UNESA	**UNIVERSITAS NEGERI SURABAYA** **FACULTY OF MATHEMATICS AND NATURAL SCIENCE** **UNDERGRADUATE PROGRAMME OF CHEMISTRY**	**Document Code**

SEMESTER LEARNING ACTIYITY PLAN

COURSE	CODE	Course Group	Credit Unit		Semester	Date
Environmental Chemistry			T=3	P=1	7	January 6 2020

AUTHORIZATION CHEMISTRY	Compiler	Coordinator	Head of Study Program
	Prof. Dr. Suyono, M.Pd	Prof. Dr. Suyono, M.Pd	Dr. Amaria, M.Si.

Learning Outcomes		
	Program Learning Outcomes (PLO)	
	PLO 1 (KNO-1)	Able to master the concepts of structure, dynamics and energy, as well as the basic principles of separation, analysis, synthesis, and characterization of micromolecular compounds and their applications
	PLO 2 (KNO-2)	Able to master the basic principles and knowledge of how to operationalize instruments for the analysis and characterization of compounds, as well as utilizing ICT for modeling more specific molecules
	PLO 5 (COM-1)	Able to apply logical, critical, systematic and innovative thinking in the context of the development or implementation of science and technology by observe and applying the value of humanities in accordance with the field of chemistry in solving problems
	PLO 6 (COM-2)	Able to master the basics of the scientific method, designing and conducting research, compiling scientific reports and communicating them both verbally and in writing by utilizing information and communication technology
	PLO 7 (SOC-1)	Able to build teamwork and have entrepreneurial skills that are environmental perspective, and make the right, honest and responsible decisions in solving problems of chemistry and have social sensitivity as a obligation of citizens and religious communities
	Course Learning Outcomes (CLO)	

	CLO1	Students have knowledge about the sources, reactions, displacement, effects, and changes of chemical species in the air, water and soil, the reciprocal effect of human activities on all of these, and Environmental Impact Analysis (AMDAL)
	CLO2	Students are skilled at using tools in conducting experiments on water quality parameters from the environment
	CLO3	Students have the ability to cooperate and are responsible for discussing knowledge about 1) sources, reactions, displacement, effects, and changes in chemical species in air, water and soil, 2) The reciprocal influence of human activities on all the so-called in no.1 and 3) Environmental impact analysis (AMDAL)
	CLO4	Students have the ability to communicate knowledge about 1) sources, reactions, displacement, effects, and changes in chemical species in the air, water and soil, 2) The reciprocal influence of human activities on all those mentioned in no. 1 and 3) Environmental impact analysis (AMDAL)
	Sub CLO	
	Sub-CLO1	Understanding the sources, reactions, transfer effects and changes of chemical species in water, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment
	Sub-CLO2	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment
	Sub-CLO3	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment
	Sub-CLO4	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)
Brief Description of the Course	Study of 1) sources, reactions, displacement, effects, and changes of chemical species in the air, water, and soil, 2) Reciprocal influence of human activities on all those mentioned in no.1 and 3) Environmental Impact Assessment (AMDAL) accompanied by supporting laboratory activities so that students are able to master related concepts, are skilled at using tools, are able to work together and can communicate their knowledge and skills scientifically	
Study Materials: Learning Materials	1. Water structure and physical properties, water microorganisms, chemical reactions in water, wastewater treatment systems and water quality parameters (chemical parameters: Pb, Hg, pH, chloride, Cd, organic, other metals, total solid, hardness, dye, pesticide, BOD, COD, detergent content; physical parameters: Water color, odor, turbidity, temperature; biological parameters: e-coli bacteria) 2. The structure of the atmosphere, the chemical composition of air, particulates in the air, chemical reactions in the air and research related to air (Polutants carbon monoxide (CO), particulate matter (PM 10), Smog, Sulfur dioxide (SO2), Volatile organics (VOC) and hydrogen sulfide (H2S))	

	3. Lithosphere structure, soil chemical composition, soil particulates, chemical reactions in soil and soil related research penelitian (Plastic pollutants, glass cans, metals, fertilizers, Styrofoam, and residual waste on the ground) 4. preparation of EIA and related legislation from within the country and from abroad
Reference	**Main :**
	1. Manahan, S.E. 1994. *Environmental Chemistry*. London: Lewis Publishers CRC Pres.Inc 2. Radojevic, Miroslav and Bashkin, Vladimir N, 1999, *Practical Environmental Analysis*, Cambridge : Royal Society of Chemistry
	Additional :
	1. De, Anil Kumar. 1987. *Environmental Chemistry*. India: Willey Eastern Limited. 2. Faust, S.D and Aly, O.M.1981. *Chemistry of Natural Water.* London: Ann Arbor Science 3. More, J.W. and More, E.A., 1976. *Environmental Chemistry*. New York: Academic Press. 4. Appropriate scientific articles
Lecturer	Prof. Dr. Suyono, M.Pd Dr. Amaria, M.Si Dina Kartika Maharani, M.Sc Rusmini S.Pd, M.Si
Prerequisite courses	Instrumental Analysis, Organic Chemistry 3, Inorganic Chemistry 3

Meeting	**The final ability of each activity**	**Assessment**		**Learning Forms, Learning Methods, Student Assignment**		**Reference**	**Rating Weight (%)**
		Indicator	**Criteria & Form**	***Offline***	***online***		
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1	- Understanding environmental chemistry in general - Understand the sources, reactions, transfer effects and changes of chemical species in water and the	- Understanding environmental chemistry in general - Explaining the hydrosphere and research related to the aquatic environment	Non test/ student activity observation sheet Essay writing test		lecture, discussion, question and answer		

	mutual influence of human activities on the air, water and soil environment	- Explaining water quality parameters					
2	Understanding the sources, reactions, transfer effects and changes of chemical species in water and the mutual influence of human activities on the air, water and soil environment	- Understanding the sources, reactions, transfer effects and changes in chemical species of lead (Pb), and Mercury (Hg) in water as well as the reciprocal influence of human activities on the air, water and soil environment along with preventive and curative efforts - Practicing water quality parameters (Color, odor, pH, chloride)	- Non test/ student activity observation sheet, presentation grading sheet - Non test/ assignment and report practicum		- lecture, discussion, presentation, question and answer - practicum		
3	Understanding the sources, reactions, transfer effects and changes of chemical species in water and the mutual influence of human activities on the air, water and soil environment	- Understanding the sources, reactions, transfer effects and changes in chemical species of polytan Cd, bacteria, in water and the reciprocal influence of human activities on the air, water	- Non test/ student activity observation sheet, presentation grading sheet - Non test/ assignment and report practicum		- lecture, discussion, presentation, question and answer - practicum		

		and soil environment along with preventive and curative measures - Practicing water quality parameters (organic, metallic, total solid, hardness)					
4	Understanding the sources, reactions, transfer effects and changes of chemical species in water and the mutual influence of human activities on the air, water and soil environment	- Understanding the sources, reactions, transfer effects and changes in chemical species of dyes, and pesticides in water as well as the reciprocal effects of human activities on the air, water and soil environment along with preventive and curative measures - Practicing water quality parameters (BOD, COD, detergen)	- Non test/ student activity observation sheet, presentation grading sheet - Non test/ assignment and report practicum		- lecture, discussion, presentation, question and answer - practicum		
5	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of	Explaining about the atmosphere and research related to the air environment	Essay writing Test Non test/ student activity observation sheet,		lecture, discussion, , question and answer		

	human activities on the air, water and soil environment						
6	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species of carbon monoxide (CO), particulate matter (PM 10) and Smog in the air and the reciprocal effects of human activities on the air, water and soil environment along with preventive and curative measures	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
7	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species of Sulfur dioxide (SO2), Volatile organics (VOC) and hydrogen sulfide (H2S) in the air and the mutual influence of human activities on the air, water and soil environment accompanied by preventive and curative measures	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		

8	**Mid-Term Exam**						
9	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Explaining the lithosphere and research related to the soil environment	Essay writing Test Non test/ student activity observation sheet,		lecture, discussion, question and answer		
10	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species from plastics, glass and metal cans, as well as fertilizers in the soil and the reciprocal effects of human activities on the air, water and soil environment along with preventive and curative measures	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
11	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species from styrofoam, detergents and residual waste in the soil and the reciprocal influence of human activities on the air, water and soil	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		

		environment along with preventive and curative measures					
12	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	Explaining ways to conduct an environmental impact analysis (AMDAL) and applicable laws	Essay writing test		lecture, discussion, question and answer		
13	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	preparation of EIA and related legislation from within the country and from abroad	assignment		Discussion, and survey		
14	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	presentation of the results of the preparation of the AMDAL and the results of the survey	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
15	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	presentation of the results of the preparation of the AMDAL and the results of the survey	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
16	**Final Exams**						**100**