GsAL Certification 2020-2021 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: 10/29/2021

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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. 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	PLO 2: Demonstrate proficiency in multiple	PLO 3: Apply scientific methodology to a geospatial based	PLO 4: Skillfully communicate geospatial topics through written

		geospatial science	geospatial science technologies	question and/or issue	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

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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: Remote Sensing, GIS 2, & Advanced GIS	TBD
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 an 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 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 2020-2021 Academic year, the Geospatial Analysis Laboratory assessed PLO #2: Demonstrate proficiency in multiple geospatial science technologies

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 grades

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

Student course grades will be used to evaluate how students acquire proficiency in multiple technologies. Overall student grades provide a holistic metric of student's ability to use these technologies.

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

Course grades 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").

We evaluated the final course grades for students taking GsAL courses from 2015 to 2020. PLO # 2 focuses on developing proficiency in multiple technologies. We evaluated numeric grades from GIS elective courses in relation to the core GIS courses during this time period to determine if certain technological skill transfers were similar to core skills during this time period.

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

Grades 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):

To control for instructor bias we computed the difference between instructor average course grades in relation to all course grades on record. Then, we adjusted the final grades to remove any instructor bias based on the aforementioned difference. The grades in Table 1 above include adjustments to remove potential 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? *

A total of 366 unique students were evaluated for grades from 6 active GIS elective courses. Of the 6 active GIS electives multiple technologies are transferred to students. These include: computation programming using HTML, CSS, JavaScript, R, and a JavaScript API, ArcGIS Pro Raster Analysis, Drones, HEC-HMS, Google Maps, Google Earth Pro, and LAS Tools. We evaluated student grades based on the overall average in addition to quantifying the number of students receiving a grade of 70% or higher. Table 1 below summarizes data from students during this time period. Table 2 and Table 3 detail the number of students achieving proficiency and the rate of proficiency achieved based on the number of core courses and elective courses taken by each student.

Table 1) Summary of courses, technologies taught, and student grades from 2015 - 2021. *No longer offered

Course	Technologies Taught	Total Proficient (Grades > 70)	Total Students	Average Grade
GIS 1	ArcGIS Pro / ArcGIS Online	175	175	91.9
GIS 2	ArcGIS Pro / ArcGIS Online	142	142	92.7
GIS 3	ArcGIS Pro / ArcGIS Online	67	67	94.9
LiDAR Technology	ArcGIS Pro / LAS Tools / R	56	57	91.4
Web Mapping	Html / CSS / JavaScript	32	32	94.3
Advanced Data Analysis	R / ArcGIS Pro	25	26	87.3
GEE	JavaScript API	54	58	89.6
Remote Sensing	ArcGIS Pro, Docker, Python	53	56	85.9
Drone Technologies	Drones	16	16	92.9
GIS & Watershed Systems	ArcGIS Pro / HEC-HMS	12	12	88.9
Google Spatial Tools *	Google Maps, Google Earth Pro	15	15	93.7

Table 2) Summary of total students proficient in elective courses based on the total number of electives taken & total core classes taken.

		Core Classes Taken				
Total Students with Proficiency		0	1	2	3	Total
Total Electives	1	96	21	14	10	141
	2	18	29	16	44	107
	3	3	3	6	3	15
	Total	117	53	36	57	263

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Table 3) Summary of percentage of students achieving proficiency in elective courses by the number of electives taken & the number of core courses taken.

Percent of Students Proficient (70>) in Electives		Core Classes Taken				
		0	1	2	3	Average
Total Electives	1	95.0%	91.3%	93.3%	100.0%	94.6%
	2	100.0%	96.7%	100.0%	100.0%	99.1%
	3	100.0%	100.0%	100.0%	100.0%	100.0%
	Average	95.5%	93.6%	96.0%	100.0%	95.9%

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

NA

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

Our assessment found that 167 students achieved proficiency in multiple geospatial technologies. Course average grades range from 85.9 to 94.3%. Across these technologies, students earn an 70% or higher at rates ranging from 91.3% to 100% within GIS elective courses. Additionally, supplemental analysis indicates that technology transfer rates are similar to our core class offerings. Table 2 details the total number of students who achieved proficiency in a new geospatial technology and the respective number of core and elective courses taken by students. Table 3 shows the percentage of students who achieve proficiency for each number of core and elective course combinations. In total, 266 unique students achieved proficiency in 1 or more technologies. This number differs from the 366 individual students evaluated as some students have only taken one core class and no GIS electives. Further, one can see that 15 students have taken 3 separate GIS elective courses, 107 have taken at least 2 GIS elective courses, and 141 students have taken 1 GIS elective course. Table 3 details the rate at which students achieve proficiency in new technologies based on a grade of 70% or higher for a given course. The Average Row at the bottom demonstrates higher rates of proficiency from an increasing number of core classes. Similarly, the Average Column reveals that the rate at which students achieve proficiency increases with the number of electives taken. The increasing proficiency rate across both total core courses and total elective courses shows support for students being able to apply skills learned in other GIS classes.

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 focus on technological transfer in the coming years. Specifically, we plan to focus on building computer coding familiarity in introductory GIS courses so that students leaving the Certificate Program have desired skills on the job market. Beyond this skill, we hope to expand the number of GIS elective offerings in the

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coming years. Foundational knowledge coding should lead to improved performance in more advanced GIS courses and allow students to leverage lessons learned from each GIS course taken at USF. Furthermore, we will dedicate future assessment to include classes that incorporate multiple technologies to directly evaluate student proficiency.

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