	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**
Satellite Geodesy	CM234420	Geodesy and Geodynamics	**T=2**	**P=0**	4	-

AUTHORIZATION	**RPS Developer**	**Course Group Coordinator**	**Head of Study Program**
	Prof. Mokhamad Nur Cahyadi, S.T., M.Sc., 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-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 and Surveying, Hydrography, Photogrammetry and Remote Sensing also Geographic Information Systems and Cadastral.
	ELO-8	Able to compile scientific reports and provide solutions based on leadership, creativity and communication skills as well as being responsible for the work done.
	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.
	ELO-10	Able to work in inter-disciplinary and inter-cultural teams so they can compete at national and international levels.
	Course Learning Outcomes (CLO)	
	CLO-1	Students have knowledge of the concept of a time system
	CLO-2	Students have knowledge of 2D and 3D coordinate systems
	CLO-3	Students have knowledge of reference frames, both sky-bound reference frames and earth-bound reference frames
	CLO-4	Students are able to explain signal concepts and signal propagation methods
	CLO-5	Students are able to explain the layers of the atmosphere and their role in satellite geodesy
	CLO-6	Students are able to explain how the VLBI, SLR, LLR, Altimetry, GNSS satellites work in data acquisition

Matrix ELO – CLO

CLO	ELO-7	ELO-8	ELO-9	ELO-10
CLO-1	V		V	V
CLO-2	V		V	V
CLO -3	V		V	V
CLO -4		V	V	
CLO -5	V	V		V
CLO -6	V	V		V

Course Description	This course examines the concepts of 2D and 3D cartesian and polar coordinate systems, reference frameworks, orbital system time systems, signal and signal propagation, signal propagation medium (atmospheric layer), Types of satellites and their applications such as VLBI, SLR, LLR, GRACE, GOCE, Altimetry and others.
Course Materials	1. The concept of 2D and 3D cartesian and polar coordinate systems 2. The concept of frame of reference 3. The concept of time system and orbital system 4. The concept of signal and signal propagation 5. The concept of signal propagation medium (atmospheric layer) 6. Concept Types of satellites and their applications such as VLBI, SLR, LLR, GRACE, GOCE, Altimetry and others
References	**Main:** 1. Abidin, H.Z., 2005. Geodesi Satelit 2. Abidin, H.Z., 2005. Survei Satelit **Additional:** 1. Wolf, 2010. Elementary Surveying
Lecturer	1. Mokhamad Nur Cahyadi, S.T., M.Sc., Ph.D. 2. Dr. Eko Yuli Handoko, S.T., M.T.
Prerequisite	None

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 system time	1. Accuracy and completeness of explanation of the concept of Satellite Geodesy 2. Attitude	1. Completeness of the material 2. Depth of explanation and effectiveness of communication 3. Timeliness	1. Lecture and Discussion Presentation Paper assignment on the concept of Satellite Geodesy [1 x 50'] 2. Quizzes in the Response class [1 x 50']		1. Syllabus Explanation, Lecture Procedures 2. Definition and concept of Satellite Geodesy 3. Definition and concept of time and space	5
2	Able to know various time systems	Accuracy and completeness of explanations of the concept of time	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture Tutorial [1 x 50'] 2. Practice questions and Independent assignments [1 x 50']		1. Sidereal Time Concept 2. Universal Time 3. Sidereal Time	5
3	Students are able to understand the coordinate frame of reference	1. Accuracy of answers in doing practice questions 2. The accuracy of the created program.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [1 x 50'] 2. Practice questions and Programming tasks [1 x 50']		1. CIS coordinate reference frame 2. CTS coordinate reference frame 3. Transformation between CIS to CTS	10
4 - 5	Students are able to understand the concepts of signal, signal propagation and bias	1. Accuracy explains the concepts of bias and error 2. Accuracy in minimizing	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [2 x 50'] 2. In-class quiz [1 x 50'] 3. Practice questions and Independent assignments [1 x 50']		1. The concept of wave propagation 2. The composition of the ionospheric layer a. Ionosphere layer in layers E and F	15

		errors and biases				b. Character of Daily and Yearly variations of the ionospheric layer 3. Effect of ionospheric bias on signal propagation 4. Ionospheric Correction	
6 - 7	Students are able to understand the concepts of signal, signal propagation and bias	1. Accuracy explains the concepts of bias and error 2. Accuracy in minimizing errors and biases	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [2 x 50'] 2. In-class quiz [1 x 50'] 3. Practice questions and Independent assignments [1 x 50']		1. Layers of the troposphere and their character 2. Wet and dry composition of the troposphere layer 3. Variations in the composition of the troposphere layer 4. The influence of tropospheric bias in signal propagation 5. Tropospheric correction	15
8	**Midterm Evaluation / Midterm Exam**						**50**
9 - 10	Students are able to explain the basics of celestial mechanics (body problem), Interference with satellite movement, Orbit determination, Constellation of satellite orbits	1. Precision describes the method of satellite orbit 2. The influence of satellite orbits in data acquisition	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [2 x 50'] 2. Tutorial and Practice counting questions [1 x 50'] 3. Self-help [1 x 50']		1. Plerian element component (Body Problem-Newton) 2. Non Disturb Keplerian Element 3. Satellite orbit on non-disturb Keplerian Element	10

						4. Effect of orbital errors in data acquisition	
11 - 12	Students are able to explain the basics of celestial mechanics (body problem), Interference with satellite movement, Orbit determination, Constellation of satellite orbits	Accuracy in explaining the concept of satellite orbital motion: Basics celestial mechanics (body problem), interference with satellite movement, orbit determination, and satellite constellations and orbits	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [2 x 50'] 2. Tutorials and Practice questions [1 x 50'] 3. Self-help [1 x 50']		1. Disturb Keplerian Element 2. The Effect of Disturb Elements on Satellite Orbit 3. The concept of satellite orbit transformation from Keplerian Element to ECEF 4. The concept of transforming satellite orbits from ECEF coordinates to Keplerian Element 5. Keplerian Elements in forming the type and model of satellite orbits	10
13 - 14	Students are able to explain the basics of celestial mechanics (body problem), Interference with satellite movement, Orbit determination, Constellation of satellite orbits	Accuracy in explaining the concept of satellite orbital motion: Basics of celestial mechanics (body problem), Interference with satellite movement, Determination	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [2 x 50'] 2. Tutorials and Practice questions [1 x 50'] 3. Self-help [1 x 50']		1. Analytical methods on orbit determination 2. Numerical Method on orbit determination 3. Ephemeris and polynomial approaches to describe satellite orbits 4. Sun-synchronous, Geostationary, and	10

		of orbit, and Constellations and satellite orbits				Transfer Orbits concepts	
15	Students are able to explain the concept of optical methods for determining direction on geodesy satellites	Accuracy in explaining the concept of optical methods for direction determination on geodesy satellites	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lectures and Discussions [1 x 50'] 2. Practice questions and Independent assignments [1 x 50'] 3. Field practicum		The concept of determining the altitude of the orbit, the revolution of the orbit, the width of the strip on the type of orbit	20
16	**Final Semester Evaluation / Final Semester Examination**						**100**