

SVT 437 Practical GPS

Syllabus

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office hours: 11-12 MWF (ask questions any time by e mail!!!)

If you wish to request an accommodation for a disability, please contact either your instructor or Student Accessibility Services (Onward Building, 1-2319) as early as possible in the semester.

Course Description:

- Presentation of all types of GPS equipment with their uses and limitations, GPS observation planning based on satellite geometry and obstructions, review of geodetic coordinate systems and datums, the geoid and how it relates to the production of elevations from GPS, execution of all components (planning, field collection, downloading, processing, and adjustment) of a GPS survey where raw data is collected, real time kinematic (RTK) GPS field execution and adjustment for control work, use of RTK GPS in collection of a topographic survey.

Prerequisites: SVT201, SVT341 (or equivalent). Lec 3, Cr 3.

Lectures: .mp4 files on Brightspace courses.maine.edu (or lectures on Youtube)

- (1) Log in with Maine Street id and Password
- (2) Find the SVT 437 Icon and click on it
- (3) On top click on content
- (4) On left click on video lectures
- (5) Click on any lectures to play them

Syllabus, homeworks/labs, powerpoints, handouts, exams, etc: In appropriate selection on left side of content screen in Brightspace.

Note this next section is how "live" worked pre-pandemic. Due to pandemic the university has told your instructor to teach asynchronous online to all so everyone watches Brightspace lectures and only online options to homework exist.

IGNORE THIS NEXT PARAGRAPH FOR FALL 2020!!!

Live lectures will exist if on campus students desire them. Obviously on campus students will use lecture time to perform field homeworks. Online students will perform either alternative field homeworks with help from a mentor/surveyor or will complete alternative homeworks to the field exercises.

Expectations: Students are expected to learn basic GPS field survey Instrumentation, operation, office processing, and how it relates to survey office products.

Measurement of outcome: Examination and completion of homework assignments

The BS in SVT is approved by the **Accreditation Board for Engineering and Technology (ABET) and this course satisfies these standards.**

SVT Program Educational Objectives (1-8):	
3.	Be able to apply design skills sufficient to meet employer and client expectations in the areas of land development and survey operations planning.
SVT Program Outcomes (1.x-9.x)	
3.5	Interpret GPS program outputs for quality assessment
7.5	Set up, gather, reduce, and analyze data for three-dimensional positioning using static and real time kinematic GPS receivers

8.3.3 Set up a control network for employment in retracement or land development surveying services
8.6.1 Understand ordinary and reasonable standards for surveying practice in the areas of boundary retracement, photogrammetry, control surveys, and construction surveys
8.6.4 Be able to plan a GPS control survey
ABET Program Objectives (1-10):
1. Utilizing measurement technologies and field mapping
4. Geodetic science
6. Data analysis
8. Analyze positional accuracy in conformance with appropriate standards
ABET Program Criteria Outcomes (a-e):
a. Utilizing modern measurement technologies to acquire spatial data
c. Applying technical concepts to the design of measurement systems to meet project requirements
d. Analyzing data for conformance with precision and accuracy requirements
e. Performing standard analysis and design in at least one of the recognized technical specialties within surveying/geomatics technology that are appropriate to the goals of the program. The specialties include boundary and/or land surveying geographic and/or land information systems, engineering project surveying, photogrammetry, mapping and geodesy, and other related areas.
ABET Criteria 3 Student Outcomes (1-5)
2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;.

Required Text:

(1) Practical GPS for Surveyors, Van Sickle, latest edition

Grading	
Exam #1	100
Exam #2	100
10 homeworks/labs @ 20 pts. each	200

TOTAL	400

Generally A is 90%+, B is 80-89, C is 70-79, and D is 60-69.
No final exam is given.

Note: Lateness for homework/labs is not allowed unless a previous arrangement has been made with the instructor at least 48 hrs before it is due. In other words, turning in an assignment late results in zero credit!!!!!!! Assignments must be turned in at the start of the lecture in which they are due, or will receive zero credit. Since this is a Wednesday lecture for on campus students all homework and exams must be turned in by 7 am on the Wednesday Eastern time it is due by email (in text of email) or email attachment (txt, doc/docx, or pdf - avoid image files) sent to ray.hintz@maine.edu. Note there is no homework drop-off being used - homework is sent in as email!!!
The textbook is an excellent resource which can be used to make your comprehension of lecture material better. Information in the text not covered in a lecture will never be on a test.

Lecture Outline - one lecture and one HW per week except exam weeks no lecture or HW

Week	Topic
1	Hand-held GPS
2	Raw data GPS collection
3	GPS control considerations
4	Internet GPS data and processing resources
5	Static GPS field procedures
6	Static GPS downloading and processing to vectors
7	Review; Exam #1
8	GPS static network adjustment
9	Short occupation post processed GPS field procedures
10	Processing of week #9
11	RTK GPS for control purposes
12	RTK GPS for topographic purposes
13	Future datum issues; alternative GPS products
14	Review; Exam #2

- Academic Honesty Statement:** Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.
- Students Accessibility Services Statement [This should be customized to include the instructor's name]:** If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581.2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible.
- Course Schedule Disclaimer (Disruption Clause):** In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Observance of Religious Holidays/Events: The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student's grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell any of your teachers about sexual discrimination involving members of the campus, **your teacher is required to report** this information to Title IX Student Services or the Office of Equal Opportunity.

Behaviors that can be “sexual discrimination” include sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct, and gender discrimination. Therefore, all of these behaviors must be reported.

Why do teachers have to report sexual discrimination?

The university can better support students in trouble if we know about what is happening. Reporting also helps us to identify patterns that might arise – for example, if more than one victim reports having been assaulted or harassed by the same individual.

What will happen to a student if a teacher reports?

An employee from Title IX Student Services or the Office of Equal Opportunity will reach out to you and offer support, resources, and information. You will be invited to meet with the employee to discuss the situation and the various options available to you.

If you have requested confidentiality, the University will weigh your request that no action be taken against the institution’s obligation to provide a safe, nondiscriminatory environment for all students. If the University determines that it can maintain confidentiality, you must understand that the institution’s ability to meaningfully investigate the incident and pursue disciplinary action, if warranted, may be limited. There are times when the University may not be able to honor a request for confidentiality because doing so would pose a risk to its ability to provide a safe, nondiscriminatory environment for everyone. If the University determines that it cannot maintain confidentiality, the University will advise you, prior to starting an investigation and, to the extent possible, will share information only with those responsible for handling the institution’s response

The University is committed to the well-being of all students and will take steps to protect all involved from retaliation or harm.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

For **confidential resources on campus**: **Counseling Center: 207-581-1392** or **Cutler Health Center: at 207-581-4000**.

For **confidential resources off campus**: **Rape Response Services: 1-800-871-7741** or **Partners for Peace: 1-800-863-9909**.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

For support services on campus: Title IX Student Services: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or [see the OSAVP website for a complete list of services.](#)

SVT 437 Practical GPS

Homework #1

Due: 7 am September 9 by email to ray.hintz@maine.edu as attached txt, doc/docx, or pdf (no image files)

Google "entering GPS coordinates into a smart phone" or similar to learn how to enter latitude and longitude into your device. Borrow a friend's device if you do not have one or if on campus ask the professor for a hand held GPS device. Note you often have to enter coordinates in decimal degrees and longitude often in decimal degrees and the longitude requires a minus sign in front of it.

If on campus you will use control point THEW which has coordinates in dd mm ss.ssss and approximate ellipsoid height in meters of

THEW 44-54- 19.92395 68-40- 15.32186 10.19 meters

Note we are only comparing horizontally.

If off campus you can use a point of survey grade coordinate precision and compare to it or find a near horizontal control point using

<https://www.ngs.noaa.gov/NGSDataExplorer/>

- (1) Describe how close you come to the actual position of the point we visited.
- (2) Force the unit to lose satellite lock and repeat (1) three more times. Re-answer question (1) each time.
- (3) Does there appear to be more random or systematic error in the four solutions.
- (4) What do you anticipate will happen if you perform (1) at a different time or date?
- (5) Explain the advantages of differential GPS over the point position GPS of this exercise.
- (6) Why is the hand held GPS an important survey tool though of limited accuracy?
- (7) Why does hand held GPS not natively produce elevation?
- (8) Why is hand held GPS very precise in measuring speed?
- (9) What is the predominate reason hand held GPS is more precise than in 1995?
- (10) Google precise point positioning and describe what is different about it from what we did in this exercise.