PROGRAM STUDI MAGISTER TEKNIK GEOMATIKA
MASTER OF GEOMATICS ENGINEERING

BUKU PEDOMAN MATA KULIAH

COURSES MODULE HANDBOOK

FOTOGRAMETRI LANJUT
ADVANCED PHOTOGRAMMETRY

DEPARTEMEN TEKNIK GEOMATIKA
Fakultas Teknik Sipil, Perencanaan, dan Kebumian

DEPARTMENT OF GEOMATICS ENGINEERING
Faculty of Civil Engineering, Planning, and Geo Engineering

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

16. Fotogrametri Lanjut / *Advanced Photogrammetry*

Nama modul *Module name*	**Fotogrametri Lanjut** ***Advanced Photogrammetry***
Tingkatan *Module level*	Pasca Sarjana (S2) *Master Degree*
Kode *Code*	CM235703
Mata kuliah *Course*	Fotogrametri Lanjut *Advanced Photogrammetry*
Semester *Semester*	III (tiga) atau IV (empat) *III (three) or IV (four)*
Penanggung jawab mata kuliah *Person responsible for the module*	Dr. Ing. Ir. Teguh Hariyanto, M.Sc.
Dosen *Lecturer*	Dr. Ing. Ir. Teguh Hariyanto, M.Sc.
Bahasa *Language*	Bahasa Indonesia dan Bahasa Inggris *Indonesian and English*
Relasi pada kurikulum *Relation to curriculum*	Mata kuliah pilihan untuk Program Master Teknik Geomatika *Elective Courses for Master of Geomatics Engineering*
Tipe pertemuan, jam tatap muka *Type of teaching, contact hours*	Kuliah, 2.5 jam x 16 minggu per semester *Lecture, 2.5 hours x 16 weeks per semester*
Beban belajar *Workload*	Kuliah: 2.5 jam x 14 minggu = 35 jam Penugasan terstruktur: 2.5 jam x 14 minggu= 35 jam Kegiatan mandiri: 2.5 jam x 14 minggu= 35 jam Ujian: 2.5 jam x 2 kali = 5 jam Paper review: 3 jam x 14 = 42 jam Studi Case-based: 3 jam x 14 = 42 jam Total = 194 jam *Lecture: 2.5 hours x 14 weeks = 35 hours* *Structured exercises and assignments: 2.5 x 14 weeks = 35 hours* *Independent activities: 2.5 x 14 weeks = 35 hours Exam: 2.5 hours x 2 time = 5 hours* *Paper review: 3 jam x 14 = 42 hours* *Case-based study: 3 jam x 14 = 42 hours* *Total = 194 hours*
Kredit *Credits*	3 SKS *3 credits*
Persyaratan sesuai dengan peraturan ujian *Requirements according to*	Minimum 80% kehadiran untuk mengikuti ujian tertulis *Minimum 80% attendance in this course in order to take*

the examination regulations	*the exams*
Deskripsi Mata Kuliah	Mata kuliah ini membahas tentang konsep dan metode pemetaan dengan Teknik fotogrametri. Topik dimulai dengan konsep dan sejarah fotogrametri yang meliputi latar belakang teori, metode akuisisi data, dan pengolahan data. Metode pengolahan data dalam fotogrametri saat ini telah berkembang kearah fotogrametri digital yang meliputi kalibrasi kamera, orientasi relative, orientasi absolut dan penyesuaian bundel. Metode terbaru lainnya dalam fotogrametri juga dibahas dalam mata kuliah ini, terutama terkait dengan bidang lain seperti pencocokan citra digital, struktur dari pergerakan, dan klasifikasi citra digital. Mata kuliah ini juga membahas tentang penerapan Teknik fotogrametri untuk berbagai kebutuhan dalam masalah lingkungan, pemukiman manusia, serta pemodelan 3D. Mata kuliah ini diajarkan di ruang kelas dan laboratorium yang memungkinkan mahasiswa memiliki banyak pengalaman dalam penerapan fotogrametri.
Description of Course	*This course discusses about the concept and method of mapping with photogrammetric techniques. The topics start with the concept and history of photogrammetry which includes theoretical background, data acquisition method, and data processing. The data processing methods in photogrammetry nowadays have been developed towards digital photogrammetry which includes camera calibration, relative orientation, absolute orientation and bundle adjustment. Other recent methods in photogrammetry are also discussed in this course, especially related to other fields such as digital image matching, structure from motion, and digital image classification. This course also discuss about application of photogrammetric techniques for various needs in environment problem, human settlements, and also 3D modeling. The course is conducted in classroom and laboratory which allows students having much experiences in the application of photogrammetry.*

Capaian Pembelajaran / *Course Learning Outcomes*	1. Mahasiswa mampu menjelaskan konsep fisika elektro optikal digital (CCD/CMOS), kamera metrik dan non metrik digital dan peralatan lainnya beserta model matematis untuk kalibrasi dan koreksinya.
	2. Mahasiswa mampu menjelaskan model konsep digital secara teoritis dan empiris dalam perhitungan fotogrametri tiga dimensi dengan data photo udara digital mono dan stereo.
	3. Mahasiswa mampu menerapkan konsep fotogrametri digital workstation dalam penyelesaian proses orientasi digital dalam bentuk model matematis 3D antara koordinat photo dan koordinat obyek (tanah) untuk mendapatkan detail planimetris dan tinggi.
	4. Mahasiswa mampu mengetahui dan menerapkan penenalan obyek secara digital dalam rangka interpretasi obyek berbasis area, dan pixel.
	5. Mahasiswa mampu mengetahui dan menerapkan konsep Teknologi LIDAR untuk mendapatkan DEM, DSM dan kontur.
Module objectives/ Course learning outcomes	1. *Students are able to explain the concepts of digital electro-optical physics (CCD/CMOS), digital metric and non-metric cameras and other equipment along with mathematical models for calibration and correction.*
	2. *Students are able to explain theoretically and empirically digital concept models in three-dimensional photogrammetry calculations with mono and stereo digital aerial photo data.*
	3. *Students are able to apply the concept of digital photogrammetry workstation in completing the digital orientation process in the form of a 3D mathematical model between photo coordinates and object coordinates (ground) to obtain planimetric and height details.*
	4. *Students are able to know and apply object recognition digitally in the context of area and pixel-based object interpretation.*
	5. *Students are able to know and apply the concept of LIDAR Technology to obtain DEM, DSM and contours.*

	CPMK dan hubungan dengan CPL Prodi *Learning outcomes and their corresponding to PLOs*										
		PLO.1	PLO.2	PLO.3	PLO.4	PLO.5	PLO.6	PLO.7	PLO.8	PLO.9
	CLO.1					✓				
	CLO.2					✓	✓			
	CLO.3						✓	✓		
	CLO.4						✓	✓		
	CLO.5							✓		

Mata kuliah wajib prasyarat
Mandatory prerequisites

-

Pokok Bahasan

1. Metode fotogrametri: definisi, sejarah, optik, pengukuran dan interpretasi.
2. Proses fotogrametri: perhitungan dasar dalam citra vertikal dan miring, sistem koordinat, transformasi koordinat, kalibrasi kamera
3. Fotogrametri digital: citra digital, persamaan kolinearitas, orientasi interior dan eksterior
4. Teknik fotogrametri terkini: kamera format kecil, fotogrametri jarak dekat, Structure from Motion (SFM)

Content

1. *Method of photogrammetry: definition, history, optics, measurement and interpretation.*
2. *Photogrammetric process: basic computations in vertical and oblique imagery, coordinate systems, coordinate transformation, camera calibration*
3. *Digital photogrammetry: digital imagery, collinearity equation, interior and exterior orientation*
4. *Recent photogrammetrc techniques: small format camera, close range photogrammetry, Structure from Motion (SFM)*

Pembelajaran dan Persyaratan Ujian
Study and examination requirements and forms of examination

Rencana Evaluasi	Bobot *Weight*
Studi kasus *Case Method*	25%
Evaluasi Tengah Semester *Middle Term Examination*	25%
Hasil Project *Team-Base Project*	30%
Evaluasi Akhir Semester *Final Examination*	20%

Media yang digunakan *Media employed*	Classical teaching tools with white board and power point presentation
Daftar Pustaka *Reading list*	**Principal :** 1. Mikhail, Bethel, McGlone. 2005. *Introduction to Modern Photogrammetry,* John Willey & Sons. 2. Wolf, PR & Dewitt,BA. *Elements of Photogrammetry with Appl. in GIS*, 2004, McGraw-Hill. 3. Kraus K., *Photogrammetry*, Vol 1 and 2. 4th rev. ed, Ferd. Dümmlers Verlag, 1993 **Supplementary :** 1. Sandau, R. 2010. *Digital Airborne Camera Introduction and Technology*, Springer. 2. Teguh Hariyanto. 2006. *Modul Ajar Fotogrametri*, Teknik Geodesi – FTSP, ITS