	INSTITUT TEKNOLOGI SEPULUH NOPEMBER **FACULTY OF CIVIL, PLANNING AND GEO ENGINEERING** **DEPARTMENT OF GEOMATICS ENGINEERING** **UNDERGRADUATE STUDY PROGRAM**	**Document Code**

SEMESTER LEARNING PLAN (SLP)

COURSE NAME	**CODE**	**COURSE GROUP**	**CREDITS (SKS)**		**SEMESTER**	**Date of Preparation**
Digital Photogrammetry	CM234421	Geoinformatics	**T=2**	**P=1**	4	-

AUTHORIZATION	**SLP Developer**	**COURSE GROUP COORDINATOR**	**Head of Study Program**
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Learning Outcomes (LO)		
	Expected Learning Outcomes (ELO) that Imposed in the Course	
	ELO-4	Able to apply mathematics, science, and engineering in the fields of geodesy, surveying, hydrography, remote sensing, photogrammetry, geographic information systems, and cadastral to gain a thorough. understanding of the principles of engineering.
	ELO-5	Able to design survey and mapping activities using the latest technology in the fields of geodesy, surveying, hydrographic, remote sensing, photogrammetry, and cadastral.
	ELO-6	Able to identify, formulate, analyze and solve problems in the fields of geodesy, surveying, hydrographic, remote sensing, photogrammetry, and cadastral.
	ELO-7	Able to perform spatial data acquisition using modern measurement methods, geospatial data processing, using industry standard software, and making standard designs and analyzes in the fields of geodesy, surveying, hydrography, remote sensing, photogrammetry, and cadastral.
	Course Learning Outcomes (CLO)	
	CLO-1	Students are able to explain and apply the concepts of digital electro-optical physics (CCD / CMOS), ddigital metric and non-metric cameras and other equipment to support stereoscopic concepts
	CLO-2	Students are able to explain theoretical and empirical concepts in photogrammetric calculations with mono and stereo digital photo data.
	CLO-3	Students are able to apply the concept of digital photogrammetry in completing the digital orientation process in the form of a 3D mathematical model between photo coordinates and object (ground) coordinates to obtain planimetric details and height.

<table>
<tr><td></td><td>CLO-4</td><td>Students are able to understand and apply the concept of LIDAR technology to obtain DEM, DSM and contours.</td></tr>
<tr><td></td><td colspan="2">Matrix ELO – CLO
<table>
<tr><th>CLO</th><th>ELO-4</th><th>ELO-5</th><th>ELO-6</th><th>ELO-7</th></tr>
<tr><td>CLO-1</td><td>V</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO-2</td><td>V</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO-3</td><td>V</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO-4</td><td>V</td><td>V</td><td>V</td><td>V</td></tr>
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<tr><td>Course Description</td><td colspan="2">In this course, students are expected to be able to apply the concepts and procedures of digital photogrammetry science and techniques as one of the methods in large-scale mapping for digital base maps and thematics. In the learning process, digital photogrammetry will be grouped into measurement methods (digital optical concepts / CCD and CMOS, analytics and digital plotting) as well as 3D transformation methods with digital plotting equipment and mathematical models, along with obtaining data and processes for height (Z) using LIDAR technology.</td></tr>
<tr><td>Course Materials</td><td colspan="2">1. Definition and use of digital Photogrammetry Techniques, Basic electro-optical concepts (CCD and CMOS) for digital cameras
2. Digital metric and non metric Camera Calibration with IMU
3. Theory of digital inner and outer orientation with 3D mathematical models, Theory and application of digital air triangulation
4. Theory and application of the model of alignment and awakening requirements in digital photos.
5. Theory and application of LIDAR data to obtain DSM, DTM, DEM, Basic concepts of Digital Photogrammetry Workstation.</td></tr>
<tr><td>References</td><td colspan="2">Main:
1. Edward, MH,Introduction to Modern Photogrammetry,John Wiley&Sons,2001
2. Fadh Abany,Advanted Photogrametry, Lecture Module, 2007
3. Teguh Hariyanto, LIDAR Overview, Lecture Module, 2013, ITS Geomatics.
4. G.Konecny, Photogrammetri, 3rd edition, Sprin verlag, 2014.
5. Koerth Sijmons, Introduction on Photogrametry, ITC-Enschede,Holland,2008
Additional
-</td></tr>
<tr><td>Lecturer</td><td colspan="2">1. Dr-Ing. Ir. Teguh Hariyanto, MSc
2. Agung Budi Cahyono, S.T., M.Sc, DEA
3. Hepi Hapsari Hndayani, S.T., M.Sc, PhD
4. Husnul Hidayat, S.T., M.T.</td></tr>
<tr><td>Prerequisite</td><td colspan="2">Photogrammetry</td></tr>
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Class/ Week	Lesson Learning Outcome (Sub-CLO)	Valuation		Learning Forms, Learning Methods, Student Assignments/Task, [Estimated Time]		Learning Materials [References]	Weight (%)
		Indicators	Criteria	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Able to explain the concept of digital photogrammetry as a large-scale mapping technique with digital photo data	Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Response [1 x 50']		Introduction to Digital Photogrammetry (review and developments)	5
2	Able to explain the concept of CCD / CMOS on Digital Cameras	Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Response, Presentation [1 x 50']		CCD/CMOS Concept in Digital Cameras	10
3 – 4	Able to explain the basic concepts of metric and nonmetric digital cameras	1. Accuracy of wearing camera components 2. Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Response, Task [2 x 50']		Basic electro Optical and wave propagation, Digital Camera (Erial/Terrestrial; Metric vs Non-Metric)	15
5 – 6	Able to describe the platform of the camera calibration system	1. Accuracy of wearing equipment 2. Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Response/Exercise [2 x 50']		Basic application of IOP Concept and Digital Camera Calibration	10
7	Able to explain the concept of Digital Analytical Orientation (EOP)	1. Accuracy in using formulas 2. Procedural correctness	1. Completeness of the material 2. Depth of explanation and	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Response [1 x 50']		Application of Digital Analytics Orientation (EOP)	10

			effectiveness of communication				
8	**Midterm Evaluation / Midterm Exam**						**50**
9	Able to explain the concept of *Digital Photogrammetry Workstation*	1. Accuracy in using formulas 2. Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Response [1 x 50']		1. Introduction : Digital Photogrammetry Workstation (E-Photo and Summit Evo software) 2. Basic equipment concepts, operating systems, results from DPW	10
11 – 12	Able to explain the concept of Digital Aerial Photo Restitution	1. Accuracy in using formulas 2. Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion of count example [2 x 50'] 3. Response [2 x 50']		Digital Concept of Aerial Photo Restitution	20
13 – 14	Able to explain the Stereoplotting process	1. Accuracy in using formulas 2. Procedural correctness	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion of count example [2 x 50'] 3. Response [2 x 50']		Stereoplotting / 3D Feature Collection	10
15	Able to explain the process of obtaining Z coordinates	3. Accuracy in using formulas 4. Procedural correctness	3. Completeness of the material 4. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Task Discussion [2 x 50'] 3. Response, Results presentation [2 x 50']		Basic concepts of data extraction to generate STM, DTM, DEM, point height, contour	10
16	**Final Semester Evaluation / Final Semester Examination**						**100**