	Universitas Negeri Surabaya Faculty of Social Sciences and Law Geography Education Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
ADVANCED REMOTE SENSING	8720200207	Study Program Elective Courses	T=2	P=0	ECTS=3.18	4	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model: Project Based Learning

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

PLO-5	Able to make appropriate decisions to solve educational problems and transformative geography learning by utilizing various learning resources based on science and technology and the arts
PLO-7	Able to make appropriate decisions to resolve regional problems in a spatial context based on an integrated geographic approach

Program Objectives (PO)

PLO-PO Matrix

P.O	PLO-5	PLO-7

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description: Discusses the science and technology of remote sensing for the study of natural resources and development.

References

Main :

1. Li Y, Shao J, Yang H, Bai X. 2009. The Relations between Land Use and Karst Rocky Desertification in Typical Karst Area China , Environ. Geol., Vol 57, hal 621-627, DOI 10.1007/s00254-008-1331-z Madhok, V, Landgrebe, DA,. 2002. A processing model for remote sensing data analysis, IEEE Life Fellow . Skidmore A. 2002. Environmental Modelling with GIS and Remote Sensing, Taylor & Francis, London. Rees, WG,. 2001. Physical Principles of Remote Sensing, Second Edition, Cambridge University Press, Cambridge. van Kemenade, CHM, La Poutre, H, Mokken, RJ,. 1999. Unsupervised class detection by adaptive sampling and density estimation, dalam : Stein, A., van der Meer, Ben Gorte, (editor),. 1999. Spatial statistics for remote sensing, Hal 165-183, Kluwer Academic, New York.

Supporters:

Supporting lecturer

Prof. Dr. Ketut Prasetyo, M.S.
Dr. Eko Budiyanto, S.Pd., M.Si.
Dr. Aida Kurniawati, S.Pd., M.Si.
Putu Wirabumi, S.Si., M.Sc.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Students are able to apply remote sensing concepts to analyze land resource potential in various landscapes based on land cover analysis through multi-level remote sensing data.	• Explain the concept of radiometric and geometric correction • Explain the components of atmospheric image correction • Perform TOA correction and image to image correction procedures on Landsat 7 ETM / Landsat 8 OLI images	**Criteria:** • The concept of the interaction of the atmosphere (Radiance, Irradiance, Energy, Photon) • TOA correction and Image to Image Correction procedures • Landsat 7 ETM, Landsat 8 OLI images **Form of Assessment** : Participatory Activities	OFFLINE 2 X 50 2 X 50	2 X 50	**Material:** 1. Adams JB, Gillespie AR, 2006, Remote Sensing of Landscape with Spectral Images – A Physical Modeling Approach, Cambridge University Press, New York. 2. Alexakis DD, Hadjimitsis, DG, Agapiou, A., 2013. Integrated use of remote sensing, GIS, and precipitation data for the assessment of soil erosion rate in the catchment area of "Yalias" in Cyprus. Atmospheric Research. DOI. 10.1016/j.atmosres.2013.02.013. 3. Borengasserm, M., Hungate, W., Watkins, R., 2008. Hyperspectral Remote Sensing – Principles and Applications. CRC Press. New York. **References:**	5%

2	Students are able to apply remote sensing concepts to analyze land resource potential in various landscapes based on land cover analysis through multi-level remote sensing data.	• Explain the concept of image sharpening and spatial filtering • Perform contrast stretching procedures using the histogram equalization method, Gramm-Schmidt method, Principal Component, and Convolution on Landsat 7 ETM, ASTER, or MODIS images	**Criteria:** • Explain the concept of image sharpening and spatial filtering • Perform contrast stretching procedures using the histogram equalization method, Gramm-Schmidt method, Principal Component, and Convolution on Landsat 7 ETM, ASTER, or MODIS images **Form of Assessment** : Participatory Activities	OFFLINE 2 X 50 2 X 50		**Material:** 20. Yang Q., Xie, Y., Li, W., Jiang, Z., Li., H., Qin, X., 2013. Assessing soil erosion risk in karst areas using fuzzy modeling and method of the analytical hierarchy process. Environ. Earth Sci. DOI 10.1007/s12665-013-2432-8. 21. Zhang M., Wang K., Zhang C., Chen H., Liu H., Yue Y., Luffman I., Qi X., 2011, Using the Radial Basis Function Network Model to Assess Rocky Desertification in Northwest Guangxi China, Environ. Earth Sci. 62:69-76, DOI 101007/s12665-010-0498-2. 22. Zhao, S., Cheng, W., Zhou, C., Chen, X., Zhang, S., Zhou, Z., Liu, H., Chai, H., 2011. Accuracy assessment of the ASTER GDEM and SRTM DEM: an example in the Loess Plateau and North China Plain of China. International Journal of Remote Sensing. p 1-13. ISSN 1366-5901. **References:**	5%
3	Students are able to apply remote sensing concepts to analyze land resource potential in various landscapes based on land cover analysis through multi-level remote sensing data.	• Explain the concept of image sharpening and spatial filtering • Perform contrast stretching procedures using the histogram equalization method, Gramm-Schmidt method, Principal Component, and Convolution on Landsat 7 ETM, ASTER, or MODIS images	**Criteria:** • Explain the concept of image sharpening and spatial filtering • Perform contrast stretching procedures using the histogram equalization method, Gramm-Schmidt method, Principal Component, and Convolution on Landsat 7 ETM, ASTER, or MODIS images **Form of Assessment** : Participatory Activities	 2 X 50	OFFLINE	**Material:** 20. Yang Q., Xie, Y., Li, W., Jiang, Z., Li., H., Qin, X., 2013. Assessing soil erosion risk in karst areas using fuzzy modeling and method of the analytical hierarchy process. Environ. Earth Sci. DOI 10.1007/s12665-013-2432-8. 21. Zhang M., Wang K., Zhang C., Chen H., Liu H., Yue Y., Luffman I., Qi X., 2011, Using the Radial Basis Function Network Model to Assess Rocky Desertification in Northwest Guangxi China, Environ. Earth Sci. 62:69-76, DOI 101007/s12665-010-0498-2. 22. Zhao, S., Cheng, W., Zhou, C., Chen, X., Zhang, S., Zhou, Z., Liu, H., Chai, H., 2011. Accuracy assessment of the ASTER GDEM and SRTM DEM: an example in the Loess Plateau and North China Plain of China. International Journal of Remote Sensing. p 1-13. ISSN 1366-5901. **References:**	5%
4	Students are able to apply the results of land form interpretation from multi-resolution remote sensing image data as a basis for regional development.	• Explain the concept of image sharpening and spatial filtering • Perform contrast stretching procedures using the histogram equalization method, Gramm-Schmidt method, Principal Component, and Convolution on Landsat 7 ETM, ASTER, or MODIS images	**Criteria:** • Explain the concept of image sharpening and spatial filtering • Perform contrast stretching procedures using the histogram equalization method, Gramm-Schmidt method, Principal Component, and Convolution on Landsat 7 ETM, ASTER, or MODIS images **Form of Assessment** : Participatory Activities	OFFLINE 2 X 50 2 X 50		**Material:** 17. The Yale Center for Earth Observation. 2010. Obtaining and Processing MODIS Data. http://www.yale.edu/ceo/Documentation/MODIS.pdf 18. The Yale Center for Earth Observation. 2012. ASTER Image. http://www.yale.edu/ceo/Documentation/ASTER.pdf 19. Wiegand, C., Rutzinger, M., Heinrich, K., Geitner, C., 2013. Automated extraction of shallow erosion areas based on multi -temporal ortho-imagery. Remote Sensing. 5: 2292-2307. DOI: 10.3390/rs5052292. **References:**	5%
5	Students are able to interpret and calculate the accuracy of interpreting medium resolution images	• Explain the concept of spectral pattern recognition. • Carrying out digital classification and interpretation processes • Calculating interpretation accuracy using the matrix method and Kappa Accuracy Method	**Criteria:** • Visual, Spectral and Hybrid interpretation concepts • Landsat 7 ETM imagery **Form of Assessment** : Participatory Activities	OFFLINE 2 X 50 2 X 50	2 X 50 2 X 50	**Material:** 15. Suharyadi, 2012. Hybrid interpretation of medium spatial resolution satellite images for the study of building densification in the urban area of Yogyakarta. Desertation. Faculty of Geography. Gadjah Mada University. Yogyakarta. 16. Tam, VT, Batelaan, O., 2011. A multi-analysis remote-sensing approach for mapping groundwater resources in the karstic Meo Vac Valley, Vietnam. Hydrogeology Journal. 19: 275-287. DOI. 10.1007/s10040-010-0684-z 17. The Yale Center for Earth Observation. 2010. Obtaining and Processing MODIS Data. http://www.yale.edu/ceo/Documentation/MODIS.pdf **References:**	5%
6	Students are able to apply the results of land use interpretation from multi-resolution remote sensing image data as a basis for regional development	• Explain the concept of Object Based Classification • Carry out object-based interpretation and classification of high resolution images	**Form of Assessment** : Project Results Assessment / Product Assessment	OFFLINE 2 X 50		**Material:** 15. Suharyadi, 2012. Hybrid interpretation of medium spatial resolution satellite images for the study of building densification in the urban area of Yogyakarta. Desertation. Faculty of Geography. Gadjah Mada University. Yogyakarta. 16. Tam, VT, Batelaan, O., 2011. A multi-analysis remote-sensing approach for mapping groundwater resources in the karstic Meo Vac Valley, Vietnam. Hydrogeology Journal. 19: 275-287. DOI. 10.1007/s10040-010-0684-z 17. The Yale Center for Earth Observation. 2010. Obtaining and Processing MODIS Data. http://www.yale.edu/ceo/Documentation/MODIS.pdf **References:**	5%

7	Students are able to apply the results of land use interpretation from multi-resolution remote sensing image data as a basis for regional development	• Explain the concept of Object Based Classification • Carry out object-based interpretation and classification of high resolution images	**Criteria:** • Object Based Classification Concepts • Quickbird Images • GoogleEarth Images **Form of Assessment** : Project Results Assessment / Product Assessment	2 X 50		**Material:** 16. Tam, VT, Batelaan, O., 2011. A multi-analysis remote-sensing approach for mapping groundwater resources in the karstic Meo Vac Valley, Vietnam. Hydrogeology Journal. 19: 275-287. DOI. 10.1007/s10040-010-0684-z 17. The Yale Center for Earth Observation. 2010. Obtaining and Processing MODIS Data. http://www.yale.edu/ceo/Documentation/MODIS.pdf 18. The Yale Center for Earth Observation. 2012. ASTER Image. http://www.yale.edu/ceo/Documentation/ASTER.pdf **References:**	5%
8	UTS PJ Continue		**Form of Assessment** : Test	2 X 50			10%
9	Students are able to apply the image spectral transformation process	• Explain the concept of image spectral transformation • Explain the procedures for adding channels, RBFN, Principal Component Analysis (PCA) and the Kauth-Thomas transformation method	**Criteria:** • Concept of spectral transformation • Landsat 8 OLI imagery **Form of Assessment** : Practice / Performance		ONLINE 2 X 50	**Material:** 16. Tam, VT, Batelaan, O., 2011. A multi-analysis remote-sensing approach for mapping groundwater resources in the karstic Meo Vac Valley, Vietnam. Hydrogeology Journal. 19: 275-287. DOI. 10.1007/s10040-010-0684-z 17. The Yale Center for Earth Observation. 2010. Obtaining and Processing MODIS Data. http://www.yale.edu/ceo/Documentation/MODIS.pdf 18. The Yale Center for Earth Observation. 2012. ASTER Image. http://www.yale.edu/ceo/Documentation/ASTER.pdf **References:**	5%
10	Students are able to apply the image spectral transformation process	• Explain the concept of image spectral transformation • Explain the procedures for adding channels, RBFN, Principal Component Analysis (PCA) and the Kauth-Thomas transformation method	**Criteria:** • Explain the concept of image spectral transformation • Explain the procedures for adding channels, RBFN, Principal Component Analysis (PCA) and the Kauth-Thomas transformation method **Form of Assessment** : Practice / Performance	OFFLINE		**Material:** 9. Newman, ME, McLaren, KP, Wilson, BS, 2011. Use of Object-oriented classification and fragmentation analysis (1985-2008) to identify important areas for conservation in Cockpit County Jamaica. Environ Monit Assess 172:391-406. 10. Papandaki, ES, Mertikas, SP, Sarris, A., 2011. Identification of lineaments with possible structural origins using aster images and DEM derived products in western Crete, Greece. EARSel eProceedings 10, 1/2011. 11. Rahman, MR, Shi, ZH, Chongfa, C., 2009. Soil erosion hazard evaluation- an integrated use of remote sensing, GIS, and statistical approaches with biophysiological parameters towards management strategies. Ecological Modelling. DOI. 10.1016/j.ecomodel.2009.04.004 **References:**	5%
11	Students are able to apply the image spectral transformation process	• Explain the concept of image spectral transformation • Explain the procedures for adding channels, RBFN, Principal Component Analysis (PCA) and the Kauth-Thomas transformation method	**Criteria:** • Concept of spectral transformation • Landsat 8 OLI imagery **Form of Assessment** : Project Results Assessment / Product Assessment	OFFLINE 2 X 50	-	**Material:** 6. Elachi, C., Zyl JV, 2006, Introduction to the Physics and Techniques of Remote Sensing, Second Edition, John Wiley & Sons, New Jersey. **References:**	5%
12		Explains the concept of Sub-Pixel Analysis transformation, Spectral Mixture Analysis, and Artificial Neural Network Analysis	**Criteria:** • the concept of Sub-Pixel Analysis, Spectral Mixture Analysis, and, Artificial Neural Network Analysis • Landsat 8 OLI Imagery **Form of Assessment** : Assessment of Project Results / Product Assessment, Practices / Performance	OFFLINE 2 X 50		**Material:** 11. Rahman, MR, Shi, ZH, Chongfa, C., 2009. Soil erosion hazard evaluation- an integrated use of remote sensing, GIS, and statistical approaches with biophysiological parameters towards management strategies. Ecological Modelling. DOI. 10.1016/j.ecomodel.2009.04.004 12. Reuter, H.I., Nelson, A., Strobl., P., Mehl, W., Jarvis, A., 2009, A first assessment of ASTER GDEM tiles for absolute accuracy, relative accuracy and terrain parameters. IEEE. DOI: 978-1-4244-3395-7 **References:**	5%
13	Students are able to apply Sub-Pixel Analysis, Spectral Mixture Analysis, and Artificial Neural Network Analysis methods	Explains the concept of Sub-Pixel Analysis transformation, Spectral Mixture Analysis, and Artificial Neural Network Analysis	**Criteria:** • the concept of Sub-Pixel Analysis, Spectral Mixture Analysis, and, Artificial Neural Network Analysis • Landsat 8 OLI Imagery **Form of Assessment** : Project Results Assessment / Product Assessment	OFFLINE 2 X 50		**Material:** 11. Rahman, MR, Shi, ZH, Chongfa, C., 2009. Soil erosion hazard evaluation- an integrated use of remote sensing, GIS, and statistical approaches with biophysiological parameters towards management strategies. Ecological Modelling. DOI. 10.1016/j.ecomodel.2009.04.004 12. Reuter, H.I., Nelson, A., Strobl., P., Mehl, W., Jarvis, A., 2009, A first assessment of ASTER GDEM tiles for absolute accuracy, relative accuracy and terrain parameters. IEEE. DOI: 978-1-4244-3395-7 **References:**	10%
14	Students are able to correct data values and topography, Topographic Modeling, and contouring	• Explain the concepts of DEM, DTM, and DSM • Carry out morphological modeling	**Criteria:** - SRTM Interferrometry Radar Imagery - GDEM ASTER Imagery **Forms of Assessment** : Project Results Assessment / Product Assessment, Practical Assessment	OFFLINE 2 X 50		**Material:** 11. Rahman, MR, Shi, ZH, Chongfa, C., 2009. Soil erosion hazard evaluation- an integrated use of remote sensing, GIS, and statistical approaches with biophysiological parameters towards management strategies. Ecological Modelling. DOI. 10.1016/j.ecomodel.2009.04.004 12. Reuter, H.I., Nelson, A., Strobl., P., Mehl, W., Jarvis, A., 2009, A first assessment of ASTER GDEM tiles for absolute accuracy, relative accuracy and terrain parameters. IEEE. DOI: 978-1-4244-3395-7 **References:**	5%

15	Students are able to correct data values and topography, Topographic Modeling, and contouring	• Explain the concepts of DEM, DTM, and DSM • Carry out morphological modeling	**Criteria:** - SRTM Interferrometry Radar Imagery - GDEM ASTER Imagery **Form of Assessment** : Project Results Assessment / Product Assessment	OFFLINE 2 X 50		**Material:** 11. Rahman, MR, Shi, ZH, Chongfa, C., 2009. Soil erosion hazard evaluation- an integrated use of remote sensing, GIS, and statistical approaches with biophysiological parameters towards management strategies. Ecological Modelling. DOI. 10.1016/j.ecomodel.2009.04.004 12. Reuter, H.I., Nelson, A., Strobl., P., Mehl, W., Jarvis, A., 2009, A first assessment of ASTER GDEM tiles for absolute accuracy, relative accuracy and terrain parameters. IEEE. DOI: 978-1-4244-3395-7 **References:**	10%
16		UAS	**Form of Assessment** : Project Results Assessment / Product Assessment				10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	25%
2.	Project Results Assessment / Product Assessment	50%
3.	Practical Assessment	2.5%
4.	Practice / Performance	12.5%
5.	Test	10%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.