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

SEMESTER LEARNING PLAN (SLP)

COURSE NAME	CODE	COURSE GROUP	CREDITS (SKS)		SEMESTER	Date of Preparation
Marine Optics	CM234981	Geomarine	T=1	P=1	Elective Course	-

AUTHORIZATION	SLP Developer	Course Group Coordinator	Head of Study Program
	Prof. Lalu Muhamad Jaelani, S.T., M.Sc., Ph.D.	Dr. Muhammad Aldila Syariz, S.T., M.S., Ph.D.	Putra Maulida, S.T., M.T., Ph.D.

Learning Outcomes (LO)

Expected Learning Outcomes (ELO) that Imposed in the Course	
ELO-6	Able to identify, formulate, analyze and solve problems in the fields of Geodesy and Surveying, Hydrography, Photogrammetry and Remote Sensing, as well as Geospatial and Land Information.
ELO-7	Able to perform spatial data acquisition using modern measurement methods, geospatial data processing, using industry standard software, and making standard designs and analyses in the fields of Geodesy and Surveying, Hydrography, Photogrammetry and Remote Sensing, as well as Geospatial and Land Information.
ELO-12	Able to apply the concepts of management, entrepreneurship, the latest technology-based innovation, sustainable, and environmentally wise.
Course Learning Outcomes (CLO)	
CLO-1	Students understand the characteristics and constituents of water, as well as their classification
CLO-2	Students understand the optical, physical, chemical and biological properties of water
CLO-3	Students understand the optical, physical, chemical and biological properties of water
CLO-4	Students are able to obtain in-situ data and validate calculation results

Matrix ELO – CLO

CPMK	ELO-6	ELO-7	ELO-12
CLO-1	V	V	

		CLO-2	V	V	
		CLO-3		V	V
		CLO-4		V	V
Course Description	This course is a continuation of Applied Remote Sensing and be devoted to obtain and analyze the remote sensing data, as well as the utilization in water studies. For this reason, besides being related to satellite image processing, the concepts related to water characteristics, optical and physical properties of water also need to be studied.				
Course Materials	1. Introduction to Marin Optics 2. Water Constituents 3. Optical Properties of Water 4. Physical, Chemical and Biological Properties of Water 5. Water classification 6. Remote Sensing For Water 7. Atmospheric Correction Algorithm 8. Bio-optical algorithm 9. Measurement in situ 10. In situ Database 11. Image processing 12. Validation				
References	**Main:**				
	1. Martin, Seelye. An introduction to ocean remote sensing. Cambridge University Press, 2014. 2. Gordon, Howard R., and André Y. Morel. Remote assessment of ocean color for interpretation of satellite visible imagery: A review. Vol. 4. Springer Science & Business Media, 2012 3. Richardson, Laurie L., and Ellsworth F. LeDrew, eds. Remote sensing of aquatic coastal ecosystem processes. Dordrecht: Springer, 2006. 4. Arst, Helgi, and Kh ÎU Arst. Optical properties and remote sensing of multicomponental water bodies. Springer Science & Business Media, 2003				
	Additional :				
	1. Mueller, J., et al. "Ocean Optics Protocols For Satellite Ocean Color Sensor Validation, Revision 3, volumes 1 and 2." NASA tech. memo 210004 (2002). 2. Kondratyev, K. Ya, and Nikolai Filatov, eds. Limnology and remote sensing: a contemporary approach. Springer Science & Business Media, 1999. 3. Grew, Gary W., and Leonard S. Mayo. "Ocean color algorithm for remote sensing of chlorophyll." (1983).				
Lecturer	Prof. Lalu Muhamad Jaelani, S.T., M.Sc., Ph.D.				
Prerequisite	Applied Remote Sensing				

Class/ Week	Lesson Learning Outcome (Sub-CLO)	Evaluation		Forms of Learning, Learning methods,Student Assignments/Task, [Estimated Time]		Learning Materials [References]	Weight (%)
		Indicators	Criteria and Form	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Able to understand the scope of to Marine Optics course and its application	Accuracy in understanding the scope of to Marine Optics course and its application	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion [1 x 45']		Introduction to Marin Optics	5
2	Able to understand the water constituents	Accuracy in understanding the water constituents	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, exercise [1 x 45']		Water components	5
3	Able to understand the optical Properties of Water and its effect to the image capture by the satellite	Accuracy in understanding the optical Properties of Water and its effect to the image capture by the satellite	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		Optical Properties of Water	5
4	Able to understand the Physical, Chemical and Biological Properties of Water	Accuracy in understanding the Physical, Chemical and	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		Physical, Chemical and Biological Properties of Water	5

		Biological Properties of Water					
5	Able to differentiate the Water classification its unique characteristics	Accuracy in differentiating the Water classification its unique characteristics	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		Classification of water based on the characteristics of water constituents	10
6	Able o understand the application of Remote Sensing For Watershed research and how to to obtain the data	Accuracy in understanding the application of Remote Sensing For Watershed research and how to to obtain the data	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, practice, Assigntment [1 x 45']		Sensor for satellite imagery for aquatic remote sensing, specifications and ways of data acquisition	10
7	Able to understand the concept and mathematical basis of Atmospheric Correction Algorithm	Accuracy in understanding the concept and mathematical basis of Atmospheric Correction Algorithm	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Exercise, practice [1 x 45']		Algorithms and Atmospheric Correction Methods	10
8	**Midterm Evaluation / Midterm Exam**						**50**
9	Able to perform the Atmospheric Correction	Accuracy in performing the	1. Completeness of the material	1. Lecture [1 x 45'] 2. Discussion, practice, Assigntment [1 x 45']		Atmospheric correction tool	5

	Algorithm for image correction using tools and softwares	Atmospheric Correction Algorithm for image correction using tools and softwares	2. Depth of explanation and effectiveness of communication				
10 – 11	Able to understand the Biooptical algorithm and perform it for the data correction	Accuracy in understanding the Biooptical algorithm and performing it for the data correction	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion [1 x 45'] 3. Practice [1 x 45'] 4. Assigntment [1 x 45']		The choice of algorithm and its use	10
12	Able to understand the concept and prosedures for in situ measurement	Accuracy in understanding the concept and prosedures for in situ measurement	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		International protocol for measuring in situ data	5
13	Able to understand and design the In situ Database	Accuracy in understanding and design the In situ Database	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		In situ database	10
14	Able to perform the Image processing and its interpretation	Accuracy in performing the Image processing and its interpretation	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		Remote sensing image processing for waters	10

15	Able to understand the data Validation and its procedures	Accuracy in understanding the data Validation and its procedures	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 45'] 2. Discussion, Assigntment [1 x 45']		Method of validation of image processing results	10
16	**Final Semester Evaluation / Final Semester Examination**						**100**