UAAC Proposal for a New Undergraduate Major or Minor

Requesting College(s)/School(s)/Center(s): College of Arts and Sciences

Requesting Department(s): Department of Earth and Atmospheric Sciences

Academic Level:	☒ Undergraduate
Associated Degree(s): *(check all that apply)*	☐ Bachelor of Arts ☒ Bachelor of Science ☐ Bachelor of
Major or Minor:	☒ Major Title: Geoinformatics and Geospatial Analytics ☐ Minor Title:
Program Start Term	☒ Fall 2021 ☐ Spring ☐ Summer ☐ Other

Approval Authority	Signature	Date
Department Chair	Charles E Graves	10/15/2020
College/School Curriculum Committee Chair		
College/School Dean		
Chair, UAAC		
Council of Academic Deans and Directors		
Governing Campus Vice President		
Chair, Academic Affairs Committee of the University Board of Trustees		
Chair, University Board of Trustees		

4.0 STUDENT LEARNING OUTCOMES AND ASSESSMENT PLAN

***Note:** You are strongly encouraged to work with the University Assessment Coordinator (977-4189 or thatcherk@slu.edu) as you develop this portion of the proposal. The University Assessment Coordinator can help you establish appropriate student learning outcomes, methods for measuring student progress and using the data to inform program improvement, and assist with all facets of academic assessment.*

4.1 Student Learning Outcomes Assessment Plan

Complete the table below to provide an overview of your plan to assess student progress toward achievement of desired program-level learning outcomes. Note that results of evaluations of student performance against each learning outcome identified below will be reviewed as part of all college/school/center-level and University-level program reviews.

Program-Level Student Learning Outcomes *What are the most important (no more than five) specific learning outcomes you intend for all program completers to be able to achieve and demonstrate upon completion of the program?*	**Evaluation Method** *How will students document/demonstrate their performance toward achievement of the learning outcomes? How will you measure student performance toward achievement of the learning outcomes?* *Describe any use of direct measures: capstone experiences/courses, standardized exams, comprehensive exams, dissertations, licensure exams, locally developed exams, portfolio reviews, course-embedded assessments, etc.* *Describe any use of indirect measures: student, alumni or employer surveys (including satisfaction surveys); exit interviews/focus groups with grads; retention/transfer studies; graduation rates; job placement/grad school admission rates; etc.*	**Use of Assessment Data** *How and when will student performance data be analyzed and then used to "close the assessment loop" and inform **program improvement**? How will you document that?*
1. *Demonstrate the ability to A) analyze patterns in large, complex datasets and B) communicate information regarding data, analyses, and graphics.*	**Direct Measures:** 1. *Students' ability to analyze patterns in large datasets (A) will be assessed in Introduction to Programming for GIS and Remote Sensing (GIS 4090). Final student projects will be evaluated against a common grading rubric to judge the percentage of students able to successfully analyze and present geospatial projects including big data. An acceptable grade results from a student grade of B or higher on final project and will be based from grading on a consistent rubric for comparison over time.* 2. *Students' ability to communicate information regarding data, analyses, and graphics will be measured using the grading rubric for students' final projects in GIS 4010. The rubric generally measures students' overall ability to describe data, conduct analyses, prepare graphics, and present outcomes.* **Indirect Measures:** 1. *Successful placement of an internship/job in GIS or Remote Sensing* 2. *Employer feedback* 3. *Participation in Ideathon/ Mapathon event* 4. *Placement in a Graduate program in GIS*	*Student performance data will be assembled by the program director annually and assessed annually as new data are accrued. Program performance in students' ability to analyze large datasets (A) and communicate relevant information about data, analyses, and graphics (B) will be measured against prior years' performance as per the direct measures of success on final projects in GIS 4010 and 4090. Student performance will be measured against prior years to document positive and negative trends in areas within each rubric. Over time, improved performance would be indicated by the positive trends in percentage of successful final projects. If stagnation or declining performance occurs, adjustments to curriculum will be made to address the identified areas of concern from the final project rubric.* *Geospatial Industry feedback will be gathered (from employers like ESRI, the NGA, USGIF, T-REX, 1904Labs, etc…) and assessed to address the satisfaction of employers of SLU graduates. Feedback will be used to adjust curriculum programs and documented further through student performance.*

		Development of the program's improvement will be documented using temporal data to note important program changes in relation to student performance metrics (i.e. a timeline).
2. Show proficiency in Remote Sensing, including the ability to acquire, process, and analyze remotely sensed data	**Direct Measures:** *1. Final Projects in GIS 4040 and 4050, which require students to acquire, process, and analyze remotely sensed data, will be graded against a common rubric to measure project quality in each focus area and judge trends in student performance over time.* **Indirect Measures:** *1. Successful placement of an internship/job in Remote Sensing* *2. Employer Feedback* *3. Placement in a Graduate program in Remote Sensing*	*Student performance data will be assembled and assessed by the program director after each semester. The rubric scores of student final projects in GIS 4040 and 4050 will be averaged each year and the average will be monitored over time. Scores will be categorized by various learning goals so that faculty may monitor student performance in each category (acquisition of data, processing, analysis, etc…).* *Student placement data will be collected annually and used to support grade-based student performance measures. We aim for a 95% placement and will require curriculum adjustments if SLU graduates are unable to compete in hiring processes.*
3. Attain skills in programming languages relevant to GIS, Remote Sensing, and Computer Science.	**Direct Measures:** **1.** *Final Projects in GIS 4090 and 4091 will be used to assess student performance in learning programming languages through grading against a common rubric. Rubric scores will be categorized based on important scripting, GIS, and Remote Sensing topics. Scores will be averaged after each semester and monitored over time.* **Indirect Measures:** *1. Participation in any hackathon/Ideathon/ Mapathon event and monitoring of GeoSLU student team placing over time in the 1904 Geospatial Hackathon.* 2. *Successful job/internship placements with GIS, remote sensing, or programming employers*	*Student performance data in programming languages will be collected and assessed by the program director after each semester. The categorized rubric scores for final projects in GIS 4090 and 4091 will assess performance in different, important subdisciplines of programming that will be used to inform changes to curriculum. Data will be organized sequentially to monitor the effect of curriculum changes on student learning performance.* *GeoSLU's annual placement in the 1904Labs Geospatial Hackathon is a good indicator of competition against other academic and professional programmers. With the targeted increase in SLU's academic involvement in the geospatial community, over time we would hope to see improvements in the placement of the GeoSLU Team in the 1904Labs hackathon.*

4.2 Curriculum Mapping

Courses should contribute to student achievement of the program learning outcomes detailed above. Sequencing should be intentional and complementary, allowing for the development of curricular content at multiple levels and the application and demonstration of student understanding and skills at multiple levels. Accordingly, complete the two curriculum maps below, indicating the course(s) in which each learning outcome is intentionally addressed and at particular levels of intellectual complexity and rigor, using the level indicators* provided below. ***Depending on the nature of the proposed program, the levels may seem more or less appropriate. Without veering from the spirit of the exercise, you may adapt the levels as deemed appropriate.***

Level I	Level II	Level III
▪ *Knowledge & Comprehension:* Recall data or information; understand the meaning, translation, interpolations, and interpretation of instructions and problems; state a problem in one's own words.	▪ *Application:* Use a concept in new situations; unprompted use of an abstraction. Application of knowledge in novel situations. ▪ *Analysis:* Separates material or concepts into component parts so organizational structure may be understood. Distinguishes facts from inferences.	▪ *Synthesis:* Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure. ▪ *Evaluation:* Make judgments about the value of ideas or materials.

Note: *When you first complete the curriculum maps, you may see that certain outcomes are not addressed in any developmentally-appropriate sequence, or that a particular outcome might not be addressed substantially enough; you might even see that you have included a course(s) in your curriculum that doesn't substantially contribute to the development of* any *outcome. You should use the map to alter your program design, course syllabi and course sequencing to best facilitate and support student achievement of the outcomes. The result of that exercise should be a final curriculum map presented below when you submit your proposal to UAAC.*

Courses Offered by Home Department of Proposed Major or Minor:

Major or Minor Student Learning Outcomes	GIS 4010	GIS 4020	GIS 4030	GIS 4040	GIS 4050	GIS 4060	GIS 4090	GIS 4091	GIS 4100	GIS 4120	GIS 4130
Outcome 1: Geospatial Thinker/Cartographer	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3
Outcome 2: Remote Sensing				1, 2, 3	1, 2, 3				1, 2, 3		
Outcome 3: Programmer/Automator	1, 2, 3	1, 2, 3				1, 2, 3	1, 2, 3	1, 2, 3		1, 2, 3	

Program Courses Offered by Other Departments:

Major or MInor Student Learning Outcomes	MATH 1510	MATH 1520	MATH 1660	MATH 2530	MATH 3110	MATH 3550	STAT 3850	STAT 4800	STAT 4850	STAT 4860	STAT 4870
Outcome 1: Geospatial Thinker/Cartographer	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2
Outcome 2: Remote Sensing	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2
Outcome 3: Programmer/Automator	1	1	1	1	1	1	1	1	1	1	1

Major or MInor Student Learning Outcomes	CSCI 1060	CSCI 1300	CSCI 3100	CSCI 3300	CSCI 4850
Outcome 1: Geospatial Thinker	*1, 2, 3*	*1, 2, 3*	*1, 2, 3*	*1, 2, 3*	*1, 2*
Outcome 2: Remote Sensing	*1, 2, 3*	*1, 2, 3*	*1, 2*	*1, 2*	*1, 2*
Outcome 3: Programmer/Automator	*1, 2, 3*	*1, 2, 3*	*1*	*1*	*1*

* Adapted from Bloom's Taxonomy (1965)