

GEOMATICS ENGINEERING
Student Outcomes Assessment Program (SOAP)
(Last updated February, 2013)

I. Mission

The mission of the Geomatics Engineering (GME) Program is to provide an educational experience that enriches the lives of students. The program teaches necessary discipline related knowledge and skills to prepare students for their profession. Students learn how to protect the health and welfare of the public while expanding their base of knowledge through research and scholarship.

II. Goals and Learning Outcomes

The GME program objectives are as follows:

1. The graduates of the Geomatics Engineering (GME) program should demonstrate competency in one or more of the following GME competency areas: boundary/land surveying, photogrammetry, geodesy, GIS, and digital mapping.
2. The graduates of the GME program should demonstrate continued capacity for employment in one or more GME specialty area.
3. The graduates of the GME program shall demonstrate capacity for graduate education.
4. The graduates of the GME program shall demonstrate continued membership in professional organizations.
5. The graduates of the GME program shall demonstrate a continuing commitment to lifelong learning.
6. The graduates of the GME program shall demonstrate a continuing commitment to serving and protecting the health and welfare of the public.
7. The graduates of the GME program shall demonstrate an ability to pass professional licensing or certification examinations after achieving requisite professional experience.

The graduates are expected to have achieved the following outcomes (which includes ABET student outcomes (a) through (k)) upon completion of the Program:

- (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

The relationship between student outcomes and program educational objectives is summarized in Table 1.

Objective #1. The first objective requires that graduates demonstrate competency in one or more of the following GME competency areas: boundary/land surveying, photogrammetry, geodesy, GIS, and digital mapping. Various course sequences (sometimes overlapping) provide the opportunity for students to attain this competency.

Students are given opportunity throughout the entire curriculum to learn a wide spectrum of topics in Geomatics Engineering. Therefore, most of the learning outcomes prepare them to attain this particular objective.

Boundary/land surveying is supported by GME 15+L, GME 16+L, GME 50, GME 151, GME 159 and GME 153. Photogrammetry is supported by GME 16, GME 23L, GME 34, GME 123, GME 125 and GME 135. Digital Mapping is supported by GME 15+L, GME 16, GME16L, GME 61, GME 66, GME 34, GME 135, and GME 126. Geodesy is supported by GME 15+L, GME 16+L, GME 102, GME 108, GME 135, GME 143 and GME 145. GIS is supported by GME 16, GME 66, GME 126, and GME 173. GME 181 (Project Design) usually incorporates elements of all five sub discipline areas into various design projects.

Geomatics Engineering Program at CSU, Fresno

Table 1 Program Educational Objectives-Student Outcomes Correlation Matrix

Objectives⇒ Outcomes↓	1	2	3	4	5	6	7
(a)	X						X
(b)	X		X				
(c)	X		X				
(d)	X	X					
(e)	X	X	X				X
(f)						X	
(g)		X	X				X
(h)	X					X	
(i)			X	X	X		
(j)		X	X		X	X	
(k)	X	X	X				X
(l)	X		X				
(m)	X	X		X			
(n)		X		X	X	X	X
(o)	X		X		X		

Objective #2. Objective #2 is directly assessed by measuring job placements (we track all graduates in this area) upon graduation. 97% 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 (ABET student outcome (k)) but actually are in a position to utilize these skills on the job.

The program prepares students for outcome (k) by exposing them to modern tools and methodologies consistent with those used in the industry. However, in addition to this outcome, a number of other outcomes, as listed in the table (Table 3.1), contribute to the attainment of this objective.

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 97% 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).

Objective #3. The third objective seeks to ensure that graduates are prepared for graduate study. A comprehensive summary of recent GME graduate admission to

graduate educational venues indicate that 8% of program graduates actually enroll in graduate programs.

Objective #4. The fourth objective seeks to ensure that program students are provided with professional membership and leadership opportunities. These opportunities exist in GME related student clubs and the Lambda Sigma honorary society, the Fore Sight Newsletter Editorship, Annual GME Conference management and related committee chairmanships, GME web site student editor and the numerous opportunities in professional societies and conferences (CLSA, ASPRS, ACSM). These opportunities illustrate the vast array of ways that GME students at CSU Fresno are provided every opportunity to exercise their leadership skills. Additionally, students routinely volunteer to help out at regional, state and national conferences. Our assessment data indicate that this objective has been continually met.

Objective #5. The fifth objective requires that students gain recognition of the need to engage in lifelong learning. Several courses promote this idea. These include: GME 1, 15, 16, 34, 66, 102, 108, 135, 145, 153, 173, 175 and 180 (Senior Project). All applicable student course assessment surveys, alumni, employers and graduating senior surveys rated the Lifelong learning issue as being well handled by the program.

Objective #6. The sixth objective requires that graduates of the program demonstrate a continuing commitment to serving and protecting the health and welfare of the public.

Many of the services provided by our graduates in their various employment areas are for society at large, and most information at some point becomes public information. Whether investigating a private boundary matter or performing land surveys, they demonstrate a commitment to serving and protecting the health and welfare of the public.

Objective #7. The seventh objective relates to the capability to pass the professional licensure or certification examinations after achieving requisite professional experience. We expect that at least 50% will do so within five years of graduation. Our comprehensive analysis of pass rates (based on records provided by the California Board of licensing for engineers and surveyors) clearly shows that our graduates manage (79%) to exceed this mark. Various courses prepare students to enter the profession with the requisite knowledge and skills which help them prepare for such examinations. In addition, students are encouraged to take FLS/LS/LSIT exams while enrolled in the program. Summer internship opportunities help students gain some of the professional experience needed for such examinations.

III. Curriculum Map (Matrix of Courses X Learning Outcomes)

Table 2 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 16L	X	X	X	X	X		X				X				
GME 34	X				X							X			
GME 50	X	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 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 145	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 153	X	X	X	X	X	X	X	X	X	X	X		X	X	X
GME 159	X	X	X	X		X		X	X	X	X		X	X	
GME 173	X	X	X		X				X			X			X
GME 181	X		X	X	X		X				X			X	

IV. Assessment Methods

The schedule in Table 3 shows assessment processes for program educational objectives and the frequency with which the assessment processes are carried out. Assessment instruments have been prepared and submitted to alumni, employers, and the program Advisory Council based upon this schedule.

The assessment processes using Alumni Surveys, Employer Surveys, and independent Assessment by Advisory Council are briefly described next.

Geomatics Engineering Program at CSU, Fresno
Table 3 Program Educational Objectives Assessment Schedule

Tool / Constituency	Frequency	Target Group
GRADUATE EMPLOYMENT STATISTICS	Annually	Program Graduates
PROFESSIONAL EXAM PASSING STATISTICS	Annually	Program Graduates
ALUMNI	Every Sixth Year	Program Graduates
EMPLOYERS	Every Sixth Year	Employers
ADVISORY COUNCIL	Every Sixth Year	GME Advisory Council

Alumni Surveys

The alumni survey is a questionnaire form developed by the GME program faculty and submitted to the program graduates to complete. The alumni survey forms were sent to the alumni who were then asked to return them, via postal mail, to the program coordinator upon completion.

The surveys are designed to assess the program educational objectives by asking alumni to give feedback on questions relating to these objectives and various outcomes as they relate to the objectives (Table 1). The survey seeks information on areas of professional focus, employment status, professional satisfaction, and level of satisfaction with educational preparation by our program and the general education at Fresno State. The outcomes of these surveys . Secondly, the alumni surveys seek feedback from the alumni about the program for their comments and suggestions, which might help future improvement of the program when appropriate. Thirdly, the surveys contains a set of questionnaire that asks for the alumni’s opinion and evaluation of the overall educational experiences in regards to how such experiences facilitated their achievement of learning outcomes. Their overall impressions is used as a measure of the program’s achievement in meeting the various outcomes which maps to the educational objectives as earlier shown in Table 1.

V. Student Learning Outcomes X Assessment Methods Matrix

**Geomatics Engineering Program at CSU, Fresno
Table 4 Student Outcome Assessment Matrix**

Assessment Techniques		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
Course Surveys ¹	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Junior Surveys	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Senior Surveys	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Competency Area ²	D	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Course Notebooks	D	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Employment Rates	D			X	X	X	X	X	X	X	X	X		X	X	
Alumni Survey	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Employer Survey	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Advisory Council ³	D						X	X	X	X	X	X	X	X	X	X
Professional Exam Passing Statistics	D	X				X	X	X		X			X		X	

Notes: I (Indirect), D (Direct)

¹ Course Evaluation Surveys by Students

² Course Competency Area Direct Assessment by Faculty

³ Assessment Letter from GME Advisory Council

VI. Timeline for Implementation of Assessment Methods and Summary Evaluations

Geomatics Engineering Program at CSU, Fresno
Table 5 Student Outcomes Assessment Schedule

Constituency	Frequency	Target Group
COURSE EVALUATION SURVEYS	3-Yr Cycle	GME Courses taught in the last six years
JUNIOR SURVEYS	3-Yr Cycle	Junior Students
SENIOR SURVEYS	3-Yr Cycle	Senior Students
COMPETENCY AREA ASSESSMENT BY FACULTY	Annually	GME 125, 126, 145, 153, 159, 180
ALUMNI	Every Sixth Year	Program Graduates
EMPLOYERS	Every Sixth Year	Employers
ADVISORY COUNCIL	Every Sixth Year	GME Advisory Council

VII. Process for Closing the Loop

Formal written assessment input is received from the constituent groups, consolidated and processed under the direction of the program coordinator. All GME faculty receive informal and oral communication relating to our on-going assessment process.

The numerical assessment results are evaluated to determine how well the educational objectives are being met. The direct input is also evaluated to determine whether the established outcomes are appropriate or perceived as viable by each constituent group. All indications before and since our program assessment startup strongly suggests that program educational objectives are appropriate for the program at this time. Fine tuning, when necessary, may be required as the assessment process continues.