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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
General Physics	8420503100	General Physics	T=3	P=0	ECTS=4.77	1	July 17, 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	
PLO-8	Able to make decisions based on data/information in order to complete tasks as part of his responsibilities in the work he has done
PLO-10	Able to design and carry out experiments in biology learning to obtain, analyze and interpret data to solve problems
Program Objectives (PO)	
PO - 1	Have the ability to think critically and use appropriate concepts to qualitatively analyze problems or situations involving physics
PO - 2	Have the ability to use physics concepts and appropriate mathematical methods to obtain solutions to quantitative problems in physics
PO - 3	Has the ability to collect and analyze data and prepare coherent reports on his abilities
PO - 4	Have the ability to communicate the results of their findings both in writing and orally

PLO-PO Matrix

P.O	PLO-8	PLO-10
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	This course discusses Motion, Fluids, Energy Changes, Temperature and Heat, Optics, Static and Dynamic Electricity, through active learning with a combination of discussion methods, question and answer and carrying out laboratory activities

References

Main :

1. Bueche, F.J., 2000, Schaum 19s Outline of College Physics, McGraw-Hill.
2. Sarojo, A.G., 2014, Seri Fisika Dasar Mekanika, edisi 5, Salemba Teknika.
3. Serway, R.A., and Jewett, J.W., 2010, Physics for Scientists and Engineers withModern Physics, Salemba Teknika.

Supporters:

Supporting lecturer	Dra. Suliyanah, M.Si. Dr. Titin Sunarti, M.Si. Dr. Dwikoranto, M.Pd. Woro Setyarsih, S.Pd., M.Si. Diah Hari Kusumawati, S.Si., M.Si. Abu Zainuddin, S.Pd., M.Pd. Dr. Eng. Evi Suaebah, M.Si., M.Sc. Mukhayyarotin Niswati Rodliyatul Jauhariyah, S.Pd., M.Pd. Dr. Muhammad Satriawan, M.Pd. Utama Alan Deta, S.Pd., M.Pd., M.Si. Muhammad Habibbulloh, M.Pd. Dr. Fitriana, S.Si. Dr. Muhimmatul Khoiro, S. Si. 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	Students are able to understand the concept of motion (kinematics)	1. Students are able to classify basic quantities, derived quantities and their units 2. Students are able to apply vector operations	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion, giving assignments 3 x 50 minutes	Discussion, giving assignments 3 x 50 minutes	**Material:** Ch 2 **Reference:** *Sarojo, AG, 2014, Basic Physics of Mechanics Series, 5th edition, Salemba Teknika.*	5%
2	Master basic knowledge about quantities and units, as well as vectors in a comprehensive, stable and in-depth manner and be able to develop and apply it to study higher physics knowledge in accordance with developments in science and technology	1. Students can identify quantities in various types of motion 2. Students can solve particle kinematics problems	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Tests	Discussion, assignment, practicum 3 X 50 minutes	Discussion, assignments, online practicum 3 x 50 minutes	**Material:** Ch 2 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
3	Students can solve particle kinematics problems	1. Explain the concept of particle dynamics 2. Solving particle dynamics problems	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch 1 **References:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Chapter 2 **Bibliography:** *Sarojo, AG, 2014, Basic Physics of Mechanics Series, 5th edition, Salemba Teknika.* **Material:** Ch 5, 6 and 7 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%

4	Students can solve particle kinematics problems	1. Explain the concept of particle dynamics 2. Solving particle dynamics problems	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch 1 **References:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Chapter 2 **Bibliography:** *Sarojo, AG, 2014, Basic Physics of Mechanics Series, 5th edition, Salemba Teknika.* **Material:** Ch 5, 6 and 7 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
5	Students are able to understand the concept of static fluids	1. Analyze variables that influence fluid conditions 2. Solving problems related to static fluid concepts	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Practical Assessment	Discussion, Practical 3 X 50	Online discussion and practicum 3 x 50	**Material:** Ch 2 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch. 14 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
6	Students are able to understand the concept of static fluids	1. Analyze variables that influence fluid conditions 2. Solving problems related to static fluid concepts	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion, Practical 3 X 50	Online discussion and practicum 3 x 50	**Material:** Ch 2 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch. 14 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%

7	Students are able to understand the concept of fluid dynamics	• Analyze and solve problems related to fluid dynamic concepts	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Tests	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch. 14 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
8	Students are able to apply the concepts of kinematics and dynamics of particles, static and dynamic fluids		**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	UTS 2 X 50	UTS 2 x 50	**Material:** Ch 1 & 2 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch 2, 5, 6, 7, 14 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	10%
9	Students are able to understand the concept of energy changes	1.• Explain the concepts of work and energy 2.• Analyze and solve problems related to the concept of energy change	**Form of Assessment** : Practical Assessment	Discussion and assignment 3 x 50	Online discussion and practicum 3 x 50	**Material:** Chapter 2 **Bibliography:** *Sarojo, AG, 2014, Basic Physics of Mechanics Series, 5th edition, Salemba Teknika.*	5%
10	Students are able to understand the concept of thermodynamics	1.• Explain the heat transfer process 2.• Apply the laws of thermodynamics to physics problems	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch 3 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch 19 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%

11	Students are able to understand the concept of thermodynamics	1.• Explain the heat transfer process 2.• Apply the laws of thermodynamics to physics problems	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch 3 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch 19 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
12	Students are able to understand the concept of optics	1.• Explain the basic concepts of physical and geometric optics 2.• Sketch the geometry of reflection and refraction processes in various optical devices 3.• Apply optical concepts, both geometric optics and physical optics	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Practical Assessment	Discussion and practicum 3 X 50	Discussion and practicum 3 x 50	**Material:** Ch 6 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch 36 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
13	Students are able to understand the concept of optics	1.• Explain the basic concepts of physical and geometric optics 2.• Sketch the geometry of reflection and refraction processes in various optical devices 3.• Apply optical concepts, both geometric optics and physical optics	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Practical Assessment	Discussion and practicum 3 X 50	Discussion and practicum 3 x 50	**Material:** Ch 6 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch 36 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
14	Students are able to understand the concept of Coulomb‘s Law and electric fields	• Students are able to carry out calculations using the concepts of Coulomb‘s Law and electric fields	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch 5 **Bibliography:** *Bueche, FJ, 2000, Schaum 19s Outline of College Physics, McGraw-Hill.* **Material:** Ch 23 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%

15	Students are able to understand the concept of dynamic electricity	1.• Students can explain the differences between various types of electrical circuits 2.• Students can solve questions related to dynamic electrical concepts	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion and assignment 3 X 50	Discussion and assignment 3 x 50	**Material:** Ch 27, 28 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	5%
16	Students are able to apply the concepts of energy, optics, static and dynamic electricity	Students are able to solve physics problems related to energy, optics and electricity	**Criteria:** Students will get full marks if they meet the assessment indicators	UAS 2 x 50	UAS 2 x 50	**Material:** Ch 23, 27, 28, 36 **References:** *Serway, RA, and Jewett, JW, 2010, Physics for Scientists and Engineers with Modern Physics, Salemba Teknika.*	20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	55%
2.	Practical Assessment	20%
3.	Test	5%
		80%

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.