



PROGRAM APPROVAL FORM

COVER SHEET

Trades and Professional Services

SCHOOL

Construction Trades

DEPARTMENT

Certificate in Surveying Technology

PROGRAM TITLE

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AUTHOR

March 18, 2009

DATE SUBMITTED

Check the action to be taken and have the indicated people sign.

☐ Program Adoption - all signatories

☒ Program Substantive Revision - all signatories except President

APPROVED BY	NAME	APPROVED	DISAPPROVED	DATE	ACTION*
DEPARTMENT CHAIR	Robert Balajadia <i>[Signature]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3/19/09	
REGISTRAR	Patrick L. Clymer <i>[Signature]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3/24/09	NC
DEAN	Reilly Ridgell <i>[Signature]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3/24/09	
CURRICULUM COMMITTEE CHAIR	Anthony San Nicolas <i>[Signature]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3/30/09	
VP, ACADEMIC AFFAIRS	R. Ray D. Somera, Ph.D. <i>[Signature]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3/21/09	WC
PRESIDENT	Mary A. Y. Okada	<input type="checkbox"/>	<input type="checkbox"/>		

* Indicate if the document had no corrections (NC), was approved with minor corrections (WC), or was disapproved and returned back to author (BTA).

This version of the cover sheet facilitates the eventual transition to an all on-line curricula approval process.

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C: Binder AY Catalog Fall 09 update

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PROGRAM APPROVAL FORM FOR ADOPTION AND SUBSTANTIVE REVISION

I. TYPE OF ACTION

Check the type of action that applies. If previous Program Approval Form exists, please attach.

A. ☐ Adoption program

B. ☒ Substantive Revision (attach Program Form).

The numbers listed next to the changes below may or may not require a response; they have been identified as those questions most likely needing to be addressed. The entire program form should be reviewed for applicability.

- ☐ Change in number of credit hours: II, IVA, IVD, VI, VII, VIII, XI
- ☒ Change in Technical/Core Requirements: II, IVA, IVD, VI, VII, VIII, XI
- ☒ Change in distribution of requirements affecting Related Technical or General Education Requirements, Technical/Core Requirements, or General Education Requirements: II, IVA, IVD, VI, VII, VIII, XI.
- ☒ Identify specific changes not listed above: Program name change: Basic Surveying to Surveying Technology and addition of SLOs

II. INTRODUCTION

The Certificate in Surveying Technology program is designed to provide the knowledge and skills required for employment as a surveying technician at the junior party chief level. The College used to offer a Certificate in Basic Surveying Technology but was deleted in September 2004 and reinstated again via Continuing Education in December 2007 due to an Memorandum of Agreement between GCC and Guam Waterworks Authority. Due to the pending military buildup there is an ever increasing demand for surveyors in the local market making this more feasibly run as a regularly scheduled post-secondary program. Substantial changes were made to the program and several courses needed to be adopted to reflect the technological changes in this field (See Comparison of Technical Requirements Chart in Section IV.D).

The Certificate in Surveying Technology is an area emphasized in The Architecture & Construction Career Cluster; one out of 16 career clusters selected in Guam's Career & Technical Education Five-Year State Plan, 2008-2013. Design/Pre-Construction is one of the three specialties identified by the National Career Technical Education Foundation (www.careerclusters.org). The other two areas under the Architecture & Construction Career Cluster are Construction and Maintenance/Operations.

III. PROGRAM DESCRIPTION & STUDENT LEARNING OUTCOMES - PROGRAM LEVEL

This program description will appear in the College Catalog followed by the Student Learning Outcomes – Program Level

Program Description:

The Surveying Technology program prepares the student for immediate employment as a surveying or Geographic Information Systems (GIS) technician and teaches the student knowledge and skills that will enable one to adapt to ever evolving technical and technological changes in geospatial field and office applications. The graduate will be prepared to face the challenge of modern Surveying and GIS practice. The program emphasizes applications-based approaches and provides an overview of the geospatial fields of surveying, mapping, and GIS and prepares the student for further study and for the Level 1 Certified Survey Technician examination prepared by the American Society on Surveying and Mapping National Society of Professional Surveyors (ACSM-NSPS).

A. General Education Requirements

EN110 Freshman English (3)

MA110A Finite Mathematics (3)

Total Gen Ed: 6

B. Technical Requirements

SU100 Surveying Drafting (3)

SU101 Surveying Problems I (3)

CE211 Plane Surveying I (3)

CE222 Plane Surveying II (3)

SU230 Advanced Surveying (3)

SU250 Introduction to Geographic Information Systems (3)

SU292 Surveying Practicum (1)

Minimum Total Technical Requirements: 19

C. Related General Education & Technical Requirements

AE121 Technical Engineering Drawing I (3)

AE150 Computer Aided Design & Drafting (CADD) I (3)

CS101 Introduction to Computer Systems & Information Technology (3)

HL130 First Aid & Safety (1)

MA161A College Algebra/Tech Math I (4)

MA161B College Algebra & Trigonometry (4)

Total Related General Education & Technical Requirements: 18

Total Credits Required: 43

If the description above is a revision, indicate the catalog page(s) to be revised.

Catalog Year:

Page Number(s):

Upon successful completion of this program, students will be able to:

1. Demonstrate preparedness to enter productive technical positions in the geospatial fields of surveying, mapping, and Geographic Information Systems.

2. Successfully pass the American Society on Surveying and Mapping National Society of Professional Surveyors (ACSM-NSPS) Level 1 Certified Survey Technician examination.
3. Develop a professional work ethic needed in the surveying industry.

IV. RATIONALE FOR PROPOSAL

- A. Reason this proposal should be adopted in light of the College's mission statement and educational goals.

The Guam Community College is mandated to provide technical and vocational education to meet the needs of Guam's workforce and is committed to providing a comprehensive offering of vocational-technical programs. This program develops the knowledge and expertise of those interested in working in the geospatial fields of surveying, mapping, and Geographic Information Systems.

- B. Long-term employment outlook for this program area, including the number of available positions in the service area for graduates and expected salary level.
Very good in light of the military build-up with expected entry salary levels above \$24,000 per annum.

- C. Conformity of this program to legal and other external requirements. Include State Voc/Tech requirements, accrediting agency standards, State Board regulations, and professional certification or licensing requirements if applicable.

The program complies with the curriculum outline for the American Congress on Surveying and Mapping - National Society of Professional Surveyors (ACSM-NSPS) Survey Technician Certification Program. Students should be able to successfully pass the ACSM-NSPS Level 1 Certified Survey Technician examination.

- D. Results of program evaluation (see Appendix F for Checklist).

Guam Community College used to offer a Certificate in Basic Surveying Technology but was deleted in September 2004 and reinstated again in December 2007 due to an MOA between GCC and Guam Waterworks Authority and offered via Continuing Education. Substantial changes need to be made to the program document as there was no current document on file other than the program description and required courses. A thorough review of the outdated program and courses, incorporation of critical information gained from participation at national surveying conferences, faculty and DC feedback, and research on other accredited surveying programs offered in the U.S. was conducted by the author. Results indicated that three new courses for the certificate had to be adopted: SU230 Advanced Surveying, SU250 Intro to Geographic Information Systems, and SU292 Surveying Practicum.

Comparison of Technical Requirements

(OLD) Cert. in Basic Surveying Tech.	(NEW) Cert. in Surveying Tech.
CE211 Plane Surveying I (3)	CE211 Plane Surveying I (3)
CE222 Plane Surveying II (3)	CE222 Plane Surveying II (3)
SU100 Surveying Drafting (3)	SU100 Surveying Drafting (3)
SU101 Surveying Problems I (3)	SU101 Surveying Problems I (3)
CE215 Construction Procedures (3)	SU230 Advanced Surveying (3)
CE224 Highways (3)	SU250 Intro to GIS (3)
	SU292 Surveying Practicum (1)

In addition to the author being a licensed surveyor, Mr. David Eaton, the President of Guam Society of Professional Land Surveyors (GSPLS) reviewed and concurred with this course. There is a Construction Trades Advisory Committee; however, this was established for construction only and not the pre-construction/design area in which surveying falls. The DC of Construction Trades will establish a separate advisory committee for the surveying programs in Fall 2009 that will focus on the Design/Pre-Construction Pathway in the identified Career Cluster. See attached letters of support from GSPLS, Guam Department of Land Management, Guam Waterworks Authority, and The Pacific Association of Land Professionals.

V. RESOURCE REQUIREMENTS AND COSTS

- A. Resources (materials, media, and equipment) and costs.
Books, computers, scientific calculators, projectors, survey instruments and accessories are needed. This program may use software donated by Environmental Systems Research Institute (ESRI) and Carlson Software during the Pacific Association of Land Professionals conference sponsored by GCC in 2007 (valued at approximately \$100,000).
- B. Personnel requirements (administrative, instructional, and support staff) and costs.
The surveying and GIS courses can be taught by adjunct faculty who have knowledge and expertise in surveying and GIS. Regular salary scales (full-time/adjunct) will apply. Office support staff normally provided to faculty will be sufficient.
- C. Facility requirements.
Existing classroom space and use of the campus field for survey fieldwork will be sufficient.
- D. Funding source(s).
The program will be part of the locally funded College budget and students will pay the usual tuition and fees, except for the online courses which are charged by the sponsoring institution. As the core surveying and GIS courses are part of the proposed Apprenticeship program, some of the costs can be funded through the Apprentice program.
- E. Impact, financial or otherwise, this program may have on the College.
Financial impact will depend on cost for faculty and resources as indicated in Item A above.

VI. IMPLEMENTATION SCHEDULE

Implementation date: Fall 2009

VII. CATALOG (MOVED TO SECTION III.)

VIII. PROGRAM DESCRIPTION

- A. Program Title(s)
Long Title: Certificate in Surveying Technology
Abbreviated Title (20 characters maximum): Surveying Technology
- B. Credit Hours
General Education: 6
Technical/Core: 19

Related Tech/Gen Ed: 18

Electives:

Options:

Total Number of Credits: 43

C. Course Sequence

First Semester

AE121 Technical Engineering Drawing I (3)

CE211 Plane Surveying I (3)

CS101 Introduction to Computer Systems & Information Technology (3)

EN110 Freshman English (3)

MA110A Finite Mathematics (3)

SU100 Surveying Drafting (3)

Total Credits: 18

Second Semester

AE150 Computer Aided Design & Drafting (CADD) I (3)

CE222 Plane Surveying II (3)

MA161A College Algebra/Tech Math I (4)

SU101 Surveying Problems I (3)

SU250 Introduction to Geographic Information Systems (3)

Total Credits: 16

Third Semester

HL130 First Aid & Safety (1)

MA161B College Algebra & Trigonometry (4)

SU230 Advanced Surveying (3)

SU292 Surveying Practicum (1)

Total Credits: 9

D. Target Population

High school graduates, individuals interested in the Certificate Program in Surveying Technology, or adults seeking re-training in new fields/career.

E. Cost to Student

Regular tuition and fees apply.

IX. PRE-REQUISITE (S)

EN100R, EN100W or placement test score before taking EN110

X. CO-REQUISITE (S)

MA108 or placement test score before taking MA110A

XI. CONTENT

A. List of courses, with course descriptions, required to complete this program. Courses grouped according to: General Education, Technical Requirements, etc. If new courses are part of the program, Course Guides must be included with this request for approval.

A. General Education Requirements

provide students with hands on experience with GIS software and hardware components.

SU292 Surveying Practicum 1
This course covers the application of field and office techniques related to the lessons covered in the surveying and drafting courses. Students will do actual field and office survey work to learn proper use of surveying and related instruments including computers and data collectors. Prerequisite: CE222

Minimum Total Technical Requirements: 19

C. Related General Education & Technical Requirements

AE121 Technical Engineering Drawing I 3
A study of the use of drawing instruments and techniques for mechanical, civil and architectural drawings involving freehand sketches, lettering, orthographic views and pictorial drawings. Skill development will focus on the use of drawing instruments to redraw given drawings calling for accurate measurements with detailed instructions on how to do it.

AE150 Computer Aided Design & Drafting (CADD) I 3
An introduction to computer aided design and drafting software as a drafting/design tool. This course is designed to introduce students to the use of computers in producing line drawings. Topics include equipment components, terminology, drawing with the computer, storing and retrieving drawings, and printing and plotting. This hands-on course uses the design computer-aided drafting and design software application. Prerequisites: AE121, CS101

CS101 Intro. to Computer Systems & Information Technology 3
This course provides students with an overview of computer technology, computer hardware and software, data communications, the Internet, social and ethical impacts on society, and an exploration of career opportunities.

HL130 First Aid & Safety 1

MA161A College Algebra/Tech Math I 4

MA161B College Algebra & Trigonometry 4

Minimum Total Related General Education & Technical Requirements: 18

Total Credits Required: 43

XII. PROGRAM MEANS OF ASSESSMENT AND CRITERIA FOR SUCCESS

Upon completion, the student should be able to pass the ACSM-NSPS Certified Survey Technician Level 1 examination.

XIII. ARTICULATION

A. Secondary programs

none

B. University of Guam

none

C. Others

Students can articulate all of the technical requirements into the Associate of Science in Surveying Technology.

* Attach SLO Map – Program & Course Levels.

SLO Map – Program & Course Levels

Courses with an asterisk are for the associate program only.


Name of Program	Surveying Technology											
Certificate AND Associate												
*If courses are not offered as a program, skip to page 2.												
I = Introduced	R = Reinforced	E = Emphasized										
List course alpha and no.			⇨									
Student Learning Outcomes – Program Level												
Upon successful completion of this program, students will be able to:												
1. CERTIFICATE: Demonstrate preparedness to enter productive technical positions in the geospatial fields of surveying, mapping, and Geographic Information Systems.												
I	I	R										
2. CERTIFICATE: Successfully pass the American Society on Surveying and Mapping National Society of Professional Surveyors (ACSM-NSPS) Level 1 Certified Survey Technician examination.												
			E	R	I							
3. CERTIFICATE: Develop a professional work ethic needed in the surveying industry.												
							R	E	I			
1. ASSOCIATE: Demonstrate preparedness for entry into mid-level technical positions in the geospatial fields of surveying, mapping, and Geographic Information Systems (GIS).												
								E	R	I		
2. ASSOCIATE: Successfully pass the American Society on Surveying and Mapping National Society of												
									E	R	I	

[illegible]


3. ASSOCIATE: Develop a professional work ethic needed in the surveying industry.

4. ASSOCIATE: Demonstrate ability to utilize modern measurement technologies to acquire spatial data and employ industry-standard software to solve technical problems.


General Education Student Learning Outcomes by Course - 1 of 3

Name of Program Surveying Technology Certificate AND Associate														I = Introduced	R = Reinforced	E = Emphasized	List course alpha and no. 								
GenEd Student Learning Outcomes														AE150	SU100	SU101	CE211	CD222	SU220	SU250	SU292	SU240*	SU241*	SU251*	SU280*
Upon completion of this course, students will be able to:																									
1. <u>Written Communication:</u> Use writing to discover, organize and communicate ideas.														I					IR	IR	E	RE			
2. <u>Written Communication:</u> Identify and analyze the audience and purpose for any intended communication.														I					IR	IR	E	RE			
3. <u>Written Communication:</u> Demonstrate mastery of the conventions of writing, including grammar, spelling, and mechanics.																			IR	IR	E	RE			
4. <u>Quantitative Reasoning:</u> Apply numeric, symbolic, and graphic skills and other forms of quantitative reasoning accurately and appropriately.														I	IR	R	R	R	RE	RE	E	R	R	R	
5. <u>Quantitative Reasoning:</u> Demonstrate mastery of mathematical concepts, skills, and applications, using technology when appropriate.														I	IR										
6. <u>Quantitative Reasoning:</u> Define quantitative issues and problems, gather relevant information, analyze that information, and present results.														I	IR										
7. <u>Oral Communications:</u> Properly identify the audience and purpose of any intended communication.																		I	I	IR	E				
8. <u>Oral Communications:</u> Use appropriate language, techniques, and strategies.																		I	I	IR	E				
9. <u>Oral Communications:</u> Speak clearly and confidently, using voice, volume, tone, and articulation.																		I	R	R	E				
10. <u>Oral Communications:</u> Use effective communication strategies to initiate and sustain discussion.																				IR	E				E

General Education Student Learning Outcomes by Course - 2 of 3

Name of Program	Surveying Technology Certificate AND Associate											
I = Introduced	R = Reinforced	E = Emphasized	List course alpha and no. 									
Student Learning Outcomes - GenEd												
Upon completion of this course, students will be able to:												
11. <u>Oral Communications</u> : Summarize, analyze, and evaluate oral communications and ask coherent questions as needed.										I		
12. <u>Critical Thinking Skills</u> : Properly identify and state issues, problems, or questions contained in a body of information.	I			I	I	I	R	R	RE	RE		R
13. <u>Critical Thinking Skills</u> : Identify and analyze assumptions and underlying points of view relating to an issue or problem	I			I	I	I	R	R	R	E	R	R
14. <u>Critical Thinking Skills</u> : Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions, assumptions, issues and biases.	I			I	I	I	R	R	R	E		IRE
15. <u>Critical Thinking Skills</u> : Apply problem-solving techniques and skills, including the rules of logic and logical sequence.							I	I	RE	E		I
16. <u>Critical Thinking Skills</u> : Synthesize information from various sources, drawing reasoned conclusions.									IR	E		IR
17. <u>Critical Thinking Skills</u> : Reflect upon and evaluate their thought processes, value systems, and worldviews in comparison to those of others.										I		
18. <u>Info. Literacy</u> : Locate, evaluate, and use information effectively.	I			I			R	R	R	R		
19. <u>Info. Literacy</u> : Properly use and cite a variety of sources.												
20. <u>Info. Literacy</u> : Use digital text, images, and data, as needed, transferring them from their original locations and formats to a new context, using a variety of software applications.	IR									RE		RE

General Education Student Learning Outcomes by Course - 3 of 3

Name of Program	Surveying Technology															
Certificate AND Associate																
I = Introduced	R = Reinforced	E = Emphasized	List course alpha and no. 													
Student Learning Outcomes - GenEd																
Upon completion of this course, students will be able to:																
21. <u>Info. Literacy</u> : Use and access information ethically and legally, with an understanding of what constitutes plagiarism.																
22. <u>Individual and Society</u> : Demonstrate an awareness of the relationship between the environment and their own physiological and psychological processes.															IRE	
23. <u>Individual and Society</u> : Examine critically and appreciate the values and beliefs of their own culture and those of other cultures.														IRE		
24. <u>Individual and Society</u> : Acknowledge opposing viewpoints.														IRE	E	
25. <u>Individual and Society</u> : Demonstrate an understanding of ethical, civic, and social issues relevant to Guam, Micronesia, and the world.														IR	IR	
26. <u>Civic Engagement</u> : Participate fully in a civic engagement experience where a service is provided to the community that relates to the academic curriculum.																
27. <u>Civic Engagement</u> : Evidence an understanding of the relevance of the completed civic engagement work to the subject matter of the course where the civic engagement experience was assigned.																
28. <u>Civic Engagement</u> : Demonstrate an awareness of the need for and value of lifelong civic engagement in addressing local community needs.																
</																

Student Learning Outcomes – Course Level

**If courses are not offered as a program, skip 'Related to Program Level SLO' column.*

Course Alpha and Number: AE150 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#
Produce line drawings using computer technology.	1,2
Demonstrate and explain basic equipment components and terminology used in the Computer Aided Design & Drafting (CADD) career.	1,2
Demonstrate basic proficiency using design software.	1

Course Alpha and Number: SU100 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#
Discuss the roles of office draftpersons or survey party chiefs.	1,2
Define common terminology in the surveying drafting career.	2
Explain the diverse engineering fieldwork and methods of graphic resolution used.	1,2

Course Alpha and Number: SU101 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#
Demonstrate understanding of basic mathematics needed for survey computations.	1,2
Apply basic arithmetic, trigonometry and geometric operations to given surveying problems.	1,2
Discuss and identify solutions to various surveying problems encountered in the work setting.	1,2,3

Course Alpha and Number: CE211 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#
Describe the fundamentals of chaining, leveling, and use of transit as it relates to plane surveying.	1,2
Properly care, adjust, and use equipment in the plane surveying field.	1,2
Given a set of tasks, demonstrate proper use and application of surveying equipment and tools.	1,2

Course Alpha and Number: SU220 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#	
Demonstrate proficiency in the mathematical computations of horizontal and vertical surveys including the process of laying out horizontal and vertical curves.	1,2	
Apply proper survey processes in construction surveys and layouts.	1,2	
Demonstrate understanding of boundary surveying and the legal aspects of property surveying.	1,2	
Analyze boundary and property survey problems using applicable survey methods.	1,2	
Demonstrate understanding of concepts of geodetic and GPS surveying.	1,2,4	

Course Alpha and Number: SU292 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#	
Demonstrate the knowledge and skills needed in the surveying field.	1,2,3	
Demonstrate preparedness to successfully pass the Level I Certified Survey Technician	1,2,3	

Course Alpha and Number: SU250 Upon successful completion of this course, students will be able to:	Related to Program Level SLO#	
Describe the fundamental concepts of GIS and the major functionality contained within the ArcGIS software.	1,2,3	
Explain the GIS analytical process and be proficient with a variety of ArcGIS tools to solve realistic problems. (The course emphasizes practical GIS skills.)	1,2,4	
Demonstrate understanding of the basics of the geodatabase and the more advanced functionality that makes the geodatabase such a powerful data model.	1,2	
Design presentation-quality maps and create a personal geodatabase.	1,2,4	

Course Alpha and Number: SU240* Upon successful completion of this course, students will be able to:	Related to Program Level SLO#	
Demonstrate understanding of boundary control and legal principles to include identification of errors in legal descriptions.	1,2	
Discuss legal principles such as deed first/survey first, common and case law.	3	

examination prepared by the American Society on Surveying and Mapping National Society of Professional Surveyors (ACSM-NSPS) for certificate majors or the Level 3 for associate majors.	
Course Alpha and Number: SU241* Upon successful completion of this course, students will be able to: Explain in detail the subjects of evidence and procedures used for determining real property boundaries.	Related to Program Level SLO# 1,2
Demonstrate proficiency of reading legal instruments prepared by land surveyors.	1,2
Describe the surveyor's role in court cases.	1,2,3
Write a legal and technical description and prepare a surveyor's report.	1,2

Course Alpha and Number: SU280* Upon successful completion of this course,	Related to Program
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Define the basic elements of a boundary survey and the proper sequence of events/actions.	3
Evaluate boundary evidence and make decisions based on this ranking.	1,2,4
Identify controlling corners and boundaries.	1,2,4
Course Alpha and Number: SU251* Upon successful completion of this course, students will be able to: Produce and control raster data using ArcGIS Spatial Analyst.	Related to Program Level SLO# 1,2,4
Create a variety of raster surfaces including hillshade relief maps, slope and aspect surfaces, and density and distance surfaces.	1,2
Create, execute, and automate spatial analysis work flows.	1,2,4
Explain what a surface model is and create both raster and vector surfaces.	1,2

Course Alpha and Number: CE222 Upon successful completion of this course,	Related to Program
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students will be able to:	Level SLO#
Produce and manipulate cadastral data and create parcel data using the Survey Analyst Extension and the Cadastral Editor tools in the ArcGIS software.	1,2
Apply Survey Analyst GIS tools on cadastral datasets and perform analysis of these datasets to ensure survey accuracy.	1,2
Use ArcGIS tools to address real-world social, economic, and environmental planning problems.	1,2,3,4

students will be able to:	Level SLO#
Demonstrate a variety of surveying techniques.	1,2
Apply appropriate skills using proper surveying instruments given various tasks.	1,2,4
Discuss reconnaissance, preliminary, and construction surveys.	1,2,4

If this SLO Map is not part of a Program Adoption or Program Substantive Revision, attach a Non-Substantive Curriculum Revision Memo to the front of this form to ensure that the SLOs, as written above, will be published in GCC's online catalog under program/course descriptions.