	Universitas Negeri Surabaya **Faculty of Mathematics and Natural Sciences** **Physics Education Undergraduate Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Basic Physics II	8420304067	Compulsory Study Program Subjects	**T=4**	**P=0**	**ECTS=6.36**	2	January 10, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

Program Objectives (PO)

PO - 1	Mastering structured concepts of Classical, especially on electricity, magnetism, optics, and Modern Physics.
PO - 2	Mastering mathematical aspects as an effective tool for understanding physics better through physical modeling.
PO - 3	Able to design and conduct practices, especially on the topics of electricity, magnetism and optics.
PO - 4	Able to communicate their ideas in the form of a written report and presenting the results of practice orally.

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4

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
PO-1																
PO-2																
PO-3																
PO-4																

Short Course Description

Basic Physics MK 2 consists of two types of Physics, namely Electricity, Magnetism and Optics. The discussion will include electric fields, Gauss's law, electric potential, capacitance and dielectrics, current and resistance, direct current circuits, magnetic fields, sources of magnetic fields, Faraday's law, inductance, alternating current circuits, electromagnetic waves. Meanwhile, for optical materials, it consists of optics as light (geometric optics), followed by interactions between light and matter, namely reflection, refraction, light wave interference, diffraction and wave polarization.

References

Main :

1. Bueche, F.J., 2000, Schaum&rsquos Outline of College Physics, McGraw-Hill.
2. Serway, R.A., and Jewett, J.W., 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.
3. Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.
4. Prahani, B.K., Jatmiko, B., & Amelia, T. 2023. Fisika Dasar: Rangkaian Listrik dan Hukum Ohm dalam Rangkaian Listrik. Sidoarjo: PT Mitra Edukasi dan Publikasi.

Supporters:

Supporting lecturer	Dr. Zainul Arifin Imam Supardi, M.Si. Dr. Titin Sunarti, M.Si. Prof. Tjipto Prastowo, Ph.D. Dr. Frida Ulfah Ermawati, M.Sc. Woro Setyarsih, S.Pd., M.Si. Nugrahani Primary Putri, S.Si., M.Si. Endah Rahmawati, S.T., M.Si. Abu Zainuddin, S.Pd., M.Pd. Lydia Rohmawati, S.Si., M.Si. Dr. Muhammad Satriawan, M.Pd. Arie Realita, M.Si. Dr. Binar Kurnia Prahani, S.Pd., M.Pd. Dr. Oka Saputra, M.Pd Muhammad Nurul Fahmi, S.Si., 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	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics	Students are able to explain the concept of Colombo Law and Electricity Field	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 1: electric field, Coulomb interaction, and Gauss law. 2. Introduction of electrical measuring instruments **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 1: electric field, Coulomb interaction, and Gauss law. 2. Introduction of electrical measuring instruments **Reference:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%

2	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics	Students are able to explain the concepts of Coulomb's Law and Electric Field	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 1: electric field, Coulomb interaction, and Gauss law. 2. Introduction of electrical measuring instruments **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 1: electric field, Coulomb interaction, and Gauss law. 2. Introduction of electrical measuring instruments **Reference:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%
3	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics 3.3. Being able to design and conduct practices with the topics of electricity.	Students are able to analyze the concept of electricity potential	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practical Assessment	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%

4	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics 3.3. Being able to design and conduct practices with the topics of electricity.	Students are able to explain the concept of electric current, and analyze series and parallel circuits.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Prahani, BK, Jatmiko, B., & Amelia, T. 2023. Basic Physics: Electric Circuits and Ohm's Law in Electric Circuits. Sidoarjo: PT Mitra Education and Publication.*	5%

5	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics 3.3. Being able to design and conduct practices with the topics of electricity.	Students are able to explain the concept of electric current, and analyze series and parallel circuits.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Prahani, BK, Jatmiko, B., & Amelia, T. 2023. Basic Physics: Electric Circuits and Ohm's Law in Electric Circuits. Sidoarjo: PT Mitra Education and Publication.*	5%

6	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics 3.3. Being able to design and conduct practices with the topics of electricity. 4.4. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	Students are able to analyze the concept of alternating current and RLC circuit.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practical Assessment	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Prahani, BK, Jatmiko, B., & Amelia, T. 2023. Basic Physics: Electric Circuits and Ohm's Law in Electric Circuits. Sidoarjo: PT Mitra Education and Publication.*	5%

7	1.1. Being able to understand concepts of electricity. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics 3.3. Being able to design and conduct practices with the topics of electricity. 4.4. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	Students are able to analyze the concept of alternating current and RLC circuit.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	Contextual Learning Discussions, Presentation, Q & A 3 x 50 minutes	**Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** 1. Concepts of electricity – part 2: electric potential, electric potential energy, conservation of energy, capacitance and dielectrics. **References:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%
8		Students can solve questions related to electricity and magnetism	**Criteria:** Students will get the maximum score if they can meet the assessment indicators **Form of Assessment** : Test	UTS 2 x 50	UTS 2 x 50	**Material:** Ch 15-21 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.*	10%
9	1.1. Being able to understand concepts of magnetism 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	Students can explain the concepts of electromagnetic waves.	**Criteria:** Students will get full marks if they meet the assessment indicators **Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment	Contextual Learning Discussions, Experiment, Presentation, Q & A 4 X 50	Contextual Learning Discussions, Experiment, Presentation, Q & A 4 x 50	**Material:** Ch 21 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** Optics **Reference:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%

10	1.1. Being able to understand concepts of optics. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to design and conduct practices with the topics of optics. 4.4. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	1.Students can explain the reflection and refraction process at mirrors and lenses. 2.Students can explain the principles of optical devices.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practical Assessment	Contextual Learning Discussions, Experiment, Presentation, Q & A 4 X 50	Contextual Learning Discussions, Experiment, Presentation, Q & A 4 x 50	**Material:** Ch 22 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** Optic **Library:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%
11	1.1. Being able to understand concepts of optics. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to design and conduct practices with the topics of optics. 4.4. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	1.Students can explain the reflection and refraction process at mirrors and lenses. 2.Students can explain the principles of optical devices.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practical Assessment	Contextual Learning Discussions, Experiment, Presentation, Q & A 4 X 50	Contextual Learning Discussions, Experiment, Presentation, Q & A 4 x 50	**Material:** Ch 23 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** Optic **Library:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%
12	1.1. Being able to understand concepts of optics. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to design and conduct practices with the topics of optics. 4.4. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	1.Students can explain the reflection and refraction process at mirrors and lenses. 2.Students can explain the principles of optical devices.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practical Assessment	Lectures, discussions, practicum 4 X 50	Lectures, discussions, practicum 4 x 50	**Material:** Ch 24-25 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** Optic **Library:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%

13	1.1. Being able to understand concepts of modern physics. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	1.Students can understand the principles of relativity and quantum physics 2.Students can understand the principles of atomic and nuclear physics.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Lectures, discussions, assignments 4 X 50	Lectures, discussions, assignments 4 x 50	**Material:** Ch 26 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.*	5%
14	1.1. Being able to understand concepts of modern physics. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	1.Students can understand the principles of relativity and quantum physics 2.Students can understand the principles of atomic and nuclear physics.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Lectures, discussions, assignments 4 X 50	Lectures, discussions, assignments 4 x 50	**Material:** Ch 27 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.*	5%
15	1.1. Being able to understand concepts of modern physics. 2.2. Being able to formulate an electrical, magnetism, optics and modern physics system using mathematics. 3.3. Being able to communicate their ideas in the form of a written report and presenting the results of practice orally.	1.Students can understand the principles of relativity and quantum physics 2.Students can understand the principles of atomic and nuclear physics.	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Lectures, discussions, assignments 4 X 50	Lectures, discussions, assignments 4 x 50	**Material:** Ch 28-29 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** Optics **Reference:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	5%

16	Students can use modern optics and physics concepts to solve physics problems.	Students can solve questions related to optics and modern physics	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Test	UAS 2 x 50	UAS 2 x 50	**Material:** Ch 22-29 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, SalembaTeknika.* **Material:** Optics **Reference:** *Yesigat, A. (2023). Electrical Component Measurement, Mechanics and Optics in Fundamental Physics-Laboratory Manual-Volume I.*	20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	54.17%
2.	Portfolio Assessment	1.67%
3.	Practical Assessment	14.17%
4.	Test	30%
		100%

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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.