Asian Institute of Technology
School of Engineering and Technology

AT76.30 *Unmanned Aerial Vehicle Applications and Processing* 1(1-0) Semester: January

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Course Objective: The objective of this course aims at providing students with knowledge and understanding about Unmanned Aerial Vehicle (UAV) technology. Additionally, students will learn how UAV are utilized in earth observation, agriculture and 3D mapping.

Learning Outcomes :

The students upon successful completion of this course will be able to:

1. Identify and demonstrate principles and operation of UAV, its system components and applications
2. Perform UAV data processing and perform products generation for earth observation and 3D mapping
3. Design the flight plan of UAV observation for specific type of applications.

Prerequisite: None

Course Outline:

I. Introduction
   1. Overview of UAV
   2. Components of UAV
   3. UAV platform and classification
   4. UAV application for Earth Observation and 3D Mapping

II. UAV Flight Planning and Management
   1. Ground Sampling Distance (GSD) and Flight Height
   2. Overlap and Sidelap
   3. UAV Flight planning and Management
   4. Ground Control Point (GCP) reference

III. UAV data processing for Earth Observation
   1. Image Acquisition
   2. Image Orientation
   3. Image Triangulation and Structure Form Motion (SFM)
   4. Dense Point Cloud
   5. Orthophoto generation

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IV. UAV data processing for 3D Mapping

1. 3D-points cloud
2. DSM, DTM and DEM data generation
3. 3D Model reconstruction

Tutorial(s):

1. UAV components and platform
2. UAV Fight planning
3. Field survey and Ground Control Point reference
4. UAV data processing for Earth Observation
5. 3D model reconstruction

Learning Resources:

Textbooks: No assigned textbook, but class notes and handouts will be provided.

Reference Books:

K. Valavanis and G. J. Vachtsevanos:

Handbook of Unmanned Aerial Vehicles, Springer , USA, 2015.

T. M. Lam:

Aerial Vehicles, Intech, USA, 2009.

Journals and Magazines:

International Journal of Digital Earth, Taylor & Francis
Journal of Geographic Information System, Scientific Research

Others: None

Teaching and Learning Methods:

1. **Lectures and class discussion**: Teaching and learning methods include lectures, class discussions and presentations on UAV technology and its applications for earth observation purpose to understand the underlying fundamental of UAV and processing. Students will receive 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.

Time Distribution and Study Load:

Lecture: 10 Hrs
Tutorials: 15 Hrs

Self-study + Assignments: 45 Hrs

Evaluation Scheme:

Tutorials + Assignment: 30%
Final exam (closed book): 70%

An "A" would be awarded if a student can elaborate the knowledge and technique learned in the class by giving his/her own skills to design innovative application of UAV. "B+" would be awarded if a student shows an overall understanding of all give topics and able to understand the core technology of UAV Technology and able to select appropriate architecture for difference applications. A "B" would be awarded if a student shows an understanding of all give topics and able to identify core technology of any applications. A "C+" would be given if a student meets average expectation on both knowledge acquired, and adaptation skills and a "C" would be given if a student meets below average expectation. A "D" would be given if a student does not meet basis expectations in understanding the topics and issues presented in course.

Instructor(s): Dr. Sarawut Ninsawat

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