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

SEMESTER LEARNING PLAN (SLP)

COURSE NAME		CODE	COURSE GROUP	CREDITS		SEMESTER	COMPILATION DATE
Analytical Geometry		CM234309		**T=2**	**P=1**	3	-
AUTHORIZATION		**SLP DEVELOPER**	**COURSE GROUP COORDINATOR**	**HEAD OF UNDERGRADUATE PROGRAM**			
		Husnul Hidayat, S.T., M.T.	Putra Maulida, ST, MT, Ph.D	Putra Maulida, ST, MT, Ph.D			

Learning Outcome (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.
	Course Learning Outcomes (CLO)	
	CLO-1	Able to describe features and differences of various coordinate systems and relation between these various systems
	CLO-2	Able to solve problems related to straight line, normal and tangent line, in 2D plane and 3D space
	CLO-3	Able to understand and solve problems related to circle equation
	CLO-4	Able to understand and calculate various equations of conic sections
	CLO-5	Able to understand the geometry of 3D object surface
	Matrix ELO – CLO	

CLO	ELO-4
CLO-1	V
CLO-2	V
CLO-3	V
CLO-4	V
CLO-5	V

Course Description	This course discusses about geometric problems with algebraic approach. The combination between geometry and algebra relates mathematical equations with geometrical positions to solve geometric problems clearly and systematically. Conversely, by geometric approach the understanding to algebraic equations will be better. By details, the topics in this course are coordinate system in 2D and 3D, straight line equation in 2D and 3D, sphere and ellipsoid geometry, conic sections and their equations, and spherical trigonometry. In relation to surveying and mapping, measurement data which rely on certain geometric principles are used to determine position of points in particular coordinate system which need systematic computation. Conversely the coordinate data of points are also used to solve certain geometric problems in surveying and mapping. The understanding of analytical geometry will help students in other courses related to surveying and mapping especially in applied geometry science.
Course Materials	1. Trigonometry Review 2. Coordinate Systems 3. Straight Lines in 2D and 3D 4. Circles and Circle Equations 5. Conic Sections and Second-Degree Equations 6. Spherical Geometry 7. Ellipsoidal Geometry 8. Tangent and Normal Lines 9. Surfaces, Curves, and Their Equations
References	**Main References :** 1. Barry, P. D. 2016. Geometry with Trigonometry. Cambridge: Elsevier 2. Simmons, G. F. 1996. Calculus with Analytic Geometry. New York: McGraw Hill 3. Smith, P. F., dan Gale, A. S. 1905. Introduction to Analytic Geometry. New Haven: Ginn & Company 4. Deakin, R. E., dan Hunter, M. N. 2013. Geometric Geodesy Part A. Melbourne: RMIT University

	5. Deakin, R. E., dan Hunter, M. N. 2010. Geometric Geodesy Part B. Melbourne: RMIT University
	6. Rapp R. H. 1991. Geometric Geodesy Part I. Columbus: The Ohio State University
	Additional References :
Lecturer	Ira Mutiara Anjasmara, ST, M.Phil, Ph.D, Husnul Hidayat, ST, MT
Prerequisite	-

Class/ Week	Lesson Learning Outcome (Sub-CLO)	Evaluation		Forms of Learning, Learning methods, Student Assignments/Task, [Estimated time]		Learning Materials [References]	Weight (%)
		Indicator	Criteria	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1-2	Understand and explain basic trigonometric concepts relevant to analytic geometry		Class observation Test: Quiz	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Trigonometry Review	10
3-4	Explain and differentiate various 2D and 3D coordinate systems and convert between them		Class observation Test: Quiz	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Coordinate Systems	10
5-6	Derive equations of straight lines and planes in 3D space,		Class observation	Interactive lecture, discussion, reading		Straigt Lines in 2D and 3D	10

	and solve intersection problems		Non-Test: Practical	references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]			
7	Understand and solve circle equations, and determine a point's position relative to the circle		Class observation Non-Test: Practical	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Circles and Circle Equations	10
8	**Midterm Evaluation / Midterm Exam**						
9	Understand and compute equations and properties of various conic sections (ellipse, parabola, hyperbola)		Class observation Non-Test: Practical	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Conic Sections and Second-Degree Equations	10
10-11	Understand the concepts and equations of spherical geometry and their application in surveying and mapping		Class observation Non-Test: Practical	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Spherical Geometry	10

12-13	Understand the concept of ellipsoidal geometry and its equations		Class observation Non-Test: Practical	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Ellipsoidal Geometry	10
14	Calculate and apply tangent and normal line concepts to 2D and 3D objects		Class observation Non-Test: Practical	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Tangent and Normal Lines	10
15	Understand surfaces, curves, and determine their equations in 3D space		Class observation Non-Test: Practical	Interactive lecture, discussion, reading references [TM: 1x(2x50'); BM: 1x(2x60'); PT: 1x(2x60')]		Surfaces, and Their Equations	20
16	**Final Semester Evaluation / Final Semester Examination**						