

## Part IV - Course Outline

**Asian Institute of Technology**  
School of Engineering and Technology

**AT76.9043 Selected Topic: Advance UAV1(1-0)**  
**Semester: January**

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**Course Objective:** This course aims at introducing different applications of Unmanned Aerial Vehicle (UAV) images. Course also aims at to develop skills in understanding the object characters through UAV imagery, measurement type with analysis, and techniques to extract/detect those objects using image analysis techniques.

### **Learning Outcomes :**

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

1. Evaluate effective sensors and advance technique to extract and mapping the features for various applications
2. Acquire skills to extract/ detect features from UAV images using image analysis tools
3. Perform UAV data analysis for agriculture, urban and survey applications

**Prerequisite:** AT76.30 Unmanned Aerial Vehicle Applications and Processing

### **Course Outline:**

- I. Introduction
  1. Overview of UAV Applications
  2. Sensors characters (RGB/Multispectral)
  3. Sensors characters (LiDAR/Thermal/Hyperspectral)
  
- II. UAV Multispectral Data Processing
  1. UAV Multispectral Application
  2. Calibration and Processing Multispectral Image
  3. Multispectral Data Applications
  
- III. UAV in Agriculture applications
  1. Agriculture characters
  2. Height model generation
  3. Canopy Height Model (CHM) from UAV
  
- IV. UAV data analysis with Object Detection
  1. Image preparation

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2. Training Data Set preparation
3. Object Detection model

- V. UAV Solutions for 3D Civil Surveying
1. Point Cloud Concept and Management
  2. 2D Distance/ Area Measurement
  3. 3D Volume Measurement
- VI. UAV Project Planning and Mapping
1. UAV project design and Assessment
  2. Project Evaluation
  3. UAV Survey and Cost management plan

**Learning resources:**

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

Reference Books:

*Franck Cazaurang, Kelly Cohen and Manish Kumar:*

Multi-Rotor Platform-based UAV Systems, ScienceDirect, 2020.

*K. Valavanis and G. J. Vachtsevanos:*

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

*T. M. Lam:*

Aerial Vehicles, Intech, USA, 2009.

*Ram Avtar and Teiji Watanabe:*

Unmanned Aerial Vehicle: Applications in Agriculture and Environment, Springer Nature Switzerland AG 2020.

Journals and Magazines:

International Journal of Digital Earth, Taylor & Francis

Journal of Geographic Information System, Scientific Research

International Journal of Applied Earth Observation and Geoinformation,  
ScienceDirect

Agricultural Water Management, ScienceDirect

Others:

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### **Teaching and Learning Methods:**

1. **Lectures and class discussion:** Students receive the lecture materials and reference materials and taught using power points and extensive discussion and explanation on white board.
2. **Term Project:** Assignments are given both on theoretical and analytical along with scientific reading and data analysis. Students are encouraged to design, planning and analysis UAV Data based on interesting application.

### **Time Distribution and Study Load:**

Lectures: 10 Hrs

Tutorials: 15 Hrs

Self-study + Assignments: 45 Hrs

### **Evaluation Scheme:**

Assignments: 60%

Term Project exam: 40%

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 Application and able to select appropriate sensor/technique 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/Dr. Sanit Arunplod

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Academic Senate Approval: \_\_\_\_\_