



**Universitas Negeri Surabaya
Faculty of Engineering
, Undergraduate Culinary Education Study Program**

**Document
Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																																																																			
Applied Chemistry	8321102026	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	1	December 3, 2023																																																																																			
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																																																																				
	Dr. Ir. Asrul Bahar, S.TPd., M.Pd. & Ratna Palupi Nurfatimah, S.TP., M.T.P.		Dr. Ir. Asrul Bahar, S.TPd., M.Pd.			Dr. Hj. Sri Handajani, S.Pd., M.Kes.																																																																																				
Learning model	Project Based Learning																																																																																									
Program Learning Outcomes (PLO)	PLO study program which is charged to the course																																																																																									
	PLO-9	Able to design, carry out, analyze and implement research results in the field of Culinary Education																																																																																								
	Program Objectives (PO)																																																																																									
	PO - 1	Mastering concepts in the field of food chemistry related to structure, properties, composition and chemical changes that occur during processing and storage.																																																																																								
	PO - 2	Understand the major chemical reactions that limit the shelf life of food.																																																																																								
	PO - 3	Able to apply the knowledge gained in the field of food chemistry, and have the initiative in educating the public in the field of food.																																																																																								
	PLO-PO Matrix																																																																																									
		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50%;">P.O</td> <td colspan="6">PLO-9</td> </tr> <tr> <td>PO-1</td> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>PO-2</td> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>PO-3</td> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>						P.O	PLO-9						PO-1							PO-2							PO-3																																																													
	P.O	PLO-9																																																																																								
	PO-1																																																																																									
PO-2																																																																																										
PO-3																																																																																										
PO Matrix at the end of each learning stage (Sub-PO)																																																																																										
	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td rowspan="2" style="width: 10%;">P.O</td> <td colspan="16">Week</td> </tr> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td> </tr> <tr> <td>PO-1</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>PO-2</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>PO-3</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>						P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																	PO-2																	PO-3																
P.O	Week																																																																																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																																																										
PO-1																																																																																										
PO-2																																																																																										
PO-3																																																																																										
Short Course Description	Study and understanding of food chemical compounds in the field of Culinary Affairs which includes practical problem solving and increasing understanding of food ingredient analysis, taste and aroma development in food products. Learning is carried out using discussion methods, presentations and practice solving example problems. Some of the components that may be covered in this course are; Basic chemistry, food ingredients and chemical composition, chemical reactions in cooking, and chemical analysis in culinary arts.																																																																																									
References	Main :																																																																																									
	<ol style="list-style-type: none"> 1. De Man, John M. 1990. Principle of Food Chemistry , 2nd ed . An AV1 book, Van Nostrang Reinhold, New York. 2. Fennemas. 2007. Food Chemistry. 4th Edition, edited by Srinivasan Damodaran, CRC Press. 																																																																																									
References	Supporters:																																																																																									
	<ol style="list-style-type: none"> 1. Burdge, Julia, 2011, Chemistry 2nd Ed, New York, McGraw-Hill. 2. Fennema, O.R., 1996. Food Chemistry. Edisi Ketiga. New York : Marcel Dekker, Inc. 3. Freeland-Graves, Jeanne H, Gladys C. Peckham. 1987. Foundation of Food Preparation , 5th ed . Macmillan Publication. 4. Hadyana Pudjaatmaka, A.1999. Ilmu Kimia Untuk Universitas Jilid 1. Jakarta : Erlangga. 5. Winarno, F. G. 1997. Kimia Pangan dan Gizi. Gramedia Jakarta. 																																																																																									

Supporting lecturer		Dra. Hj. Suhartiningsih, M.Pd. Dr. Ir. Asrul Bahar, M.Pd.					
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	Able to understand the description of Food Chemistry learning within the scope of Culinary Management.	<ol style="list-style-type: none"> 1.Explains learning methods and rules, as well as the importance of the Food Chemistry course. 2.Explains the description of Food Chemistry in the scope of culinary arts. 3.Explains basic chemical concepts such as elements, compounds, molecules and chemical reactions as well as the relationship between chemistry and culinary arts. 	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>		<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Explanation of lecture rules, explanation of food chemistry, relationship between food chemistry and cooking.</p> <p>References: <i>De Man, John M. 1990. Principles of Food Chemistry, 2nd ed. An AV1 book, Van Nostrang Reinhold, New York.</i></p>	5%
2	Able to understand the structure, properties and function of the main constituent substances of food ingredients as well as chemical reactions during the food processing process.	<ol style="list-style-type: none"> 1.Explain the structure, properties and function of the main constituent substances of food (WATER, macronutrients, micronutrients, additives, acids, bases and salts, as well as molecular gastronomy). 2.Explain the consequences of chemical changes that occur during food processing and storage. 	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>		<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom.</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: - Brief knowledge of chemical elements of food (water, macronutrients, micronutrients, additives, acid base salt) and molecular gastronomy. Chemical reactions in food processing. - Explanation of student assignments.</p> <p>Bibliography: <i>Fennemas. 2007. Food Chemistry. 4th Edition, edited by Srinivasan Damodaran, CRC Press.</i></p>	5%
3	<ol style="list-style-type: none"> 1.Able to understand water material (structure, physicochemical properties, function, chemical reactions in food processing). 2.Have knowledge to control chemical reactions caused by water in food. 	<ol style="list-style-type: none"> 1.Explain the structure, physicochemical properties, functions, chemical reactions of water in food processing. 2.Identify and describe the properties and chemical reactions that occur in a particular food product. 	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>		<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 x 50</p>	<p>Material: Chemical structure of water, Role of water in food, Physicochemical properties of water, Degree of attachment of water, Active transport, Water Activity, Water content, Relationship between the two, Chemical reactions of water in the food processing process.</p> <p>References: <i>Burdge, Julia, 2011, Chemistry 2nd Ed, New York, McGraw-Hill.</i></p>	5%

4	<p>1.Able to understand Carbohydrate material (structure, physicochemical properties, function, chemical reactions in food processing).</p> <p>2.Have knowledge to control chemical reactions caused by the presence of carbohydrates in food.</p>	<p>1.Explain the structure, physicochemical properties, function, chemical reactions of carbohydrates in food processing.</p> <p>2.Identify and describe the properties and chemical reactions that occur in a particular food product.</p>	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>		<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition of carbohydrates, sources of carbohydrates, classification of carbohydrates, qualitative analysis methods for carbohydrates, digestibility of carbohydrates, influence of food processing.</p> <p>References: <i>Fennema, OR, 1996. Food Chemistry. Third Edition. New York : Marcel Dekker, Inc.</i></p>	5%
5	<p>1.Able to understand Protein material (structure, physicochemical properties, function, chemical reactions in food processing).</p> <p>2.Have knowledge to control chemical reactions caused by the presence of protein in food.</p>	<p>1.Explain the structure, physicochemical properties, function, chemical reactions (chemical changes that occur when food ingredients undergo processing and their relationship to changes in flavor, color and texture) of proteins in food processing.</p> <p>2.Identify and describe the properties and chemical reactions that occur in a particular food product.</p>	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>		<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition of amino acids, classification of amino acids, definition of proteins, physicochemical properties of proteins, classification of proteins, structure of proteins, chemical reactions of proteins, functional properties of proteins.</p> <p>Bibliography: <i>Freeland-Graves, Jeanne H, Gladys C. Peckham. 1987. Foundations of Food Preparation, 5th ed. Macmillan Publications.</i></p>	5%
6	<p>1.Able to understand Fat material (structure, physicochemical properties, function, chemical reactions in food processing).</p> <p>2.Have knowledge to control chemical reactions caused by the presence of fat in food.</p>	<p>1.Explain the structure, physicochemical properties, function, chemical reactions of fats in food processing.</p> <p>2.Identify and describe the properties and chemical reactions that occur in a particular food product.</p>	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>		<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition of fat, structure of fat, glyceride derivatives, types of fat, function of fat, deficiency of fat, nature of fat, sensory properties of fat, causes of damage to fat, processed products from fat.</p> <p>Reference: <i>Hadyana Pudjaatmaka, A. 1999. Chemistry for Universities Volume 1. Jakarta: Erlangga.</i></p>	5%

7	Ability to briefly explain: A. Characteristics of food products B. Processing raw materials C. Processing	Explains paper assignments about food chemistry which underlies the properties and chemical reactions of various food components (related to water, carbohydrates, proteins and fats).	Criteria: Refers to UNESA standards Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment		-Learning method: Discovery learning (TM: 7 (1x50')) (PT: 7 (1x50')) -Task-1: Make an observation paper and PPT presentation 2 X 50	Material: - Students choose food products. - Students must write an individual short paper (max 15 pages) about the chemical properties that underlie the properties and reactions of various food components, apply knowledge of food chemistry to control reactions in food, the main chemical reactions that limit the shelf life of food, and their causes. - Students explain changes in food characteristics and control of reactions in food during processing, distribution and storage. - Students present the results of their work during learning. References: <i>Winarno, FG 1997. Food Chemistry and Nutrition. Gramedia Jakarta.</i>	5%
8	MIDTERM EXAM		Form of Assessment : Test		2 X 50		10%
9	1. Able to understand Vitamin material (structure, physicochemical properties, function, chemical reactions in food processing). 2. Have knowledge to control chemical reactions caused by the presence of vitamins in food.	1. Explain the structure of vitamins 2. Explain the properties of vitamins 3. Explain the benefits of vitamins in food	Criteria: Refers to UNESA standards Form of Assessment : Participatory Activities		Form of learning: Virtual face-to-face lecture via e-learning and zoom (online). Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50	Material: Definition of Vitamins, Vitamin Needs, Classification of Vitamins, Fat Soluble Vitamins (Vit. A, D, E, K), Water Soluble Vitamins (Vit. B, C). Types and classification of vitamins, Composition, properties and chemical structure of water-soluble and fat-soluble vitamins, Effect of processing on the stability of water-soluble and fat-soluble vitamins, Factors causing loss of vitamins. Bioavailability of Vitamins. References: <i>De Man, John M. 1990. Principles of Food Chemistry, 2nd ed. An AV1 book, Van Nostrang Reinhold, New York.</i>	5%
10	1. Able to understand Mineral material (structure, physicochemical properties, function, chemical reactions in food processing). 2. Have knowledge to control chemical reactions caused by the presence of minerals in food.	1. Explain the structure of minerals 2. Explain the properties of minerals 3. Explains methods of utilizing minerals in food	Criteria: Refers to UNESA standards Form of Assessment : Participatory Activities		Form of learning: Virtual face-to-face lecture via e-learning and zoom (online). Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 10	Material: Definition of minerals, Function of minerals for the body, Mineral Needs, Mineral Classification, Effect of food processing on minerals, Mineral fortification, Physicochemical properties of minerals, Macro and Micro minerals, Heavy metal contamination. Bibliography: <i>Fennemas. 2007. Food Chemistry. 4th Edition, edited by Srinivasan Damodaran, CRC Press.</i>	5%

11	<p>1. Able to understand Acid Base and Salt material (structure, physicochemical properties, function, chemical reactions in food processing).</p> <p>2. Have knowledge to control chemical reactions caused by the presence of acids, bases and salts in food.</p>	<p>1. Explain the meaning of acids and bases</p> <p>2. Explain the properties of acids and bases</p> <p>3. Explain how to identify acids and bases</p> <p>4. Identify the function of acids and bases in food</p> <p>5. Identify the effect of acids and bases on food</p> <p>6. Explain the concept of salt compounds</p> <p>7. Describe the properties of salt Describe the types of salt</p>	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>	<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition and properties of acids, Definition and properties of bases, Differences in properties of acids and bases, definition of salt, Identification of acids, bases and salts, theory of acids and bases, application in food processing, buffer solutions.</p> <p>Bibliography: <i>Fennemas. 2007. Food Chemistry. 4th Edition, edited by Srinivasan Damodaran, CRC Press.</i></p>	5%
12	<p>1. Able to understand Food Additives material (structure, physicochemical properties, function, chemical reactions in food processing).</p> <p>2. Have knowledge to control chemical reactions caused by the presence of BTM in food.</p>	<p>Explain the structure, physicochemical properties, function, chemical reactions of various dyes in food processing.</p>	<p>Criteria: Refers to UNESA standards</p>	<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition of dyes, classification of dyes, natural dyes, synthetic dyes, types of dyes, functions, chemical reactions and the role of pigments in food processing.</p> <p>References: <i>Burdge, Julia, 2011, Chemistry 2nd Ed, New York, McGraw-Hill.</i></p>	5%
13	<p>1. Able to understand Food Emulsifier material (structure, physicochemical properties, function, chemical reactions in food processing).</p> <p>2. Have knowledge to control chemical reactions caused by the presence of emulsifiers in food.</p>	<p>1. Explain the definition and function of food emulsifiers, as well as the right types of emulsifiers for food.</p> <p>2. Explain the application of emulsifiers in food processing and emulsifiers in food products.</p>	<p>Criteria: Refers to UNESA standards</p>	<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition of emulsifier, function of emulsifier, structure of emulsifier, types of emulsifier, basis for selecting emulsifier, hydrophilic-lipophilic balance (HLB), application of emulsifier in food processing, application of emulsifier in food products.</p> <p>References: <i>Fennema, OR, 1996. Food Chemistry. Third Edition. New York : Marcel Dekker, Inc.</i></p>	5%
14	<p>Able to analyze and apply molecular gastronomy techniques.</p>	<p>1. Explain the definition of molecular gastronomy</p> <p>2. Explain the basic principles of molecular gastronomy</p> <p>3. Explains molecular gastronomy techniques</p> <p>4. Explains molecular gastronomy dishes</p>	<p>Criteria: Refers to UNESA standards</p> <p>Form of Assessment : Participatory Activities</p>	<p>Form of learning: Virtual face-to-face lecture via e-learning and zoom (online).</p> <p>Learning methods: Assignment presentations, lectures, discussions and questions and answers. 2 X 50</p>	<p>Material: Definition of molecular gastronomy, Basic principles of molecular gastronomy, Molecular gastronomy techniques, Molecular gastronomy dishes</p> <p>Bibliography: <i>Freeland-Graves, Jeanne H, Gladys C. Peckham. 1987. Foundations of Food Preparation, 5th ed. Macmillan Publications.</i></p>	5%

15	Able to apply the knowledge gained in the field of food chemistry to educate the public in the field of food	Explain the application of the knowledge gained in the field of food chemistry, and have the initiative in educating the public in the field of food	Criteria: Refers to UNESA standards Form of Assessment : Project Results Assessment / Product Assessment		-Learning method: Project based learning (BM: 15 (2x50')) -Task-2: Make an observation paper and PPT presentation 2 X 50	Material: - Students in groups choose a specified topic - Make a poster about food chemistry which aims to educate the public - The poster highlights chemical reactions or chemical changes during product processing, storage and distribution (solutions/innovations to maintain product shelf life). References: <i>De Man, John M. 1990. Principles of Food Chemistry, 2nd ed. An AV1 book, Van Nostrang Reinhold, New York.</i>	5%
16	FINAL EXAMS		Form of Assessment : Test		2 X 50		20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	52.5%
2.	Project Results Assessment / Product Assessment	7.5%
3.	Test	30%
		90%

Notes

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Forms of assessment:** test and non-test.
- 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.
- 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.
- Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 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%.
- TM=Face to face, PT=Structured assignments, BM=Independent study.