



UNIVERSITAS PENDIDIKAN INDONESIA

SEMESTER LEARNING PLAN (RPS)

COURSE IDENTITY

Course Name	Course Code	Sks	Workload	Course Group	Semester	Prerequisite Course	Publication Date
WATER RESOURCE SURVEY AND MAPPING	SA526	2	90	Mata Kuliah Keahlian Pilihan Program Studi	6		2025-09-09 11:26:56

Prepared by	Reviewed by	Approved by
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COURSE DESCRIPTION AND GRADUATE LEARNING OUTCOMES

Course Description	The Water Resource Survey and Mapping course provides an in-depth understanding of the principles and techniques involved in mapping and the sustainable management of water resources. Students will study various types of water resources, including surface water (rivers, lakes, reservoirs, springs, and swamps), groundwater, and several phenomena related to water resources such as hydrological and climatological drought, water resource conservation in relation to land erosion closely linked to sedimentation and changes in water quality. In addition, the evaluation of water resource-based renewable energy potential, such as hydroelectric power plants (PLTA) and micro-hydro systems, will constitute an important component of this course. The course also develops technical skills in the use of mapping hardware and software to identify, analyze, and map various water resources using technology. A project-based learning approach will be implemented, in which students work in teams to design and conduct field surveys, collect and analyze data, and prepare and present the results of their water resource mapping projects.		
Graduate Learning Outcomes (GLO/CPL)	1	Proficient in the theoretical concepts of geography, the application of geospatial technology for resolving geospheric problems, and in developing models and methods for geospheric problem-solving.	
	2	Proficient in the fundamental concepts of regional survey and mapping, as well as the principles and applications of mathematics and statistics in the field of regional survey and mapping.	
	3	Capable of integrating learning and innovative competencies, mastery of technology and information, career development, and life skills to become a lifelong learner.	
	4	Capable of designing, developing, producing, utilizing, managing, and evaluating models of spatial information analysis and theory grounded in science and technology.	
Course Learning Outcomes (CLO/CPMK)	1	Understand the fundamental concepts of water resources, their characteristics, and related environmental issues.	
	2	Apply geospatial technology for water resource mapping and analysis.	
	3	Analyze water resource conservation issues, including the impacts of erosion, sedimentation, changes in water quality, and drought.	
	4	Evaluate the potential of water resource-based renewable energy through geospatial methods.	
Sub-CPMK	1	CPMK - 1	Understand the definition, types, and role of water resources within the hydrological system.
	2	CPMK - 2	Use geospatial technology (DEM) for watershed (DAS) and sub-watershed delineation, as well as area analysis in accordance with government regulations.
	3	CPMK - 1	Understand the various forms of surface water (rivers, lakes, reservoirs, springs, swamps) along with their hydrological characteristics.
	4	CPMK - 2	Use geospatial technology to map surface water elements (rivers, lakes, reservoirs, springs).
	5	CPMK - 3	Understand the challenges of water resource conservation resulting from erosion, sedimentation, and changes in water quality.
	6	CPMK - 2	Use GIS for spatial analysis related to erosion and sedimentation.

	7	CPMK - 3	Understand the concept of drought, its causes, and its impacts at both local and global scales.
	8	CPMK - 2	Use GIS to identify and map drought-prone areas, and to interpret mapping results in order to evaluate drought conditions within a given region.
	9	CPMK - 4	Understand the concept of water resource-based renewable energy (hydroelectric power plants and micro-hydro systems) along with their development potential.
	10	CPMK - 4	Use GIS to analyze and map the potential of water resource-based renewable energy.
	11	CPMK - 1	Understand the characteristics, ecological functions, and management challenges of swampland.
	12	CPMK - 2	Use GIS for mapping the distribution and characteristics of swampland.
	13	CPMK - 1	Understand the concept of the Peatland Hydrological Unit (PHU/KHG) and its role in hydrology and climate change mitigation.
	14	CPMK - 2	Use GIS for mapping the Peatland Hydrological Unit (PHU/KHG) and analyze its relevance to water resource management.
Course Materials	1	Introduction to and Concepts of Water Resources	
	2	Identifying and Selecting a Watershed Study Area	
	3	Concepts of Surface Water (Classification, Utilization, and Conservation)	
	4	Mapping Practice (ArcGIS): Rivers, Lakes, Springs, Reservoirs	
	5	Water Resource Conservation (Erosion, Sedimentation, Changes in Water Quality)	
	6	Land Erosion Analysis Practice using GIS	
	7	Drought (Hydrological and Meteorological)	
	8	Drought Mapping Practice using Geospatial Technology	
	9	Potential of Water Resource-Based Renewable Energy	
	10	Renewable Energy Potential Mapping Practice	
	11	Swampland	
	12	Swampland Mapping Practice	
	13	Peatland Hydrological Unit (PHU/KHG)	
	14	PHU/KHG Mapping Practice	

Demonstrable Learning Outcomes at the End of the Course *)	Students are able to analyze the potential and drawbacks of various water resources and integrate such information in mapping practices based on field surveys and geospatial technology.	
Learning Strategy		Case Method
	✓	Team based Project
		Others
Learning Steps	Instruction will be conducted using a project-based learning approach, in which students work in teams to identify water resources using the watershed (Daerah Aliran Sungai/DAS) as the unit of analysis, collect and analyze data, and prepare and present the results of their water resource mapping projects. Through this approach, students are expected to develop collaborative and communication skills within the context of sustainable water resource management.	
References	1	Asdak, C. (1995). Hidrologi dan Pengelolaan Daerah Aliran Sungai. Yogyakarta. Gadjah Mada University Press.
	2	C. Alewell at al. (2019). Using the USLE: Chances, Challenges and Limitation of Soil Erosion Modelling. International Soil and Water Conservation Research 7(203-225)
	3	Direktorat Pengairan dan Irigasi Kementerian PPN/BAPPENAS (2020). Pengembangan dan Pengelolaan Rawa Berkelanjutan. Bandung. ITB Press
	4	Kironoto, B.A dkk. (2020). Erosi dan Konservasi Lahan. Yogyakarta. Gadjah Mada University Press
	5	Pusat Penelitian Sumber Daya Air (2019). Monitoring dan Prediksi Kekeringan Hidrologis. Bandung. Badan Penelitian dan Pengembangan Pusat Penelitian dan Pengembangan Sumber Daya Air.
	6	Sudarmadji, Hadi dkk. (2014). Pengelolaan Sumberdaya Air Terpadu. Yogyakarta. Gadjah Mada University
	7	Sutikno, Sigit dkk. (2020). Neraca Air Kesatuan Hidrologis Gambut. Jakarta. Badan Restorasi Gambut Indonesia
	8	Undang-Undang Nomor 17 Tahun 2019 tentang Sumber Daya Air

LEARNING PLAN

Week	Sub-CPMK	Sub-CLO Achievement Indicators Demonstrable by Students	Course Material	Assessment		Learning Form and Method		Duration(mi n)	Ref.No.	Access Time
				Assessm entForm(t est/non-test)	Weight(%)	Synchrono us(Face-to-face& Online)	Asynchronou s(Individual &Group Tasks)			
1	Understand the definition, types and role of water resources in the hydrological system.	Able to distinguish types of water sources (surface water and groundwater); analyze uses of water (electricity generation, raw water supply, irrigation, transportation, recreation, and tourism); understand the concepts of River Territory (WS) and Watershed (DAS) as hydrological and ecological units.	Introduction to and Concepts of Water Resources	Essay	5	Face-to-face using expository and question-and-answer methods	Independe nt material exploration	2 x 50	8	04-02-2025 13:00
2	Using geospatial technology (DEM) for watershed and sub-watershed delineation as well as area area analysis based on government regulations.	Delineate watershed (DAS) and sub-watershed boundaries and comparatively analyze the results against government regulations.	Identifying and Selecting a Watershed Study Area	Performanc e	5	Face-to-face using expository and question-and-answer methods	Practice: Watershed Selection	2 x 50	8	11-02-2025 13:00
3	Understand various forms of surface water (rivers, lakes, reservoirs, springs, swamps) and their hydrological characteristics.	Identify types of surface water, and describe their utilization and conservation.	Concepts of Surface Water (Classification, Utilization, and Conservation)	Short Answer	5	Tatap muka	Independe nt material exploration	2 x 50	1,6	18-02-2025 13:00
4	Using geospatial technology to map surface water elements (rivers, lakes, reservoirs, springs).	Use geospatial technology to map water resources.	Mapping Practice (ArcGIS): Rivers, Lakes, Springs, Reservoirs	Performanc e	7	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	6	25-02-2025 13:00

Week	Sub-CPMK	Sub-CLO Achievement Indicators Demonstrable by Students	Course Material	Assessment		Learning Form and Method		Duration(mi n)	Ref.No.	Access Time
				Assessm entForm(t est/non-test)	Weight(%)	Synchrono us(Face-to-face& Online)	Asynchronou s(Individual &Group Tasks)			
5	Understand the challenges of water resource conservation due to erosion, sedimentation, and changes in water quality.	Explain the processes of erosion and sedimentation and their impacts on water quality within a watershed; analyze factors influencing erosion and sedimentation rates using geospatial data.	Water Resource Conservation (Erosion, Sedimentation, Changes in Water Quality)	Short Answer	5	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	2	04-03-2025 13:00
6	Using GIS for spatial analysis related to erosion and sedimentation.	Produce a land erosion hazard map using GIS technology based on slope gradient, soil type, and rainfall parameters.	Land Erosion Analysis Practice using GIS	Performance	7	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	2	11-03-2025 13:00
7	Understand the concept of drought, its causes and impacts on a local and global scale.	Understand the concepts of hydrological and meteorological drought and their respective impacts.	Drought (Hydrological and Meteorological)	Essay	5	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	5	18-03-2025 13:00
8	MIDTERM EXAMINATION				10					25-03-2025 13:00
9	Using GIS to identify and map drought-prone areas and interpret mapping results to evaluate the drought conditions of an area.	Interpret mapping results to evaluate drought conditions within a given region.	Drought Mapping Practice using Geospatial Technology	Performance	7	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	5	08-04-2025 13:00

Week	Sub-CPMK	Sub-CLO Achievement Indicators Demonstrable by Students	Course Material	Assessment		Learning Form and Method		Duration(mi n)	Ref.No.	Access Time
				Assessm entForm(t est/non-test)	Weight(%)	Synchrono us(Face-to-face& Online)	Asynchronou s(Individual &Group Tasks)			
10	Understand the concept of renewable energy based on water resources (PLTA, micro-hydro) and its development potential.	Explain the fundamental principles of hydroelectric power generation (hydroelectric power plants and micro-hydro systems); identify key factors determining site feasibility for hydro energy development (elevation, water discharge, topography, and environmental aspects).	Potential of Water Resource-Based Renewable Energy	Short Answer	5	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	6	15-04-2025 13:00
11	Using GIS to analyze and map the potential for renewable energy based on water resources.	Produce a map of water resource-based renewable energy potential using GIS with hydrological and topographic parameters.	Renewable Energy Potential Mapping Practice	Performance	7	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	6	22-04-2025 13:00
12	Understand the characteristics, ecological functions, and challenges of swamp land management.	Understand the characteristics, functions, and management challenges of swampland	Swampland	Short Answer	5	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	3	29-04-2025 13:00
13	Using GIS to map the distribution and characteristics of swamp land.	Determine appropriate data sources for swampland mapping (satellite imagery, DEM, hydrological data, etc.); select suitable classification methods for interpreting swampland from satellite imagery or aerial photographs; conduct spatial analysis using GIS for swampland delineation and mapping.	Swampland Mapping Practice	Performance	7	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	3	06-05-2025 13:00

Week	Sub-CPMK	Sub-CLO Achievement Indicators Demonstrable by Students	Course Material	Assessment		Learning Form and Method		Duration(mi n)	Ref.No.	Access Time
				Assessm entForm(t est/non-test)	Weight(%)	Synchrono us(Face-to-face& Online)	Asynchronou s(Individual &Group Tasks)			
14	Understand the concept of Peat Hydrological Units (KHG) and their role in hydrology and climate change mitigation.	Explain the fundamental concepts of the Peatland Hydrological Unit (PHU/KHG) and its role within the hydrological system; identify the physical and ecological characteristics of peatland in a hydrological context; analyze the relationship between PHU/KHG and water balance, conservation, and climate change mitigation.	Peatland Hydrological Unit (PHU/KHG)	Short Answer	5	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	7	13-05-2025 13:00
15	Using GIS to map the Peat Hydrological Unit (KHG) area and analyze its relevance in water resources management.	Collect spatial data related to PHU/KHG, including topographic, land cover, hydrological, and peat depth data; delineate PHU/KHG areas using GIS-based methods in accordance with applicable regulations; produce PHU/KHG maps containing spatial information covering area boundaries, drainage systems, and hydrological characteristics.	PHU/KHG Mapping Practice	Performance	5	Face-to-face using expository and question-and-answer methods	Assignment	2 x 50	7,8	20-05-2025 13:00
16	FINAL EXAMINATION				10					27-05-2025 13:00

STUDENT LEARNING TIME (WORKLOAD)

LEARNING	Activity		Synchronous(Face-to-Face / Online)	Asynchronous(Structured / Independent)	Student LearningPreparation	Total Student Learningand Instructional Time
	Lectures / Recitation / Tutorial		14 × 90 min = 1,260 min	14 × 60 min = 840 min	14 × 30 min = 420 min	2,520 min (42.0 hrs)
	Project-Based Learning		2 × 450 min = 900 min	2 × 450 min = 900 min	2 × 30 min = 60 min	1,860 min (31.0 hrs)
	Discussion (Case-Based Learning)		-x-	4 × 60 min = 240 min	4 × 10 min = 40 min	280 min (4.7 hrs)
	SUBTOTAL					4,660 min (77.7 hrs)
ASSESSMENT		Continuous Assessment				
		Participation During Learning	-x-	14 × 10 min = 140 min	-x-	140 min (2.3 hrs)
		Project Work	-x-	1 × 180 min = 180 min	-x-	180 min (3.0 hrs)
		Assignment	-x-	1 × 180 min = 180 min	-x-	180 min (3.0 hrs)
		Quiz	-x-	6 × 10 min = 60 min	-x-	60 min (1.0 hrs)
		Formative				90 min (1.5 hrs)
		Summative				90 min (1.5 hrs)
	SUBTOTAL					740 min (12.3 hrs)
TOTAL WORKLOAD						5,400 min (90 hrs)
IDEAL CREDIT HOURS						90 Hours
CREDITS (SKS)						2
CONFORMITY WITH CREDIT LOAD						COMPLIANT

CLO ASSESSMENT CRITERIA

No	CPMK	CPL				Taxonomy	Weight	CLO Achievement Criteria
		CPL-1	CPL-2	CPL-3	CPL-4			
1	Understand the fundamental concepts of water resources, their characteristics, and related environmental issues.					3	20	70% of all students achieve a minimum score of 70 (on a scale of 100)
2	Apply geospatial technology for water resource mapping and analysis.					4	38	70% of all students achieve a minimum score of 70 (on a scale of 100)
3	Analyze water resource conservation issues, including the impacts of erosion, sedimentation, changes in water quality, and drought.					3	10	70% of all students achieve a minimum score of 70 (on a scale of 100)
4	Evaluate the potential of water resource-based renewable energy through geospatial methods.					4	12	80% of all students achieve a minimum score of 70 (on a scale of 100)

COLLABORATIVE ASSIGNMENT DESIGN

Assignment Title	Water Resource Mapping with a Project-Based Learning (PjBL) Approach
Learning Method	Team based Project
Time	
Assessment Weight	45
SUB-CPMK	Understand the definition, types, and role of water resources within the hydrological system.

TASK DESCRIPTION

Students will work collaboratively in groups to undertake a geospatial-based water resource mapping and analysis project. Each group will be assigned a case study or may select a relevant study area aligned with the predetermined theme, namely a River Territory (WS) in Indonesia.

TASK COMPLETION STEPS

1. **Delineation and Analysis of Watersheds (DAS) Based on Geospatial Data** — Students work in teams to delineate watersheds and sub-watersheds using DEM and compare the results with government regulations.
2. **GIS-Based Drought Risk Mapping in the Selected Study Area** — Students analyze hydrological and meteorological drought phenomena and map drought-prone areas using spatial data.
3. **Evaluation of Water Resource-Based Renewable Energy Potential (Hydroelectric Power Plants and Micro-Hydro Systems)** — Students map potential sites for hydroelectric or micro-hydro development based on hydrological and topographic parameters.
4. **Erosion and Sedimentation Risk Mapping as a Water Resource Conservation Measure** — Students analyze causative factors of erosion and sedimentation and produce an erosion risk zoning map using GIS.
- **Pemetaan dan Analisis Kesehatan Ekosistem Lahan Rawa dengan Pendekatan Geospasial**
5. **Mapping and Analysis of Swampland Ecosystem Health using a Geospatial Approach** — Students identify changes in swampland cover and assess their impacts on the balance of aquatic ecosystems.
6. **Delineation and Mapping of the Peatland Hydrological Unit (PHU/KHG) as a Basis for Sustainable Management** — Students map PHU/KHG areas using geospatial data and analyze the conservation challenges and mitigation impacts involved.

DETAILED EXPECTED OUTPUTS

Thematic maps produced in accordance with the project topic

1. A comprehensive spatial analysis report.
2. GIS files used in data processing.
3. A presentation of results in PowerPoint format.

ASSESSMENT INDICATORS, CRITERIA, AND WEIGHTS

Data collection quality (20%): assessed based on the completeness and accuracy of data sources used in the analysis.

Data analysis and modeling (25%): evaluated based on the appropriateness of the methods applied and the use of GIS/SIG technology in the analysis process.

Strategy formulation (25%): focused on the relevance of the proposed strategy to the analysis results and the issues identified in the study watershed.

Report and map quality (20%): reflects the integration of information and the clarity and informativeness of data visualization.

Presentation and discussion (10%): measures students' ability to communicate their findings and defend their arguments based on data and analysis conducted.

IMPLEMENTATION SCHEDULE

NOTE: The total number of days in one semester is $16 \times 7 = 112$ days. The schedule may be determined based on a day-count calculation.

Activity	Time of Implementation
Practicum	100

ADDITIONAL NOTES

LIST OF REFERENCES

1. C. Alewell at al. (2019). Using the USLE: Chances, Challenges and Limitation of Soil Erosion Modelling. International Soil and Water Conservation Research 7(203-225)
2. Direktorat Pengairan dan Irigasi Kementerian PPN/BAPPENAS (2020). Pengembangan dan Pengelolaan Rawa Berkelanjutan. Bandung. ITB Press
3. Kironoto, B.A dkk. (2020). Erosi dan Konservasi Lahan. Yogyakarta. Gadjah Mada University Press
4. Pusat Penelitian Sumber Daya Air (2019). Monitoring dan Prediksi Kekeringan Hidrologis. Bandung. Badan Penelitian dan Pengembangan Pusat Penelitian dan Pengembangan Sumber Daya Air.
5. Sutikno, Sigit dkk. (2020). Neraca Air Kesatuan Hidrologis Gambut. Jakarta. Badan Restorasi Gambut Indonesia