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| Course Instructor | George Bevan | Email: bevan@queensu.ca |
| Office | Mac-Corry D130 (basement) | |
| Contact Time | Lectures Monday 11:30-13:00 and Thursday 13:00-14:30; Lab Section 002 Tuesday 8:30-11:30, Lab Section 003 Monday 14:30-17:30 in the departmental GIS lab, Macintosh Corry E223 (Office Hours TBA) | |
| Format | 2x1.5 hour lectures per week; 1x3 hour labs (two sections available) | |
| Class Assessment | Participations in labs and online (asking questions, giving answers) 10%; six lab assignments (due every second week) 60%; two multiple choice tests (at middle of term and in the final week): 30% | |

COURSE OVERVIEW

This course proposes to give a rigorous introduction to the theory and practice of Digital Photogrammetry, a technique that has witnessed a tremendous rise in popularity with the rise of high-resolution digital cameras and fast, multi-core computers in the early 2000s. While the underlying mathematics will not be treated in detail (no specific mathematical background is required), considerable attention will be paid to photogrammetry as a quantitative technique in Geography, Geomorphology, Cartography, Archaeology, Architecture, Geology, Civil Engineering, and related fields where accurate 3D measurement is of great importance. Proper planning of photogrammetric projects will be emphasized, along with a focus on a priori estimates of accuracy of photogrammetric measurement. The use of Remotely Piloted Aerial Systems (“drones”) to collect 3D data will be emphasized, along with basic mapping operations.

LEARNING OUTCOMES

- 1) to operate modern digital photogrammetry software
- 2) to analyze 3D datasets in software to produce meaningful sets of measurements
- 3) to present photogrammetry data effectively, and the fundamental concepts of photogrammetry, in the form of or presentations and written reports

COURSE TOPICS

History of Photography, History of Photogrammetry, Camera Fundamentals (Exposure, ISO, Shutter Speed and Aperture), Statistics (Models and Residuals), Root Mean Square Error, Principles of Photogrammetry, Stereoplotting, Network Bundle Adjustment/Least Squares, Exterior Orientation, Interior Orientation, Camera Calibration, Fan-geometry, Absolute Orientation, Ground Control Points and Surveying, Coordinate Systems, Aerial Photography, Orthophoto Generation, Remotely Piloted Aerial Systems, Aerial Project Planning, Photo Scale, Image File Formats, Spatial Resolution and the Modulation Transfer Function, Diffraction Limits on Optical Systems, Stereo Matching Algorithms, Meshing, Observations and Redundancy, Advanced Terrestrial Camera Networks, Photogrammetry Applications

COURSE READINGS

Wolf, P.R. and B. DeWitt, and B. Wilkinson, Elements of Photogrammetry with Application in GIS, 4th edition (McGraw-Hill, 2014) (available online through Queen’s Library)

It is strongly recommended that students have a portable hard drive or USB flash drive with at least 32 gigabytes of free space to store course data between lab sessions. 3D Anaglyph glasses will be loaned for labs that require them, but students may want to purchase their [own pair on Amazon](#).