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
Computer Programming	CM234208	Geoinformatics	T=2	P=1	2	-

AUTHORIZATION	SLP DEVELOPER	COURSE GROUP COORDINATOR	HEAD OF UNDERGRADUATE PROGRAM
	Agung Budi Cahyono, ST, M.Sc, DEA	Husnul Hidayat, S.T., M.T.	Putra Maulida, ST, MT, Ph.D

Learning Outcome (LO)	**Expected Learning Outcomes (ELO) that Imposed in the Course**	
	ELO-2	Able to study and utilize science and technology in order to apply it to the areas of expertise in Geodesy and Surveying, Hydrography, Photogrammetry, and Remote Sensing, as well as Geospatial and Land Information, and able to make appropriate decisions from the results of their own work or group work in the form of a final project report or other forms of learning activities whose outcomes are equivalent to the final project through logical, critical, systematic and innovative thinking.
	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, surveying, hydrography, remote sensing, photogrammetry, 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.
	Course Learning Outcomes (CLO)	
	CLO-1	Student can do vector and matrix operations and implement in certain programing language

<table>
<tr><td></td><td>CLO-2</td><td>Student can apply matrix and vector in spatial problems with implementation in certain programming language</td></tr>
<tr><td></td><td>CLO-3</td><td>Student can create program to solve geomatics problems using dynamic program controls</td></tr>
<tr><td></td><td>CLO-4</td><td>Student can make program which utilizes spatial data from various sources and external files</td></tr>
<tr><td></td><td>CLO-5</td><td>Student can make program in geomatics orimarily in statistics, terrestrial mapping, and coordinate transformation</td></tr>
<tr><td></td><td>CLO-6</td><td>Student can write report and present the result of data processing and analysis in a graphical user interface</td></tr>
<tr><td></td><td></td><td>Matrix ELO – CLO
<table>
<tr><td>CLO</td><td>ELO-2</td><td>ELO-7</td><td>ELO-8</td></tr>
<tr><td>CLO-1</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO-2</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO-3</td><td></td><td>V</td><td></td></tr>
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<tr><td>CLO-6</td><td></td><td>V</td><td>V</td></tr>
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<tr><td>Course Description</td><td colspan="2">This course teaches students the basics of computer programming using Matlab or R language, which is widely used for mathematical computation and analysis, and spatial data analysis and representation. This course covers the basic mathematical concept e.g. linear algebra, vector, matrix, and mathematical functions, and also the utilization of programming language to automatize those various computations. Then, the students learn the algorithm design for solving various problem in geodesy and geomatics which involves various mathematical operations and tasks such as logical decision, looping and iteration, and operation termination. In the end of the course, the students learn how to build simple computer application to solve problems related to surveying, geodesy, and geomatics.</td></tr>
<tr><td>Course Materials</td><td colspan="2">1 Introduction to Programming
2 Basic syntax
3 Calculation operations
4 Control statements
5 Dynamic input and output
6 Control and Operator Introduction
7 Data analysis, functions, and graph visualisation
8 File interaction
9 Data analysis, exploration
10 Numerical and statistical analysis</td></tr>
</table>

	11 Data visualisation
References	**Main References :**
	Additional References :
Lecturer	Husnul Hidayat, ST, MT Dr-Ing.Noorlaila Hayati, ST, MT Hepi Hapsari Handayani, ST, M.Sc, PhD Putra Maulida, ST, MT, Ph.D
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	Students are able to explain the concept of Linear and Matrix Equation Systems		Accuracy applies and calculates using Systems of Linear Equations and Matrices.	Lecture Discussion Literature review 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Elementary Line Operations • Vectors and Vector Operations • Length and Point Multiplication • Matrices and Linear Equations • Elementary Matrix	5

2	Students are able to calculate determinants, cofactors, and inverses based on the concept of determinants and Cramer's rule on matrices using Matlab		Students are able to calculate determinants, cofactors, and inverses based on the concept of determinants and Cramer's rule on matrices using Matlab	Lecture Discussion Literature review 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Determinants • Cofactor • Inverse Matrix • Cramer's rule	5
3	Students are able to solve problems in Linear Equation Systems using matrices, vectors and Gaussian elimination in Matlab programming		Accuracy and correctness of results in solving problems in Linear Equation Systems using matrices, vectors and Gaussian elimination in Matlab programming	Lectures and discussions Demo Practice 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Vector space • Norm • Linear, Base and dimension free • Gaussian Elimination • Line Reduction • Gaussian elimination for SPL	5
4	Students are able to do programming for graphing systems of linear equations in Matlab		Accuracy of graphing systems of 2-dimensional and 3-dimensional linear equations using the Matlab programming language	Lectures and discussions Demo Practice 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Graphs of linear equations • The idea of elimination • Elimination with Matrix • Matrix operation rules • Elimination by Factorization A=LU	10

						• Transpose and Permutation	
5	Students are able to create dynamic input and output programs to solve systems of linear equations in the geomatics field using Matlab		Accuracy in creating dynamic input and output programs to solve linear equation systems in the geomatics field using Matlab	Lectures and discussions Problem-based Simulation Practice 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Gaussian Elimination • Cramer's rule • Determinant properties • SPL and Inverse Matrix, • SPL and Cramer rule	10
6	Students are able to solve problems in Systems of Linear Equations using matrices, vectors and Gaussian elimination in programming Matlab		Accuracy and correctness of results in problem solving in Systems of Linear Equations using matrices, vectors and Gaussian elimination in Matlab programming	Lectures and discussions Problem-based Simulation Practice 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Eigenvalue and eigenvector • Matrix diagonalization • Matrix Symmetry • Positive Definitive Matrix • Stability and preconditioning	5
7	Students are able to create programs using simple control controls to solve simple mathematical calculations using Matlab		Precision programming uses control controls to solve simple mathematical calculations using Matlab	Lectures and discussions Problem-based Simulation Practice 1x(3x50')	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Gauss Elimination of LU Decomposition • Gauss-Jordan elimination • Cholesky Decomposition Singular, Non-	10

						Singular, Almost Singular • Taylor series	
8	**Midterm Evaluation / Midterm Exam**						**50**
9	Students are able to create programs for function analysis and interpolation using Matlab		Accuracy in creating programs for function analysis and interpolation using Matlab	Lectures and discussions Case-study Demo Practice	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Line Graph • Line and Net Type Determination • Plot Graphs for Matrix-Shaped Data • Creating Custom and 3D Plots • Interpolation and curve-fitting • Histogram • Matlab program for first-order polynomials • in coordinate transformations	5
10	Students are able to create programs using complex control controls to solve calculations from various data sources using Matlab		Accuracy in making programs using complex control controls to solve calculations based on statistics in the field of geomatics using Matlab	Lectures and discussions Case-study Demo Practice	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Input and Output Formats • Variables and strings • Basic dynamic programs such as trigonometry	5

						• Dynamic programs for simple problems for basic distributed mapping e.g. coordinate calculations with azimuth and distance	
11	Students are able to create programs for function analysis and interpolation using Matlab		Accuracy in creating programs for function analysis and interpolation using Matlab	Lectures and discussions Case-study Demo Practice	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• if, else, and elseif Conditional Statements • if-else Conditional Statement • Elseif Conditional Statements • Nested if conditional statements • Switch and while statements • Looping for, continue and break • Control control programs for calculations in geomatics e.g.	5

						use control controls for correlation calculations	
12	Students are able to create programs using file interaction		Accuracy of creating programs in Matlab using file interaction	Lectures and discussions Case-study Demo Practice	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Interaction with formatted files • Open and close files • Open syntax and close syntax • Read the contents of the file	5
13	Students are able to complete calculations and analyze responsibly problems in the Geoshutdown field based on dynamic input-output and control control.		Ability to complete calculations and responsibly analyze problems in the Geoshutdown field based on dynamic input-output and control control.	Lectures and discussions Case-study Problem-based Simulation Practicum	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Descriptive and inferential statistics for • Spatial Data Analysis • Distributed mapping for horizontal and vertical control nets of both closed and open polygons • The matlab program uses dynamic input-output and	15

						complex control controls for statistical tests or	
14-15	Students are able to explore spatial data responsibly in the Graphical User Interface (GUI)		Accuracy in exploring spatial data responsibly with the Graphical User Interface (GUI)	Lectures and discussions Case-study Problem-based Simulation Practicum	Blended learning through MyITS-learning: https://classroom.its.ac.id/course/view.php?id=8330	• Designing a GUI: graphs and tables • Objects and hierarchies in the GUI • Create an application figure/window • Create a Uicontrol object, Uipanel • Interaction between objects	15
16	**Final Semester Evaluation / Final Semester Examination**						**100**