



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

Document Code

**SEMESTER LEARNING PLAN**

<b>Courses</b>	<b>CODE</b>	<b>Course Family</b>	<b>Credit Weight</b>	<b>SEMESTER</b>	<b>Compilation Date</b>		
Modern Physics	4720103029		T=3   P=0   ECTS=4.77	3	July 18, 2024		
<b>AUTHORIZATION</b>		<b>SP Developer</b>	<b>Course Cluster Coordinator</b>	<b>Study Program Coordinator</b>			
		.....	.....	Dr. Amaria, M.Si.			
<b>Learning model</b>	<b>Case Studies</b>						
<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program that is charged to the course</b>						
	<b>Program Objectives (PO)</b>						
	<b>PLO-PO Matrix</b>						
		P.O					
<b>Short Course Description</b>	This course examines the concepts of modern physics which include the theory of relativity, the principle of wave and particle duality, quantum mechanics, hydrogen atoms, atoms with many electrons, molecules, solids, and the atomic nucleus.						
<b>References</b>	<b>Main :</b>						
	1. Beiser, A. 2003. Concepts of Modern Physics , 6th Ed. USA: McGraw-Hill Companies. 2. Burns, M.L. 2012. Modern Physics for Science and Engineering, 1st Ed. USA: Physics Curriculum & Instruction, Inc.						
	<b>Supporters:</b>						
<b>Supporting lecturer</b>	ABDUL AZIS ABDULLAH Dr. I Gusti Made Sanjaya, 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	Understand the dynamics of the development of modern physics	Explain the function of modern physics Explain the benefits of modern physics	<b>Criteria:</b> according to the performance assessment rubric	Presentation and discussion 3 X 50			0%

P.O

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

2	Understand the theory of relativity	Explain the concept and theory of special relativity Explain the concept and theory of general relativity	<b>Criteria:</b> written test assessment criteria	Presentation and discussion 3 X 50			0%
3	Understand the principle of wave-matter dualism and the principle of wave-matter dualism	Explaining the principle of wave-matter dualism. Explaining the principle of wave-matter dualism	<b>Criteria:</b> written test assessment criteria	Presentation and discussion 3 X 50			0%
4	Understand the basics of quantum mechanics	Explain the postulates underlying quantum mechanics	<b>Criteria:</b> written test assessment criteria	Presentation and discussion 3 X 50			0%
5	Understand the properties of wave functions used in quantum mechanics	Explain the characteristics of the wave function in quantum mechanics	<b>Criteria:</b> Written test assessment criteria	Presentation and discussion 3 X 50			0%
6	Understand the use of the time-dependent Schrodinger equation	Explain the use of the time-dependent Schrodinger equation	<b>Criteria:</b> written test assessment criteria	Presentation and discussion 3 X 50			0%
7	Understanding the expectation value in measuring the value of physical quantities with quantum mechanics	Determining the expected value of a physical quantity	<b>Criteria:</b> written test assessment criteria	Presentation, discussion and practice questions 3 X 50			0%
8	MID-SEMESTER EXAMINATION	MID-SEMESTER EXAMINATION	<b>Criteria:</b> TEST ASSESSMENT CRITERIA	MIDDLE SEMESTER EXAMINATION 3 X 50			0%
9	Understand the use of the time-independent Schrodinger equation	Explain the use of the Schrodinger equation independent of time	<b>Criteria:</b> written test assessment criteria	Presentation and discussion 3 X 50			0%
10	Understanding the particle-in-a-box problem	Determining quantum levels of translational energy	<b>Criteria:</b> written test assessment criteria	Presentation, discussion and practice questions 3 X 50			0%
11	Understanding energy quantum levels in the harmonic oscillator model	Determine the energy levels and energy transitions of vibrational motion	<b>Criteria:</b> written test assessment criteria	Presentation, discussion and practice questions 3 X 50			0%
12	Understand the quantum mechanics of the hydrogen atom	Explain the quantum mechanics of the hydrogen atom	<b>Criteria:</b> written test assessment criteria	Presentation and discussion 3 X 50			0%
13	Understanding the quantum mechanics of many-electron atoms	Analyzing the differences in the results of applying quantum mechanics to atoms with many electrons	<b>Criteria:</b> written test assessment criteria	Presentation, discussion and practice questions 3 X 50			0%
14	Understand the formation of a molecule	Explain the models of bonds in a molecule	<b>Criteria:</b> written test assessment criteria	Presentation, discussion and practice questions 3 X 50			0%
15	Understand the characteristics of solid substances	Explain the characteristics of solid substances	<b>Criteria:</b> according to the performance test rubric	Making reports, presentations and discussions 3 X 50			0%

16	FINAL EXAMS	FINAL EXAMS		FINAL EXAMINATION OF SEMESTER 3 X 50			0%
----	-------------	-------------	--	--------------------------------------	--	--	----

**Evaluation Percentage Recap: Case Study**

No	Evaluation	Percentage
		0%

**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.