SEMESTER LEARNING PLAN (RPS)

	NUSA CENDANA UNIVERSITY POST GRADUATE PROGRAM MASTER'S PROGRAM ENVIRONMENTAL SCIENCE	DOCUMENT CODE 03

SEMESTER LEARNING PLAN (RPS)

COURSE (MK)	CODE	RUMPUN MK	WEIGHT (SKS)		SEMESTER	Date of Preparation
Karst Ecology and Resource Management	IPSAL 61305	***Compulsory Courses***	**T=2**	**P=1**	**1**	**05- 09 - 2023**

AUTHORIZATION/ ENDORSE MENT Postgraduate Director, Deputy Director I,	RPS Developer Lecturer	Head of the Institute for Development, Learning, and Quality Assurance (LPPPM) Undana	Coordinator of Master's Environmental Science Study Program
Dr. Karolus K Medan SH MHum NIP 196204221990031001 Date: January 5, 2024	(Dr. Ir. Alfred O. M. Dima, M.Si .) (Dr. Refli,M.Sc)	Dr. Ir. Jacob Ratu, M.Kes NIP. 19690522 199512 1 001 Date: January 6, 2024	(Dr. Ir. Alfred O. M Dima, M.Si) NIP. 197004102000121001 January 6, 2024

Learning Outcomes	SLO-PRODI Charged to MK	
	PLO 1	: be able to understand in depth the physical, chemical, and biological systems that support the environment.
	PLO 6	: be able to learn for life and can keep up with the latest developments in environmental science and policy
	PLO 8	: be able to design and implement environmental research projects, collect and analyze data, and interpret results to make evidence-based decisions.
	PLO 9	: be able to develop and implement environmental policies and strategies that address complex environmental challenges and promote sustainable development.

Course Learning Outcomes (CPMK)	
CPMK-1	Be able to understand the geological, hydrological, and biological characteristics of karst ecosystems and their role in environmental sustainability.
CPMK-2	Be able to assess the interactions between karst environments and natural resource use, including biodiversity conservation, water resource management, and energy exploitation
CPMK-3	Be able to formulate approaches for the conservation and responsible management of natural resources in karst landscapes, integrating scientific, economic, and policy perspectives.
CPMK-4	Be able to utilize case studies and research methodologies to address environmental challenges in karst regions, supporting sustainable development and ecosystem resilience.

End Capability of each learning stage (Sub-CPMK)	
Sub-CPMK1	Karst Ecosystem Formation and Characteristics : Understanding the geological, hydrological, and ecological processes shaping karst landscapes.
Sub-CPMK2	Biodiversity and Ecological Functions : Examining the unique flora and fauna in karst ecosystems and their adaptations to extreme environmental conditions.
Sub-CPMK3	Water Resource Management in Karst Regions : Assessing groundwater dynamics, water quality, and sustainability challenges in karst aquifers.
Sub-CPMK4	Human Impacts on Karst Ecosystems : Analyzing the effects of mining, agriculture, tourism, and urban development on karst environments.
Sub-CPMK5	Energy and Resource Utilization in Karst Landscapes : Exploring the role of karst areas in energy production, including renewable and non-renewable resource extraction.
Sub-CPMK6	Conservation and Restoration Strategies : Developing methods for habitat protection, ecosystem restoration, and sustainable land use in karst regions.
Sub-CPMK7	Environmental Policies and Governance : Evaluating policy frameworks and legal instruments for karst ecosystem conservation and sustainable resource management.
Sub-CPMK8	Case Studies and Applied Research : Applying theoretical knowledge to real-world examples of karst conservation, land-use planning, and sustainable management practices.

Correlation of CPMK to Sub-CPMK

	Sub-CPMK1	Sub-CPMK2	Sub-CPMK3	Sub-CPMK4	Sub-CPMK5	Sub-CPMK6	Sub-CPMK7	Sub-CPMK8
CPMK1	√	√	√	√	√	√	√	√
CPMK2		√	√	√	√		√	√
CPMK 3					√	√	√	√
CPMK 4					√	√	√	√

Brief description of the course	Karst Ecology and Resource Management in Dryland and Archipelago Regions of Nusa Tenggara Timur (NTT) province focuses on the unique ecological characteristics, biodiversity, and resource management challenges of karst landscapes in NTT. The course explores the formation and hydrology of karst systems in dryland and coastal environments, their role in water storage, and their adaptation to arid conditions. It also examines conservation strategies, sustainable land use, and the impact of human activities such as agriculture, tourism, and mining on karst ecosystems in the region.

Study Material: Learning Materials	1. Karst Ecosystem Formation and Characteristics 2. Biodiversity and Ecological Functions 3. Water Resource Management in Karst Regions 4. Human Impacts on Karst Ecosystem 5. Energy and Resource Utilization in Karst Landscapes 6. Conservation and Restoration Strategies 7. Environmental Policies and Governance 8. Case Studies and applied research
Library	**Main:** 1. Zhang, C., Li, P., & Wang, J. (2022). Characteristics of Karst Formations and Their Significance for Shale Gas Exploration. *Frontiers in Earth Science*. https://www.frontiersin.org/journals/earth-science/articles/10.3389/feart.2022.907685/full 2. Elliott, W. R. (2020). Creatures of the deep karst: The hidden biodiversity of subterranean ecosystems. *American Scientist*, 108(4), 228-235. https://www.americanscientist.org/article/creatures-of-the-deep-karst 3. Zagmajster, M., Malard, F., & Culver, D. C. (2021). Environmental specificity of karst cave habitats evidenced by diverse and predictable faunal assemblages. *BMC Ecology and Evolution*, 21, Article number: 48. https://doi.org/10.1186/s12862-021-01792-9 4. Fauna & Flora International. (2021). Our work in limestone habitats. https://www.fauna-flora.org/environments/limestone-habitats/ 5. Kresic, N., & Stevanovic, Z. (2022). Karst Aquifers: Characterization and Engineering. *Springer International Publishing*. https://doi.org/10.1007/978-3-030-67897-2 6. Hartmann, A., Goldscheider, N., Wagener, T., Lange, J., & Weiler, M. (2023). Karst Water Resources in a Changing World: Review of Hydrological Modeling Approaches. *Reviews of Geophysics*, 61(2), e2023RG000811. https://doi.org/10.1029/2023RG000811 7. Li, P., Qian, H., & Wu, J. (2020). Urbanization and Its Impact on Karst Groundwater Systems in Southwest China. *Journal of Hydrology*, 584, 124706. https://doi.org/10.1016/j.jhydrol.2020.124706 8. Zhu, H., Liu, L., & Zhang, J. (2022). Effects of Agricultural Practices on Soil Erosion and Water Quality in Karst Regions of Southwest China. *Agriculture, Ecosystems & Environment*, 319, 107551. https://doi.org/10.1016/j.agee.2021.107551 9. Zhou, Q., Jiang, Y., & Wang, S. (2021). Impacts of Human Activities on Karst Water Resources in Southwestern China: A Case Study in the Guizhou Province. *Environmental Earth Sciences*, 80(5), 193. https://doi.org/10.1007/s12665-021-09419-5 10. Kresic, N., & Stevanovic, Z. (2021). Advances in Karst Hydrogeology. *Springer International Publishing*. https://doi.org/10.1007/978-3-030-67897-2 **Supporters:**

	1. Smith, J. A., & Johnson, L. M. (2020). *Microplastics in Marine Ecosystems: Impacts on Biodiversity and Human Health.* Environmental Science & Technology. 2. Garcia, R. P., & Lee, S. H. (2021). *Climate Change and Agricultural Sustainability: A Meta-Analysis.* Journal of Environmental Management. 3. Nguyen, T. K., & Patel, R. (2022). *Urban Air Pollution and Respiratory Health: Longitudinal Evidence from Developing Countries.* International Journal of Environmental Research and Public Health. 4. Chen, Y., & Wang, H. (2023). *Renewable Energy Adoption: Socioeconomic and Environmental Impacts.* Renewable and Sustainable Energy Reviews. 5. Oluwole, F. A., & Smith, D. (2021). *Deforestation and Its Effects on Soil Erosion: A Global Perspective.* Land Degradation & Development. 6. Kumar, S., & Gupta, P. (2020). *Heavy Metal Contamination in Urban Soils: Sources and Remediation Techniques.* Environmental Pollution. 7. Martinez, L. J., & Thompson, G. (2022). *Evaluating the Effectiveness of Marine Protected Areas in Biodiversity Conservation.* Marine Policy. 8. Zhang, X., & Li, Q. (2023). *Advancements in Wastewater Treatment: Nanotechnology Applications.* Journal of Environmental Chemical Engineering.
Lecturer	1. Dr. Ir. Alfred O. M. Dima, M.Si 2. Dr. Refli, M.Sc 3. Prof. Dr. Ir. Denik K, ST.,MT. 4. Dr. Ir. Ida Nurwiyana, M.Si 5. Dr. Hery Kota, ST., MT
Course Requirements	None

Mg-	**End ability of each Learning stage (Sub-CPMK)**	**Assessment**		**Learning Forms; Learning Methods; Student Assignments Estimated Time**		**Learning Materials**	**Assessment Weight (%)**
		Indicator	**Assessment Criteria**				
(1)	**(2)**	**(3)**	**(4)**	**Offline (5)**	**Online (6)**	**(7)**	**(8)**
1	Understand an overview of the course: description, objectives, materials, methods and relevance of the course.	--	--	--	--	--	--

2-3	Sub-CLO 1: Review and analyze the geological, hydrological, and biological features of karst ecosystems and their contribution to environmental sustainability.	1.1 Accuracy in explaining Assessment of karst landforms, rock composition, and formation processes influencing ecosystem stability. 1.2 Accuracy in Evaluation of water storage, groundwater flow, and vulnerability to pollution in karst systems. 1.3 Accuracy in Analysis of unique flora and fauna, habitat sustainability, and the role of karst ecosystems in supporting biodiversity and environmental balance.	**Criteria**: Scoring guidelines (Marking Scheme) **Non-test technique:** • Summarize • Quiz 1	• **Lecture** • **Discussion** **[PB: 1x(2x50")]** **Assignment 1:** Summarize the lecture with examples. **[PT+KM1 (1+1)x(2x60")]**	LMS Undana	Analyze Ecological Dynamics of Karst Systems : Understand the geological, hydrological, and biological characteristics of karst ecosystems and their role in environmental sustainability.	10
4-5	Sub-CLO 2 :Analyze and Examining the unique flora and fauna in karst ecosystems and their adaptations to extreme environmental conditions.	2.1 Accuracy in identification of unique plant and animal species in karst ecosystems, including endemic and specialized organisms. 2.2. Accuracy in Examination of how flora and fauna adapt to extreme conditions such as water scarcity, low soil fertility, and cave environments. 2.3. Accuracy in Analysis of species interactions, trophic dynamics, and contributions to ecosystem stability and resilience.	**Criteria**: Scoring guidelines (Marking Scheme) **Non-test technique:** • Summarize • Quiz 2	• **Lecture** • **Discussion** **[PB: 1x(2x50")]** **Task 2:** Compile a summary of the lecture in question For example. **[PT+KM1 (1+1)x(2x60")]**	LMS Undana	Biodiversity and Ecological Functions : Examining the unique flora and fauna in karst ecosystems and their adaptations to extreme environmental conditions.	10
6	Sub-CPMK-3: Analyze Water Resource Management in Karst Regions : Assessing groundwater dynamics, water quality, and	3.1 Accuracy in the analyze and Evaluation of recharge rates, flow patterns, and the capacity of karst aquifers to store and supply water.	**Criteria**: Holistic Rubric **Non-test technique:** Quiz 3	• **Lecture** • **Discovery learning**	LMS Undana	Water Resource Management in Karst Regions : Assessing groundwater dynamics, water	15

	sustainability challenges in karst aquifers.	3.2. Accuracy in the Assessment of pollution risks, contamination sources, and the natural filtration capacity of karst systems. 3.3. Accuracy in the Analysis of water extraction practices, conservation measures, and policies for sustainable water use in karst regions.				quality, and sustainability challenges in karst aquifers.	

7-8	Sub-CPMK-4: Analyze and explain Human Impacts on Karst Ecosystems : Analyzing the effects of mining, agriculture, tourism, and urban development on karst environments.	4.1. Accuracy in Analyze and Assessment of ecosystem disturbances caused by mining, deforestation, and land conversion in karst regions. 4.2. Accuracy in Analyze of groundwater over-extraction, contamination from agriculture and industry, and the impact on karst hydrology. 4.3. Accuracy in Evaluation of habitat fragmentation, species displacement, and changes in ecological interactions due to human activities. 4.4. Accuracy in Examination of conservation policies, land-use planning, and sustainable practices to minimize human impacts on karst ecosystems.	**Criteria**: Holistic Rubric **Non-test technique:** Compile a report on the results of field observations • Quiz 4	• **Lecture** • **Discussion** **[PB: 1x(2x50")]** **Task 2:** Compare the analysis results from published research on hypothesis testing, confidence intervals, and statistical significance**. [PT+KM1 (1+1)x(2x60")]**	LMS Undana	Human Impacts on Karst Ecosystems : Analyzing the effects of mining, agriculture, tourism, and urban development on karst environments.	15
9	**UTS (Midterm Exam): Validate assessment results, evaluate and improve the next learning process.**						

10-11	Sub-CLO 5: Analyze, interpret, and Exploring the role of karst areas in energy production, including renewable and non-renewable resource extraction.	5.1. Accuracy in Analyze Assessment of karst regions for renewable energy sources such as hydroelectric, geothermal, and wind energy. 5.2. Accuracy in Analysis of mining activities for fossil fuels, minerals, and their environmental impacts on karst ecosystems. 5.3. Accuracy in Evaluation of resource extraction effects on groundwater availability, land subsidence, and ecological balance. 5.4. Accuracy inExploration of policies and strategies for balancing energy production with environmental conservation in karst areas.	**Criteria**: Descriptive Rubric **Non-test technique:** Quiz 5	• **Lecture** • **Case study** • **Discussion**	LMS Undana	Energy and Resource Utilization in Karst Landscapes : Exploring the role of karst areas in energy production, including renewable and non-renewable resource extraction.	15
12	Sub-CLO 6: Assess and Analyze Developing methods for habitat protection, ecosystem restoration, and sustainable land use in karst regions	6.1. Accuracy in Evaluation of protected areas, biodiversity preservation programs, and policies to safeguard karst ecosystems. 6.2. Accuracy in analyzing and evaluation of reforestation, soil stabilization, and rehabilitation methods for degraded karst landscapes. 6.3. Accuracy in Assessment of land management approaches that balance conservation with	**Criteria**: Holistic Rubric **Non-test technique:** Make a work report • Quiz 6	• **Lecture** • **Case study** • **Debate** **[PB: 1x(2x50")]** **Task 3:** Conduct field observations and interviews, as well as analyze and interpret data from field observations and interviews with community	LMS Undana	Conservation and Restoration Strategies : Developing methods for habitat protection, ecosystem restoration, and sustainable land use in karst regions	15

		agriculture, tourism, and urban development. 6.4. Accuracy in Examination of local participation, regulatory frameworks, and governance in promoting sustainable practices in karst regions.		members at karst mining sites and stakeholders involved in karst area management.. **[PT+KM1 (1+1)x(2x60")]**			
13	Sub-CLO 7: Review, analyze and interpret Evaluating policy frameworks and legal instruments for karst ecosystem conservation and sustainable resource management.	1.1. 7.1. Accuracy in analyze and Assessment of national and regional policies, laws, and regulations related to karst ecosystem conservation and resource management. 1.2. 7.2.Accuracy in analyze and Evaluation of the implementation, enforcement, and impact of legal measures on protecting karst landscapes and biodiversity. 1.3. 7.3.Accuracy in analyze of how policies promote sustainable extraction, land use, and conservation practices in karst regions. 1.4. 7.4.Accuracy in Examination of the roles of government, local communities, and private sectors in policy development and implementation for sustainable karst management.	**Criteria**: Descriptive Rubric **Non-test technique:** Quiz 7	• **Lecture** • **Team-based** • **Discussion**	LMS Undana	Environmental Policies and Governance : Evaluating policy frameworks and legal instruments for karst ecosystem conservation and sustainable resource management.	10

14-15	Sub-CPMK-8: Assessing, Review and applying theoretical knowledge to real-world examples of karst conservation, land-use planning, and sustainable management practices.	1.5. Accuracy in analyze and Evaluating how ecological and conservation principles are implemented in karst ecosystem protection efforts. 1.6. The ability to Analyzing the application of sustainable land-use planning strategies in managing karst landscapes. 1.7. The ability to reviewing real-world examples of successful karst conservation and resource management practices. 1.8. The ability to Assessing the effectiveness of translating theoretical frameworks into practical policies and community-based conservation initiatives.	**Criteria**: Descriptive Rubric **Non-test technique:** Product result writing • Quiz 8	• **Lecture** • **Team-based** • **Discussion** **[PB: 1x(2x50")]** **Task 4:** Carry out Case Studies and Applied Research: Implementing theoretical knowledge in practical examples of karst conservation, land-use planning, and sustainable management, in accordance with the lecturer's agreement.	LMS Undana	Case Studies and Applied Research : Applying theoretical knowledge to real-world examples of karst conservation, land-use planning, and sustainable management practices.	10

				[PT+KM1 (1+1)x(2x60")]			
16	**UAS (End of Semester Exam): Validate the final assessment and determine student graduation.**						**100**

FORMAT OF LEARNING PLAN AND EVALUATION OF CASE SOLVER COURSE ON "INTRODUCTION TO EDUCATION"

1. LESSON PLAN FORMAT

NO	MEETING	MATERIAL (INDONESIAN)	SUBJECT (ENGLISH)
1	1	*Gambaran Umum Mata Kuliah: deskripsi, tujuan, materi, metode, penilaian, dan relevansi mata kuliah.*	*General picture of the subject: course description, objectives, learning materials, methods, evaluation and subject relevance*
2	2,3	Pembentukan dan Karakteristik Ekosistem Karst	*Karst Ecosystem Formation and Characteristics*
3	4,5	Keanekaragaman Hayati dan Fungsi Ekologis	*Biodiversity and Ecological Functions*
4	6	Pengelolaan Sumber Daya Air di Wilayah Karst	*Water Resource Management in Karst Regions*
5	7,8	Dampak Aktivitas Manusia terhadap Ekosistem Karst	*Human Impacts on Karst Ecosystem*
6	**9**	**UTS: Ujian Teangah Semester**	***Mid-Semester Exam***
7	10,11	Pemanfaatan Energi dan Sumber Daya di Lanskap Karst	*Energy and Resource Utilization in Karst Landscapes*
8	12	Strategi Konservasi dan Restorasi	*Conservation and Restoration Strategies*
9	13	Kebijakan Lingkungan dan Tata Kelola	*Environmental Policies and Governance*
10	14-15	Studi kasus dan riset terapan	*Case Studies and Applied research*
12	**16**	**FINAL EXAM: End of Semester Exam**	

2. **EVALUATION PLAN FORMAT**

NO	EVALUATION BASIS	BOBOT (%)	EVALUATION COMPONENTS	DESCRIPTION INDONESIAN LANGUAGE	DESCRIPTION ENGLISH
1	Participatory activities	25			
2	Project results	25			
3	Cognitive/Knowledge	10	Tasks	*Tugas 1 -4 dalam SSP*	*Assignments 1 - 4 from Basic Course Outline*
		10	Quiz	*Kuis dari setiap topik*	*Quiz every topic*
		15	Midterm Exam	*Pertanyaan-pertanyaan didasarkan pada indikotor sub CPMK 1-4*	*Test items are based on indicators of learning objectives 1 to 4.*
		15	End of Semester Exam	*Pertanyaan-pertanyaan didasarkan pada indikotor sub CPMK5-8*	*Test items are based on indicators of learning objectives 5 to 8*

SEMESTER LEARNING PLAN (RPS)

	NUSA CENDANA UNIVERSITY **POST GRADUATE PROGRAM** **MASTER'S PROGRAM ENVIRONMENTAL SCIENCE**	**DOCUMENT CODE** **19**

SEMESTER LEARNING PLAN (RPS)

COURSE (MK)	**CODE**	**RUMPUN MK**	**WEIGHT (SKS)**		**SEMESTER**	**Date of Preparation**
Waste Management	IPSAL 63225	***Elective courses***	**T=2**	**P=1**	**3**	**05- 09 - 2023**

AUTHORIZATION/ ENDORSE MENT **Postgraduate Director, Deputy Director I,**	**RPS Developer Lecturer**	**MK Coordinator**	**Coordinator of Master's Environmental Science Study Program**
Dr. Karolus K Medan SH MHum NIP 196204221990031001 Date: January 5, 2024	Dr. Ir. Alfred O. M. Dima, M.Si	Dr. Ir. Jacob Ratu, M.Kes NIP. 19690522 199512 1 001 Date: January 6, 2024	(Dr. Ir. Alfred O. M Dima, M.Si) NIP. 197004102000121001 January 26, 2024

Learning Outcomes	CLO-PRODI Charged to MK	
	PLO 1	: able to understand in depth the physical, chemical, and biological systems that support the environment.
	PLO 5	: be able to be aware of the social and cultural factors that influence environmental issues and be able to work effectively with diverse communities and stakeholders.
	PLO 9	: be able to design and implement environmental research projects, collect and analyze data, and interpret results to make evidence-based decisionsment.
	PLO 10	: be able to develop and implement environmental policies and strategies that address complex environmental challenges and promote sustainable development.

Course Learning Outcomes (CPMK)	
CPMK-1	Be able to Identify different types of waste, their sources, and potential environmental and health impacts.
CPMK-2	Be able to Waste Treatment and Sustainable Management : Apply appropriate waste treatment, recycling, and disposal technologies for effective waste management.
CPMK-3	Be able toAnalyze national and international regulations, policies, and best practices in waste management.
CPMK-4	Be able to Develop sustainable waste management strategies through community engagement and circular

End Capability of each learning stage (Sub-CPMK)	
Sub-CPMK1	*Introduction to Waste Management :Definition, classification*, and *Sources of waste, and Impact of waste on the environment and human health*
Sub-CPMK2	*Municipal, Industrial, and Hazardous Waste : Characteristics* and *Management of different types of waste and Case studies on waste issues in dryland and island regions*
Sub-CPMK3	Waste Treatment Technologies : *Physical, chemical, and biological treatment methods* and *Innovative and sustainable waste processing techniques*
Sub-CPMK4	Recycling and Circular Economy : *Waste reduction strategies and resource recovery* and *Circular economy principles and their applications in waste management*
Sub-CPMK5	Regulatory Framework and Policies : *National and international waste management regulations* and *Policy implementation and compliance challenges*
Sub-CPMK6	Community-Based Waste Management : *Role of communities in sustainable waste management* and *Case studies of successful community-led waste initiatives*
Sub-CPMK7	Waste-to-Energy Conversion : *Technologies for energy recovery from waste* and *Environmental and economic considerations of waste-to-energy projects*
Sub-CPMK8	Sustainable Waste Management in Dryland and Island Ecosystems : *Challenges and opportunities in remote and resource-limited areas* and *Integrated approaches for managing waste in environmentally sensitive regions*

Correlation of CPMK to Sub-CPMK								
	Sub-CPMK1	Sub-CPMK2	Sub-CPMK3	Sub-CPMK4	Sub-CPMK5	Sub-CPMK6	Sub-CPMK7	Sub-CPMK8
CPMK1	√	√	√	√	√	√	√	√
CPMK2	√	√	√	√	√	√	√	√
CPMK 3	√	√	√	√	√	√	√	√
CPMK 4	√	√	√	√	√	√	√	√

Brief description of the course	This course provides an in-depth understanding of waste management principles, technologies, and policies within the context of environmental sustainability. It covers waste classification, sources, and environmental and health impacts, with a focus on municipal, industrial, and hazardous waste. Students will explore waste treatment technologies, circular economy models, and innovative waste-to-energy conversion methods. A significant emphasis is placed on regulatory frameworks, both national and international, as well as policy implementation challenges. The course also examines community-based waste management strategies and integrated waste management approaches in dryland and island ecosystems, particularly relevant to regions like East Nusa Tenggara (NTT). Through case studies and research projects, students will develop analytical skills to assess waste management strategies and propose sustainable solutions that align with global best practices and local environmental conditions. The course follows an **Outcome-Based Education (OBE)** approach to ensure practical applications in environmental science and policy-making.

Study Material: Learning Materials	1. *Introduction to Waste Management :Definition, classification,* and *Sources of waste, and Impact of waste on the environment and human health* 2. *Municipal, Industrial, and Hazardous Waste : Characteristics* and *Management of different types of waste and Case studies on waste issues in dryland and island regions* 3. Waste Treatment Technologies : *Physical, chemical, and biological treatment methods* and *Innovative and sustainable waste processing techniques* 4. Recycling and Circular Economy : *Waste reduction strategies and resource recovery* and *Circular economy principles and their applications in waste management* 5. Regulatory Framework and Policies : *National and international waste management regulations* and *Policy implementation and compliance challenges* 6. Community-Based Waste Management : *Role of communities in sustainable waste management* and *Case studies of successful community-led waste initiatives* 7. Waste-to-Energy Conversion : *Technologies for energy recovery from waste* and *Environmental and economic considerations of waste-to-energy projects* 8. Sustainable Waste Management in Dryland and Island Ecosystems : *Challenges and opportunities in remote and resource-limited areas* and *Integrated approaches for managing waste in environmentally sensitive regions*
Library	**Main:**
	1. Tietenberg, T., & Lewis, L. (2018). Environmental and Natural Resource Economics (11th ed.). Routledge. 2. Phaneuf, D. J., & Requate, T. (2017). A Course in Environmental Economics: Theory, Policy, and Practice. Cambridge University Press.Harris, J. M., & Roach, B. (2018). Environmental and Natural Resource Economics: A Contemporary Approach (4th ed.). Routledge. 3. Chancel, L. (2020). Unsustainable Inequalities: Social Justice and the Environment. Harvard University Press. 4. Saito, K. (2020). Capital in the Anthropocene. Shueisha. 5. Gupta, S. K., & Gupta, P. (2020). *Integrated Waste Management: An Introduction*. CRC Press. https://www.routledge.com/Integrated-Waste-Management-An-Introduction/Gupta-Gupta/p/book/9780367894966 6. Suthar, S., & Singh, P. (2021). *Solid Waste Management: Principles and Practice*. Springer. https://link.springer.com/book/10.1007/978-3-030-72389-9 7. Kumar, S., & Kumar, R. (2019). *Waste Management: An Introduction*. Wiley. https://www.wiley.com/en-us/Waste+Management%3A+An+Introduction-p-9781119509851 8. Tchobanoglous, G., & Kreith, F. (2022). *Handbook of Solid Waste Management*. McGraw-Hill Education. https://www.mheducation.com/highered/product/handbook-solid-waste-management-tchobanoglous-kreith/M9780071356237.html 9. Suthar, S., & Singh, P. (2021). *Solid Waste Management: Principles and Practice*. Springer. https://link.springer.com/book/10.1007/978-3-030-72389-9 10. Rahman, A., & Bagastyo, A. Y. (2021). Solid Waste Management in Island Communities: Case Study in Arjasa District, Kangean Island. *Journal of Environmental Management and Sustainability*, 5(3), 123-135.
	Supporters:
	1. Hsu, Y.-C., Dille, P., Cross, J., Dias, B., & Sargent, R. (2018). Community-Empowered Air Quality Monitoring System. *arXiv preprint arXiv:1804.03293*. 2. Wolff, E., French, M., Ilhamsyah, N., Sawailau, M. J., & Ramirez-Lovering, D. (2021). Collaborating with Communities: Citizen Science Flood Monitoring in Urban Informal Settlements. *arXiv preprint arXiv:2112.07128*. 3. Danielsen, F., Jensen, P. M., Burgess, N. D., Coronado, I., & Holt, S. (2021). Testing Focus Groups as a Tool for Connecting Indigenous and Local Knowledge on Abundance of Natural Resources with Science-Based Land Management Systems. *Conservation Letters*, 14(2), e12726. 4. Johnson, N., Alessa, L., Behe, C., Danielsen, F., & Gearheard, S. (2021). The Contributions of Community-Based Monitoring and Traditional Knowledge to Arctic Observing Networks: Reflections on the State of the Field. *Arctic*, 74(1), 1-13.

	5. Pulsifer, P. L., Laidler, G. J., Taylor, D. R. F., & Hayes, A. (2021). Towards an Indigenist Data Management Program: Reflections on Experiences Developing an Atlas of Sea Ice Knowledge and Use. *The Canadian Geographer/Le Géographe Canadien*, 65(1), 1-17. 6. Russell, D. E. (2021). Arctic Borderlands Ecological Knowledge Cooperative: Can Local Knowledge Inform Caribou Management? *Rangifer*, 41(1), 1-12. 7. Huntington, H. P. (2021). The Local Perspective. *Nature*, 594(7863), 9-9. 8. Pulsifer, P. L., Laidler, G. J., Taylor, D. R. F., & Hayes, A. (2021). Towards an Indigenist Data Management Program: Reflections on Experiences Developing an Atlas of Sea Ice Knowledge and Use. *The Canadian Geographer/Le Géographe Canadien*, 65(1), 1-17.
Lecturer	1. Dr. Ir. Alfred O. M. Dima, M.Si 2. Dr. Refli, M.Sc 3. Fidelis Nitti, S.Si., M.Sc., Ph.D
Course Requirements	None

Mg-	**End ability of each Learning stage (Sub-CPMK)**	**Assessment**		**Learning Forms; Learning Methods; Student Assignments Estimated Time**		**Learning Materials**	**Assessment Weight (%)**
		Indicator	**Assessment Criteria**				
(1)	**(2)**	**(3)**	**(4)**	**Offline (5)**	**Online (6)**	**(7)**	**(8)**
1	Understand an overview of the course: description, objectives, materials, methods and relevance of the course.	--	--	--	--	--	--
2	Sub-CPMK-1 : Understand and Explain *Definition, classification*, and *Sources of waste, and Impact of waste on the environment and human health*	1.1. Accuracy and Ability to Identify and Classify Waste Types 1.2. Accuracy in Explaining and Assess Environmental and Health Impacts of Waste 1.3.Accuracy in Understanding of Waste Management Hierarchy and Sustainability Principles	**Criteria**: Scoring guidelines (Marking Scheme) **Non-test technique:** • Summarize • Quiz 1	• **Lecture** • **Discussion** **[PB: 1x(2x50")]** **Assignment 1:** Summarize the lecture with examples. **[PT+KM1 (1+1)x(2x60")]**	LMS Undana	*Introduction to Waste Management :Definition, classification*, and *Sources of waste, and Impact of waste on the environment and human health*	5

3	Sub-CPMK-2: Analyze and explain *Characteristics* and *Management of different types of waste and Case studies on waste issues in dryland and island regions*	2.1. Capability to Analyzes the physical, chemical, and biological properties of municipal, industrial, and hazardous waste. 2.2. Accuracy in Examines case studies of waste accumulation, marine pollution, and landfill limitations in dryland and island regions.. 2.3.Accuracy in Evaluates policy and technological interventions to improve waste management sustainability in dryland and island ecosystems.	**Criteria**: Scoring guidelines (Marking Scheme) **Non-test technique:** • Summarize • Quiz 2	• **Lecture** • **Discussion** **[PB: 1x(2x50")]** **Task 2:** Compile a summary of the lecture in question For example. **[PT+KM1 (1+1)x(2x60")]**	LMS Undana	*Municipal, Industrial, and Hazardous Waste : Characteristics* and *Management of different types of waste and Case studies on waste issues in dryland and island regions*	10
4-5	Sub-CPMK-3: Analyze and Evaluate *Physical, chemical, and biological treatment methods* and *Innovative and sustainable waste processing techniques*	3. 1. Capability to Compares the advantages and limitations of each treatment method based on waste characteristics and environmental impact. 3.2. Accuracy in Assesses the environmental, economic, and social impacts of waste treatment technologies. 3.3. Accuracy in Explores emerging technologies such as bio-remediation, pyrolysis, gasification, and advanced recycling processes. 3.4. Accuracy in Identifies potential improvements and innovations in existing waste processing systems for better environmental outcomes.	**Criteria**: Holistic Rubric **Non-test technique:** Quiz 3	• **Lecture** • **Discovery learning**	LMS Undana	Waste Treatment Technologies : *Physical, chemical, and biological treatment methods* and *Innovative and sustainable waste processing techniques*	15

6-7	Sub-CPMK-4: Identify and Analyze *Waste reduction strategies and resource recovery* and *Circular economy principles and their applications in waste management*	4. 1. Accuracy in Analyzes the effectiveness of waste minimization techniques in various sectors, such as manufacturing, agriculture, and urban environments. 4.2.Accuracy in Examines methods for recovering valuable materials from waste, such as recycling, composting, and energy recovery. 4.3. Accuracy in Explores the role of circular economy concepts, such as product life cycle extension, remanufacturing, and industrial symbiosis, in waste management. 4.4. Capability to Evaluates the feasibility and challenges of transitioning from a linear to a circular waste management system.	**Criteria**: Holistic Rubric **Non-test technique:** Compile a report on the results of field observations • Quiz 4	• **Lecture** • **Discussion** **[PB: 1x(2x50")]** **Task 3:** Lessons Learned and Best Practices of successful circular economy implementation in waste management at local, national, and global levels. • **[PT+KM1 (1+1)x(2x60")]**	LMS Undana	Recycling and Circular Economy : *Waste reduction strategies and resource recovery* and *Circular economy principles and their applications in waste management* .	10
8	**UTS (Midterm Exam): Validate assessment results, evaluate and improve the next learning process.**						
9-10	Sub-CLO 5: Analyze and Evaluate *National and international waste management regulations* and *Policy implementation and compliance challenges*	5. 1. Accuracy in Identifies key national and international waste management policies, including Basel Convention, EU Waste Framework Directive, and country-specific regulations. 5.2.Accuracy in Analyzes the role of government institutions, private sector	**Criteria**: Descriptive Rubric **Non-test technique:** Quiz 5	• **Lecture** • **Case study** • **Discussion**	LMS Undana	Regulatory Framework and Policies : *National and international waste management regulations* and *Policy implementation and compliance challenges*	15

		participation, and public awareness in implementing waste management policies. 5.3.Capability to Assesses compliance monitoring strategies and their effectiveness in reducing illegal dumping and waste mismanagement. 5.4. Accuracy in Analyzes how waste policies contribute to achieving Sustainable Development Goals (SDGs) and circular economy transitions.				. .	
11-12	Sub-CLO 6: Assess and Analyze *Role of communities in sustainable waste management* and *Case studies of successful community-led waste initiatives*	6.1. Accuracy in Evaluates the level of community awareness and participation in waste sorting, composting, and recycling programs. 6.2. Accuracy in Analyzes how community-driven waste programs contribute to job creation, economic empowerment, and poverty reduction. 6.3. Accuracy in dentifies common obstacles faced by community-based waste initiatives, such as funding constraints, policy support, and behavioral change. 6.4. Accuracy in evaluates how these models can be replicated or adapted to different socio-	**Criteria**: Holistic Rubric **Non-test technique:** Make a work report • Quiz 6	• **Lecture** • **Case study** • **Debate** **[PB: 1x(2x50")]** **Task 4:** Comparative Case Studies of Community Waste Initiatives : key success factors, including strong leadership, stakeholder collaboration, and local government support Solo City **[PT+KM1 (1+1)x(2x60")]**	LMS Undana	Community-Based Waste Management : *Role of communities in sustainable waste management* and *Case studies of successful community-led waste initiatives*	15

		environmental contexts.					
13	Sub-CLO 7: Review, analyze, and explore *Technologies for energy recovery from waste* and *Environmental and economic considerations of waste-to-energy*	7.1. Accuracy in Evaluates different Waste-to-Energy(WTE) technologies (incineration, anaerobic digestion, pyrolysis, gasification) based on energy efficiency and environmental impact. 7.2. Accuracy in Assesses greenhouse gas emissions, air pollution, and residual waste from different WTE processes. 7.3. Accuracy in Analyzes the cost-effectiveness of WTE projects, including initial investment, operational costs, and long-term financial benefits.	**Criteria**: Descriptive Rubric **Non-test technique:** Quiz 7	• **Lecture** • **Team-based** • **Discussion**	LMS Undana	Waste-to-Energy Conversion : *Technologies for energy recovery from waste* and *Environmental and economic considerations of waste-to-energy projects* .	15
14-15	Sub-CPMK-8: Assessing and evaluate *Challenges and opportunities in remote and resource-limited areas* and *Integrated approaches for managing waste in environmentally sensitive regions*	8.1. Accuracy in Evaluates limitations in waste collection, transportation, and disposal infrastructure in remote and resource-limited areas. 8.2. Accuracy in Analyzes the feasibility of decentralized waste treatment solutions such as composting, biogas production, and small-scale recycling initiatives. 8.3. Accuracy in Assesses the role of local communities in waste	**Criteria**: Descriptive Rubric **Non-test technique:** Product result writing • Quiz 8	• **Lecture** • **Team-based** • **Discussion** **[PB: 1x(2x50")]** **Task 5:** Compare the Role of Local Communities in Waste Management Initiatives in Kupang City: A Case Study of Two Waste Banks in Kupang City	LMS Undana	Sustainable Waste Management in Dryland and Island Ecosystems : *Challenges and opportunities in remote and resource-limited areas* and *Integrated approaches for managing waste in environmentally sensitive regions*	15

		management initiatives, including behavioral change, education, and policy acceptance. 8.4. Accuracy in Evaluates the effectiveness of integrated approaches combining government regulations, private sector involvement, and community-driven solutions.					
				[PT+KM1 (1+1)x(2x60")]			
16	**UAS (End of Semester Exam): Validate the final assessment and determine student graduation.**						**100**

FORMAT OF LEARNING PLAN AND EVALUATION OF CASE SOLVER COURSE ON "INTRODUCTION TO EDUCATION"

1. LESSON PLAN FORMAT

NO	MEETING	MATERIAL (INDONESIAN)	SUBJECT (ENGLISH)
1	1	Gambaran Umum Mata Kuliah: deskripsi, tujuan, materi, metode, penilaian, dan relevansi mata kuliah.	*General picture of the subject: course description, objectives, learning materials, methods, evaluation and subject relevance*
2	2	Pengantar Pengelolaan Sampah: Definisi, klasifikasi, dan sumber sampah, serta dampaknya terhadap lingkungan dan kesehatan manusia.	*Introduction to Waste Management :Definition, classification,* and *Sources of waste, and Impact of waste on the environment and human health*
3	3	Sampah Perkotaan, Industri, dan Berbahaya: Karakteristik dan pengelolaan berbagai jenis sampah serta studi kasus tentang permasalahan sampah di wilayah lahan kering dan kepulauan.	*Municipal, Industrial, and Hazardous Waste : Characteristics* and *Management of different types of waste and Case studies on waste issues in dryland and island regions*
4	4,5	Teknologi Pengolahan Sampah: Metode pengolahan fisik, kimia, dan biologi serta teknik pengolahan sampah yang inovatif dan berkelanjutan.	Waste Treatment Technologies : *Physical, chemical, and biological treatment methods* and *Innovative and sustainable waste processing techniques*
5	6,7	Daur Ulang dan Ekonomi Sirkular: Strategi pengurangan sampah dan pemulihan sumber daya serta prinsip ekonomi sirkular dan penerapannya dalam pengelolaan sampah.	Recycling and Circular Economy : *Waste reduction strategies and resource recovery* and *Circular economy principles and their applications in waste management*
6	**8**	UTS: Ujian Teangah Semester	***Mid-Semester Exam***
7	9, 10	Kerangka Regulasi dan Kebijakan: Regulasi pengelolaan sampah di tingkat nasional dan internasional serta tantangan dalam implementasi dan kepatuhan kebijakan.	Regulatory Framework and Policies : *National and international waste management regulations* and *Policy implementation and compliance challenges*
8	11,12	Pengelolaan Sampah Berbasis Komunitas: Peran komunitas dalam pengelolaan sampah yang berkelanjutan serta studi kasus inisiatif komunitas yang berhasil dalam pengelolaan sampah.	Community-Based Waste Management : *Role of communities in sustainable waste management* and *Case studies of successful community-led waste initiatives*
9	13	Konversi Sampah Menjadi Energi: Teknologi pemanfaatan energi dari sampah serta pertimbangan lingkungan dan ekonomi dalam proyek waste-to-energy.	Waste-to-Energy Conversion : *Technologies for energy recovery from waste* and *Environmental and economic considerations of waste-to-energy projects*
10	14-15	Pengelolaan Sampah Berkelanjutan di Ekosistem Lahan Kering dan Kepulauan: Tantangan dan peluang di daerah terpencil dan dengan sumber daya terbatas serta pendekatan terpadu untuk pengelolaan sampah di wilayah yang sensitif terhadap lingkungan.	Sustainable Waste Management in Dryland and Island Ecosystems : *Challenges and opportunities in remote and resource-limited areas* and *Integrated approaches for managing waste in environmentally sensitive regions*
11	**16**	**FINAL EXAM: End of Semester Exam**	

2. **EVALUATION PLAN FORMAT**

NO	EVALUATION BASIS	BOBOT (%)	EVALUATION COMPONENTS	DESCRIPTION INDONESIAN LANGUAGE	DESCRIPTION ENGLISH
1	Participatory activities	25			
2	Project results	25			
3	Cognitive/Knowledge	10	Tasks	*Tugas 1 - 5 dalam SSP*	*Assignments 1 - 5 from Basic Course Outline*
		10	Quiz	*Kuis dari setiap topik*	*Quiz every topic*
		15	Midterm Exam	*Pertanyaan-pertanyaan didasarkan pada indikotor sub CPMK 1-4*	*Test items are based on indicators of learning objectives 1 to 4*
		15	End of Semester Exam	*Pertanyaan-pertanyaan didasarkan pada indikotor sub CPMK 5-8*	*Test items are based on indicators of learning objectives 5to 8*