiple courses.

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 rubric results from final projects in multiple courses are attached below. Students were given this rubric as a guide to completing each course's final project.

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

Rubric Elements were assigned to students from both full-time and part-time faculty from courses in the GsAL.

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 a consistent sliding scale measure on specific method 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

Results

25. What were the direct data results? *

The results for each class are presented in the following order: an overview of the overall results, the guiding rubric, and then the results for each class individually.

Table 1: Summary of results

	Description		PLO 3 Target	Average Score
Class 1	LiDAR	Elective (Both)	**D**	96.3%
Class 2	Advanced GIS	Graduate	M	98.6%
Class 3	GIS 2	Undergraduate	M	94.3%

Table 2: LiDAR Final Project Rubric

Name	Criteria	Points
Title of project	Has Name and title on project	2
Defined Study Area	Has a defined study area with basemap (basemap should have a title, north arrow and scale bar)	3
Problem statement	Has enough background information to understand the study. Includes at least 1 reference	5
Data sources	Has information about where the data was obtained from	10
Methodology	Has step by step methods and includes screenshots of all scripts	10
Results	Has map(s) and/or images showing the final result of the LiDAR chosen process. Includes result summary	15
Appendix	QA/QC is created correctly	5
	Total	**50**

Table 3: LiDAR Final Project Rubric Method Results

				Rubric Questions: Methodology	
Student	**Class**	**Class Name**	**Term**	**Methodology**	
1	ENVM-676	LiDAR	Fall 2021	10	
2	ENVM-676	LiDAR	Fall 2021	10	
3	ENVM-676	LiDAR	Fall 2021	10	
4	ENVM-676	LiDAR	Fall 2021	10	
5	ENVM-676	LiDAR	Fall 2021	10	
6	ENVM-676	LiDAR	Fall 2021	10	
7	ENVM-676	LiDAR	Fall 2021	10	
8	ENVM-676	LiDAR	Fall 2021	10	
9	ENVM-676	LiDAR	Fall 2021	10	
10	ENVM-676	LiDAR	Fall 2021	8	
11	ENVM-676	LiDAR	Fall 2021	10	
12	ENVM-676	LiDAR	Fall 2021	10	
13	ENVM-676	LiDAR	Fall 2021	10	
14	ENVM-676	LiDAR	Fall 2021	10	
15	ENVM-676	LiDAR	Fall 2021	10	
16	ENVM-676	LiDAR	Fall 2021	6	**96.3%**

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Table 4: Advanced GIS Final Project (StoryMap) Rubric

ArcGIS StoryMap		%
Title	Clear title of report with authors and group name	1
	Clear organization of the report and Branding of the GsAL in the report (Use one of the logos)	2
Problem Statement	Well defined issue.	2
	Justification for addressing this issue.	3
Brief Literature Review	Summary of key literature that addresses your issue (Keep this limited roughly to 5 major sources per major issue)	5
	Synthesis of key literature to identify both gaps and consensus in key findings	5
Objectives/Research Question	Clearly state the objective for research	5
	Clearly state the research question(s) that help you reach your objective	5
Study Area	Map of Study area that includes major mapping elements (Title, legend, scale, north arrow, etc)	3
	Justification for study area is consistent with problem statement	2
Metadata	Description of key data sets	5
Methods	Define information products to be developed by plan (What maps/analysis are you going to produce)	5
	Justify the need for each information products as related to the problem statement	5
	Flowchart of project analysis that illustrates data inputs, geoprocessing steps, analytical elements, and outputs. (See Model builder illustrations)	5
	Defined the datasets that you would need for each information product and their potential source	2
	Define the geoprocessing steps that you would use for developing each information product (Just include enough information so that a non-GIS user can follow the steps)	5

Table 5: Advanced GIS Final Project (StoryMap) Rubric Method Results

				Rubric Questions: Methodology						
Student	Class	Class Name	Term	Define information products to be developed by plan (What maps/analysis are you going to produce)	Justify the need for each information products as related to the problem statement	Flowchart of project analysis that illustrates data inputs, geoprocessing steps, analytical elements, and outputs. (See Model builder illustrations)	Defined the datasets that you would need for each information product and their potential source	Define the geoprocessing steps that you would use for developing each information product	Total Points (22)	
1	ENVM-675	Advanced GIS	Fall 2021	5	5	3	2	5	20	
2	ENVM-675	Advanced GIS	Fall 2021	5	5	3	2	5	20	
3	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
4	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
5	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
6	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
7	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
8	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
9	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
10	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
11	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
12	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	
13	ENVM-675	Advanced GIS	Fall 2021	5	5	5	2	5	22	98.6%

Table 6: GIS 2 Final Project Rubric

Story Map

You've already rated students with this rubric. Any major changes could affect their assessment results.

Criteria	Ratings		Pts
Story impression The story map is fun / interesting / compelling The anlaysis is interesting and includes sound methods Results and at least one key take-aways is clear	15 pts Full Marks	0 pts No Marks	15 pts
Maps At minimum 1 interactive map is present as part of the results. The map shares the results of the teams analysis.	10 pts Full Marks	0 pts No Marks	10 pts
Methods Criteria 1 met The methods used are sound AND must include two of the following: Geocoding Buffers & Spatial Analysis including Statistics Network Analysis Cluster Analysis Features to Rasters: Kernel Interpolation or Density Distance Analysis Least Cost Path Analysis Suitability maps (weighted or fuzzy logic) Watershed delineation / Stormwater delineation	15 pts Full Marks	0 pts No Marks	15 pts
Methods Criteria 2 met AND, each team will be required to present their methods using flow-chart of their work made by ArcGIS's model builder or following the styling of ArcGIS's model builder made in Google Slides / Power Point You do not need to include this figure in your storymap instead you can provide a link to a stand-alone-public-facing Google Slide shared	10 pts Full Marks	0 pts No Marks	10 pts
Methods Criteria 3 met AND, each team will need to move beyond only presenting maps. Results must include supplementary information in the form of a table of statistics or a graph. The table or graph must complement the map results to convey meaningful information in support of achieving the projects goal.	10 pts Full Marks	0 pts No Marks	10 pts
Structure Introduces importance of topic visually or through paragraph or combination. Introduces the question or goal of the project Points out the interesting findings and key take-aways There should be a clear project goal and result that the audience remembers at the end of the presentation	15 pts Full Marks	0 pts No Marks	15 pts
			Total Points: 75

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Table 7: GIS 2 Final Project Rubric Method Results

				Rubric Questions: Methodology				
Student	Class	Class Name	Term	Methods Criteria 1 met	Methods Criteria 2 met	Methods Criteria 3 met	Total Points (35)	
1	ENVS	ENVS-376	Spring 2022	14	8	10	32	
2	ENVS	ENVS-376	Spring 2022	15	8	9	32	
3	ENVS	ENVS-376	Spring 2022	15	10	10	35	
4	ENVS	ENVS-376	Spring 2022	15	10	10	35	
5	ENVS	ENVS-376	Spring 2022	15	10	10	35	
6	ENVS	ENVS-376	Spring 2022	15	9	7	31	
7	ENVS	ENVS-376	Spring 2022	15	9	7	31	94%

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

NA

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

The recent evaluations revealed that the students in all three classes excelled in their ability to apply the scientific method in relation to geospatial sciences. Class 1, which covered LiDAR technology, had an average score of 96.3% and was open to both undergraduate and graduate students. Class 2, an advanced course in GIS techniques, had an average score of 98.6% and was geared toward graduate students only. Class 3, a course in GIS 2, had an average score of 94.3% and was for undergraduate students. All of the classes were aligned with Program Learning Outcome 3 (PLO 3) and the results indicate that the students successfully met that objective.

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. *

In the future, we will continue to emphasize the application of the scientific method in our geospatial courses and encourage students to present these methods through innovative means such as videos and story maps.