GEOMATICS DEPARTMENT
GIS OPTION
Oregon Institute of Technology
NWCCU Assessment Report
2015-2016 Academic Year

1. Program Introduction

1.1 Program History

Geomatics education has been offered virtually since the inception of the Oregon Institute of Technology, with an associate degree in Surveying initiated in 1951. The program was accredited by the Engineer's Council on Professional Development (ECPD) in 1953. ECPD is now recognized as ABET. A baccalaureate Surveying Technology degree was offered in 1966, and accredited by TAC-ABET in 1970. The program was one of the first two Bachelors of Science surveying programs in the nation to receive RAC-ABET accreditation in 1984. The geomatics program has enjoyed 62 years of continuous accreditation under ABET or its predecessor, ECPD. Oregon Tech can be proud of having the oldest BS Geomatics program in the nation. The program degree title was officially changed from Surveying to Geomatics in 2001, reflecting a global trend recognizing the broadening of the profession and the impact of a revolution in advanced technology. As of 2007 the department now offers the BS Surveying option (former BS Geomatics degree), and the BS GIS option on the Klamath Falls campus.

1.2 Enrollment Trends (GIS Students)

Fall Terms	Year (2011-12)	Year (2012-13)	Year (2013-14)	Year (2014-15)	Year (2015_16)
Full-time Students	9	7	9	10	9

Reported values represent enrollment during the fourth week of fall quarter as recorded by Oregon Tech Institutional Research.

Table 1.1 – Geomatics - GIS Option enrollment trends

1.3 Recent Number of Graduates

A summary of the number of geomatics degrees (GIS option) awarded for the last 5 years is shown below.

Fall Terms	Year (2011-12)	Year (2012-13)	Year (2013-14)	Year (2014-2015)	Year (2015-2016)
First-time Students	3	3	5	1	2

Reported values represent graduations as recorded by Oregon Tech Institutional Research for the Geomatics-Survey Option

Table 1.2 – Geomatics – GIS Option degrees awarded

1.4 Employment Rates and Salaries

Based on the results of the senior exit survey (June 2016), both graduates had found employment. The reported range of salaries was $37,000/year to $62,400/year.

2. Program summary

2.1 Geomatics Department Mission, Objectives, and Program Student Learning Outcomes (PSLOs)

On September 17, 2015 the Geomatics department faculty met and reviewed the department mission, program educational objectives (PEOs) and Program Student Learning Objectives (PSLOs) listed below. Faculty affirmed that the department mission, PEOs, and PSLOs still meet the goals of the program.

Department Mission

The mission of the Geomatics Department is to provide students with fundamental knowledge and skills in the geomatics and GIS disciplines. The Surveying Option prepares students to pass the Fundamentals of Surveying (FS) examination and pursue licensure as a registered Professional Land Surveyor (PLS). The GIS Option prepares students to become certified GIS Professionals. All students learn the professional responsibility of protecting the health, safety and welfare of the public, and become aware of global and cultural issues.

Program Educational Objectives

Program educational objectives are statements that describe the expected accomplishments of graduates during the first few years after graduation—usually 3-5 years. These objectives are consistent with the mission of the program and the institution**.**

Graduates of the Oregon Tech Geomatics Options will:

1. Acquire the ability to obtain professional licensure and/or certifications in the geospatial industry.
2. Advance in the geospatial industry during their career by becoming involved in local, state, national, or international professional organizations.
3. Obtain industry positions requiring increased responsibility.
4. Assume responsibility for lifelong learning in professional and personal development.
5. Demonstrate readiness for graduate education and/or advanced technical education.

Program Student Learning Outcomes (PSLO)

(a) An ability to apply knowledge of mathematics, science, and applied sciences.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to formulate or design a system, process or program to meet desired needs.
(d) An ability to function on multi-disciplinary teams.
(e) An ability to identify and solve applied science problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of solutions in a global and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.

Note: The expected learning outcomes for the survey option are based on ABET/ASAC accreditation criteria.

2.2 Survey Option Student Learning Opportunities

Geomatics student professional learning opportunities include:

1. Geomatics Student Club community service activities. Each year, students in the Geomatics Club are encouraged to take on survey/GIS related projects that benefit the community. These projects provide the students with exposure to real-world projects, negotiation and fulfillment of a specific scope of work, and the opportunity to work with other disciplines.
2. The National Society of Professional Surveyors (NSPS) (formerly the American Congress of Surveying and Mapping) national student surveying competition. Geomatics students organize each year, and begin a fundraising drive to supplement funding provided by professional organizations.
3. Professional Land Surveyors of Oregon (PLSO) annual conference. Students volunteer as runners to assist with conference details, attend technical paper presentations, and staff the OREGON TECH Geomatics department booth.
4. GME 468 Geomatics Practicum. Students are responsible for completing a number of community service projects for city, county, state, and federal agencies.
5. Industry speakers are invited to make presentations at the PLSO Student Chapter meetings.
6. Students are encouraged to participate in international organizations such as the International Federation of Surveyors (FIG).
7. Oregon Tech annual workshop staffed by Bureau of Land Management (BLM) speakers.

3. **Summary of Six-Year Assessment Cycle**

Table 3.1 shown below depicts the six year PSLO/ISLO assessment cycle for the geomatics GIS option. Table 3.1 indicates the PSLO/ISLO and the academic year and the course where the learning outcome will be assessed.

PSLO	ISLO	AY 12/13	AY 13/14	AY 14/15	AY 15/16	AY 16/17	AY 17/18
(a) an ability to apply knowledge of mathematics, science, and applied sciences	6	GME452 GME444			GME452 GME454		
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	-	GME454 GME162			GME161 GME454		
(c) an ability to formulate or design a system, process or program to meet desired needs	4	GME351 GME454			GME351 GME372		
(d) an ability to function on multi-disciplinary teams	2		GME163 GME468			GME163 GME163	
(e) an ability to identify and solve applied science problems	-		GME351 GME452			GME351 GME452	
(f) an understanding of professional and ethical responsibility	3		GME161 GME466			GME175 GME466	
(g) an ability to communicate effectively	1		GME466 GME434			GME454 GME466	
(h) the broad education necessary to understand the impact of solutions in a global and societal context	8			GME434 GME241			GME343 GME466
(i) a recognition of the need for, and an ability to engage in life-long learning	5			GME161 GME468			GME161 GME468
(j) a knowledge of contemporary issues	-			GME351 GME454			GME351 GME466
(k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice	7			GME162 GME454			GME175 GME351
Additional PSLO Assessments							
Review FS Exam Results		X	X	X	X	X	X
Review IAC comments		X	X	X	X	X	X
Alumni Survey			X			X	
Employer Survey				X			X

Table 3.1 – Six Year Assessment Cycle

4. Summary of Current Academic Year Assessment Activities

4.1 Matrix Summary of 2015/2016 PSLO/ISLOs Evaluated During this Assessment Cycle.

Table 4.1 summarizes the PSLO/ISLOs that will be assessed during the 2015/2016 academic year. The matrix also indicates what course the outcome will be assessed in, the quarter of assessment, the instructor who will perform the assessment, and the method that will be utilized.

PSLO	ISLO	Course	Faculty	Term	Method
(a) an ability to apply knowledge of mathematics, science, and applied sciences		GME452 GME454/ 455	Walker Marker	Winter 2016 Winter 2016	Lab Project Homework Problem
(b) an ability to design and conduct experiments, as well as to analyze and interpret data		GME161 GME454/ 455	Marker Marker	Fall 2015 Winter 2016	Exam Question Lab Exercise
(c) an ability to formulate or design a system, process or program to meet desired needs		GME351 GME372	Marker Marker	Spring 2016 Spring 2016	Lab Project Lab Project

Table 4.1 – PSLO/ISLOs to be evaluated during the 2015/2016 assessment cycle

4.2 Summaries of individual assessment activities

4.2.1 PSLO (a) - **"**The ability to apply knowledge of mathematics, science, and applied sciences**".** GME 452 – Map Projection Design Lab Project Assessment.

Performance Criteria:

The student will:

1. **Demonstrate an understanding of Theoretical Concepts** with regards to the mathematics of map projections.
2. **Perform computations** that translate theoretical concepts into a useful projection.
3. **Design an application** that demonstrates the student's ability to convert theoretical calculations into a useful computer application.
4. **Transform terrestrial observations** into coordinates in a projected system.
5. **Transform projected map data** into coordinate data that can be located on the "real" earth.

Students are rated on the following scores:

1. Poor work
2. Significantly below average work
3. Slightly below average work
4. Average
5. Above average

Assessment Results:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Understand theoretical concepts	Instructor scored rubric	1 to 4 scale	70%	75%
Ability to perform calculations	Instructor scored rubric	1 to 4 scale	70%	100%
Ability to design an application	Instructor scored rubric	1 to 4 scale	70%	100%

Number of students assessed = 8

Table 4.1 – Student performance on PSLO (a) in GME 452 Winter Quarter, 2016

Actions to be taken

As the scores in all categories exceeded the departmentally established minimum of 70%, no actions will be taken for this PSLO at this time.

4.2.2 PSLO (a) - **"**The ability to apply knowledge of mathematics, science, and applied sciences**".** GME 454/455 State Plane Coordinate Calculations homework assignment.

Performance Criteria: The student will

1. **Demonstrate an understanding of Theoretical Concepts** behind State Plane Coordinate System Calculations.
2. **Perform computations** for conversion of grid distances to ground distances, and grid azimuth to geodetic azimuth.
3. **Identify** potential problems with using data derived from State Plane Coordinates in surveying and mapping projects.

Students are rated on the following:

Students were assessed on their ability to correctly answer questions with respect to each of the performance criteria. If the question was answered correctly, the student was given a score of "1" and if it was not answered correctly, it was given a score of zero. The class was expected to have 70% or more of the students answer the questions successfully in each category.

Assessment Results:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Understand theoretical concepts	Homework Assignment	0 or 1	70%	75%
Perform computations	Homework Assignment	0 or 1	70%	88%
Correctly identify potential problems	Homework Assignment	0 or 1	70%	88%

Number of students assessed = 8

Table 4.2 – Student performance on PSLO (a) in GME 454/455 Winter Quarter, 2016

Actions to be taken

As the scores in all categories exceeded the departmentally established minimum of 70%, no actions will be taken for this PSLO at this time.

4.2.3 PSLO (b) – "An ability to design and conduct experiments, as well as analyze and interpret data." GME 161 Exam question where student is asked to reduce and analyze level loop data.

Performance Criteria: Students must demonstrate the following:

1. **Correctly Reduce** a given set of closed level loop field notes
2. **Demonstrate** that the observations meet the required requirements

Students are rated on the following:

Students are given field notes for a closed level loop. Each student is expected to be able to reduce the notes and determine if the data obtained meets the given accuracy requirements. The expectation is that 70% or more of the students will be able to successfully complete all parts of this problem.

Assessment Results:

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Correctly reduce given level notes	Exam Question	0 or 1	70% of class scores 1	97%
Demonstrate that the provided observation meet the given accuracy requirements	Exam Question	0 or 1	70% of class scores 1	97%

Number of students assessed = 32

Table 4.3 – Student performance on PSLO (b) in GME 161 Fall Quarter, 2015

Actions to be taken

As the scores in all categories exceeded the departmentally established minimum of 70%, no actions will be taken for this PSLO at this time.

4.2.4 PSLO (b) – "An ability to design and conduct experiments, as well as analyze and interpret data." GME 454/455 Static Network Design, data collection and processing lab exercise.

Performance Criteria: Students must demonstrate the following:

3. **Demonstrate** the ability to import and process field data from a control network.
4. **Demonstrate** the ability to analyze and collected field data and assess its suitability for a given project requirement.
5. **Produce** final, adjusted coordinate values for the measured network.

Students are rated on the following scores:

1. Poor Work
2. Significantly below average
3. Slightly below average
4. Average
5. Above average

Departmentally Expected Score:

For PSLO (b), the geomatics department expects that 70% or more of students evaluated will score a 4 or 5 in all categories.

Assessment results:

Students in GME 454/455 – GNSS Surveying Applications are expected to design a GNSS control network, determine its suitability for a given set of project standards, and produce finished results. The network design is competed in Part I of a lab exercise and Part II analyzes and publishes results from the field observations. This assessment was conducted on Part II of this lab exercise.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Import and process data	Lab Exercise	1 to 4 scale	70%	89%
Analyze data and assess suitability	Lab Exercise	1 to 4 scale	70%	89%
Produce final data	Lab Exercise	1 to 4 scale	70%	89%

Number of students assessed = 9

Table 4.4 – Student performance on PSLO (b) in GME 454, Winter 2016

Actions to be taken

As the scores in all categories exceeded the departmentally established minimum of 70%, no actions will be taken for this assessment.

4.2.5 PSLO (c) – "An ability to formulate or design a system, process or program to meet desired needs" assessed in GME 351 – Construction and Engineering Surveying during Spring Quarter 2016.

Performance Criteria: Students must demonstrate the following:

1. **Demonstrate** the ability to collect topographic data and produce a topographic map for engineering design.
2. **Demonstrate** the ability to integrate a site plan with the topographic data and produce a site plan suitable for construction layout.
3. **Demonstrate** the ability to layout the site plan in the field.

Students are rated on the following:

Students in GME 351 spend the quarter working on a lot in an industrial park subdivision that will be developed into a small medical building. The project includes collection of field data, integration of field measurements and an engineered site plan into a set of construction drawings, and field layout of the completed project. It is expected that 70% of the class will obtain a score of 70% or better on the final project.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Complete lab project with a score of 70% or better	Lab Exercise	0 or 1	70%	100%

Number of students assessed = 4

Table 4.5 – Student performance on PSLO (c) in GME 351, Spring 2015

Actions to be taken

As the scores in all categories exceeded the departmentally established minimum of 70%, no actions will be taken for this assessment.

4.2.6 PSLO (c) – "An ability to formulate or design a system, process or program to meet desired needs" assessed in GME 372 – Subdivision Planning and Platting during Spring Quarter 2016.

Performance Criteria: Students must demonstrate the following in a quarter long lab project:

1. **Demonstrate** the ability to subdivide a legal parcel utilizing state and county laws and regulations for subdivision design.
2. **Demonstrate** the ability to produce a subdivision plat that meets the requirements specified in ORS 92.050 and ORS 209.050.

Students are rated on the following:

Students in GME 372 are assigned a 20 acre parcel at the beginning of the quarter. During the quarter, the student is expected to subdivide the parcel utilizing client wishes, county land development code, and state law as a guide for creating a 70 lot subdivision. The students are then expected to produce a finished subdivision plat that meets all of the requirements for filing at the Klamath County Clerk's Office and the Klamath County Surveyor's Office. The department expects that 70% of students in the class will score a 70% or higher on the final project.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Complete lab project with a score of 70% or better	Lab Exercise	0 or 1	70%	100%

Number of students assessed = 7

Table 4.6 – Student performance on PSLO (c) in GME 351, spring 2015

Actions to be taken

As the scores in all categories exceeded the departmentally established minimum of 70%, no actions will be taken for this assessment.

4.2.7 - Industrial Advisory Committee (IAC) Meetings

During this assessment period Geomatics faculty met with the Industrial Advisory Committee (IAC) three times. The meetings took place on October 21, 2015, January 21, 2016, and May, 2016. The most critical item with regard to program improvement from the IAC was stepping up of recruiting efforts within the program:

1. **Recruiting efforts** are a top priority with the IAC committee. They would like to see the following items accomplished of the next year:
    a. Improve the GME home page on the Oregon Tech website. The IAC committee believes that the current GME home page does not represent a good reflection on the program. They also feel that since the webpage is the front door for many individuals shopping for a school, it should be the best representation of the program put out to the public.
    b. The IAC committee would like to see a stronger effort to recruit in the Veteran population. Particularly, an emphasis on Oregon Tech's rating as a "Veteran Friendly School".
    c. The IAC committee would like to see the Geomatics Department begin developing online courses. In particular, start with courses that might draw interest from practicing technicians that might want to take courses as a review for the FS exam. In particular, the legal sequence courses should be the top priority for starting online course offerings.

4.2.8 – Senior Exit Survey

At the end of the GME 468 (Senior Practicum) course, students are given the opportunity to answer a short survey regarding their experience in the program. One of the questions asks the student to rate how well prepared they felt that they were for each of the program student learning outcomes a-k. This provides an indirect assessment from the students on how well they feel they have been prepared for each of the objectives stated for the program. The survey is administered online to graduating seniors using the Qualtrics survey tool.

Performance Criteria: The student will feel that they are prepared or highly prepared in PSLO a-k recognized by the geomatics department.

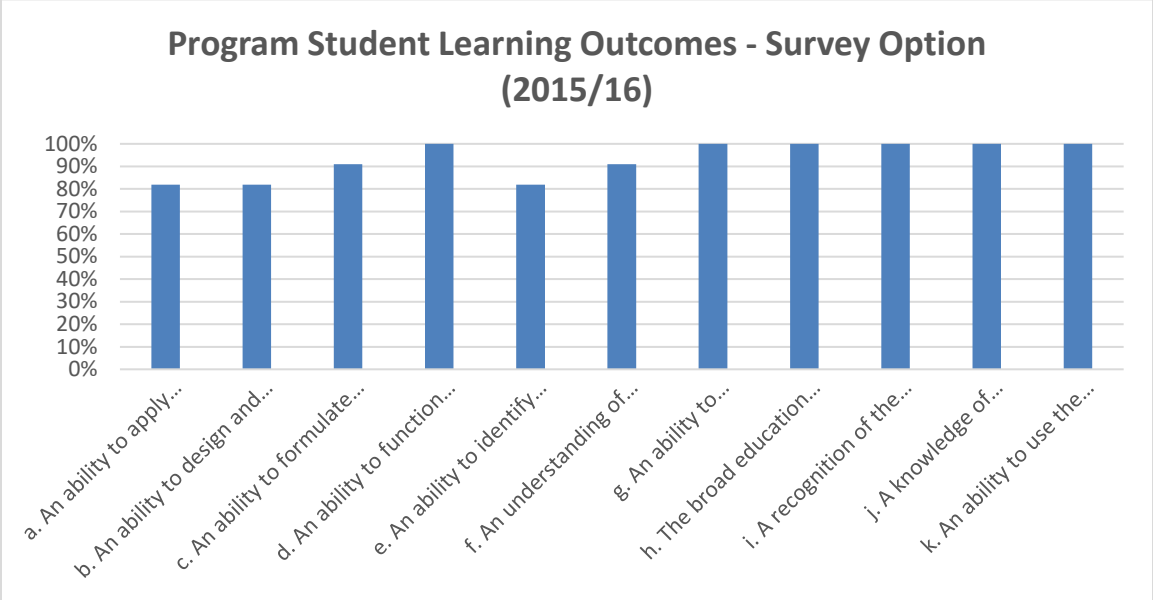

Figure 4.1 – Senior exit survey results for student individual feeling of preparation for each PSLO. Graphs represents results of spring 2016 survey.

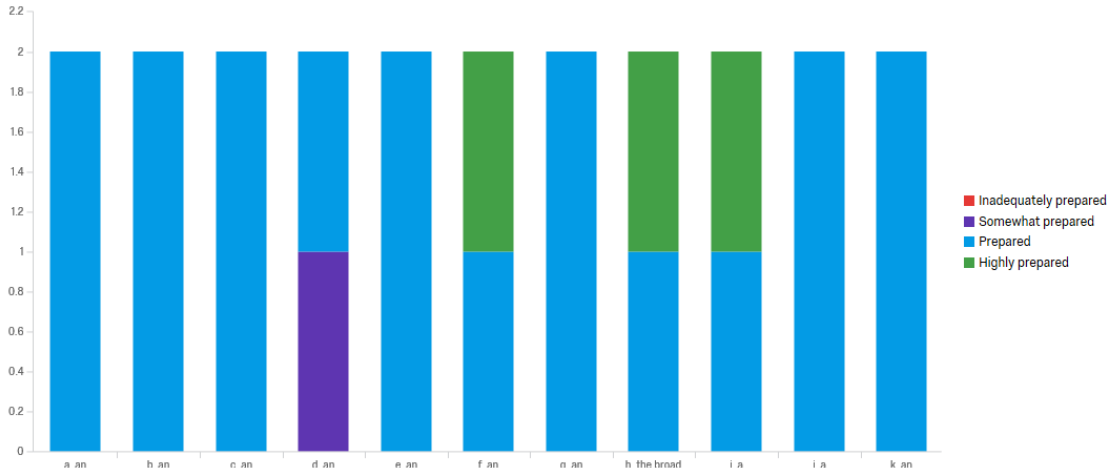

Figure 4.2 – Senior exit survey results for student individual feeling of preparation for each PSLO. Graph represents results of spring 2015 survey. NOTE: each bar represents a-k of the PSLOs. The x-axis labels were cut off in the Qualtrics report.

Assessment Results

Comparison of Figure 4.1 and Figure 4.2 shows that this year all categories (with one exception) scored 3.0 or higher. The program is still falling short of the stated goal with PSLO d (Ability to function on a multi-disciplinary team). Review of the direct assessments in these categories from previous years shows that students are performing adequately in these areas, but the students are not making the connection between the PSLO and what they perceive their performance to be in that area.

Actions to be taken

Faculty will continue to try and tie PSLOs to class work to help students understand how what they learn in the classroom is related to the overall program objectives. The 2016 results will be compared to the 2017 results to see if there is a trend in improvement, or if the improvements seen in 2016 are a one-time result.

5. Evidence of Student Learning

5.1 Summary of Department Discussions on Assessment Activities

September 15, 2015 – Geomatics department faculty met to review the department mission, Program Learning Objectives, and Program Student Learning Outcomes. Faculty agreed to continue with the above stated items as listed in the 2014/2015 assessment report. Faculty also discussed division of assignment (not teaching loads) that will be necessary with the department being short one faculty member.

5.2 Summary of Faculty Decisions on Program Improvements

The following is a summary of areas identified during this assessment cycle as areas than need additional monitoring or improvement:

1. Faculty need to continue to improve connecting classroom activities with the a-k PSLOs. The 2016 senior exit survey indicates that students still feel that they are not adequately prepared for multi-disciplinary work. This will continue to be a challenge for geomatics instructors to include this in course work as the geomatics specific course work does not provide significant opportunities for inter-disciplinary work. The institution is making efforts to improve this as a part of the general education reform at the institution, but these changes are projected to be three to four years out. Faculty will seek to develop projects with civil engineering and environmental science in senior practicum in order to provide more major specific opportunities.

6. "Closing the Loop" – Changes Resulting from Assessment

The following is a summary of areas identified during the last assessment cycle as areas that need additional monitoring or improvement:

Senior Exit Survey - The 2015 senior exit survey showed an improvement in how students view themselves as being prepared for the (a) through (k) assessed outcomes over the 2014 senior exit survey. The 2016 survey shows students felt "Prepared" in all areas with the exception of "an ability to function on interdisciplinary teams". For the 2016-2017 cycle, providing students more opportunity to work with other disciplines will be a department goal.

7. References

1. Oregon Institute of Technology. Institutional Research Home Page. June 9, 2011 <http://www.Oregon Tech.edu/ir>

8. Appendices - Appendix A – SLO Curriculum Map

Geomatics – Survey Option
Appendix A - PSLO Curriculum Map
2015/2016

PSLO (a) "Ability to apply knowledge of mathematics, science, and applied sciences".

Shaded courses indicate that the PSLO is taught in the course and that students are evaluated on the outcome.

	Freshman		**Sophomore**		**Junior**		**Senior**	
Fall	GIS 103		GIS 306		GIS 446		BUS 304	
	GME 161		GME 241		MIS 118		GME 425	
	MATH 111		MATH 252		SPE 321		GME 451	
	WRI 121		PHY 221		WRI 227		WRI 327	
Winter	CE 203		GIS 316		GIS 332		GME 452	
	GIS 134		GME 242		MIS 218		GME 455	
	GME 175		PHY 222		MIS 341		GIS 456	
	MATH 112		MATH 254N		Math Elec.		Humanities Elec.	
	Social Science Elec.						Science Elec.	
Spring	GIS 205		GIS 426		BUS 226		GIS 468	
	GME 162		MATH 361		GIS 432		Business Elec.	
	MATH 252		MIS 275		MGT 345		Humanities Elec.	
	SPE 111		Social Science Elec.		Social Science Elec.		Science Elec.	
	WRI 122				Social Science Elec.			

PSLO (b) "An ability to design and conduct experiments, as well as to analyze and interpret data".

Shaded courses indicate that the PSLO is taught in the course and that students are evaluated on the outcome.

	Freshman		Sophomore		Junior		Senior	
Fall	GIS 103		GIS 306		GIS 446		BUS 304	
	GME 161		GME 241		MIS 118		GME 425	
	MATH 111		MATH 252		SPE 321		GME 451	
	WRI 121		PHY 221		WRI 227		WRI 327	
Winter	CE 203		GIS 316		GIS 332		GME 452	
	GIS 134		GME 242		MIS 218		GME 455	
	GME 175		PHY 222		MIS 341		GIS 456	
	MATH 112		MATH 254N		Math Elec.		Humanities Elec.	
	Social Science Elec.						Science Elec.	
Spring	GIS 205		GIS 426		BUS 226		GIS 468	
	GME 162		MATH 361		GIS 432		Business Elec.	
	MATH 252		MIS 275		MGT 345		Humanities Elec.	
	SPE 111		Social Science Elec.		Social Science Elec.		Science Elec.	
	WRI 122				Social Science Elec.			

PSLO (c) "An ability to design a system, process or program to meet desired needs".

Shaded courses indicate that the PSLO is taught in the course and that students are evaluated on the outcome.

Note: PSLO (c) was assessed in GME 3551 and GME 372 during the 2015/16 assessment cycle. During this academic year, all GIS option majors were either dual major with the survey option or were taking survey minors which required them to take the GME 351 and GME 372 courses. These courses are not on the GIS option only curriculum map.

	Freshman		**Sophomore**		**Junior**		**Senior**	
Fall	GIS 103		GIS 306		GIS 446		BUS 304	
	GME 161		GME 241		MIS 118		GME 425	
	MATH 111		MATH 252		SPE 321		GME 451	
	WRI 121		PHY 221		WRI 227		WRI 327	
Winter	CE 203		GIS 316		GIS 332		GME 452	
	GIS 134		GME 242		MIS 218		GME 455	
	GME 175		PHY 222		MIS 341		GIS 456	
	MATH 112		MATH 254N		Math Elec.		Humanities Elec.	
	Social Science Elec.						Science Elec.	
Spring	GIS 205		GIS 426		BUS 226		GIS 468	
	GME 162		MATH 361		GIS 432		Business Elec.	
	MATH 252		MIS 275		MGT 345		Humanities Elec.	
	SPE 111		Social Science Elec.		Social Science Elec.		Science Elec.	
	WRI 122				Social Science Elec.			