



**SURE 440: ADVANCED
PHOTOGRAMMETRY**

Fall 2008/09

Instructor: Robert Burtch

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Office Phone: 591-2634

Office Hours: M 12:00-12:50, T 2:00-2:50, W 12:00-12:50, R 2:00-2:50

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COURSE DESCRIPTION

- © This course acquaints the student to advanced photogrammetric concepts that are normally encountered in photogrammetric practice. Topics include an introduction to analytical photogrammetric principles, concepts of the bundle adjustment, principles of advanced sensors, orthophotography, and principles of digital photogrammetry.



Textbook:

ELEMENTS OF PHOTOGRAMMETRY, 3rd edition, by P. Wolf and B. Dewitt,

Reference:

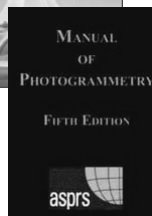
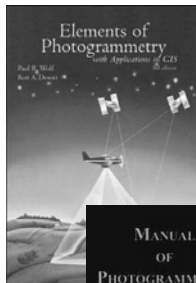
Introduction to Modern Photogrammetry, E.M. Mikhail, J.S. Bethel, and J.C. McGlone, John Wiley


Digital Photogrammetry, T. Schenk, TerraScience

Manual of Photogrammetry, 5th edition, J.C. McGlone, E.M. Mikhail, J.S. Bethel, American Society for Photogrammetry and Remote Sensing

Analytical Photogrammetry, S. Ghosh, Pergamon Press

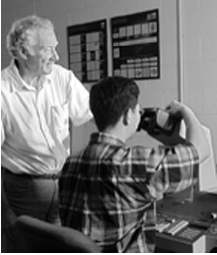
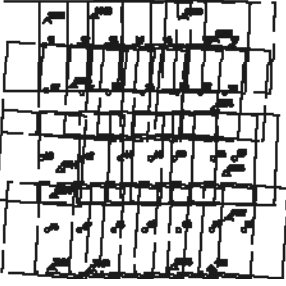
Mapping from Aerial Photographs, 2nd edition, C. Burnside, Halsead Press






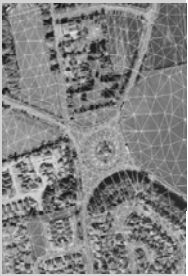
COURSE SCHEDULE:


- ⊙ **Lecture:** T, R 12:00-12:50, SWN 207
- ⊙ **Laboratory:**
 - ⊙ **Section 211:** M 1:00-3:50, SWN 201
 - ⊙ **Section 212:** R 8:00 – 10:50, SWN 201





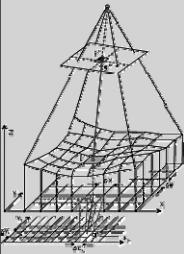



COURSE SCHEDULE:

	Week 1 Sep 1 – 5 (No class Sep 1)	Introduction: Understand course objectives, grading policy, etc.; Review of basic concepts in photogrammetry
	Week 2 Sep 8 - 12	Transformations, affine transformation, polynomial transformation
	Week 3 Sep 15 - 19	Transformations in three dimensions

COURSE SCHEDULE:		
	Week 4 Sep 17 - 21	Corrections to photo coordinates: interior orientation, film deformation, lens distortion, atmospheric refraction, earth curvature
	Week 5 Sep 29 – Oct 3	Collinearity condition, coplanarity equation, linearization of collinearity equations

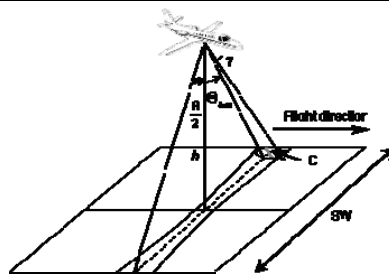
COURSE SCHEDULE:		
	Week 6 Oct 6 - 10	Mid-Term Exam #1, Oct 9 Numerical resection and orientation
	Week 7 Oct 13 - 17	Numerical resection and orientation
	Week 8 Oct 20 - 24	Principles of aerial triangulation
	Week 9 Oct 27 - 31	Principles of airborne GPS triangulation and direct sensor orientation

COURSE SCHEDULE:		
	Week 10 Nov 3 - 7	Orthophotography: creation of orthophotos, rectification, advantages and disadvantages
	Week 11 Nov 10 - 14	Digital photogrammetry: basic principles of DPW, scanners and digital cameras
	Week 12 Nov 17 - 21	Mid-Term Exam #2, Nov 18 Image processing: principles of human vision, resampling, compression, geometric corrections

COURSE SCHEDULE:		
	Week 13 Nov 24 - 28 (No Classes Nov 27-28)	Image processing: filtering, image transformation and programming with images
	Week 14 Dec 1 - 5	Digital photogrammetry: image correlation and matching, principles of computer vision, Hough transform, object recognition

COURSE SCHEDULE:


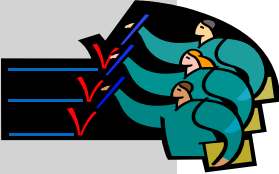
Week 15 Dec 8 - 12	Principles of laser scanning for mapping
Week 16	Final Exam: Tuesday, Dec 16, 12:00-1:40





ASSIGNMENTS

- ⊙ All work will be due on the date specified
- ⊙ Late assignments will be assessed a penalty of 5% per day or fraction thereof
- ⊙ All work must be completed to receive a passing grade for this course
- ⊙ No assignments will be accepted after the unit exam in which the assignment was given



	<h2>ASSIGNMENTS</h2>
	<ul style="list-style-type: none">⊙ Each assignment will be submitted in a report folder that can be reused throughout the semester.⊙ A cover sheet will be included with each assignment identifying the assignment, student name, and class⊙ Unless otherwise stated, only one assignment per folder will be accepted

	<h2>LAB WORK</h2>
	<ul style="list-style-type: none">⊙ Work that is submitted in hand-written form must be prepared on engineering paper in pencil. Corrections will be erased or placed above the incorrect values that will be stuck out with a single line through the error. Use only the front side of the sheet. Always include units in the answer and highlight the answer by either underlining it, placing a box around the answer, or by using a highlighter. When you have answers that are less than 1, always begin the number with a zero. For example, .471 shall be written as 0.471. When writing angles, minutes and seconds must always have two units, excluding any decimal portion. If a minute or second contains only single units, i.e., 4 minutes, 7 seconds, the number shall be preceded by a zero. In this case, 04' 07". Unless otherwise stated, all angles will be presented in degrees, minutes and seconds format. Use common sense in portrayal of significant figures.

NAME _____

SAMPLE HOMEWORK

1) GIVEN: $S_M = 1:62,500$
 $ab_M = 29.05\text{mm}$
 $f = 152.14\text{mm}$
 $ab_P = 54.81\text{mm}$
 $h = 240\text{ft}$

FIND H.

SOLUTION: $S_P = \frac{f}{H-h} \Rightarrow H = \frac{f}{S_P} + h$

$S_P = \frac{ab_P}{AB} \Rightarrow AB = \frac{ab_P}{S_P}$

$S_M = \frac{ab_M}{AB} \Rightarrow AB = \frac{ab_M}{S_M}$

$\therefore \frac{ab_P}{ab_M} = \frac{S_P}{S_M} \Rightarrow S_P = \frac{ab_P}{ab_M} S_M = \frac{54.81\text{mm}}{29.05\text{mm}} \left(\frac{1}{62,500} \right)$

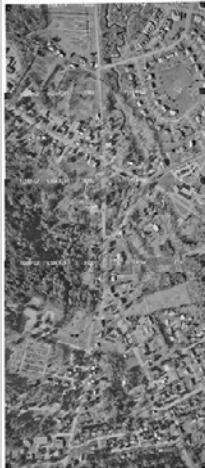
$= \frac{1}{33,125.8}$

then,


$$H = \frac{f}{S_P} + h = \left(\frac{152.14\text{mm}}{\frac{1}{33,125.8}} \right) \left(\frac{1''}{25.4\text{mm}} \right) \left(\frac{1'}{12''} \right) + 240'$$

$= \underline{16,775'}$

ATTENDANCE POLICY




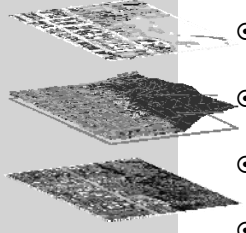
- ⊙ Each student will be allowed to miss up to 4 classes, either lectures or lab, without penalty
 - ⊙ These absences may be for any reason and do not require giving me an excuse
 - ⊙ A student who is absent a fifth time will be required to withdraw from the course if this absence occurs during the withdrawal period of the semester
 - ⊙ If this absence occurs after the withdrawal period the student will receive a failing (F) grade in the course
- ⊙ All laboratory absences must be made up during the semester.



ATTENDANCE POLICY


⊙ **Exceptions to the Attendance Policy (Verification is necessary):**

- ⊙ A University-sponsored event in which an excused absence from the Vice President for Academic Affairs office is given.
- ⊙ Death of a family member or close personal relation (friends, neighbors).
- ⊙ Extended hospitalization (this does not apply to a visit to the health center because of a cold or other illness).
- ⊙ Jury duty or being subpoenaed to testify in a court case.
- ⊙ Dangerous weather conditions in which driving is considered by local authorities to be unsafe (for commuter students).




CLASS CONDUCT

- ⊙ Class starts on the hour so please make every effort to arrive on time by planning ahead for any contingencies.
- ⊙ Class lasts for 50 minutes so do not begin to pack up your books and other items early.
- ⊙ Turn off all cell phones, pagers, pda's, MP3 players, and other electronic devices before class. If there are extenuating reasons, please see me.
- ⊙ During the lecture, feel free to ask questions, but refrain from conducting personal conversations.
- ⊙ When you leave the classroom, please pick up after yourself.



CLASS CONDUCT

- ⊙ Sleeping, eating and reading newspapers are not allowed in class. While in class the student is expected to pay attention and participate in this class and not finish work for another class during this class periods.
- ⊙ Come to class prepared. Instructional material students should not be without include, as a minimum, writing material, computer disks and calculators.
- ⊙ Students are expected to check the web page for this course weekly and students are responsible for all material on this web page along with textbook and other readings.




A cartoon illustration of a student with orange hair, wearing a blue shirt and green pants, slumped over a desk with their head resting on their hand, appearing to be asleep. A red apple is on the desk in front of them.

PERFORMANCE CRITERIA/ GRADING

- ⊙ 60% from exams and quizzes
20% from term paper and presentation
20% from lab assignments, project, and readings
100% TOTAL

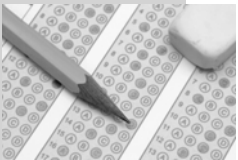
90 - 100%	- A Range
80 - 89%	- B Range
70 - 79%	- C Range
60 - 69%	- D Range
0 - 59%	- F Range



A cartoon illustration of two students, a male and a female, standing at a table. They appear to be looking at a document or project on the table. The male student is on the left, and the female student is on the right.


ADDITIONAL COMMENTS

- ⊙ Absence from test – must be made up prior to next class
 - ⊙ Failure to do so will result in 0% grade
 - ⊙ Student’s responsibility to set up time for make-up
- ⊙ Missed quizzes will not be made up
- ⊙ Course has cumulative final exam
- ⊙ Final exam information:
 - ⊙ If 3 or more finals scheduled on same day, student can elect to take first and last on that day
 - ⊙ Must notify affected instructor no later than 2 weeks prior to exam date (have to provide authentication)
 - ⊙ Rescheduled exam taken another day arranged by course instructor and student



ADDITIONAL COMMENTS

- ⊙ Office hours are as given
 - ⊙ Other times may be arranged if needed
 - ⊙ If problems, see me as soon as possible – waiting until end of semester may be too late
- ⊙ I reserve the right to make needed and appropriate adjustments to this syllabus



In World War II, it took many people to assemble the photographs taken during a mission into one aerial photograph.