	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Chemistry Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Advanced Organic Chemistry: Reaction Mechanisms	4720102119		T=2	P=0	ECTS=3.18	5	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dr. Amaria, M.Si.

Learning model	**Project Based Learning**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PLO-PO Matrix

	P.O

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description	Study of the intramolecular properties of organic compounds (electrical and steric effects), determining non-kinetic reaction mechanisms, substitution, addition and elimination reaction mechanisms, predicting products that are likely to occur and products that are expected to be dominant based on kinetic control and thermodynamic control. Lectures are carried out using discussion, presentation and problem solving methods
References	**Main :**

1. Fessenden,R. J. and Fessenden, J. S. (1998).Organic Chemistry. 6th Edition. New York:Cole Publishing Company.
2. GouldE. S (1964,).Mechanism and structure inOrganic Chemistry. USA: Holt, Rinehart and Winston.
3. Smith,M. B. & March, J. (2007).March 19sAdvanced Organic Chemistry.6th ed. New York: John Wiley &Sons, Inc.
4. Bansal, R. K. (1998).Organic Reaction Mechanism.3rded. New York: Tata Mc Graw Hill Publishing Company Limited
5. Knipe, A. C. & Watts, W. E. (2003).Organic Reaction Mechanism. New York:John Wiley & Sons, Inc.
6. Solomon, T. W. G. &Fryhle, C. B. (2011). Organic Chemistry. 10th Edition. New York: John Wiley & Sons, Inc.

	Supporters:
Supporting lecturer	ISMONO Prof. Dr. Suyatno, M.Si. Prof. Dr. Tukiran, M.Si.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

1	1. Students understand the Advanced Organic Chemistry lecture system2. Students can explain orbitals and their role in covalent bonds	1. Explain the RPS, lecture system, assessment system, determination of graduation, and rules for Advanced Organic Chemistry lectures2. Explain bonding and antibonding orbitals. 3. Explain the hybrid orbitals of carbon, nitro gen, oxygen. 4. Explain about conjugated double bonds, resonance (electon shift, main and additional contributors, resonance stability). 5. Explain the role of resonance in influencing compound stability.	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
2	Able to explain the intramolecular properties of organic compounds	1. Describe the induction effect and mesomery effect and their influence on the acidic and basic properties of organic compounds 2. Explain the hyperconjugation effect and its influence on the stability of organic compounds 3. Distinguish between the steric hindrance effect and the steric assistance effect	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and 1 X 1 assignments			0%
3	Able to explain the non-kinetic determination of organic chemical reaction mechanisms	1. Mention 9 ways to determine organic chemical reaction mechanisms non-kinetically 2. Explain at least 5 ways to determine organic chemical reaction mechanisms non-kinetically	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
4	Able to explain the mechanism of the SN2 reaction and the factors that influence the rate of SN-2 in an organic compound	1. Explain the difference between nucleophility and basicity 2. Explain the SN2 mechanism both in terms of stereochemistry, the impact of energy on rate and product, the influence of structure on reaction rate, steric hindrance on rate correctly	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%

5	Explain the mechanism of the SN-1 reaction and the factors that influence the rate of the SN-1 reaction	1. Explain the mechanism of SN1 both in terms of stereochemistry. 2. Explain the factors that influence the stability of carbocation. 3. Explain the factors that cause rearrangement in carbocation. 4. Predict the dominant product from the reaction using the SN1 mechanism for compounds that have alkyl groups. 5. Predict the dominant product from the reaction using the SN1 mechanism for compounds that have allylic and benzylic groups. 6. Distinguish between reaction results using the SN-2 and SN-1 mechanisms	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
6	Be able to explain the mechanism of the E-1 and E-2 reactions, as well as the factors that influence the reaction rates of E-1 and E-2	1. Explain the mechanism of E1 and E2 in terms of stereochemistry and isotope effects. 2. Distinguish between which alkene compounds are formed based on Saytseff's and Hofmann's rules. 3. Explain the factors that influence reactions E1 and E2. 4. Distinguish between the results of reactions using the E2 and E1 mechanisms	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
7	Be able to explain the mechanism of the E-1 and E-2 reactions, as well as the factors that influence the reaction rates of E-1 and E-2	1. Explain the mechanism of E1 and E2 in terms of stereochemistry and isotope effects. 2. Distinguish between which alkene compounds are formed based on Saytseff's and Hofmann's rules. 3. Explain the factors that influence reactions E1 and E2. 4. Distinguish between the results of reactions using the E2 and E1 mechanisms	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
8	Midterm exam	Midterm exam	**Criteria:** Attached	Midterm Exam 2 X 50			0%

9	Students can explain the reaction mechanism of free radicals	1. Explain the mechanism of free radical reactions. 2. Predict the products that will form from free radicals and predict the dominant products. 3. Explain the stages that determine the rate of free radical reactions. 4. Explain the selectivity reactions that occur with free radicals. 5. Explain the role of free radicals in everyday life	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
10	Be able to explain the reaction mechanisms in organometallics	1. Explain the role of Grignard reagents. 2. Explain the reactivity of Grignard reagents. 3. Explain the role of other metal organ compounds (other than Mg).	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
11	Be able to explain the mechanism of addition reactions	1. Explain reactions based on the Markovnikov rule 2. Explain reactions based on the anti-Markovnikov rule 3. Explain the addition reactions of H2SO4, H2O, Borane 4. Explain the addition reactions of 1,2 and 1,4	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
12	Be able to explain the mechanism of addition reactions	1. Explain reactions based on the Markovnikov rule 2. Explain reactions based on the anti-Markovnikov rule 3. Explain the addition reactions of H2SO4, H2O, Borane 4. Explain the addition reactions of 1,2 and 1,4	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
13	Be able to explain the bonds in benzene, the stability of benzene, and the aromaticity of a compound	1. Explain the bonds in benzene. 2. Predict about the stability of benzene. 3. Explain the requirements for aromatic compounds	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%

14	Be able to explain the first electrophilic aromatic substitution	1. Explain the mechanism of the first electrophilic aromatic substitution reaction from halogenination. 2. Explain the role of isotopes in the mechanism of the first electrophilic aromatic substitution reaction. 3. Explain the mechanics of the first electrophilic aromatic substitution reaction from nitration. 4. Explain the mechanics of the first electrophilic aromatic substitution reaction from alkylation. 5. Explain the mechanism of the first electrophilic aromatic substitution reaction from acylation	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
15	Be able to explain the second and third electrophilic aromatic electrophilic substitutions as well as the mechanism of nucleophilic reactions in aromatic compounds	1. Explain the mechanics of the second electrophilic aromatic substitution reaction. 2. Explain the mechanics of the second electrophilic aromatic substitution reaction with ortho and para direction. 3. Explain the mechanics of the second electrophilic aromatic substitution reaction with a meta-director. 4. Explain the mechanics of the third electrophilic aromatic substitution reaction. 5. Explain the aromatic substitution reaction mechanism, nucleophilic mechanism 6. Explain the concept of synthesis using benzene compounds	**Criteria:** Attached	Presentations, questions and answers, discussions, problem solving, and assignments 2 X 50			0%
16	Understand the concepts in advanced organic chemistry courses	Understand the concepts in advanced organic chemistry courses	**Criteria:** Attached	Final Semester Examination (UAS) 2 X 50			0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.