SEMESTER LEARNING PLAN
DEPARTMENT OF GEOMATICS ENGINEERING
FACULTY OF CIVIL, PLANNING, and GEO ENGINEERING

PROGRAM	**UNDERGRADUATE**		
COURSE NAME	**Global Navigation Satellite System Survey**	**CODE**	**RM184517**
SEMESTER	**5 (five)**	**CREDITS**	**3 (three)**
LECTURERS	**Eko Yuli Handoko (Coordinator)**		
	Akbar Kurniawan, Mokhammad Nur Cahyadi, Khomsin, Akbar Kurniawan		

COURSE MATERIALS	1	GNSS concept and positioning technology.
	2	Propagation of GNSS signals and distance measurements using GNSS signals using phase and code signals.
	3	Different types of GNSS data.
	4	Types of bias and errors in all three segments of the GNSS technology.
	5	Measurement method using GNSS technology.
	6	Procedures for preparation of the GNSS survey.
	7	GNSS data processing techniques using commercial and scientific software.
	8	Procedure for GNSS survey in the field.
	9	The concept of GNSS survey other applications.
EXPECTED LEARNING OUTCOMES THAT IMPOSED IN THE COURSE	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.
	G	Able to plan, perform and evaluate the process of surveying and mapping activities using the latest technology in the fields of geodesy, surveying, hydrographic, remote sensing, photogrammetry, and cadastral.
COURSE LEARNING OUTCOMES	1	Able to understand the basic concepts of GNSS.
	2	Able to understand the propagation of signals in the ionosphere and troposphere as well as the biases and errors of propagation.
	3	Able to understand the procedures, have knowledge and experience in measuring and calculating distance using either pseudorange or using phase.
	4	Able to explain errors and biases in 3 GNSS segments along with how to eliminate these errors.
	5	Able to perform measurements using several methods on GNSS survey.
	6	Able to perform data processing using scientific and commercial software.

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 basic concepts of GNSS	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	10%	Syllabus Explanation, Lecture Standards,	Lecture	Teacher-centered learning	2 x 50'
				GNSS definitions and concepts	Discussion	Student-centered learning	2 x 50'
				Definition and concept of earth observation technology	Practice	Problem-based learning	2 x 50'
2	Able to understand the signal propagation	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	10%	Development of signal technology	Lecture	Teacher-centered learning	1 x 50'
				Electromagnetic signals in GNSS signals	Discussion	Student-centered learning	1 x 50'
				Distance measurements using phases and codes in GNSS measurements	Practice	Problem-based learning	1 x 50'
3	Able to understand the GNSS differential data	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	10%	The development of GNSS technology in this case is differential data	Lecture	Teacher-centered learning	2 x 50'
				Differential between satellites	Discussion	Student-centered learning	2 x 50'
				Differential between epochs	Practice	Problem-based learning	2 x 50'
				Differential between receivers			
4-5	Able to minimize bias and errors in each GNSS	Material completeness, depth of explanation, effectiveness of		The oversight of the satellite clock	Lecture	Teacher-centered learning	2 x 50'

	technology segment	communication, accuracy of attitude	10%	Orbital error	Discussion	Student-centered learning	2 x 50'
				Atmospheric bias	Practice	Problem-based learning	2 x 50'
				Satellite clock error		Tugas 1: Menentukan jenis -jenis bias dan error pada pengamatan GNSS dan kontribusi errornya pada	
				Multipath error			
				Cycleslips			
				Precise ephemeris			
				Sbas and waags			
6-7	Able to understand and evaluate measurement methods using GNSS	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	10%	Static method	Lecture	Teacher-centered learning	2 x 50'
				Static rapid method	Discussion	Student-centered learning	2 x 50'
				Kinematic method	Practice	Problem-based learning	2 x 50'
				Stop and go method			
				Network measurement			
				Radial measurement			
8				Mid Semester Evaluation			
9 - 10	Able to explain the procedures for GNSS survey	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	10%	Field orientation	Lecture	Teacher-centered learning	2 x 50'
				Count the number of points and proportional to area	Discussion	Student-centered learning	2 x 50'
				Calculating costs	practice	Problem-based learning	2 x 50'
				Put down and pick a point		Tugas 2: Membuat desain dan perencanaan	
				Personnel mobility			
11-12	Able to understand and perform theß GNSS data processing techniques using scientific and commercial software	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	10%	Processing using scientific software	Lecture	Teacher-centered learning	1 x 50'
				Processing using commercial software	Discussion	Student-centered learning	1 x 50'
					Practice	Problem-based learning	1 x 50'
						Tugas 3: Pengolahan GNSS dengan menggunakan komersial dan ilmiah	
13-14	Able to perform the GNSS measurements in the field	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	15%	Measurement using the radial method	Lecture	Teacher-centered learning	2 x 50'
				Measurement using the network method	Discussion	Student-centered learning	2 x 50'
					Practice	Problem-based learning	2 x 50'
						Tugas 4: Pengukuran GNSS dengan metode baseline dan radial di kampus ITS	
15	Able to explain the concept of GNSS survey in other applicationsß	Material completeness, depth of explanation, effectiveness of communication, accuracy of attitude	15%	GNSS measurement for RTRW	Lecture	Teacher-centered learning	2 x 50'
				Measurement of GNSS on land parcels	Discussion	Student-centered learning	2 x 50'
					Practice	Problem-based learning	2 x 50'
16				End of Semester Evaluation			
			100%				