COURSE PORTFOLIO

Mathematical Chemistry
Academic Year – 2020/2021

PLO 1	Able to apply religious attitudes, demonstrate an internalizing academic and human values
PLO 2	Able to demonstrate excellence, honesty, competitiveness, leadership, and possessing social sensitivity to society and the environment
PLO 3	Able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner
PLO 4	Able to communicate ideas, scientific research results clearly in oral or written format to scientists and the wider community
PLO 5	Able to Integrating mathematical and basic concepts of science to solve problems in chemistry
PLO 6	Able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical
PLO 7	Able to understand concepts and applications in the field of biosciences and materials chemistry to solve problems in the field of chemistry and its applications
PLO 8	Able to understand operational knowledge about functions, how to operate chemical instruments, and analysis of data and information from these instruments
PLO 9	Able to understand work safety, ethics, environmental issues, and policies related to the chemical field
PLO 10	Able to carry out laboratory and research work by paying attention to the safety and security of laboratory work and applying responsible scientific behavior.
PLO 11	Able to obtain, process, interpret, and evaluate scientific data and produce conclusions by considering scientific and technological aspects and scientific ethics.
PLO 12	Able to solve science and technology problems in chemistry independently based on relevant scientific methodologies and present it as a scientific work.

Course Outcome (CO):

CO 1.	Apply the principles of the exponential number of a number form
CO 2.	Applying logarithmic theorems, significant figures, conversion factors in cases of mathematical chemistry problems
CO 3.	Creating relationships between variables in a "functional relationship"
CO 4.	Generate the solution form of an equation of Differential Calculus
CO 5.	Generate the solution form of an Integral Calculus equation

CO 6.	Distinguish between a Taylor series and a Maclaurin series in a mathematical series
CO 7.	Examine a mathematical equation based on the principles of complex numbers
CO 8.	Differentiate the types of matrices and their solutions
CO 9.	Distinguish between Improper Integral, Double Integral, and Fractional Integral
CO 10.	Analyze the relationship of variables through a polar coordinate
CO 11.	Analyzing mathematical theorems on work and heat research, enthalpy functions, and heat capacity in the Laws of Thermodynamics
CO 12.	Analyzing the logarithm theorem for determining the pH of a solution
CO 13.	Analyze the integral theorem on the zero-order, first-order, and second-order integrated rate law concepts

Lecturers:

1. **Dr. Afrizal, M.Si.**
2. **Dr. Hanhan Dianhar, M.Si.**
3. **Dr. Darsef, M.Si.**
4. **Yussi Pratiwi, M.Sc.**

Mapping Course Learning Outcome (CO) and Program Learning Outcome (PLO)

Program Learning Outcome / **Course Outcome**	PLO 3. Able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner	PLO 6. Able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical)
CO 1. Apply the principles of the exponential number of a number form	● (Assignment)	
CO 2. Applying logarithmic theorems, significant figures, conversion factors in cases of mathematical chemistry problems	● (Assignment)	
CO 3. Creating relationships between variables in a "functional relationship"	● (Assignment)	

CO 4. Generate the solution form of an equation of Differential Calculus		• (Midterm Exam)
CO 5. Generate the solution form of an Integral Calculus equation	• (Assignment)	
CO 6. Distinguish between a Taylor series and a Maclaurin series in a mathematical series	• (Assignment)	
CO 7. Examine a mathematical equation based on the principles of complex numbers	• (Assignment)	
CO 8.Differentiate the types of matrices and their solutions		• (Midterm Exam)
CO 9. Distinguish between Improper Integral, Double Integral, and Fractional Integral	• (Assignment)	
CO 10. Analyze the relationship of variables through a polar coordinate	• (Assignment)	
CO 11. Analyzing mathematical theorems on work and heat research, enthalpy functions, and heat capacity in the Laws of Thermodynamics	• (Assignment)	
CO 12. Analyzing the logarithm theorem for determining the pH of a solution	• (Assignment)	
CO 13. Analyze the integral theorem on the zero-order, first-order, and second-order integrated rate law concepts		• (Final Exam)

Forms of Assessment

Group/Individuals Assignment	= 30%
Quiz	= 10%
Midterm examination	= 30%
Final examination	= 30%
Total	= 100%

	PLO 3 Critical Thinking	PLO 5 Problem Solving
Group/Individuals Assignment	50 %	50 %
Quiz	40 %	60 %
Midterm examination	40 %	60 %
Final examination	30 %	70 %

Outcomes Assessment

No	Nama	Assignment	Quiz	Midterm Exam	Final Exam	Final Score and Grade	
1	A	85	80	77	78	80,00	B+
2	B	85	80	77	78	79,50	B+
3	C	85	80	77	78	79,50	B+
4	D	85	80	82	81	81,90	A-
5	E	85	80	69	65	73,20	B
6	F	85	80	77	74	78,30	B+
7	G	85	80	87	82	83,70	A-
8	H	85	80	77	72	77,70	B+
9	I	85	80	87	82	83,70	A-
10	J	85	80	72	68	75,00	B
11	K	85	80	77	74	78,30	B+
12	L	85	80	77	74	78,30	B+
13	M	85	80	77	74	78,30	B+
14	N	85	80	72	62	73,20	B
15	O	85	80	77	67	76,20	B+

16	P	85	80	68	58	70,80	B-
17	Q	85	80	77	67	76,20	B+
18	R	85	80	87	77	82,20	A-
19	S	85	80	77	67	76,20	B+
20	T	85	80	82	72	79,20	B+
21	U	85	80	35	25	51,00	B-
22	V	85	80	77	67	76,20	B+
23	W	85	80	77	67	76,20	B+
24	X	85	80	77	67	76,20	B+
25	Y	85	80	77	67	76,20	B+
26	Z	85	80	72	62	73,20	B
27	AA	85	80	77	67	76,20	B+
28	AB	85	80	87	77	82,20	A-
29	AC	85	80	77	67	76,20	B+
30	AD	85	80	82	72	79,20	B+
31	AF	85	80	77	67	76,20	B+
32	AG	85	80	77	67	76,20	B+
33	AH	85	80	77	67	76,20	B+
34	AI	85	80	77	67	76,20	B+
35	AJ	85	80	90	80	84,00	A-
36	AK	85	80	77	67	76,20	B+
37	AL	85	80	82	72	79,20	B+
38	AM	85	80	75	65	75,00	B
39	AN	85	80	77	67	76,20	B+
40	AO	85	80	77	67	76,20	B+
41	AP	85	80	82	72	79,20	B+
42	AQ	85	80	80	70	78,00	B+

Calculation of Weight per PLO

Form of Assessment	Weight	Weight per PLO		Total	Total Weight	
		PLO 3	PLO 5		PLO 3	PLO 5
Assignment	0,30	0,50	0,50	1,00	0,15	0,15
Quiz	0,10	0,40	0,60	1,00	0,04	0,06
Midterm Exam	0,30	0,40	0,60	1,00	0,12	0,18
Final Exam	0,30	0,30	0,70	1,00	0,09	0,21
Total	1,00	1,60	2,40	1,00	0,40	0,60

Example of PLO Calculation

No	Name	Assignment	Quiz	Midterm Exam	Final Exam	Final Score and Grade	
1	A	85	80	77	78	80,00	B+

No	Name	PLO 3	PLO 5
1	A	((85*0.15) + 80*0.04) + (77*0.12)+(78*0.09)) / 0.40 = 80.53	((85*0.15) + 80*0.06) + (77*0.18)+(78*0.21)) / 0.60 = 79.65

PLO Assessment Rubric

PLO	Performance Criteria	Excellent (E)	Good (G)	Satisfy (S)	Fail (F)
3	Demonstrate performance independently or as part of a team professionally and measurably by applying	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary

	interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner	knowledge and skill, critical, and creative thinking in the context of being a lifelong learner, at with a score of at least 80.	knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of at least 70 and less than 80..	knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of at least 70 and less than 80.	knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of less than 60.
6	Mathematical and basic concepts of science to solve problems in chemistry.	Students are able to Integrating mathematical and basic concepts of science to solve problems in chemistry at with a score of at least 80.	Students are able to Integrating mathematical and basic concepts of science to solve problems in chemistry with a score of at least 70 and less than 80.	Students are able to Integrating mathematical and basic concepts of science to solve problems in chemistry with a score of at least 70 and less than 80.	Students are able to Integrating mathematical and basic concepts of science to solve problems in chemistry with a score of less than 60.

Example of PLO Predicates for Each Student

No	Name	PLO 3	PLO 5
1	A	80.53 Excellent	79.65 Good

PLO Predicates for All Students

No.	Name	Assignment	Midterm Exam	Final Exam	Grade
1	A	85	80	77	B+
2	B	85	80	77	B+
3	C	85	80	77	B+
4	D	85	80	82	A-

PLO 3	PLO 6	PLO 3	PLO 6
80,53	79,65	E	G
80,53	79,65	E	G
80,53	79,65	E	G
82,70	82,20	E	E

5	E	85	80	69	B		75,20	72,70	G	G
6	F	85	80	77	B+		79,63	78,25	G	G
7	G	85	80	87	A-		84,43	84,05	E	E
8	H	85	80	77	B+		79,18	77,55	G	G
9	I	85	80	87	A-		84,43	84,05	E	E
10	J	85	80	72	B		76,78	74,65	G	G
11	K	85	80	77	B+		79,63	78,25	G	G
12	L	85	80	77	B+		79,63	78,25	G	G
13	M	85	80	77	B+		79,63	78,25	G	G
14	N	85	80	72	B		75,43	72,55	G	G
15	O	85	80	77	B+		78,05	75,80	G	G
16	P	85	80	68	B-		73,33	69,95	G	S
17	Q	85	80	77	B+		78,05	75,80	G	G
18	R	85	80	87	A-		83,30	82,30	E	E
19	S	85	80	77	B+		78,05	75,80	G	G
20	T	85	80	82	B+		80,68	79,05	E	G
21	U	85	80	35	B-		56,00	48,50	F	F
22	V	85	80	77	B+		78,05	75,80	G	G
23	W	85	80	77	B+		78,05	75,80	G	G
24	X	85	80	77	B+		78,05	75,80	G	G
25	Y	85	80	77	B+		78,05	75,80	G	G
26	Z	85	80	72	B		75,43	72,55	G	G
27	AA	85	80	77	B+		78,05	75,80	G	G
28	AB	85	80	87	A-		83,30	82,30	E	E
29	AC	85	80	77	B+		78,05	75,80	G	G
30	AD	85	80	82	B+		80,68	79,05	E	G
31	AF	85	80	77	B+		78,05	75,80	G	G
32	AG	85	80	77	B+		78,05	75,80	G	G

33	AH	85	80	77	B+	78,05	75,80	G	G
34	AI	85	80	77	B+	78,05	75,80	G	G
35	AJ	85	80	90	A-	84,88	84,25	E	E
36	AK	85	80	77	B+	78,05	75,80	G	G
37	AL	85	80	82	B+	80,68	79,05	E	G
38	AM	85	80	75	B	77,00	74,50	G	G
39	AN	85	80	77	B+	78,05	75,80	G	G
40	AO	85	80	77	B+	78,05	75,80	G	G
41	AP	85	80	82	B+	80,68	79,05	E	G
42	A	85	80	80	B+	79,63	77,75	G	G

Distribution of PLO Achievements

		PLO 3	PLO 6
%	E	30,95238095 %	14,28571429 %
%	G	66,66666667 %	80,95238095 %
%	S	0 %	2,380952381 %
%	F	2,380952381 %	2,380952381 %
		100%	100%

Achievement Percentage of PLO