GEOMATICS DEPARTMENT
GIS OPTION
Oregon Institute of Technology
NWCCU Assessment Report
2010/2011

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 57 years of continuous accreditation under ABET or its predecessor, ECPD. OIT 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 new BS GIS option.

1.2 Enrollment Trends

Fall Terms	Year (2006-07)	Year (2007-08)	Year (2008-09)	Year (2009-10)	Year (2010-11)
Full-time Students	46	65	67	72	61

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

Table 1.1 – Geomatics enrollment trends

1.3 Retention Rates

Fall Terms	Year (2004-05)	Year (2005-06)	Year (2006-07)	Year (2007-08)
First-time Freshman	0 (0%) (n=1)	5 (55.6%) (n=9)	6 (100%) (n=6)	2 (40%) (n=5)
Continuing Freshman: Changed major	0	2	0	0
Full-Time New Transfers	6 (86%) (n=7)	7(100%) (n=7)	3 (75%) (n=4)	TBD

Reported values are from OIT Institutional Research retention and graduation rates statistics.

Table 1.2 – Geomatics Retention Rates

1.4 Recent Number of Graduates

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

Fall Terms	Year (2007-2008)	Year (2008-2009)	Year (2009-2010)	Year (2010-2011)
First-time Students	0[1]	1	3	1

Notes:

1. 2007-2008 was the first year the GIS option was offered to students

Table 1.3 – Geomatics degrees awarded (GIS Option)

1.5 Employment Rates and Salaries

Historically, the number of graduates returning Career Services graduate survey forms has been low, for example only 2 responses from the 10 graduates of the Geomatics class of 2006. Geomatics faculty attempted to contact graduates and assist Career Services to obtain significant placement and salary data for graduates. The 2009 employment rate was 100%. The first graduate from the GIS option in 2009 obtained a job from the City of Grants Pass with a starting salary of ~$45,000. The second graduate from the option obtained a job from the United States Forest Service in Cave Junction Oregon, also with a salary of ~$40,000. The third graduate from the option in 2010 went on to graduate school at Portland State University to pursue further studies in GIS and geography.

2. Program summary

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

The program faculty reviewed and affirmed the mission, objectives, and program student learning outcomes during the fall 2010 convocation. The current version of these items is shown below.

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 related to their discipline.

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**.**

Geomatics Department Program Educational Objectives

- Prepare graduates to enter into professional practice
- Provide students with a broad foundation in major geomatics and GIS disciplines
- Prepare students to function effectively on multidisciplinary teams
- Prepare graduates to become licensed or certified professionals.

Program Student Learning Objectives

1. Ability to work effectively in teams.
2. An understanding of professional and ethical responsibility.
3. Demonstrate critical thinking skills in solving geospatial problems.
4. Ability to devise database schema required for addressing geospatial problems.
5. Ability to develop customized user interfaces appropriate for geospatial investigations.
6. Ability to appropriately incorporate GPS, CAD, and historical paper-based record data into a GIS framework.
7. Ability to identify geospatial problems and the requisite method, or set of procedures needed to address the issue.
8. Ability to construct a clear, presentable cartographic product that addresses a geospatial issue.
9. Understand the software/hardware requirements for implementing a scalable GIS.

2.2 GIS Option Student Learning Opportunities

Geomatics student professional learning opportunities include:

- American Congress on Surveying and Mapping (ACSM) national student surveying competition. Geomatics students organize each year, and begin a fundraising drive to supplement funding provided by professional organizations. Students volunteer as runners to assist with conference details, attend technical paper presentations, and staff the OIT Geomatics department booth.
- Intermountain GIS Conference map contest. Students are able to enter class projects and compete against student projects from academic institutions across the Pacific Northwest.
- GIS in Action Conference. Like the Intermountain Conference, students can enter maps derived from class projects in competition with students from other institutions.
- ESRI ArcGIS Users Conference. Students attending this conference are able to attend seminars, participate in map competitions, and view the application of GIS to dozens of different disciplines.
- GME 468 Geomatics Practicum. Students typically form a hypothetical corporation, and are responsible for completing a number of community service projects for city, county, state, and federal organizations and agencies. During fall quarter, GME 499 Geomatics Practicum was offered for students graduating in March. These students assisted with completion of a BLM cadastral survey, precise deformation monitoring of Ponderosa Junior High School, and planning for use of ODOT RTN GPS network to map City of Klamath Falls fire hydrants. During the academic year, a massive terrestrial, GPS, and hydrographic survey of the Lakeshore drive was completed. Students in GME 343 Boundary Surveys and GME 468 completed a cadastral survey under BLM authority.
- Industry speakers are invited to make presentations at the Geomatics club student meetings.

3. Summary of Three-Year Assessment Cycle

Table 3.1 below depicts the PSLO/ISLO three year assessment cycle for the geomatics GIS option. The table indicates the PSLO/ISLO and the academic year and quarter where the learning outcome will be assessed.

PSLO	ISLO	AY 09/10	AY 10/11	AY 11/12
(1) Ability to work effectively in teams	2	Winter		
(2) An understanding of professional and ethical responsibility	3	Fall		
(3) Demonstrate Critical thinking skills in solving geospatial problems	4			Fall
(4) Ability to devise database schema required for addressing geospatial problems	-		Fall	
(5) Ability to develop customized user interfaces appropriate for geospatial investigations	-		Spring	
(6) Ability to appropriately incorporate GPS, CAD, and historical paper-base record data into a GIS framework	8	Spring		
(7) Ability to identify geospatial problems and the requisite method, or set of procedures needed to address the issue	6&7	Winter		
(8) Ability to construct a clear, presentable cartographic product that addresses a geospatial issue	1			Spring
(9) Understand the software/hardware requirements for implementing a scalable GIS	5			Winter

Table 3.1 - Three Year Assessment Cycle

4. Summary of Current Academic Year Assessment Activities

4.1 Matrix Summary of 2009/2010 PSLO/ISLOs.

Table 4.1 summarizes the PSLO/ISLOs that will be assessed during the 2010/2011 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
(4) Ability to devise database schema required for addressing geospatial problems	-	GIS 446	Ritter	Fall	Project Evaluation
(5) Ability to develop customized user interfaces appropriate for geospatial investigations	-	GIS 332	Ritter	Winter	Project Evaluation
	1_1	GIS 407	Ritter	Fall	Presentation
	5_2	GIS 407	Ritter	Fall	Paper

Notes:

1. Demonstrate the ability to communicate effectively utilizing both oral and written methods.
2. Demonstrate an understanding of the importance of and need for life long learning.

Table 4.1 - 2010-11 Assessment Matrix

4.2 Summaries of individual assessment activities

4.2.1 PSLO (4) – "Students will demonstrate an ability to devise database schema required for addressing geospatial problems"

PSLO (4) was assessed by a rubric evaluation of a final lab project in the GME 446 (GIS Database Development) course. Students were provided with instructions and a sample dataset they would work through identifying information to be cataloged, grouping of data into thematic tables, the assignment of cardinalities to the tabular relationships, and the use of ArcGIS software to create the desired relationship classes. After completing the exercise with the sample data, the students were asked to use the same methodology developed in the sample exercise to solve a geospatial problem of their choosing. Students were evaluated using the criteria listed below.

Performance Criteria: The student will

1. Identify a problem that can be solved utilizing geospatial techniques.
2. Identify data required to solve the problem.
3. Design a database schema to store the data
4. Design tools a methodologies allowing use of the database for solution of the identified problem.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Identify problem to be solved utilizing geospatial techniques	Rubric graded project	1 to 4 scale	70% score at 3 or 4	90%
Identify data required to solve the problem	Rubric graded project	1 to 4 scale	70% score at 3 or 4	85%
Design a database schema to manage and query the data set	Rubric graded project	1 to 4 scale	70% score at 3 or 4	90%
Design tools allowing manipulation and query of the database for problem solution	Rubric graded project	1 to 4 scale	70% score at 3 or 4	90%

Table 4.2 – Student Performance on PSLO (4) Fall Quarter, 2010

Assessment Results

Assessment of PSLO (4) shows that GIS option students exceed the 70% minimum requirement for the database design performance criteria. This is an improvement over the 2008-2009 assessment of this PSLO where students failed to meet the 70% minimum for two of the stated performance criteria. The reason for the improvement is most attributed to refinement of the project students were asked to do and better preparation in earlier course work in the area of GIS. PSLO (4) for the GIS option was last assessed during the second year of the GIS options existence. Curriculum development and faculty experience have improved as the option has evolved over the last four years.

Actions to be taken

No formal action will be taken on this PSLO.

4.2.2 PSLO (5) – "Students will demonstrate the ability to develop customized user interfaces appropriate for geospatial investigations"

During the first five weeks of the term students worked on a sequence of exercises intended to build the background necessary to understand the Python programming language. The next three weeks were used to understand how the Python programming language could be used to customize the ArcGIS user interface. The last two weeks were used to understand how the ModelBuilder environment could be used to automate and extend the Python/ArcGIS environment.

One of the term's projects was to perform a set of operations on a data file obtained from the county tax assessor's office that included the address of every addressed land parcel in the county. Such data from the county Assessor's office is generally multi-valued in

that the street number and street name are found within the same text string. The task given to the students was to create a new tool accessible from the user interface that would take these data (approximately 60,000 records) and extract the street number from each record and place the street number in a newly created field.

Another of the term's projects was to create a tool using a combination of ModelBuilder and Python programming techniques. This tool was to be accessed from the user interface and would find those land parcels with at least 50% of their area within a 35 m buffer of a selected street within the Klamath Falls Urban Growth Boundary. The tool would then insert the address, owner, and owner address for the selected parcels into a new, programmatically created table.

Performance Criteria: The student will

1. Recognize need and utility of a customized interface in a GIS application.
2. Design a customized interface with user needs in mind.
3. Build a customized interface using suitable program routines.
4. Demonstrate a functioning user interface.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Recognize the need and utility of a customized interface in a GIS application	Rubric graded project	1 to 4 scale	70% score at 3 or 4	100%
Design a customized interface with user needs in mind	Rubric graded project	1 to 4 scale	70% score at 3 or 4	96%
Build a customized interface using suitable program routines	Rubric graded project	1 to 4 scale	70% score at 3 or 4	96%
Build a customized interface using suitable program routines	Rubric graded project	1 to 4 scale	70% score at 3 or 4	100%

Table 4.3 – Student Performance on PSLO (5) Winter Quarter, 2011

Assessment Results

Assessment of PSLO (5) demonstrates that GIS option students exceed the 70% minimum requirement for customization performance criteria. It should be noted that the students that were evaluated for this PSLO were exceptional students and took significant time to learn the Python programming language which was new to ArcGIS this year. Faculty expect that results will all be above the 70% mark in future assessments, but may not be as high as the results presented here.

Actions to be taken

No formal action will be taken on this PSLO.

4.2.3 ISLO (1) – "Students will demonstrate an ability to communicate effectively"

Written Communication

This assessment consisted of students writing a five to seven page paper that asked them to describe what the student expected the lifelong learning requirements will be for a professional in geomatics. This exercise was designed to encourage students to think about the importance of lifelong learning, benefits of membership in professional societies, the need for continuing education, and what credentials will be required of them to advance in their profession. The paper was graded for both content and structure. The results of this assessment look only at the structural components of the paper. The goal of this assessment is to determine the student's ability to communicate their ideas effectively with written communications.

Performance Criteria: The student will

1. Clearly state the purpose and idea of the paper
2. Demonstrate efficient and consistent organization
3. Support arguments with sufficient detail and documentation
4. Utilize a writing style appropriate to a professional report
5. Use standard writing conventions
6. Document all research

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Purpose and Ideas	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%
Organization	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%
Support	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%
Style	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%
Conventions	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%
Documentation	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%

Table 4.4 – Student Performance on ISLO (1) Fall Quarter, 2010

Assessment Results

The students who were evaluated for this assessment met all of the minimum requirements for acceptable performance as summarized in the table above.

Actions to be taken

No formal action will be taken at this time.

Verbal Communication

NOTE: The verbal component of ISLO (1) was done winter quarter in GME 466 (Boundary Law II). This course is not a part of the GIS curriculum, but during this quarter all of the GIS option students were enrolled in the course. It was decided to use this assessment data for both options to reduce assessment work load for the primary GIS instructor. This assessment was done by Professor Duryea.

This assessment consisted of each student selecting a legal aspect of boundary determination. The student was then asked to prepare a summary of existing case law that covered the topic and then present it to the class. The students were expected to summarize their case studies and provide sufficient graphics to help illustrate the legal concepts being discussed. The student was expected to make use of Microsoft Power Point as a presentation aid.

Performance Criteria: The student will

1. Presentation contains appropriate content
2. Organization is clear and easy to follow
3. Presentation is in a style consistent with professional presentation
4. Delivery is professional
5. Visual aids are utilized effectively

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Appropriate content	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	94%
Organization is clear	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	88%
Presentation style	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	94%
Delivery	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%
Visual aids	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	100%

Table 4.5 – Student performance on ISLO (1) Winter Quarter, 2011 Assessment of Verbal Communication Skills

Assessment Results

The minimum acceptable performance of 70% was met in all five performance criteria. The lowest category, organization at 88%, is most probably due to the fact that this is geomatics student's first exposure to interpreting and presenting legal case studies. As this requires a somewhat different approach than a typical technical report, most of our students are not yet practiced at it. Given that this is the first time most of them have had to give a presentation using legal cases as the primary documentation, this is an excellent performance.

Actions to be taken

Given the high results for this assessment, no formal actions will be taken. As the GME 466 – Boundary Law II course comes up for review with both the department and the Industrial Advisory Committee, the structure of the presentation assignment will be evaluated, but no significant changes are anticipated.

4.2.4 ISLO (5) – "Students will demonstrate a recognition of the need for and an ability to engage in life-long learning"

This assessment consisted of students writing a five to seven page paper that asked them to describe what the student expected the lifelong learning requirements will be for a professional in geomatics. This exercise was designed to encourage students to think about the importance of lifelong learning, benefits of membership in professional societies, the need for continuing education, and what credentials will be required of them to advance in their profession. The paper was graded for both content and structure. The results of this assessment look only at the content components of the paper. The goal of this assessment is to determine the students understanding of the need for lifelong

learning and what will be required for professional development once they leave the university.

Performance Criteria: The student will

1. Define and describe the necessity for lifelong learning
2. Recognize the importance of professional societies and organizations
3. Understand the need for professional credentials
4. Recognize the necessity for continuing education
5. Be able to articulate short and long term career goals

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Lifelong Learning	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	94%
Professional societies and organizations	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	88%
Credentials	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	81%
Continuing education	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	38%
Short and long-term career plans	Rubric-scored assignment	1 to 4 scale	70% score at 3 or 4	98%

Table 4.6 – Student performance on ISLO (5) Fall Quarter, 2010

Assessment Results

Overall, the students who were evaluated for this assessment performed well. One notable exception is in the area of continuing education. The average score of 38% was significantly below the department and institutional minimum level of acceptable performance. This result came as a surprise to the faculty given that our students receive significant exposure to the requirement of continuing education. The topic is discussed in the classroom setting and most of our students participate in one or more conferences during their time at OIT were continuing education is the primary focus of the event.

Actions to be taken

With the low score in continuing education, GME faculty will meet and discuss strategies to place this topic in more of our courses. Faculty will also try and stress to students attending conferences that one of the main reasons for the event is continuing education. It is vital that our students understand that to advance in their profession, they will need to continue studying once they leave the classroom.

4.2.7 – Industrial Advisory Committee Meetings

The OIT Geomatics department makes extensive use of the knowledge and expertise of our Industrial Advisory Committee (IAC). This group is made up of representatives from private industry and governmental organizations that have an interest in the success of the OIT geomatics program and the students graduating from it. Over the course of the 2010/2011 academic year, faculty met with the IAC committee to discuss a variety of program related issues including: curriculum design, funding issues, staffing issues, scholarships, and student internships. The IAC committee met with faculty in September, January, and May of this year.

For the GIS option, the main topics of discussion included increasing student enrollment in the program and development of a Master's degree in the GIS option. The IAC committee encouraged the Geomatics faculty to continue attending GIS conferences such as the GIS in Action Conference, the Intermountain GIS conference, and the ESRI ArcGIS Users Conference. IAC members also indicated that they would be willing to help promote the GIS option in their professional meetings.

The second item of discussion was the proposed Master's in GIS. IAC members felt that this would be an excellent way to bolster interest in the GIS program and the GIS option in particular. However, some concern was expressed that this might detract from the core mission of the four year degree. Faculty indicated that a condition of the Master's degree proceeding is insuring that it will not draw resources from either the GIS or Survey option baccalaureate degrees.

5. Evidence of Student Learning

5.1 Summary of Department Discussions on Assessment Activities

Geomatics faculty met during the start of fall quarter, 2010 to plan assessment activities for the upcoming year and to assign assessment tasks to individual instructors. Faculty met again at the end of spring quarter, 2011 to discuss the results of the year's assessment activities. All assessment meetings were attended by faculty from both the survey option and the GIS option.

5.2 Summary of Faculty Decisions on Program Improvements

Only one area in the GIS option was identified as requiring improvement. GIS option students scored below the established 70% minimum for their understanding of the necessity for continuing education. Faculty will work to incorporate more discussion of continuing education in course curriculum in order to develop student awareness of this critical aspect of their future career development. This area was also weak in the Survey option so this topic will be addressed in courses that are common to both such as GME 161 (Plane Surveying I) and GME 241 (Boundary Law I).

6. “Closing the Loop” – Changes Resulting from Assessment

No issues were identified in the 2009-2010 report, so there are no follow-up reports for the 2010/2011 assessment.

7. References

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

8. Appendices

Appendix A – SLO Curriculum Maps

PSLO Curriculum Map
2010/2011

PSLO (4): Ability to devise database schema required for addressing geospatial problems.

	Freshman		Sophomore		Junior		Senior	
Fall	GME 161		GIS 306		GIS 446		GME 425	
	GIS 103		GME 241				GME 451	
Winter	CIV 112		GME 242		GIS 205		GIS 446	
	GME 175		GIS 316		GIS 332		GME 452	
	GIS 105						GME 454	
Spring	GME 134		GIS 426		GIS 432		CIV 221	
	GME 162						GME 468	

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

PSLO (5): Ability to devise database schema required for addressing geospatial problems.

	Freshman		Sophomore		Junior		Senior	
Fall	GME 161		GIS 306		GIS 446		GME 425	
	GIS 103		GME 241				GME 451	
Winter	CIV 112		GME 242		GIS 205		GIS 446	
	GME 175		GIS 316		GIS 332		GME 452	
	GIS 105						GME 454	
Spring	GME 134		GIS 426		GIS 432		CIV 221	
	GME 162						GME 468	

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