



**SEPULUH NOPEMBER INSTITUTE OF TECHNOLOGY
FACULTY OF CIVIL, PLANNING AND EARTH 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				
Geodesy Control Network		CM235024	Geodesy and Geodynamics	T=2	P=1	5	-				
AUTHORIZATION		SLP Developer		Course Group Coordinator		Head of Study Program					
		Ira Mutiara Anjasmara, S.T., M.Phil., Ph.D.		Prof. Dr. Eko Yuli Handoko, S.T., M.T.		Putra Maulida, S.T., M.T., Ph.D					
Learning Outcomes (LO)	Expected Learning Outcomes (ELO) that Imposed in the Course										
	ELO-5	Able to design survey and mapping activities using the latest technology in the fields of Geodesy and Surveying, Hydrography, Photogrammetry and Remote Sensing also Geographic Information Systems and Cadastral.									
	ELO-6	Able to identify, formulate, analyze and solve problems in the fields of Geodesy and Surveying, Hydrography, Photogrammetry and Remote Sensing also Geographic Information Systems and Cadastral.									
	ELO-9	Able to plan, perform and evaluate the process of surveying and mapping activities using the latest technology in the fields of Geodesy and Surveying, Hydrography, Photogrammetry and Remote Sensing also Geographic Information Systems and Cadastral.									
	Course Learning Outcomes (CLO)										
	CLO-1	Able to explain geodetic concepts related to the earth's mathematical model (reference ellipsoid) and the concept of coordinate system and geodetic method of determining coordinates using various methods									
	CLO-2	Able to explain and apply the concept of horizontal and vertical control network in the field of geodesy / geomatics									
	CLO-3	Able to explain and identify the types of local, national and international geodetic control network									
	CLO-4	Able to explain and create horizontal geodetic control network design									
	CLO-5	Able to calculate the strength of the network configuration (strength of figure)									
	CLO-6	Able to perform network adjustment for free and tied network using least squared adjustment method									
	CLO-7	Able to carry out optimization and evaluation of the Geodesy Control Network									

	CLO-8	Able to apply the process of procurement and evaluation of geodetic control networks for various purposes (eg Deformation Monitoring)			
		Matrix ELO – CLO			
		CLO	ELO-5	ELO-6	ELO-9
		CLO-1	V		
		CLO-2	V		
		CLO -3		V	
		CLO -4		V	V
		CLO-5		V	V
		CLO-6			V
		CLO-7			V
		CLO-8			V
Course Description	In this course, the basic concepts of geodesy related to reference ellipsoids and coordinate systems will be studied as well as basic concepts regarding triangulation, trilateration and triangulation nets. The concept of Horizontal Geodetic Control Nets (JKGH) and Vertical Geodetic Control Framework Nets (JKGH) and their realization on a local, national, regional and international scale will also be given in this course. Next, we will be given the theory and procedures for building a horizontal and vertical geodetic control net, including how to design, calculate the strength of the shape of the net (strength of figure) and the alignment of free and bound nets.				
Course Materials	<ol style="list-style-type: none">1. The basic concepts of geodesy related to mathematical modeling of the earth in the form of reference ellipsoids and geometric ellipsoidal shapes2. Basic concepts (coordinate system, triangulation net, trilateration net, triangulation net)3. Harisontal geodesy control net system and vertical geodesy control net4. Local, National, Regional and International Geodesy Control Net (ITRF)5. Horizontal Geodesy Framework Net Design6. Calculating the strength of the net shape (strength of figure)7. Calculating free and bonded net alignment with conditional alignment (geometry)8. Calculating the alignment of free and bound nets with parameter alignment9. Geodesy Framework Net Optimization10. Geodesy Framework Nets for various special purposes (e.g. Deformation Monitoring)				
References	Main:				
	<ol style="list-style-type: none">1. Vanicek, P. and E.J. Krakiwsky.1986. Geodesy: the Concepts 2nd Ed. Amsterdam: Elsevier.2. Torge, W. 2001. Geodesy. de Gruyter, Berlin3. Ghilani, C. C and P. R. Wolf. 2015. Elementary Surveying: An Introduction to Geomatics. Pearson Prentice Hall, Inc.				

		4. Ghilani, C. C., 2017. Adjustment Computation: Spatial Data Analysis, John Wiley & Sons, Inc. 5. Wolf, P.R., and C.D. Ghilani, 1997. Adjustment Computations, John Wiley & Sons, Inc. Additional: 1. E-learning Jaring Kontrol Geodesi (share.its.ac.id) 2. Badan Informasi Geospasial, 2013, Naskah Akademik Sistem Referensi Geospasial Nasional, Datum Geodesi Nasional 2013, Bandung. 3. Rapp, R.H., 1984, Geometry Geodesy, OSU, Departement of Geodetic Science and Surveying, Ohio State University					
Lecturer		1. Prof. Dr. Ir. Bangun Muljo Sukojo, DEA, DESS 2. Dr. Eko Yuli Handoko, S.T., M.T. 3. Yanto Budisusanto, S.T., M.Eng 4. Mohammad Rohmaneo Darminto, S.T., M.Sc 5. Nurwatik, S.T., M.Sc					
Prerequisite		1. Advanced Terestris Mapping 2. Calculate Alignment					
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 and apply the concept of datum and geodetic coordinate system in the field of geodesy / geomatics	Accuracy in explaining and applying the concept of datum and geodetic coordinate system in the field of geodesy / geomatics	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Exercise [1 x 50']		Introduction <ul style="list-style-type: none"> Geodesy Datum Geodesy Coordinate System 	5
2 - 3	Able to explain the concept of geodesy control framework nets	Accuracy in explaining the concept of geodesy control framework nets	1. Completeness of the material 2. Depth of explanation and	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Responses, Exercises and Assignments/Quizzes [2 x 50']		Geodesy control net concept <ul style="list-style-type: none"> Understanding geodesy control nets 	10

			effectiveness of communication			<ul style="list-style-type: none"> • Types of geodesy control nets (horizontal, vertical, gravity) • Geodesy control net classification (0th order, 1st order, 2nd order, 3rd order) 	
4 - 5	Able to explain Standards in Geodetic Control Network Procurement; National Geodetic Control Network in Indonesia	Accuracy in explaining Standards in Geodetic Control Network Procurement; National Geodetic Control Network in Indonesia	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Responses, Exercises and Assignments/Quizzes [2 x 50']		1. Geodesy control net procurement standards <ul style="list-style-type: none"> • SNI horizontal control net • SNI vertical control net • SNI gravity control 2. National Geodesy Control Net in Indonesia	10
6 - 7	Able to explain procedures in the procurement of geodesy control nets	Accuracy in explaining procedures in the procurement of geodesy control nets	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Responses, Exercises and Assignments/Quizzes [2 x 50']		Procurement of geodesy control nets <ul style="list-style-type: none"> • Geodesy control net design (strength of figure, measurement method) • Geodesy control net measurement • Geodesy control net calculation (strength of figure, net alignment) 	15

						<ul style="list-style-type: none"> Geodesy control net analysis (quality control) 	
8	Midterm Evaluation / Midterm Exam						40
9	Able to design and calculate the strength value of geodesy control nets	Accuracy in designing and calculating the strength value of geodetic control nets	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1x 50'] 2. Discussion [1 x 50'] 3. Responses, Exercises and Assignments/Quizzes [1 x 50']		1. Geodesy control net design classification 2. Computation of strength of figure	10
10 - 11	Able to apply procedures in the procurement of geodesy control nets in the field of geodesy / geomatics	Accuracy in applying procedures in the procurement of geodesy control nets in the field of geodesy / geomatics	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Responses, Exercises and Assignments/Quizzes [2 x 50']		Geodesy control net measurement <ul style="list-style-type: none"> Classical methods (polygons, triangulation, trilateration, triangulation) Modern methods (GNSS) 	15
12 - 13	Able to perform geodesy control net alignment calculations	Accuracy in performing geodesy control net alignment calculations	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50'] 3. Responses, Exercises and Assignments/Quizzes [2 x 50']		Geodesy control net calculation and analysis <ul style="list-style-type: none"> Geodetic control net adjustment Geodetic control net Quality Measurement <ul style="list-style-type: none"> *JKG (Network Precision) Precision - (<i>Global precision, local precision</i>) *JKG (<i>Network Reliability</i>) Power – (internal, external) 	20

14	Able to perform geodesy control framework net optimization	Accuracy in performing geodesy control framework net optimization	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Responses, Exercises and Assignments/Quizzes [1 x 50']		Geodesy control net optimization <ul style="list-style-type: none"> • JKG optimization based on criteria (precision, net strength) • JKG optimization method ("Trial and Error" Method and Computer Simulation; analytical methods;) 	10
15	Able to apply concepts, procedures, and analysis of geodesy control nets in the field of geodesy / geomatics	Accuracy in applying concepts, procedures, and analysis of geodesy control nets in the field of geodesy / geomatics	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50'] 3. Responses, Exercises and Assignments/Quizzes [1 x 50']		Utilization of geodesy control nets <ul style="list-style-type: none"> • In the field of surveying and mapping • In the field of photogrammetry and remote sensing • In for deformation monitoring 	5
16	Final Semester Evaluation / Final Semester Examination						100