



MINISTRY OF EDUCATION, CULTURE, RESEARCH, AND TECHNOLOGY
UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
CHEMISTRY EDUCATION DEPARTMENT
CHEMISTRY EDUCATION STUDY PROGRAMME

COURSE LEARNING PLAN

COURSE NAME	CODE	CLASS COURSES	CREDIT (SKS)	SEMESTER	DATE	
Environmental Chemistry	KIM 6314	Compulsory Course	2	6	11 November 2021	
Authorization	Lecturer		Coordinator of Educational Courses		Coordinator of Study Programme	
	Erfan Priyambodo, M.Si.		Sukisman Purtadi, M.Pd.		Dr. Antuni Wiyarsi, M.Sc.	
Learning Outcomes	PLO	LO (Learning Outcomes)				
	PLO1	A1: Cooperate and have social sensitivity and concern for society and the environment				
	PLO2					
	PLO3	K3: Understand the theoretical concepts and applications of chemical structure, dynamics, and energy, separation, analysis, synthesis and characterization (content knowledge) as the basis for carrying out chemical education research				
	PLO4	GS: Able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing science and technology that pays attention to and applies humanities values in accordance with the research field of chemistry education				
	PLO5					
	PLO6	SS1: Planning, managing, and evaluating chemistry learning in schools according to the characteristics of the material (content knowledge) and the characteristics of students, learning approaches, learning resources, learning media (pedagogical knowledge), as well as relevant information and communication technology (technological knowledge) innovative and adaptive.				
		SS3: Developing problem-solving plans in supporting educational programs for sustainable development and increasing the relevance of chemistry education to society				
	CO (Course Outcomes)					
	CO-A	Students are able to show the value of honesty, independence and responsibility in determining attitudes towards the environment				
	CO-K	Students are able to analyze various environmental problems and solve these problems using their chemical concepts.				
	CO-GS	Students are able to collaborate with colleagues to make the right decisions related to solving various problems in the environment.				
CO-SS	Students are able to analyze various pollutants in the environment and propose appropriate solutions to minimize and reduce the impact of these pollutants on the environment.					
Course Description	This course provides students with experience in analysing chemical concepts related to the interaction of chemicals with the biotic, abiotic, and social environment. Lecture materials focus on the sources, reactions, transportation, effects and condition of chemical species in the air, water, and soil environment, as well as the influence of human activities on these processes. Lectures are carried out with discussions, demonstrations, and assignments that provide students with experience in solving environmental problems. The environmental problems are related to the local context issues.					
Content	<ol style="list-style-type: none"> 1. Sources of Environmental Pollution 2. Atmospheric Pollution 3. Soil Pollution 4. Water Pollution 					

	5. Toxic Substances 6. Environmental Chemistry for Sustainable Development	
References	Main References	
	U1. Priyambodo, E. (2021) Kimia Lingkungan: Tinjauan secara Socio Scientific Issue untuk Pembangunan Berkelanjutan. U2. Lichtfouse, E., Schwarzbauer, J., Robert, D. (2005). Environmental Chemistry: Green Chemistry and Pollutants in Ecosystems. Berlin: Springer. U3. Andrews, J.E., Brimblecombe, P., Jickells, T.D., Liss, P.S. & Reid, B.J. (2004). An Introduction of Environmental Chemistry 2 nd ed. Oxford: Blackwell Publishing U4. Radojevic, M. & Bashkin, V. N. (1999) Practical environmental Analysis. Cambridge: Royal Society of Chemistry. U5. Alloway, B.J. & Ayers, D.C. (1994) Chemical Principles of Environmental Pollution. London: Blackie	
	Supporting References	
	P1. Harrison, R.M. (1992). Understanding our Environment: An Introduction to Environmental Chemistry and Pollution 2 nd ed. Cambridge: Royal Society of Chemistry. P2. North, C.M., Rice, M.B., Ferkol, T., Gozal, D., Hui, C., Jung, S.H., Kuribayashi, K., McCormack, M.C., Mishima, M., Morimoto, Y., Song, Y., Wilson, K.C., Kim, W.J., & Fong, K.M. (2019) Air Pollution in the Asia-Pacific Region. A Joint Asian Pacific Society of Respiriology/American Thoracic Society Perspective. Am. J. Respir. Crit. Care Med. 199: 693–700. doi: 10.1164/rccm.201804-0673PP. P3. Other relevant journal articles	
Forms of Learning Media	Software	Hardware
	PPT BESMART	Board and Stationery Projector
Team-Teaching	-	
Language	English	
Prerequisite Course		

Learning Activities

Week	Sub-CO	Content	Learning Experiences	Assessment Technique	References
1	Students are able to understand the scope of chemistry in environment.	<ul style="list-style-type: none"> Introduction Chemistry and the environment 	<ul style="list-style-type: none"> Discussion about course learning plan Question-Answer regarding the scope of chemistry in environment 	Observation of students' activities	U1 – U5, PI – P3
2	Students are able to analyze the sources of environmental pollution	Sources of environmental pollution	Discussion and Question-Answer regarding the sources of environmental pollution, i.e. natural sources & human activities	Observation of students' activities and assignment Task I: Analysis the sources of environmental pollution	U1 – U5, PI – P3
3	<ul style="list-style-type: none"> Students are able to explain gases that are included in GHGs 	Green house gases (GHGs) and climate changes	Discussion and Question-Answer regarding the GHGs	Observation of students' activities and quiz.	U1 – U5, PI – P3

Week	Sub-CO	Content	Learning Experiences	Assessment Technique	References
	– students are able to explain the relationship between the greenhouse effect and climate change		and how its affected the global climate	Quiz I: GHGs and gloal climate changes	
4	Students are able to analyze the depletion of the ozone layer by ODSs	Stratospheric ozone depletion	Discussion and Question-Answer regarding the ozone depletion	Observation of students' activities and quiz. Quiz II: ozone depletion	U1 – U5, PI – P3
5	Students are able to analyze sources and kinds of air pollutants in urban areas	Urban air pollution	Discussion and Question-Answer regarding the sources and kinds of air pollutants in urban areas	Observation of students' activities	U1 – U5, PI – P3
6	Students are able to explain acid deposition affected by air pollution	Acid deposition	Discussion and Question-Answer regarding acid deposition affected by air pollution	Observation of students' activities and quiz. Quiz III: Acid deposition	U1 – U5, PI – P3
7	Students are able to analyze sources and kinds of soil pollutants	Soil pollution	Discussion and Question-Answer regarding the sources and kinds of soil pollutants	Observation of students' activities and assignment Task II: Analysis the sources of soil pollution	U1 – U5, PI – P3
8	Midterm exam			Online exam through BeSmart	
9	Students are able to explain hydrological cycle and how its affected the availability of drinking water	Hydrological cycle and availability of drinking water	Discussion and Question-Answer regarding the hydrological cycle and how its affected the availability of drinking water	Observation of students' activities and quiz. Quiz IV: Hydrological cycle	U1 – U5, PI – P3
10	Students are able to analyze sources and kinds of freshwater and marine water pollutants	Freshwater and marine water pollution	Discussion and Question-Answer regarding the sources and kinds of freshwater and marine water pollutants	Observation of students' activities and assignment Task III: Analysis the kinds of freshwater and marine water pollutants	U1 – U5, PI – P3
11	Students are able to examine the distribution, dynamics and fate of pollutants, the	Ecotoxicological chemistry	Discussion and Question-Answer regarding the distribution, dynamics and fate of pollutants	Observation of students' activities and assignment	U1 – U5, PI – P3

Week	Sub-CO	Content	Learning Experiences	Assessment Technique	References
	biologic and toxic effects of man-made chemical pollutants on ecotoxicological animal models and plants.			Task IV: Analysis the distribution, dynamics and fate of pollutants in environment	
12	Students are able to analyze the distribution, dynamics and fate of heavy metals in environment	Environmental chemistry of heavy metals	Discussion and Question-Answer regarding the distribution, dynamics and fate of heavy metals in environment	Observation of students' activities	U1 – U5, PI – P3
13	Students are able to analyze the distribution, dynamics and fate of organics pollutants in environment	Organic xenobiotics	Discussion and Question-Answer regarding distribution, dynamics and fate of organics pollutants in environment	Observation of students' activities Quiz V: Organic xenobiotics	U1 – U5, PI – P3
14	Students are able to analyze the environment critical loads regarding to the pollutants	Environmental critical loads	Discussion and Question-Answer regarding the environment critical loads	Observation of students' activities and assignment Task V: Social media campaign: Environmental chemistry for sustainable development	U1 – U5, PI – P3
15	Students are able to examine the treatment of the waste before its released to the environment	Waste treatment	Discussion and Question-Answer regarding treatment of the waste before its released to the environment	Observation of students' activities	U1 – U5, PI – P3
16	Final Exam			Online exam through BeSmart	

ASSESSMENT

No.	Assessment Component	Weight
1.	Student activities	15
2.	Assignments (Task & Quiz)	45
3.	Midterm exam	20
4.	Final exam	20
Total		100%

$$\text{Students' Mark} = \frac{(\text{Activity} \times 15) + (\text{assignment} \times 45) + (\text{midterm exam} \times 20) + (\text{final exam} \times 20)}{100}$$

