	SEMESTER LEARNING PLAN **DEPARTMENT OF GEOMATICS ENGINEERING** **FACULTY OF CIVIL, PLANNING, and GEO ENGINEERING**			
PROGRAM	**UNDERGRADUATE**			
COURSE NAME	**Adjustment Computation**		**CODE**	**RM184412**
SEMESTER	**IV (four)**		**CREDITS**	**3 (three)**
LECTURERS	**Ira Mutiara Anjasmara [coord]**			
	Eko Yuli Handoko, Udiana Wahyu Deviantari, Husnul Hidayat			
COURSE MATERIALS	1	Concept of measurements and errors		
	2	Correlation, varians-covarians, cofactor, and weight matrices		
	3	Error propagation and linierization		
	4	The concept of least-squares adjustment		
	5	Least square adjustment of indirect observation		
	6	Least square adjustment of oservation only		
	7	Distance, angle, and azimuth conditions and their linierizations		
	8	Application of least squares adjustment in the field of surveying		
	9	Pre-analysis of survey measurements		
	10	Error ellipse		
EXPECTED LEARNING OUTCOMES THAT IMPOSED IN THE COURSE	A	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.		
	C	Able to identify, formulate, analyze and solve problems in the fields of geodesy, surveying, hydrographic, remote sensing, photogrammetry, and cadastral.		
	D	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.		
	H	Able to work in inter-disciplinary and inter-cultural teams so they can compete at national and international levels.		
COURSE LEARNING OUTCOMES	1	Able to explain the concept of measurement and error in the field of Geomatics Engineering.		
	2	Able to explain and apply the concepts of error propagation and linearization in the field of Geomatics Engineering.		
	3	Able to explain and apply the concept of adjustment computation in a simple way and with the principle of the least squares in the field of Geomatics Engineering.		
	4	Able to explain the concept of least square adjustment of indirect observation and least square adjustment of oservation only		
	5	Able to apply least square adjustment of indirect observation in the field of Geomatics Engineering.		
	6	Able to apply least square adjustment of oservation only in the field of Geomatics Engineering.		
	7	Able to analyze the result of least square adjustment		
	8	Able to present the result of least square adjustment in the form of error ellipse		
ABILITY CATEGORIES	*Cognitive Prosecess*	*Analyse*		
	Knowledge Domain	*Procedural*		
	Psychomotor	*Conscious control*		
	Affective	*Change of attitude*		

Class	Lesson learning outcome	Criteria dan Assessment Indicator	Weight	Learning Materials	Learning Experience	Learning Methods	Estimated Time
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

1	Able to explain the concept of measurement and error.	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	5	The concept of measurements and errors The concept of probability Realibility of measurements	Lecturer	Teacher-centered learning	1 x 50'
					Discussion	Student-centered learning	1 x 50'
					Exercise	Problem-based learning	1 x 50'
2	Able to explain correlated and uncorrelated measurements and apply them in determining the variance-covariance matrix, cofactor matrix and weight matrix	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	5	Variance and covariance Correlation coeficient Variance-Covariance matrix Cofactor matrix Weight matrix	Lecturer	Teacher-centered learning	1 x 50'
					Discussion	Student-centered learning	1 x 50'
					Exercise	Problem-based learning	1 x 50'
					Tutorial assignment		
3	Able to explain the concept of error propagation and its linearization, as well as applying it in the field of Geomatics Engineering	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	10	Sistematic error propagation Random error propagation Linierizatiom	Lecturer	Teacher-centered learning	1 x 50'
					Discussion	Student-centered learning	1 x 50'
					Exercise	Problem-based learning	1 x 50'
					Tutorial assignment		
4 -5	Able to explain the concept of simple adjustment calculations and the least squares adjustment and apply them in the field of Geomatics Engineering	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	10	Redudancy and degree of freedom	Lecturer	Teacher-centered learning	2 x 50'
				Simple adjustment computatiom	Discussion	Student-centered learning	2 x 50'
				Least-squares adjustment computation	Exercise	Problem-based learning	2 x 50'
				Example of simple least-square adjustment	Tutorial assignment		
6	Able to perform the method least square adjustment of indirect observation	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	10	Condition equation	Lecturer	Teacher-centered learning	1 x 50'
				General equation of least square adjustment of indirect observation	Discussion	Student-centered learning	1 x 50'
				Example of simple least-square adjustment of indirect observation	Exercise	Problem-based learning	1 x 50'
					Tutorial assignment		
7	Able to perform the method least square adjustment of observation only	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	10	Condition equation	Lecturer	Teacher-centered learning	1 x 50'
				General equation of least square adjustment of observation only	Discussion	Student-centered learning	1 x 50'
				Example of simple least-square adjustment of observation only	Exercise	Problem-based learning	1 x 50'
					Assignment 1		
8				**Mid Semester Exam**	**Assessment**		**2 x 50'**
9 -10	Able to calculate errors in the elevation difference measurements using least square adjustment of indirect observation method and observation only method	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	15	Adjustment for observation with equal precision (weight)	Lecturer	Teacher-centered learning	2 x 50'
				Adjustment for observation with unequal precision (weight)	Discussion	Student-centered learning	2 x 50'
				Solution of adjustment of indirect observation	Exercise	Problem-based learning	2 x 50'

	observation only method.			Solution of adjustment of observation only	Tutorial assignment		
11	Able to linierize distance, angle, and azimuth observations for the least-square adjustment	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	10	The distance condition and its linierization	Lecturer	Teacher-centered learning	2 x 50'
				The angle condition and its linierization	Discussion	Student-centered learning	2 x 50'
				The azimuth condition and its linierization	Exercise	Problem-based learning	2 x 50'
					Tutorial assignment		
12 - 13	Able to calculate errors in the coordinates determination using least square adjustment of indirect observation method and observation only method.	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	15	Adjustment for observation with equal precision (weight)	Lecturer	Teacher-centered learning	1 x 50'
				Adjustment for observation with unequal precision (weight)	Discussion	Student-centered learning	1 x 50'
				Solution of adjustment of indirect observation	Exercise	Problem-based learning	1 x 50'
				Solution of adjustment of observation only	**Assignment 2**		
14	Able to perform pre-analysis of survey measurementsin the field of Geomatics engineering	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	5	Procedure of pre-analysis	Lecturer	Teacher-centered learning	1 x 50'
				Angle measurement with theodolite	Discussion	Student-centered learning	1 x 50'
				Distance measurement with EDM	Exercise	Problem-based learning	1 x 50'
				Elevation difference with direct levelling	Tutorial assignment		
				Survey tolerance			
15	Able to calculate, present, and analyze the error ellipse	Completeness of materials, the depth of explanations, correctness of the answers, communication effectiveness, proper attitude	5	Error ellipse	Lecturer	Teacher-centered learning	1 x 50'
				Calculation of error elipse orientation and size	Discussion	Student-centered learning	1 x 50'
				Presenting error ellipse	Exercise		
					Tutorial assignment	Problem-based learning	1 x 50'
16				**Final Semester Exam**	**Assessment**		**2 x 50'**
JUMLAH			100				