Subject Description Form

Subject Code	LSGI3662
Subject Title	**Field Scheme of Unmanned Aerial Vehicle (UAV) Photogrammetry and Laser Scanning**
Credit Value	3
Level	3
Pre-requisite	LSGI2373 Surveying; and LSGI3333 Photogrammetry
Objectives	The aims of this subject are: • To consolidate the students' awareness and knowledge of using UAV and laser scanning regarding the current standards, associated laws, and operation safety procedures. • To provide an opportunity for students to have hands-on practice of UAV and laser scanning operation and apply the knowledge and methods to serve the purpose of professional surveying and engineering practice in a real-life environment. • To train students' essential ability and skills for working and communicating with others, making professional presentations, and preparing technical reports. This subject emphasizes on team work, project management, and problem solving in the field. These in turn help students develop communication, critical and creative thinking, and cooperative altitudes and behavior of working with others.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. Describe the data collection and operation mechanism of the equipment (L2). 2. Understand the safety-related regulations, standards and laws (L2). 3. Operate the equipment in both indoor and outdoor environments, and perform on-site adjustment and decision making of the data collection strategies (L3). 4. Perform UAV and laser scanning mission planning, establishment of control points, data collection, data post-processing, and to generate an ortho-rectified data product and 3D model (L4).
Subject Synopsis/ Indicative Syllabus	Students should learn operation safety procedure, associated law standards, mission planning, operation of the equipment for surveying and mapping, production of 3D model, and report writing.

Teaching/Learning Methodology

The subject has three phases. Students have to attend a one-day lecture (8 hours) before the camp. The pre-camp lecture aims to cover the topics related to UAV safety regulations, mission planning, drone/laser scanner operation, data acquisition, and the corresponding software operation.

In the second phase, students will attend a 4-hour briefing session before the field camp regarding the information of the camp site, safety protocols, logistics arrangement, and tasks required to do. The final phase of the subject includes a physical project implementation assigned by the instructor. These include collection of the users' requirement of the final product, equipment check and calibration, mission planning, establishment of control points, data collection of UAV and laser scanning, data post-processing, and delivery of final product and report.

Students should work in small groups, where each group should have a representative. The representative of each group should report to the instructor regarding the progress of the work daily, identifies the difficulties (if any) and proposes alternative solutions if problems encountered. Each group member should get involve in every task of the project and operation of both the hardware and software.

Students will be given feedbacks on-site of their performance and suggested improvements. Proficiency in equipment calibration and operation, managing the project with limited supply of survey equipment, to carry out field observations, booking and checking, as well as data reduction and survey plan production will be assessed.

This learning process will help students develop communication skills, creative and critical thinking, enable students to understand and appreciate the importance of team work, provide students opportunities to develop resource, time and manpower management, and leadership skill.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		1	2	3	4
1. Hands-on test	30%	✓	✓	✓	
2. MC test	30%	✓	✓		
3. Delivery of final product and report	40 %				✓
Total	100 %				

Student performance will be assessed based on their field performance of operation of the equipment, a MC test, and the delivery of the final product

	and report at the end of the survey camp. Assessment areas will be based on the following: 1. Activities and documentation conforming to professional standards throughout; 2. Planning activity by each student, prior to the period of field data collection, is acceptable to the instructor of his/her group; 3. Individual hands-on operation of the equipment in both indoor and outdoor environments; 4. Processing of work to the satisfaction of the instructor; 5. Awareness of the safety issues and on-site adjustment of the data collection strategies; 6. Fair drawn plots of the control scheme and survey, the referenced field data and computations, and a short report describing the methods used to complete the survey as well as the results by each student group.	
Student Study Effort Expected	Class contact:	
	▪ Practice work in camp	39 Hrs.
	▪ One-day pre-camp lecture (8 hours)	8 Hrs.
	▪ Pre-field work briefing session	4 Hrs.
	Other student study effort:	
	▪ Field Scheme of Unmanned Aerial Vehicle (UAV) Photogrammetry and Laser Scanning	62 Hrs.
	Total student study effort	113 Hrs.
Reading List and References	Armenakis, C., & Patias, P. (2018). Unmanned vehicle systems for geomatics: Towards robotic mapping. Whittles Publishing, 318 pp. Civil Aviation Department (2022) Small Unmanned Aircraft Order (Cap.448G). Available at: https://www.cad.gov.hk/english/sua.html. Shan, J., & Toth, C. K. (Eds.). (2018). Topographic laser ranging and scanning: principles and processing. CRC Press, 654 pp. Vosselman, G., & Maas, H. G. (2010). Airborne and terrestrial laser scanning. CRC Press, 320 pp.	