Asian Institute of Technology
School of Engineering and Technology

AT76.14 ***Digital Photogrammetry*** **2 (1-3)** **Semester: August**

Course Objective: The course conveys the basics of terrestrial and satellite digital photogrammetry. It aims at providing basic photogrammetry concept, procedures and processing task. Insights on products quality and error analysis are also considered and explained with various methods. Basic concepts of terrestrial and aerial laser scanning will be also given.

Learning Outcomes:

The students on the completion of this course would be able to:

1. Comprehend basic concepts of digital photogrammetry (including terrestrial, aerial and satellite photogrammetry)
2. Explain photogrammetric processing principles and methods
3. Generate digital ortho-products (orthophotos, digital elevation models, building, point clouds) from multi-source photogrammetric data and evaluate the results
4. Identify the role of relief displacement, evaluate elevation data products and assess their use for a range of applications

Pre-requisite: None

Course Outline:

I. Introduction
   1. Basic principles and historical overview
   2. Image Sources: analogue and digital cameras
   3. Properties of aerial photography
   4. Scanning of analogue photos
   5. Digital image enhancement

II. Elements of Analytical Photogrammetry
   1. Concept of image and object space
   2. Coordinate Systems
   3. Interior Orientation
   4. Exterior Orientation of a single image
   5. Relative and absolute orientation of stereo photo pairs
   6. Aerial triangulation of image blocks, block adjustment
   7. Automatic DTM acquisition from stereo pairs or image blocks

8. Orthophotos, Mosaicing, Colour balancing
9. Feature extraction, points, lines and polygons

III. Laser Scanning
1. Airborne laser scanning
2. Terrestrial laser scanning

Laboratory Session(s):

1. Introduction to ERDAS IMAGINE - Image Photogrammetry
2. Stereo pairs and complex stereoscopic models generation, orthophoto production and orthomosaicing
3. Digital elevation model extraction from stereo pairs and complex stereoscopic models
4. Semi-automatic building extraction:
5. Satellite photogrammetry: rigorous generation of digital ortho-images from SPOT/ASTER, DEM generation ASTER stereo pairs
6. Airborne laser scanning data basic processing
7. Terrestrial laser scanning data basic processing

Learning Resources:

Text Books: No designated textbook, but class notes and handouts will be provided.

Reference Books:

W. Linder:
Digital Photogrammetry - A Practical Course (Fourth Edition). Springer-Verlag Berlin Heidelberg, 2016

Kraus, Karl.:
Photogrammetry - Geometry from Images and Laser Scans (2nd Edition). Berlin - New York, De Gruyter, 2007.

Paul Wolf, Bon DeWitt, Benjamin Wilkinson:
Elements of Photogrammetry with Application in GIS, New York, McGraw-Hill Professional, 2014.

Journals and Magazines:

ISPRS Journal of Photogrammetry and Remote Sensing, Elsevier
Photogrammetric Engineering and Remote Sensing, ASPRS

International Journal of ISPRS, ISPRS
The Journal of Survey, Japan Association of Surveyors (JAS)

Others: None

Teaching and Learning Methods:

1. **Lectures and class discussion**: Students will received the lecture notes and the weekly lecture schedule at the beginning of the course, and requested them to read the lecture notes before coming to the class.
2. **Laboratory sessions**: The laboratory instruction will be provided to the students. Lab instruction will provide a basic guideline for student to learn and be familiar with the remote sensing software and remote sensing data. Students are requested to understand the algorithm of each operation so that they able to operate with other software. The home assignments and discussion are requested to submit.

Time Distribution and Study Load:

Lecture: 15 Hrs
Laboratory: 30 Hrs
Self-study: 45 Hrs

Evaluation Scheme:

The final grade will be based on the following weight distribution: assignments (30), mid-semester exam (30%), final exam (50%). An "A" would be awarded if a student can elaborate the knowledge learned in class by giving his/her own analysis on real case examples given in this course and from journal articles and including assigned readings. A "B" would be awarded if a student shows an overall understanding of all given topics, a "C" would be given if a student meets below average expectation on both knowledge acquired and analysis. A "D" would be given if a student does not meet basis expectations in understanding and analyzing the topics and issues presented in the course.

Instructor: Adjunct/seconded faculty.