



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																																																																																																				
Hydrology	8720203070	Compulsory Curriculum Subjects	T=2 P=0 ECTS=3.18	3	July 17, 2024																																																																																																				
AUTHORIZATION		SP Developer	Course Cluster Coordinator	Study Program Coordinator																																																																																																					
		National Drs. Bambang Hariyanto, M.Pd. / Drs. Agus Sutedjo, M.Si. / Putu Wirabumi, S.Si., M.Sc.	 Drs. Bambang Hariyanto, M.Pd.	 Dr. Nugroho Hari Purnomo, S.P., M.Si.																																																																																																					
Learning model	Project Based Learning																																																																																																								
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																																																																								
	PLO-8	Able to obtain, process, analyze, present geosphere data and information using geospatial technology in integrated geographic studies with in-depth urban studies that support regional sustainability																																																																																																							
	Program Objectives (PO)																																																																																																								
	PO - 1	Describe the hydrological cycle																																																																																																							
	PO - 2	Examining hydrometeorology and hydroclimatology																																																																																																							
	PO - 3	Details potamology and hydromorphometry studies																																																																																																							
	PO - 4	hydromorphology, hydrogeology, and geohydrology																																																																																																							
	PLO-PO Matrix																																																																																																								
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>P.O</td> <td colspan="4">PLO-8</td> </tr> <tr> <td>PO-1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>PO-2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>PO-3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>PO-4</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				P.O	PLO-8				PO-1					PO-2					PO-3					PO-4																																																																															
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PO Matrix at the end of each learning stage (Sub-PO)																																																																																																									
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Short Course Description	This course discusses the formation of the elements of the water cycle, further discussion for students to understand includes the types and factors that influence the amount of evapotranspiration, analysis and calculations of precipitation and evapotranspiration in an area. Regarding runoff or surface flow, it discusses regional diversity, river discharge calculations and factors that influence runoff. Another element, namely infiltration, is only limited to the factors that influence infiltration and the practical importance of infiltration from several aspects. Understanding groundwater includes the presence of groundwater and various types of aquifers which are related to the properties of rock layers, groundwater movement, their relationship with surface water, and seawater intrusion. Also studied is the role of hydrology in human life and the use of information technology (IT) in learning will increase understanding of the material being studied. Achievement of learning competencies by using a project based learning approach with inquiry, discussion, question and answer, assignment methods. Assessment is carried out by performance and written tests.																																																																																																								
References	Main :																																																																																																								
	<ol style="list-style-type: none"> 1. Asdak, C., 2014, Hidrologi dan Pengelolaan Daerah Aliran Sungai, Yogyakarta, Gadjah Mada University Press. 2. Hadi Susanto, N. 2015, Aplikasi Hidrologi, Yogyakarta : Jogja Mediautama 3. Kodoatie, R.J., 2012, Tata Ruang Air Tanah, Yogyakarta: Penerbit Andi 4. Kodoatie, R. J., 2013, Rekayasa dan Manajemen Banjir Kota, Yogyakarta: Penerbit Andi 5. Seyhan, E. , 2010, Dasar-dasar Hidrologi, Yogyakarta: Gadjah Mada University Press 6. Soemarto, C.D., 2007, Hidrologi Teknik, Suabaya: Usaha Nasional 																																																																																																								
	Supporters:																																																																																																								

- Petersen, J.F., Sack, D., Gabler, R.E., 2012, Physical Geography 10th Edition, Canada, Brooks/Cole, Cengage Learning
- Mulyaningsih, S., 2010, Pengantar Geologi Lingkungan, Yogyakarta: Panduan

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	Analyze the hydrological cycle and the role of each cycle element in life	<ol style="list-style-type: none"> 1.Explain the meaning of Hydrology 2.Analyzing the Hydrological Cycle 3.Analyze the role of each hydrological element in life 4.Accurate analysis of the hydrological cycle and the role of each cycle element in life 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Minimum Completeness Criteria (KKM): > 65 2.Learning Process Assessment 3.Assessment of Learning Outcomes <p>Form of Assessment : Participatory Activities</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion 2 X 50 		<p>Material: Explaining the meaning of Hydrology, Analyzing the Hydrological Cycle, Analyzing the role of each Hydrological element in life.</p> <p>Reference: <i>Seyhan, E., 2010, Basics of Hydrology, Yogyakarta: Gadjah Mada University Press</i></p>	5%
2	Analyze the magnitude of rain elements based on automatic rain data (rain graph on fluviogram)	<ol style="list-style-type: none"> 1.Explain the classification of rain 2.Analyze and calculate the magnitude of rain elements on a rain chart (fluviogram) 3.Accuracy of analysis regarding the magnitude of rain elements based on automatic rain data (rain charts on fluviograms) 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Minimum Completeness Criteria (KKM): > 65 2.Learning Process Assessment 3.Assessment of Learning Outcomes <p>Form of Assessment : Participatory Activities</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion 4. Individual Assignment 2 x 50 		<p>Material: Rain classification, Rain elements in rain charts (fluviograms)</p> <p>Reference: <i>Hadi Susanto, N. 2015, Hydrology Applications, Yogyakarta : Jogja Mediautama</i></p>	5%
3	Able to calculate average regional rainfall based on rainfall data at a minimum of 5 rain stations	<ol style="list-style-type: none"> 1.Explain the diversity of rain spaces 2.Calculates the arithmetic average of regional rainfall, Thiessen polygons and isohyets 3.The accuracy of the evaluation regarding the average regional rainfall is based on rainfall data at a minimum of 5 rain stations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Minimum Completeness Criteria (KKM): > 65 2.Learning Process Assessment 3.Assessment of Learning Outcomes <p>Form of Assessment : Participatory Activities</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion 4. Individual Assignment 2 X 50 		<p>Material: Spatial diversity of rainfall, arithmetic average regional rainfall, Thiessen polygons, and isohyets.</p> <p>Reference: <i>Hadi Susanto, N. 2015, Hydrology Applications, Yogyakarta: Jogja Mediautama</i></p>	5%
4	Able to analyze factors that influence evapotranspiration that occurs in a certain time period using empirical formulas	<ol style="list-style-type: none"> 1.Explain the meaning of evapotranspiration 2.Analyze the factors that influence evapotranspiration 3.Calculating daily evapotranspiration using the Modified Penman method 4.Accurate analysis of factors that influence evapotranspiration that occurs in a certain time period using empirical formulas 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Minimum Completeness Criteria (KKM): > 65 2.Learning Process Assessment 3.Assessment of Learning Outcomes <p>Form of Assessment : Participatory Activities</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion 2 X 50 		<p>Material: Definition of evapotranspiration, factors that influence evapotranspiration, and daily evapotranspiration using the Penman method</p> <p>Modification of literature: <i>Hadi Susanto, N. 2015, Hydrology Applications, Yogyakarta : Jogja Mediautama</i></p>	5%

5	Able to analyze factors that influence evapotranspiration that occurs in a certain time period using empirical formulas	<ol style="list-style-type: none"> 1. Calculating monthly evapotranspiration using the Thornthwaite-matter method 2. Calculating 10 daily evapotranspiration using the Turc method 3. Accuracy of evaluation of factors that influence evapotranspiration that occurs in a certain time period using empirical formulas 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment : Participatory Activities</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion <p>2 X 50</p>		<p>Material: Monthly evapotranspiration using the Thornthwaite-matter method and 10 daily evapotranspiration using the Turc method.</p> <p>Reference: <i>Soemarto, CD, 2007, Engineering Hydrology, Suabaya: National Enterprise</i></p>	5%
6	Able to analyze runoff factors and calculate the amount of runoff in a river.	<ol style="list-style-type: none"> 1. Understanding Runoff 2. Factors influencing runoff 3. Runoff diversity 4. River discharge using the Manning method 5. Accuracy of analysis regarding runoff factors and calculating the amount of runoff in a river 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion 4. Individual Assignment <p>2 X 50</p>		<p>Material: Understanding runoff, factors that influence runoff, diversity of runoff, and river discharge using the Manning method.</p> <p>Reference: <i>Kodoatie, RJ, 2012, Groundwater Spatial Planning, Yogyakarta: Andi Publisher</i></p>	5%
7	Describe runoff in an area using empirical formulas	<ol style="list-style-type: none"> 1. Runoff with rational formula 2. Runoff by the Melchior method 3. Runoff using the Weduwen method 4. The accuracy of the description of runoff in an area using empirical formulas 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion 4. Individual Assignment <p>2 X 50</p>		<p>Material: Runoff using the rational formula, Runoff using the Melchior method, and Runoff using the Weduwen method.</p> <p>Library: <i>Asdak, C., 2014, Hydrology and Watershed Management, Yogyakarta, Gadjah Mada University Press.</i></p>	5%

8	Midterm Exam (UTS)	Provisions according to the assessment rubric	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment : Test</p>		LMS SIDIA 2 x 50	<p>Material: Meetings 1 to 7 References: Asdak, C., 2014, <i>Hydrology and Watershed Management</i>, Yogyakarta, Gadjah Mada University Press.</p> <p>Material: Meetings 1 to 7 References: Hadi Susanto, N. 2015, <i>Hydrology Applications</i>, Yogyakarta : Jogja Mediautama</p> <p>Material: Meetings 1 to 7 References: Kodoatie, RJ, 2012, <i>Groundwater Spatial Planning</i>, Yogyakarta: Andi Publisher</p> <p>Material: Meetings 1 to 7 References: Seyhan, E. , 2010, <i>Basics of Hydrology</i>, Yogyakarta: Gadjah Mada University Press</p> <p>Material: Meetings 1 to 7 References: Soemarto, CD, 2007, <i>Engineering Hydrology</i>, Suabaya: National Enterprise</p>	10%
9	Able to analyze the occurrence of groundwater and groundwater movement in an area.	<ol style="list-style-type: none"> 1. Explain the concept of infiltration 2. Analyze the factors that influence infiltration 3. Analyze the character of infiltration for practical purposes 4. Accuracy of analysis regarding the occurrence of groundwater and groundwater movement in an area 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion <p>2 X 50</p>		<p>Material: The concept of infiltration, factors that influence infiltration, and the character of infiltration for practical purposes. Reference: Seyhan, E., 2010, <i>Basics of Hydrology</i>, Yogyakarta: Gadjah Mada University Press</p>	5%
10	Able to analyze the occurrence of groundwater and groundwater movement in an area.	<ol style="list-style-type: none"> 1. Explain the properties of rocks and the occurrence of ground water 2. Accuracy of analysis regarding the occurrence of groundwater and groundwater movement in an area 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment : Assessment of Project Results / Product Assessment, Practices / Performance</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and Answer 3. Discussion <p>2 X 50</p>		<p>Material: Rock properties and groundwater occurrence Reference: Kodoatie, RJ, 2013, <i>Urban Flood Engineering and Management</i>, Yogyakarta: Andi Publisher</p>	5%

11	Analyze the occurrence of groundwater and groundwater movement in an area	<ol style="list-style-type: none"> Analyzing the direction of groundwater movement using cartographic methods Accuracy of analysis regarding the occurrence of groundwater and groundwater movement in an area 	<p>Criteria:</p> <ol style="list-style-type: none"> Minimum Completeness Criteria (KKM): > 65 Learning Process Assessment Assessment of Learning Outcomes <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> Lecture Question and Answer Discussion 2 x 50 		<p>Material: Direction of groundwater movement using cartographic methods. Reference: Seyhan, E., 2010, <i>Basics of Hydrology</i>, Yogyakarta: Gadjah Mada University Press</p>	5%
12	Able to determine the types of aquifers in an area	<ol style="list-style-type: none"> Explain the meaning of aquifer, aquiclude, and aquifuge Accuracy of evaluation regarding the types of aquifers in an area 	<p>Criteria:</p> <ol style="list-style-type: none"> Minimum Completeness Criteria (KKM): > 65 Learning Process Assessment Assessment of Learning Outcomes <p>Form of Assessment : Assessment of Project Results / Product Assessment, Practices / Performance</p>	<ol style="list-style-type: none"> Lecture Question and Answer Discussion 2 x 50 		<p>Material: Understanding aquifers, aquicludes, and aquifers Reference: Soemarto, CD, 2007, <i>Engineering Hydrology</i>, Suabaya: National Enterprise</p>	5%
13	Able to determine the types of aquifers in an area	<ol style="list-style-type: none"> Determine the types of aquifers based on the character of the rock layers Accuracy of evaluation regarding the types of aquifers in an area 	<p>Criteria:</p> <ol style="list-style-type: none"> Minimum Completeness Criteria (KKM): > 65 Learning Process Assessment Assessment of Learning Outcomes <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> Lecture Question and Answer Discussion 2 x 50 		<p>Material: Types of aquifers based on the character of rock layers Reference: Seyhan, E., 2010, <i>Basics of Hydrology</i>, Yogyakarta: Gadjah Mada University Press</p>	10%
14	Able to analyze the relationship between groundwater and surface water and sea water	<ol style="list-style-type: none"> Analyze the relationship between groundwater and surface water Accurate analysis of the relationship between groundwater and surface water and sea water 	<p>Criteria:</p> <ol style="list-style-type: none"> Minimum Completeness Criteria (KKM): > 65 Learning Process Assessment Assessment of Learning Outcomes <p>Forms of Assessment : Project Results Assessment / Product Assessment, Practical Assessment</p>	<ol style="list-style-type: none"> Lecture Question and Answer Discussion 2 x 50 		<p>Material: Relationship between groundwater and surface water Reference: Seyhan, E., 2010, <i>Basics of Hydrology</i>, Yogyakarta: Gadjah Mada University Press</p>	5%
15	Able to analyze the relationship between groundwater and surface water and sea water	<ol style="list-style-type: none"> Calculating the magnitude of seawater intrusion into the ground Accurate analysis of the relationship between groundwater and surface water and sea water 	<p>Criteria:</p> <ol style="list-style-type: none"> Minimum Completeness Criteria (KKM): > 65 Learning Process Assessment Assessment of Learning Outcomes <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> Lecture Question and Answer Discussion 2 x 50 		<p>Material: Seawater intrusion into the ground Reference: Soemarto, CD, 2007, <i>Engineering Hydrology</i>, Suabaya: National Enterprise</p>	10%

16	Final Semester Examination (UAS)	Accuracy according to the assessment rubric	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Minimum Completeness Criteria (KKM): > 65 2. Learning Process Assessment 3. Assessment of Learning Outcomes <p>Form of Assessment :</p> <p>Project Results Assessment / Product Assessment, Portfolio Assessment</p>	LMS SIDIA 2 x 50	<p>Material: Meetings 1 to 15 References: Asdak, C., 2014, <i>Hydrology and Watershed Management</i>, Yogyakarta, Gadjah Mada University Press.</p> <p>Material: Meetings 1 to 15 References: Hadi Susanto, N. 2015, <i>Hydrology Applications</i>, Yogyakarta : Jogja Mediautama</p> <p>Material: Meetings 1 to 15 References: Kodoatie, RJ, 2012, <i>Groundwater Spatial Planning</i>, Yogyakarta: Andi Publisher</p> <p>Material: Meetings 1 to 15 References: Kodoatie, RJ, 2013, <i>City Flood Engineering and Management</i>, Yogyakarta: Andi Publisher</p> <p>Material: Meetings 1 to 15 References: Seyhan, E., 2010, <i>Basics of Hydrology</i>, Yogyakarta: Gadjah Mada University Press</p> <p>Material: Meetings 1 to 15 References: Soemarto, CD, 2007, <i>Engineering Hydrology</i>, Suabaya: National Enterprise</p> <p>Material: Meetings 1 to 15 References: Petersen, JF, Sack, D., Gabler, RE, 2012, <i>Physical Geography 10th Edition</i>, Canada, Brooks/Cole, Cengage Learning</p> <p>Material: Meetings 1 to 15 References: Mulyaningsih, S., 2010, <i>Introduction to Environmental Geology</i>, Yogyakarta: Guide</p>	10%
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Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	25%
2.	Project Results Assessment / Product Assessment	52.5%
3.	Portfolio Assessment	5%
4.	Practical Assessment	2.5%
5.	Practice / Performance	5%
6.	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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.