

## **Mission Statement**

Mission Statement – See SVT Strategic Plan

**Criteria 1 – Program Educational Objectives** (Broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation.)

The mission is accomplished by preparing surveying engineering technology students such that graduates shall:

<b><u>Objectives</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
1. Demonstrate a practical understanding of skills in mathematics, basic physical sciences, business, surveying, and engineering sufficient to pass professional registration exams.	a, b	SVT418, LSIT refresher	Fundamentals of Surveying Exam
2. Show proficiency in using surveying equipment and gathering experimental and surveying data for the use of analytical and problem-solving skills reasonably expected for surveying practice necessary to be in responsible charge of surveying operations.	b, c, f	CET 101, Plane Surveying	Alumni & Employer Survey
3. Be able to apply design skills sufficient to meet employer and client expectations in the areas of land development and survey operations planning.	d	SVT329, Land Development SVT437 Practical GPS	Alumni & Employer Survey
4. Conduct themselves ethically and professionally and exhibit personal integrity and responsibility in surveying practice.	i	TSO360, Engineering Ethics or SVT325, Surveying Ethics	Alumni & Employer Survey
5. Be proficient in written, oral, and graphic communication to deal with promotion of professional services, business communications, reporting to clients, interacting with peers, and addressing client matters in public forums	g	SVT475, Surveying Management; SVT221 Boundary Law	Alumni & Employer Survey
6. Awareness for the arts, humanities, social sciences, and diversity and their place among society and the profession in taking leadership roles in the community and profession.	j	General Education Requirements	Alumni & Employer Survey

7. Be able to work in a multi-disciplinary team environment, and lead when necessary to accomplish a given mission or project when providing professional services to the public.	e	SVT490, Surveying Capstone	Alumni & Employer Survey
8. Recognize, participate, and appreciate the need for quality improvement of services, continuous improvement of professional skills, and embarking on lifelong learning.	h, k	SVT418, LSIT Refresher	Alumni & Employer Survey

### **Criteria 2 – Program Outcomes**

The Surveying Engineering Technology program outcomes are linked to the educational objectives created by input from employers, the IAC, and professional licensure requirements. They describe what students are expected to know or be able to do by the time of graduation. These are statements that describe what units of knowledge or skill students are expected to acquire from the program to prepare them to achieve the program educational objectives. The must factor in ABET a-k criteria.

#### **Outcome I - Mathematical Skills**

1 Understand and apply mathematics to the solution of surveying problems to include (b, c, f).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
1.1 Compute conventional traverse closure and compass rule adjustment		CET101, Plane Surveying	Exam Questions #400-#449
1.2 Apply proportionate measurement in boundary survey computations		SVT341, Advanced Surveying	Exam #2 Problem #6
1.3 Apply trigonometric skills sufficient to perform coordinate geometry and inverse calculations	BS(b)	CET101, Plane Surveying	Exam Questions #400-#449
1.4 Employ matrix Algebra to perform least squares adjustment of survey data.	BS(a)	SVT201, Adjustment Computations	Exam #1 Problem #3-#6
1.5 Employ proper mathematics for computation on plane projection systems.		SVT341, Advanced Surveying	Exam #1 Problem #6
1.6 Perform partial derivative computations for solution of non-linear problems in least squares adjustment	BS(a)	SVT201, Adjustment Computations	Exam #1 Problem #3

#### **Outcome II – Communication Skills**

- 2 Understand and apply ordinary written style and communication forms to surveying business practice and operations within a surveying firm or division (g).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
2.1 Employ memorandum expected within a business enterprise with substantially correct grammar, style, and vocabulary		SVT221, Boundary Law	See Policy See Homework Introduction Homework Assignments #3 or #4
2.2 Employ functional letters expected within a business with substantially correct grammar, style, and vocabulary		SVT221, Boundary Law	See Policy See Homework Introduction Homework Assignments #6 or #7
2.3 Compose a clear, complete, concise, and comprehensible survey report with substantially correct grammar and vocabulary meeting Maine survey standards.		SVT322, Preparing Effective Property Descriptions	Exercise 9 or 10
2.4 Make clear and understandable oral presentations while using multi-media elements		SVT490, Surveying Capstone	Use of Powerpoint in final presentation
2.5 Prepare a metes-and-bounds description to ordinary and reasonable professional standards		SVT322, Preparing Effective Property Descriptions	Exercises 1-5, 7
2.6 Properly mark construction stakes for heavy highway construction operations to meet workmanlike and ordinary standards.		CET202, Construction Surveying	Exam Questions #851-#870 Practical Exercises E
2.7 Prepare a retracement plat or land development plan to ordinary and reasonable survey standards		SVT322, Preparing Effective Property Descriptions SVT329, Land Development	Exercises 8 Homework #8-9-10

### **Outcome III – Statistical Skills**

- 3 Understand and apply basic concepts of statistics and probability to surveying data analysis (b, c).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
3.1 Understand the mean, median, and standard deviation as it applies to surveying practice	BS(b)	CET101, Plane Surveying	Exam Questions #900-#912
3.2 Perform and determine error propagation of a sum	BS(b)	CET101, Plane Surveying	Exam Questions #900-#912
3.3 Performing analysis to determine compliance with ACSM/ALTA positional tolerance standards	BS(a)	SVT201, Adjustment Computations	Exam #2 Problem #6
3.4 Understand how to interpret statistics of least squares analysis reports		SVT201, Adjustment Computations	Homework #5
3.5 Interpret GPS program outputs for quality assessment		SVT437, Practical GPS	Homework #3

### **Outcome IV – Business Skills**

4 Understand basic skills required in small business practice appropriate to ordinary surveying business.

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
4.1 Read and comprehend accounting information ordinarily provided for a small business operations.		SVT475, Small Business Management	
4.2 Understand and differentiate between common business entities of small business enterprises		SVT475, Small Business Management	
4.3 Write and understand contracts ordinarily employed for professional surveying services		SVT475, Small Business Management	
4.4 Understand employment law appropriate to small business nationwide.		SVT475, Small Business Management	
4.5 Prepare a business plan for operating a surveying business offering surveying services to the public.		SVT475, Small Business Management	

### **Outcome V – Engineering Skills**

5 Understand and apply basic engineering skills appropriate for land development (a, c, d, f).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
5.1 Understand and employ mass-hall analysis to balance cut and fill volumes for road construction		CET332, Civil Engineering Technology	Exam Questions #500-#513
5.1 Gather data and calculate overland flow quantities for a watershed using the Rational and SCS method given area and rainfall constraints.		CET332, Civil Engineering Technology	Exam Questions #701-#747
5.2 Gather data and calculate estimated flow using the Hazen-Williams and Mannings empirical equations given the area and surface factors		CET332, Civil Engineering Technology	Exam Questions #100-#146
5.3 Understand and employ the continuity principle in hydraulic systems to determine energy loss in a closed system		CET332, Civil Engineering Technology	Exam Questions #100-#146
5.4 Perform preliminary water system analysis to determine quantity and direction of flow in a closed system using the Hardy Cross method		CET332, Civil Engineering Technology	Exam Questions #805-#832
5.5 Gather and analyze soil information for land development purposes from soil information found in the public records		CET332, Civil Engineering Technology	Exam Questions #400-#453
5.6 Estimate soil erosion given site factor constraints and activity at the site		CET332, Civil Engineering Technology	Exam Questions #300-#313
5.7 Understand BMP to mitigate soil loss at a development site		CET332, Civil Engineering Technology	Exam Questions #300-#313
5.8 Understand factors for locating and designing on-site and public		CET332, Civil Engineering Technology	Exam Questions #352-#373, #601-610

waste disposal transport systems or waste treatment systems.			
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## Outcome VI – Computer Skills

6 Possess general-purpose computer skills ordinarily employed in surveying practice (a).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
6.1 Use word processing and spreadsheet programs for composing correspondence, reports, and rudimentary calculations.	AS(b)	SVT221, Boundary Law SVT332, Writing Effective Property Descriptions SVT490, Surveying Capstone	See Policy See Homework Introduction Homework Assignments #6 or #7 Final Report
6.2 Operate and employ CAD software to prepare development plans	AS(b)	SVT329, Land Development	Homework #5-6-7
6.3 Understand photogrammetry rectification software	BS(a)	SVT341, Advanced Surveying	Homework #12
6.4 Employ GIS software for analysis and display of spatial information.			
6.5 Understand survey data collection software for capturing, manipulating, and analyzing field data.	AS(b)	SVT110, Data Collectors	Exam 1
6.6 Understand use of plane and geodetic coordinate geometry programs		SVT341, Advanced Surveying	Homework #5 Questions 1-3
6.7 Use of least squares adjustment programs		SVT201, Adjustment Computations	Homework #5
6.8 Create and analyze digital terrain models		SVT329, Land Development	Homework #5-6-7

## Outcome VII – Surveying Equipment Skills

7 Understand and use surveying equipment ordinarily employed in surveying practice (a, e).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
7.1 Set up, level, and gather horizontal angles, zenith angles, and distances using a total station and prism	AS(a)	CET101, Plane Surveying	Exam Questions #550-#575
7.2 Measure distances using a steel tape/total station and eliminate systematic errors in the distance	AS(a)	CET101, Plane Surveying	Exam Questions #700-#779
7.3 Employ data collectors to acquire and store spatial data	AS(a)	SVT110, Data Collectors	
7.4 Set up, level, and gather differential vertical information using a laser level and automatic level.	AS(a)	CET101, Plane Surveying	Exam Questions #603-#658
7.5 Set up, gather, reduce, and analyze data for three dimensional positioning using static and real time kinematic GPS receivers.	AS(a)	SVT437, Practical GPS	Homework #5 and #9

## Outcome VIII – Surveying Knowledge

8 Understand and employ surveying knowledge, theory, principles, techniques, rules, and practice standards ordinarily expected of licensed professional land surveyors (a, c, d, f).

8.1 Boundaries

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
8.1.1 Know and employ the rules of construction in re-establishing boundaries and corners for private property, public property, and easements.	BS(c)	SVT221, Boundary Law	Exam Questions #500-#541
8.1.2 Perform research to a common grantor using public land records in the tax office and registrar of deeds.	BS(c)	SVT221, Boundary Law	Exam Questions #200-#247 Rural/Suburban Record Research Project
8.1.3 Analyze property descriptions to include metes-and-bounds.	BS(c)	SVT221, Boundary Law	Exam Questions #114-#161
8.1.4 Understand the United States Public Land Survey System, description of aliquot parts, double proportionment and single proportionment measurements.	BS(c)	SVT221, Boundary Law SVT341, Advanced Surveying	Exam Questions #775-#781
8.1.5 Be familiar with easements and their retracement	BS(c)	SVT221, Boundary Law	Exam Questions #550-#574
8.1.6 Be familiar with undocumented title transfers		SVT221, Boundary Law	Exam Questions #700-#713
8.1.7 Convert between geodetic and grid directions		SVT341, Advanced Surveying	
8.1.8 Convert between magnetic and astronomic directions	BS(c)	CET101, Plane Surveying	Exam Questions #500-#524

8.2 Engineering Project Surveying

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
8.2.1 Stake out building and heavy highway construction projects	BS(c)	CET202, Construction Surveying	Exam Questions #851-#870 Practical Exercises E
8.2.2 Calculate area using X & Y coordinates (the ladder method)	BS(c)	CET101, Plane Surveying	
8.2.3 Calculate volume using the average end area, prismatic formula, and prism formula	BS(c)	CET202, Construction Surveying	Exam Questions #801-#850
8.2.4 Calculate the volume of a borrow pit	BS(c)	CET101, Plane Surveying	
8.2.5 Calculate $\Delta$ , R, L, LC, T, E, and M for horizontal, reverse, and compound given two parameters of a curve	BS(c)	CET202, Construction Surveying	Exam Questions #604-#652
8.2.6 Calculate elevations along a vertical curve given the grade and length of the curve	BS(c)	CET202, Construction Surveying	Exam Questions #701-#737

8.3 Mapping and Geodesy

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
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8.3.1 Determine azimuths from astronomic observations	BS(a) BS(c)	SVT341, Advanced Surveying	Homework #6 and #7
8.3.2 Adjust and analyze horizontal and vertical survey data using least squares	BS(a) BS(b) BS(c)	SVT201, Adjustment Computations	Homework #3 and #5
8.3.3 Set up a control network for employment in retracement or land development surveying services.	BS(a) BS(b) BS(c)	SVT437, Practical GPS	Homework #5 and #9
8.3.4 Convert between common horizontal and vertical coordinate systems	BS(a) BS(c)	SVT341, Advanced Surveying	Homework #1-5
8.3.5 Understand and work with various plane and spherical projection systems	BS(a) BS(c)	SVT341, Advanced Surveying	Homework #1-5

#### 8.4 Photogrammetry

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
8.4.1 Understand vertical photogrammetric equations in estimation of accuracies		SVT341, Advanced Surveying	Homework #11 Question #3
8.4.2 Understand ground control requirements of different photogrammetric products		SVT341, Advanced Surveying	Exam #3, Questions #2 & #4
8.4.3 Understand input and product of aerotriangulation		SVT341, Advanced Surveying	Homework #12 Questions #1-3
8.4.4 Understand production and use of image based products		SVT341, Advanced Surveying	Exam #3, Questions #5 & #6
8.4.5 Understand overlap of image based products with ground survey data		SVT490, Survey Capstone	Final CAD product

#### 8.5 Geographic Information Systems

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
8.5.1 Integration of vector and raster data		SVT 490, Surveying Capstone	Final CAD product
8.5.2 Set up and use layers /themes		SVT 490, Surveying Capstone	Final CAD product
8.5.3 Perform coordinate, datum, and unit transformations		SVT 490, Surveying Capstone	Final CAD product
8.5.4 Import of multiple vector and raster formats		SVT 490, Surveying Capstone	Final CAD product
8.5.5 Integrate data of varying qualities		SVT 490, Surveying Capstone	Final CAD product

#### 8.6 Miscellaneous

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
8.6.1 Understand ordinary and reasonable standards for surveying practice in the areas of boundary retracement, photogrammetry, control surveys, and construction surveys.		SVT341, Advanced Surveying SVT437, Practical GPS	Exam #3 Questions #2-6 Exam #2
8.6.2 Be familiar with common and reasonable land development rules and regulations (e.g., subdivision, zoning)		SVT329, Land Development	Maine Subdivision Regulations lecture
8.6.3 Be able to create a survey product from a wide variety of data sources		SVT490, Surveying Capstone	Final CAD product
8.6.4 Be able to plan a GPS control survey		SVT437, Practical GPS	Homework #6
8.6.5 Be able to successfully prepare for the Land Surveyor in Training Exam		SVT418, Land Surveyor in Training Refresher	Land Survey in Training Exam results

### **Outcome IX – Professional, Peer, and Societal Interaction**

9 Recognize, understand, and adhere to common ethical constraints and integrity and the role of the surveying profession in dealing with the public, client, peers, employees, and employer (h, i, j, k).

<b><u>Outcomes</u></b>	<b>ABET</b>	<b>Course</b>	<b>Assessment</b>
9.1 Appreciate the role of the profession in society		SVT221, Boundary Law General Education Requirements	Exam Questions #400-#412
9.2 Understand, recognize, and adhere to ethical constraints in professional practice		SVT221, Boundary Law TSO360, Engineering Ethics	Exam Questions #850-#853 Homework #56, #200
9.3 Know the requirements for professional licensure in at least one United States jurisdiction		SVT221, Boundary Law	Exam Questions #403
9.4 Understand and assume responsibility for surveying projects and personnel management.		SVT490, Surveying Capstone SVT475, Small Business Management	
9.5 Recognize the changing nature of technology and the need for continuous learning.		SVT221, Boundary Law TSO360, Engineering Ethics	Homework #89, #102, #105

For purposes of this study, an “objective” is a statement that describes the expected accomplishments of graduates during their first few years after graduation. The audiences for objective statements are external constituents such as prospective students, employers, transfer institutions and student sponsors.

For purposes of this study, “outcomes” are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program. The

outcomes of ABET accredited programs must embrace the eleven (a) through (k) requirements of Criterion 2, and achievement of these outcomes by each student should be assessed before certification for graduation.