

GEOMATICS ENGINEERING

Department of Civil and Geomatics Engineering Student Outcomes and Assessment (SOAP) Plan

February 25, 2009

I. Mission and Goals of the Program

Detailed published educational objectives have been developed for the Geomatics Engineering program at CSU, Fresno. That Geomatics engineers are prepared to manage the global spatial infrastructure. The complete mission statement and program objectives appear on the program web page, and on the program major sheets used for recruitment activities. Also note that the program mission and objectives are posted on the walls of many program related classrooms and laboratories.

Mission

Provide an educational experience that enriches the lives of Geomatics Engineering students by transmitting to them the necessary discipline related knowledge and skills so that they are prepared to enhance the profession and protect the health and welfare of the public while expanding the base of knowledge through research and scholarship.

Educational Objectives

The graduates of the Geomatics Engineering (GME) program shall demonstrate:

1. Competency in one or more of the following GME competency areas: Boundary/land surveying, photogrammetry, geodesy, GIS and digital mapping.
2. Continued capacity for employment in one or more GME specialty area.
3. Capacity for graduate education.
4. Continued membership in professional organizations.
5. A continued commitment to lifelong learning.
6. A continuing commitment to serving and protecting the health and welfare of the public.
7. An ability to pass professional or certification examinations after achieving requisite professional experience.

II. Alignment of the Program and the University's Missions and Goals

The mission statement was developed by the program faculty during an assessment meeting conducted during April of 1999. These statements were correlated with the Missions and goals of the University Mission. The mission statement and educational objectives were submitted to program advisory council in May of 1999. Ken Meme, Council President and 1986 program graduate stated - "From my perspective the program has changed over the years, staying current with modern trends, and that the current program appears well designed." The council voted unanimously to accept the final versions at the April 21, 2000 meeting. The program assures that these objectives are achieved by continuously analyzing our assessment instruments and other sources of feedback. The educational objectives were written to support the mission.

Continuous achievement of the program outcomes and absence of evidence to the contrary, strongly indicates that the objectives are continuously attained.

III. Alignment of the Program and the College Goals

The Geomatics Engineering mission and goals easily dovetail with those of the College of Engineering. The quality of the program is continually maintained. Strong ties to local, regional and statewide industrial partners keep the program strong and focused. Without the Professional Geomatics Engineers generated by this program the essential property boundary line location and terrain mapping needed to continue developing our essential local, regional and statewide infrastructure would not be possible. Most students enjoy well paid summer work experiences that prepare them well for the professional world they are about to enter. Course related design project assignments and real world experience insure that (GME) graduates are aligned with the College mission and goals as stated in the university catalog.

IV. Student Learning Outcomes as Developed in the Program's Student Outcomes Assessment Plan

The following list of Geomatics Engineering (GME) program outcomes was developed by the faculty with the concurrence of the program advisory council. Alumni and employer assessment survey addressees also had a chance to comment. These outcomes are provided to insure that GME graduates at CSU, Fresno meet the mandated ABET a-k set of outcomes and are also able to create and/or utilize modern GME related computer software, develop their GME job skills through student employment opportunities, pass professional licensing exams in adequate numbers, and demonstrate that graduates are able to enter graduate educational programs.

Geomatics Engineering Program Outcomes

The Geomatics Engineering Program at CSU, Fresno shall demonstrate that graduates have:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired and applicable GME related needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering 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 engineering solutions in a Global and societal context
- (i) a recognition of the need for , and an ability to engage in lifelong learning
- (j) knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern GME tools needed for GME work
- (l) an ability to create and or use GME related computer programs
- (m) a recognition of the need for acquiring GME related work experience prior to graduation.
- (n) a recognition of the importance of professional registration and or licensing in GME
- (o) demonstrated their capacity and preparation for graduate education

III.B.2.a. Structure/Coherence of Instructional Program

The GME program is simply understood by reference to the curricular roadmap for 2008-2009 as shown below.

CLASS	Units	Date	Grade	CLASS	Units	Date	Grade
FIRST SEMESTER Total 17 Units				SECOND SEMESTER Total 14 Units			
Engl 10	3			Comm 3/7/8	3		
Math 75	4			Chem 3A	4		
GME 1	1			Math 76	4		
GME 15,L	3			GME 16,L	3		
GME 66	3			GME 23L	1		
PI Sci 2	3						
THIRD SEMESTER Total 17 Units				FOURTH SEMESTER Total 15 Units			
Math 77	4			Phys 4B	3		
Phys 4AL	4			Hist 11/12	3		
GME 40	3			GE (C1)	3		
GME 61	3			GME 34	3		
GE D3	3			GME 50	3		
FIFTH SEMESTER Total 16 Units				SIXTH SEMESTER Total 18 Units			
Geol 1	4			GE (C2)	3		
GME 123	3			GME 102	3		
GME 135	3			GME 108	3		
GME 151	3			GME 126	3		
GME 173	3			GME 159	3		
UDWE	---			GE (B2)	3		
SEVENTH SEMESTER Total 17 Units				EIGHTH SEMESTER Total 14 Units			
PI Sci 120	3			Phil 120	3		
GME 143	3			Tech Des*	3		
CE 161	2			Tech Des*	3		
Tech Crs**	3			GME 125	3		
GME 150	3			GME 180	2		
GME 181	3						

- Choose two technical design courses from: GME 145, GME 153, GME 161, GME 175.
- ** Select a GME approved technical course from the catalog Listing.

III.D.2.a. Adequacy and Availability

The Process That Insures That Graduates Meet Program Objectives

The on-going process can also be most effectively described by reference to Figure 1. This illustrates the continuity and comprehensiveness associated with this process for GME program

at CSU, Fresno. Assessment instruments are prepared and submitted to employers, alumni, juniors, seniors and students regularly. The GME professors annually evaluate (usually in mid September) the assessment results from the preceding year. Identified weak areas (if any) are checked to see if they represent a long term trend and if any of these issues pervade many other assessments during this evaluation cycle. The results of this comprehensive analysis are then cross correlated with the program mission and objectives.

The decision of how well desired outcomes were being achieved was simplified by virtue of the fact that several of the program specific outcomes (and a few of the others) were written to be easily quantifiable. Determination of passing rates for the FLS and LS exam, cumulative work experience tabulations and the determination of the number of graduates employed are excellent ways to test the overall effectiveness of meeting desired program objectives. The total array of external assessment instruments used and careful monitoring of student and graduate work experiences and professional licensing success allows these issues to be effectively monitored.

The Geomatics engineering faculty decided that 3.50 on a 5.00 scale indicates agreement. Scores less than 3.50 (average) are noted, while scores less than 3.00 are analyzed thoroughly. Random isolated scores less than 3.50 are noted, but action is not taken unless a trend develops. These assessment indicators then can be used to demonstrate when objectives are being met.

GME CONTINUOUS ASSESSMENT CYCLE

3 YEAR PROCESS CYCLE	2 YEAR PROCESS CYCLE	1 YEAR PROCESS CYCLE	6 MONTH PROCESS CYCLE	
→→→	→→→→→→→	→→→→→→→	→→→→→→→	Responsive Input From Constituencies
↑	↑	↑	↑	↓
↑	↑	↑	↑	Evaluate and Assess Input Data
↑	↑	↑	↑	↓
↑	↑	↑	↑	Develop and Fine Tune Educational Objectives
↑	↑	↑	↑	↓
Alumni Surveys	Advisory Council	Junior Surveys	↑	Developing and Maintaining Objective Driven Outcomes
↑	↑	↑	Graduating Seniors	↓
Employer Surveys	Student Course Evaluations	Student Work Summary	↑	Deciding and Revising How to Achieve Desired Outcomes
↑	↑	↑	↑	↓
↑	↑	↑	↑	Determining and Revising How Desired Outcomes Will be Assessed
↑	↑	↑	↑	↓
↑	↑	↑	↑	Establishing and Modifying Indicators That Demonstrate How Objectives are Being Met
↑	↑	↑	↑	↓
←←←	←←←←←←←	←←←←←←←	←←←←←←←	Formal Instruction and Student Based Activities

Direct quantitative measures are integrated throughout the assessment process. The way in which this is accomplished can be best observed by summarizing the ways in which the achievement of certain program outcomes (i, k, m, n and o) are met.

Direct Programmatic Outcomes Assessment

Criteria (k): “90% of program graduates are employed in GME related full time jobs within one year of graduation from the program.”

Compliance with this outcome demonstrates that graduates of the program have not only acquired the ability to use the techniques, skills and modern GME tools necessary for professional practice but actually are in a position to utilize these skills on the job. An analysis of graduate employment statistics, maintained by the program faculty, is used to illustrate compliance with this desired outcome. Here we see that a vast majority of program graduates acquire full time professional employment within one year after graduation. This data is compelling. Since an average of 98% are employed in GME related jobs, it seems to logically follow that they have acquired the ability to use the techniques, skills and modern GME tools necessary for GME practice as required by mandated outcome k.

Criteria (m): “75% of Program graduates must have had at least six months of GME related part time or summer job experience prior to graduation”.

Compliance with this outcome demonstrates that graduates of the program have not only acquired a recognition of the need for GME related job experience prior to graduation, but that 79% actually do acquire six months or more of practical experience prior to graduation. An annual analysis of student summer and part time job experiences provides the data needed to demonstrate that this outcome is attained. A comprehensive analysis of 150 graduates over a ten year period indicates compliance with programmatic based outcome (m).

Criteria (n): “50% of all program graduates shall pass the FLS exam within 5 years of graduation and pass the LS or PE exam or become a Certified Photogrammetrist or attained similar levels of professional accomplishment within 10 years of graduation.”

Compliance with this outcome demonstrates that graduates of the program have not only acquired a recognition of the importance associated with professional registration or licensing in GME, but that a majority actually do pass the requisite exams within the indicated time frame. The data indicates that the FLS exam is passed by a large majority (average is 79% over the appropriate preceding thirteen years, 1988-2000) of program graduates. Eight graduating classes (1988-1995 were analyzed over the requisite 10 year period. for LS licensure. The eight year average is 67%.

How Assessment Results are Used to Improve the Program

Assessment results are used to improve the program regularly. The continuous assessment cycle shows the steps in the continuous improvement process. Historically, some of the best interaction has been achieved at the advisory council meetings. Here, the future of the program and the quality of graduates are the primary issues. Faculty and industrial representatives from both the public and private sector interact.

Assessment results is continuously updated and reviewed to develop trends. This helps determine the quality and direction of the program. While most results seem to indicate that the program is successful in meeting its current objectives, the faculty and the program constituencies remain alert watching for negative trends and looking for ways to correct any future problems. Particularly perplexing are mandated changes from the CSU System, campus and college administration that are not based on any of our assessment processes. Of course, when these mandates arrive, they are dealt with by relying on assessment data to minimize potential negative impacts as much as possible.

EDUCATIONAL OBJECTIVES-OUTCOMES CORRELATION MATRIX

Objectives⇒ Outcomes↓	1	2	3	4	5	6	7
A	X		X				X
B	X		X				
C	X	X				X	X
D	X	X					
E	X					X	X
F	X	X		X	X	X	
G	X	X					
H	X	X	X		X	X	X
I	X		X	X	X		
J	X				X	X	
K	X	X					
L	X		X				
M	X	X		X			
N	X	X		X		X	X
O	X		X		X		

The next table describes all the assessment tools used to insure that program graduates have achieved the desired program outcomes. These tools have been initiated and the results analyzed over a period of seven years. Thus assessment data has and continues to stream in to the program.

The Geomatics Engineering Program Outcomes Assessment listing itemizes the assessment tools that will be used to insure that program outcomes are achieved. These items correspond directly with the program outcomes a-o.

Two Year Assessment Cycle

The student course assessment surveys for each course in the curriculum have been conducted every two years, since 1999-2000. Additionally, the GME Advisory Council is routinely involved in discussion about program direction and the adequacy of our assessment measures and results. The advisory council discusses these items every other year.

**ASSESSMENT SCHEDULE for GEOMATICS ENGINEERING
at CSU, FRESNO**

Constituency	Frequency	Timing	Target Group	Purpose
ALUMNI	Every Third Year	1999, 2002, 2005 2008, 2011, 2014 etc.	All Program Graduates	Learning Outcomes Assessment
EMPLOYERS	Every Third Year	1999, 2002, 2005 2008,2011,2014 Etc.	All Employers	Assessment of Graduates Performance
GME ADVISORY COUNCIL	Every Second Year	Spring Meeting Starting 1999	GME Advisory Council Members	Program Mission, Goals, Objectives Outcomes Assessment, Program Oversight
JUNIOR SURVEY	Annually	GME 151 class every Fall	GME 108 Class	Learning Outcome Assessment Benchmark Reading
SENIOR SURVEY	Each Semester	GME 180 each semester	Graduating Seniors GME 180 Class	Learning Outcome Assessment Exit Reading
COURSE EVALUATION	Every Second Year	2005-2006, 2007-2008, 2009-2010, 2011-2012, etc	All GME Courses	Learning Outcome Assessment and Contribution to the Entire Curriculum
Professional Exam Passing Statistics	Every Second Year	FLS & LS exam passing statistics documented by graduating class	Alumni and Students	Program Outcomes Assessment
STUDENT WORK EXPERIENCES	Annually	Data collected at start of the Fall semester	GME Student Summer and Part Time Workers	Program Mission, Goals, Objectives and Outcomes Assessment

One Year Assessment Cycle

Currently operating on a one year assessment cycle are the Junior Surveys, and the annual analysis of student work experiences. Note that the new freshmen are assessed each fall using the same form that juniors and seniors use

These freshmen evaluations are not statistically significant to our assessment effort, since freshmen don't know much about the discipline yet. However, they do get an introduction to our assessment process in their introductory class, GME 1. So, by taking this assessment they have the program outcome goals reinforced in their minds. Senior surveys are tabulated by calendar year but collected every semester.

6 Month Assessment Cycle

Graduating seniors are questioned at the end of every semester to garner their assessments. The data is consolidated by calendar year and tabulated accordingly.

Informal Periodic Assessment Mechanisms

Several constituencies have been consulted on an informal period for as long as 42 years. Consider the Geomatics Engineering Conference which started at CSU, Fresno in 1958 (13 years before the program began) under the direction of program founder Edward Kulhan. Students have managed and directed this event for the past 20 years. The 45th Annual Conference was held in January of this year. Over 10,000 students and professionals have attended that event since its inception providing a continuous and effective line of communication between program students and the geomatics profession. The Foresight Magazine was first published in 1976 and 1977 and again from 1985 (with at least one edition per year) until the present. Mailed to geomatics professionals throughout the state and the nation, this student publication provided effective communication between the program and all constituent groups. The Magazine and Conference have served the program as excellent indirect assessment mechanisms for years.

Geomatics Engineering Program Outcomes Assessment

The Geomatics Engineering Program at CSU, Fresno shall demonstrate that graduates have met the desired outcomes listed above in the following ways:

- (A) Junior, Senior, Course, Employer, and Alumni Surveys
- (B) Junior, Senior, Course, Employer, and Alumni Surveys
- (C) Junior, Senior, Course, Employer, and Alumni Surveys
- (D) Junior, Senior, Course, Employer, and Alumni Surveys
- (E) Junior, Senior, Course, Employer, and Alumni Surveys
- (F) Junior, Senior, Course, Employer, and Alumni Surveys
- (G) Junior, Senior, Course, Employer, and Alumni Surveys
- (H) Junior, Senior, Course, Employer, and Alumni Surveys
- (I) Junior, Senior, Course, Employer, and Alumni Surveys
- (J) Junior, Senior, Course, Employer, and Alumni Surveys
- (K) Junior, Senior, Course, Employer, and Alumni Surveys and evidence that at least 90% of program graduates are employed in geomatics engineering related full time positions within one year of graduation
- (L) Junior, Senior, Course, Employer, and Alumni Surveys
- (M) Junior, Senior, Course, Employer, and Alumni Surveys and evidence that 75% of program graduates have had at least six months (26 weeks) of GME related part time or summer job experience
- (N) Junior, Senior, Course, Employer, and Alumni Surveys and evidence that at least 50% of program graduates have passed the FLS exam within five years of graduation and that at least 50% of program graduates have either passed the LS exam, become a certified photogrammetrist, passed a PE exam or attained other similar levels of professional accomplishment within ten years of graduation.
- (O) Junior, Senior, Course, Employer, and Alumni Surveys

All of the constituency assessment data is compiled as it is generated. Two concurrent processes are being conducted here. First, the mission, goals and outcomes are evaluated for appropriateness. Juniors, graduating seniors and alumni are periodically asked to evaluate the appropriateness of program outcomes.

Secondly each of the program outcomes is assessed for compliance. Employers, alumni, Juniors and graduating Seniors, and all students through periodic course evaluations are routinely asked to help evaluate how well the established outcomes are being met. Minor changes were made to this comprehensive assessment plan during the preparation for the recent ABET visit. The assessment schedule shown a few pages ago is the result of that slight modification. The Final ABET visit report may recommend (or mandate) additional modifications.

GEOMATICS ENGINEERING COURSE OUTCOME ASSESSMENT MATRIX (X=Correlated Item)

GME Courses	a	b	c	d	e	f	g	h	i	j	k	L	m	n	o
GME 1				X		X	X		X				X		
GME 15	X				X	X	X				X			X	
GME 15L	X	X	X	X	X		X				X		X		
GME 16	X				X				X					X	
GME 34	X				X				X			X			
GME 40	X				X										
GME 50	X	X	X	X	X		X				X		X	X	X
GME 61	X	X										X			
GME 66	X	X			X				X			X		X	
[GME 73]		X	X	X		X		X	X	X	X	X			
GME 102	X	X	X	X	X				X	X	X		X		X
GME 108	X	X			X				X						X
[GME 114]	X	X		X	X			X	X	X	X				
GME 123	X	X	X	X	X									X	
GME 125	X	X	X	X	X									X	
GME 126	X	X	X	X	X									X	
GME 135	X	X			X				X		X	X			X
GME 143	X				X				X			X			
[GME 145]D	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
GME 151	X		X	X	X	X	X	X			X		X	X	X
[GME 152]	X	X	X		X	X	X	X	X	X			X	X	X
[GME 153]D	X	X	X	X	X	X	X	X	X	X	X		X	X	X
GME 159-D	X	X	X	X		X		X	X	X	X		X	X	
GME 173	X	X	X		X				X			X			X
GME 180-D	X	X	X		X	X	X	X	X	X	X		X	X	
GME 181-D	X		X	X	X		X				X			X	

The effectiveness of the program is continually monitored through the extensive assessment process outlined earlier in this report. Action is taken when problems develop.

SUMMARY

The Geomatics Engineering program has developed a comprehensive assessment plan and process. This process has been implemented and the results used to further enhance and strengthen the program. All identified constituent groups appear to have endorsed this approach. They also appear to recognize how effectively program goals and objectives are being met. The students support the program and objectives. They have also demonstrated a strong endorsement of the programs' mandated outcomes and the methodology for measuring these outcomes. Should there be any questions concerning this self study document, contact Dr. James Crossfield, program Coordinator, at your earliest convenience. Thank you for your consideration.

James K. Crossfield, Ph.D. L.S.
Chair, Dept. of CGEC
278-4827 (W)
278-7002 (FAX)
james_crossfield@csufresno.edu