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**B.S. Geomatics**

**Academic Assessment Plan**

**Adopted by**

**The Geomatics faculty: 30 March 2018**

Reviewed with curriculum changes by the Academic Assessment Committee as an information item: 2/19/21

Reviewed by the Faculty Senate as an information item: 3/5/21

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Reviewed by the Faculty Senate as an information item: 5/4/18

# Mission Statement

The mission of the Geomatics department is to contribute to the wider body of knowledge in the geospatial sciences, and to disseminate this to society. By advancing our theoretical, professional, technical and educational capabilities, we will develop and maintain a community dedicated to the highest standards of scholarship. Within a student-centered environment, we are committed to the theoretical, professional and technical advancement of all our students, so that they may contribute to the advancement of their profession, their society, and their world, throughout their lives.

# Program Student Learning Outcomes

In Spring 2018, the Geomatics Advisory Board Approved changes to the Student Learning outcomes to align with changes made by the Applied and Natural Science Accreditation Commission of ABET. Students graduating with a BS in Geomatics will have:

1. An ability to identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.
2. An ability to formulate or design a system, process, procedure or program to meet desired needs.
3. an ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions
4. an ability to communicate effectively with a range of audiences
5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts
6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.
7. An ability to apply knowledge in all six areas of surveying and mapping:
	1. Field surveying and methods;
	2. Photogrammetric mapping, image interpretation and remote sensing;
	3. Surveying calculation and data adjustment;
	4. Geodetic coordinates and astronomy;
	5. Cartographic representation, projections, and map production;
	6. Computer-based multipurpose cadastre, geographic information systems.

# Mapping of Student Learning Outcomes changes

**Applied and Natural Science Accreditation Commission**

| **Current ASAC GENERAL** **CRITERION 3. STUDENT** **OUTCOMES**  | **Changes to current general criterion**  | **Proposed ANSAC GENERAL** **CRITERION 3. STUDENT** **OUTCOMES**  |
| --- | --- | --- |
| The program must have documented student outcomes that prepare graduates to attain the program educational objectives. There must be a documented and effective process for the periodic review and revision of these student outcomes.  | No edits or changes  | The program must have documented student outcomes that prepare graduates to attain the program educational objectives. There must be a documented and effective process for the periodic review and revision of these student outcomes.  |
| A. Baccalaureate degree programs must demonstrate that graduates have:  | Reorganized and edited  | B. Baccalaureate degree program student outcomes must include, but are not limited to the following:  |
| (a) an ability to apply knowledge of mathematics, science, and applied sciences  | Renumbered as Item 1 and incorporated (e) and SASC wording  | (1) An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.  |
|  (b) an ability to design and conduct experiments, as well as to analyze and interpret data  | Renumbered as Item 3 and edited with SASC wording  | (3) an ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions  |
| (c) an ability to formulate or design a system, process, or program to meet desired needs  | Renumbered as Item 2 and edited with SASC wording  | (2) An ability to formulate or design a system, process, procedure or program to meet desired needs.  |
| (d) an ability to function on multidisciplinary teams  | Renumbered as Item 6 and edited per Task Group  | (6) An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.  |
| (e) an ability to identify and solve applied science problems  | Renumbered as Item 1,combined with (1), and edited  | See (1) Above  |
| (f) an understanding of professional and ethical responsibility  | Renumbered as Item 5, combined with (h), and edited  | (5) An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.  |
| (g) an ability to communicate effectively  | Renumbered as Item 4 and edited per Task Group  | (4) an ability to communicate effectively with a range of audiences  |
| (h) the broad education necessary to understand the impact of solutions in a global and societal context  | Combined with (f), and edited  | (5) See Above  |
| (i) a recognition of the need for and an ability to engage in life-long learning  |   | Moved to curriculum 1st Paragraph  |
| (j) a knowledge of contemporary issues  |   | Eliminate  |
| (k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.  | Moved to curriculum  | Now incorporated into Criterion 5, Paragraph 2, new item C  |

# Measures

Three principal measures are to be used to assess student attainment of the program SLOs. These include course level assessments, results from the Fundamentals of Surveying (FS) examination, and a graduate exit survey. The relationship between the measures and SLOs is given in Table 1. Each measure is described in its own appendix to this assessment plan.

| **Table 1: Mapping of SLOs to Measures** |  Course Level Assessment | FS Examination | Graduate Exit Survey |
| --- | --- | --- | --- |
| 1. An ability to identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline. |  **1** | **1** | **1** |
| 2. An ability to formulate or design a system, process, procedure or program to meet desired needs. |  **1** | **1** | **1** |
| 3. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions |  **1** | **0** | **1** |
| 4. An ability to communicate effectively with a range of audiences | **1** | **0** | **1** |
| 5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts | **1** | **0** | **1** |
| 6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty. | **1** | **1** | **1** |
| 7 a. Field surveying and methods | **1** | **1** | **1** |
| 7 b. Photogrammetric mapping, image interpretation and remote sensing | **1** | **1** | **1** |
| 7 c. Surveying calculation and data adjustment |  **1** | **1** | **1** |
| 7 d. Geodetic coordinates and astronomy |  **1** | **1** | **1** |
| 7 e. Cartographic representation, projections, and map production |  **1** | **1** | **1** |
| 7 f. Computer-based multipurpose cadastre, geographic information systems |  **1** | **1** | **1** |

# Process

Table 2 summarizes the process for administering the various measures. The department Assessment Coordinator is to work with the faculty each semester to identify artifacts from within the courses which can be used directly observe and assess the level to which students are attaining the SLOs.

The data obtained from the various measures will be presented and discussed annually at the end of the spring semester. In this meeting, faculty will evaluate the collected data and explicitly review each SLO and make a judgment as to the level of student attainment of each outcome. Faculty will also discuss and recommend changes to curriculum, advising procedures, assessment plans, and other factors which will aid future students in better attainment of the SLOs. The results of these discussions will be summarized by the assessment coordinator in brief report which will include, for each SLO:

* Level of student attainment of the SLO.
* A rationale for the level determination
* Potential actions which could enhance student performance relative to the SLO
* Recommendations for improving the applicable measures

This report will be filed on the department’s directory on the college’s shared drive so that they can be used for reporting to OAA and accreditors.

**Table 2**

## Program SLO Assessment Measures and Administration

| **Tool** | **Description** | **Frequency/ Start Date** | **Collection Method** | **Administered by** |
| --- | --- | --- | --- | --- |
| Course Level Assessment | Faculty each year will identify specific courses and assignments where student attainment of SLOs can be directly observed/measured  | Occurs Every Academic yearEach SLO will be assessed on a two year cycle, SLO’s will be assessed at least twice in a six year cycle | Faculty provide results for the courses they teach | Geomatics Assessment Coordinator and Faculty |
| FS Examination | The FS is a pre-licensure exam administered by the State of Alaska | Every year | Results are made available twice a year | State administered, Geomatics Assessment Coordinator collates |
| Graduate Exit Survey | Survey of graduating students administered in the capstone course | Every Year | Survey in Capstone | Capstone course instructor |

# Appendix A: Course Level Assessment

Tool Description:

The primary means of assessing student attainment of the SLOs. Student artifacts from across the curriculum will be used to determine the level to which students are attaining each SLO.

At the start of each fall semester the faculty will meet and produce a mapping matrix between courses and SLOs where they will identify the BEST two places in the curriculum where each SLO can be observed and assessed. Table A.1 gives the general form of the mapping matrix.

**Table A.1
Course to SLO Mapping (Conceptual)**

| **SLO/Course** | **Instructor** | **SLO #1** | **SLO #2** | **SLO #3** |
| --- | --- | --- | --- | --- |
| Course #1 | Faculty A |  |  |  |
| Course #2 | Faculty A | Yes |  | Yes |
| Course #3 | Faculty B |  |  |  |
| Course #4 | Faculty C |  | Yes |  |
| Course #5 | Faculty A | Yes |  | Yes |
| Course #n | Faculty C |  | Yes |  |

The faculty member responsible for the identified courses, will submit a department approved form at the end of each semester which will collect the result of the assessment activity for each SLO evaluated in their course.

Typical information collected:

* Course identification information
* Faculty member
* SLO being assessed
* Short description of the student work product used for the assessment
* Criteria (rubric) used for determining level of attainment
* Summary of student attainment of the SLO in the course
* Copy of the prompting document for the work product.
* Copy/example of a work product meeting each level of attainment.

The assessment coordinator collects these forms and prepares a summary report for the end-of-year assessment meeting.

Factors that affect the collected data:

* The quality of the prompting document. Students need to be clear on what is being requested.
* Single person review of the artifacts may skew the results if faculty are not in agreement on the rubric elements used in the evaluation.

How to interpret the data:

The faculty will develop and refine rubrics which can be used to interpret the data. Also, the faculty will have a chance to review the submitted data annually at the end-of-year meeting and come to a consensus regarding the meaning of the results.

UAA Geomatics Program

**Example of Course Level Assessment of Program Student Learning Outcomes**

Fall 2016-Spring 2017

Date: 5/5/2017

Course: Prefix GEO GEO Numbers: 359 GIS Numbers: Choose an item.

Course Title Geodesy and Map Projections

Instructor: Jeffery Hollingsworth

Program Outcome Assessed: 1a. An ability to apply knowledge of mathematics

Description of student work product(s) used for this assessment:

Exam Question

Additional Information Computing Radius of Curvature

Criteria for being rated as below expectation:

 Answer is missing or incorrect (Poor).

Criteria for being rated as meeting expectation:

 Answer is correct or in the right direction (Developing or Satisfactory).

Criteria for being rated as above expectation:

 Answer is perfectly correct (Excellent).

Number of BS Geomatics students whose work was rated as being:

Below expectation: \_\_\_\_\_\_\_

Meeting expectation: \_\_\_\_\_19\_\_\_\_\_\_

Above expectation: \_\_\_\_\_\_\_\_\_\_

Attachments:

* Prompting document for the work product
* Example of work rated as being below expectations (remove student identifiers)
* Example of work rated as meeting expectations (remove student identifiers)
* Example of work rated as above expectations (remove student identifiers)

**Assessment Rubric:**

| **Outcome 1a:** **an ability to apply knowledge of mathematics** |
| --- |
| **Performance Indicator (PI)** | **Poor** | **Developing** | **Satisfactory** | **Excellent** |
| 1. Selects appropriate theory, model or governing equation
 | Does not demonstrate understanding of appropriate model | Demonstrates some idea of appropriate model | Selects appropriate model or theory for the problem | Judgment exceeds expectations when selecting model for problem |
| 1. Understands simplifying assumptions or limitations of the chosen model
 | Does not demonstrate understanding of simplifying assumptions or limitations | Demonstrates incomplete understanding of simplifying assumptions or limitations | Demonstrates understanding of simplifying assumptions or limitations | Demonstrates particularly thorough understanding of limitations of model |
| 1. Implements theory, model or governing equation correctly to perform analysis
 | Is unable to implement theory or model to perform analysis | Begins analysis but is unable to see it to completion | Implements theory or model correctly to perform analysis | Implements theory or model to perform analysis in a way that exceeds expectations |

**Summary of results:**

|  |  | **Number of Students Achieving this Level** |
| --- | --- | --- |
| **PI** | **Assessment method** | **Poor (1)** | **Developing (2)** | **Satisfactory (3)** | **Excellent (4)** | **% Students scoring 3 or 4** |
| 1 |  |  |  |  | 19 | 100 |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |

**Direct Assessment Action:**

 Meets expectations

**Comments and Proposed Improvement:**

 Give repeatable questions in blackboard to add additional practice with computations

# Appendix B: Fundamentals of Surveying Examination Results

Tool Description:

The State of Alaska administers the Fundamentals of Surveying (FS) examination to students who are pursuing a Professional Land Surveyors license. This is a voluntary exam and is not taken by all Geomatics students. The exam is a nationally recognized exam administered by the State of Alaska and results from UAA students are compared regionally and nationally with other students taking the exam.

The results are provided to the College twice annually and can be used to evaluate a number of the SLOs.

Factors that affect the collected data:

* Not all students take the exam. It is of interest primarily to students in the Surveying concentration.
* Students may retake the exam. The results do not distinguish how many of the exam takers are repeating the exam. As a result the summary data may include the same student multiple times.
* The reported results are aggregated and are not individual specific, making the issue with multiple attempts impossible to resolve.

How to interpret the data:

The faculty use the data obtained from this exam to look only at a select few of the SLOs. Student performance is determined to be acceptable if the aggregate results meet or exceed national performance.

# Appendix C: Graduate Exit Survey

Tool Description:

The students in the capstone course will be surveyed annually.

This survey may vary from year to year, depending on what other information may be desired each year, but at a minimum the students will be asked how well they were instructed relative to each SLO and what they feel their level of attainment has been.

The questions could take the form of:

The UAA BS Geomatics program has adopted 7 student learning outcomes. Please rate your knowledge/skills and the program’s effectiveness in teaching you knowledge/skills relative each student learning outcome.

The program states that students graduating with a BS in Geomatics will have:

1) An ability to apply knowledge of mathematics, statistics, and general physics;

What is your ability now? □ poor, □ fair, □ good, □ excellent,

□ outstanding, □ No opinion

How well did we do teaching this? □ poor, □ fair, □ good, □ excellent,

□ outstanding, □ No opinion

2) An ability to collect, analyze and interpret data in all of the recognized surveying and mapping areas

What is your ability now? □ poor, □ fair, □ good, □ excellent,

□ outstanding, □ No opinion

How well did we do teaching this? □ poor, □ fair, □ good, □ excellent,

□ outstanding, □ No opinion

Add questions until all SLOs are covered.

Factors that affect the collected data:

* Research has shown that self-assessments are often inaccurate.

How to interpret the data:

The faculty is to compare these results to the more direct measures and discuss comparison. If student perceptions are significantly different that direct performance measures, then additional investigation may need to be establish the validity of the direct measures.