



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

Document  
Code

### SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date
Engineering Physics	8320302209	Basic MK	T=2 P=0 ECTS=3.18	1	April 28, 2023
<b>AUTHORIZATION</b>	<b>SP Developer</b>		<b>Course Cluster Coordinator</b>	<b>Study Program Coordinator</b>	
	Ika Nurjannah, S.Pd., M.T. ; Hanna Zakiyya, S.T., M.T.		Ika Nurjannah, S.Pd., M.T.	Ir. Wahyu Dwi Kurniawan, S.Pd., M.Pd.	

<b>Learning model</b>	<b>Case Studies</b>
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<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program that is charged to the course</b>																					
	<b>PLO-10</b>	Have an understanding of mathematics and basic mechanical engineering																				
	<b>Program Objectives (PO)</b>																					
	<b>PO - 1</b>	Students are able to understand and communicate their understanding of quantities and units in physics																				
	<b>PO - 2</b>	Students are able to understand and communicate their understanding of vectors																				
	<b>PO - 3</b>	Students are able to understand and communicate their understanding of equilibrium																				
	<b>PO - 4</b>	Students are able to understand and communicate their understanding of two-dimensional motion																				
	<b>PO - 5</b>	Students are able to understand and communicate their understanding of Style																				
	<b>PO - 6</b>	Students are able to understand and communicate their understanding of work and energy																				
	<b>PO - 7</b>	Students are able to understand and communicate their understanding of momentum																				
	<b>PO - 8</b>	Students are able to understand and communicate their understanding of Elasticity																				
	<b>PO - 9</b>	Students are able to understand and communicate their understanding of temperature and heat																				
	<b>PLO-PO Matrix</b>																					
		<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">P.O</th> <th style="width: 10%;">PLO-10</th> </tr> </thead> <tbody> <tr><td>PO-1</td><td></td></tr> <tr><td>PO-2</td><td></td></tr> <tr><td>PO-3</td><td></td></tr> <tr><td>PO-4</td><td></td></tr> <tr><td>PO-5</td><td></td></tr> <tr><td>PO-6</td><td></td></tr> <tr><td>PO-7</td><td></td></tr> <tr><td>PO-8</td><td></td></tr> <tr><td>PO-9</td><td></td></tr> </tbody> </table>	P.O	PLO-10	PO-1		PO-2		PO-3		PO-4		PO-5		PO-6		PO-7		PO-8		PO-9	
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<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																						

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<b>Short Course Description</b>	Study of basic physics concepts and their application in mechanical engineering, including quantities, unit systems, vectors, equilibrium, kinematics, dynamics, work, energy, impulse, momentum, elasticity, temperature and heat																																																																																																																																																																																																										
<b>References</b>	<b>Main :</b> 1. Diah Wulandari. 2014. Fisika Teknik I. Swadana. 2. Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, edisi kesepuluh. Erlangga. 3. Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son. 4. Sears Zemansky. 1986. Fisika Untuk Universitas I. Binacipta.																																																																																																																																																																																																										
	<b>Supporters:</b> 1. Mikrajuddin Abdullah. 2016. Fisika Dasar 1. Institut Teknologi Bandung.																																																																																																																																																																																																										
<b>Supporting lecturer</b>	Dany Iman Santoso, S.T., M.T. Hanna Zakiyya, S.T., M.T. Ika Nurjannah, S.Pd., M.T.																																																																																																																																																																																																										
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 )																																																																																																																																																																																																						
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1	1.Students are able to communicate their understanding of quantities in physics 2.Students are able to communicate their understanding of quantities and units in physics	1.Students can determine quantities in physics 2.Explain the symbols and units of physical quantities 3.Convey ideas/questions 4.perform unit conversions	<b>Criteria:</b> Completeness of reports on quantity analysis results and unit conversions.  <b>Form of Assessment :</b> Participatory Activities	Discussion lectures and questions and answers 2 X 50		<b>Material:</b> quantities and units <b>Reference:</b> Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.  <b>Material:</b> quantities and units <b>References:</b> Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.	2%																																																																																																																																																																																																				

2	Students are able to communicate their understanding of vectors	<ol style="list-style-type: none"> <li>1. Students can calculate addition and subtraction of vectors</li> <li>2. Determine the resultant force by vector decomposition</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Full marks are obtained if you do all the questions correctly</li> <li>2. The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Discussion lectures and questions and answers 2 X 50		<p><b>Material:</b> vector</p> <p><b>Bibliography:</b> <i>Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, tenth edition. Erlangga.</i></p> <p><b>Material:</b> vector</p> <p><b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	2%
3	Students are able to communicate their understanding of particle equilibrium	<ol style="list-style-type: none"> <li>1. Students can: Explain the conditions for balance</li> <li>2. Determines the decomposition of forces on particles</li> <li>3. Convey ideas/questions</li> </ol>	<p><b>Criteria:</b> Completeness of the report on the results of the particle balance analysis.</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Discussion lectures and questions and answers 2 X 50		<p><b>Material:</b> equilibrium</p> <p><b>References:</b> <i>Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley &amp; Son.</i></p>	4%
4	Students are able to communicate their understanding of force moment equilibrium	<ol style="list-style-type: none"> <li>1. Students can: Calculate the moment of force</li> <li>2. Calculating the resultant parallel force</li> <li>3. Convey ideas/questions</li> </ol>	<p><b>Criteria:</b> Completeness of the report on the results of the force moment equilibrium analysis.</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Problem-based learning brainstorming, 2 X 50 discussions		<p><b>Material:</b> balance of moments of force</p> <p><b>References:</b> <i>Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley &amp; Son.</i></p>	3%
5	Students are able to understand and communicate their understanding of two-dimensional motion	<ol style="list-style-type: none"> <li>1. Students can understand the magnitudes of motion</li> <li>2. Explain the motion of a bullet</li> <li>3. Explains average &amp; instantaneous speed &amp; acceleration</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Full marks are obtained if you do all the questions correctly</li> <li>2. The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> magnitude of motion and movement of bullets</p> <p><b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	5%
6	Students are able to understand and communicate their understanding of two-dimensional motion	<ol style="list-style-type: none"> <li>1. Students can determine types of motion in physics</li> <li>2. Explains average &amp; instantaneous speed &amp; acceleration</li> <li>3. explain and solve circular motion problems</li> </ol>	<p><b>Criteria:</b> Completeness of the report on the results of circular motion analysis</p> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	Discussion lectures and questions and answers 2 X 50		<p><b>Material:</b> circular motion</p> <p><b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	5%

7	Students are able to understand and communicate their understanding of free force diagrams, friction force and centripetal force	<ol style="list-style-type: none"> <li>freestyle diagram</li> <li>friction force and centripetal force</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>Full marks are obtained if you do all the questions correctly</li> <li>The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Discussion lectures and questions and answers 2 X 50		<p><b>Material:</b> free force, centripetal force, friction force</p> <p><b>Reference:</b> <i>Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, tenth edition. Erlangga.</i></p>	5%
8	Midterm Exam (UTS)	Able to understand the concept of quantities in physics, vectors, particle balance, force moment balance, and motion	<p><b>Criteria:</b></p> <p>Full marks are obtained if you do all the questions correctly</p> <p><b>Form of Assessment :</b> Test</p>	written exam 2 X 50		<p><b>Material:</b> quantities and units, vectors, forces</p> <p><b>Reference:</b> <i>Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, tenth edition. Erlangga.</i></p>	20%
9	Students are able to understand and communicate their understanding of work and energy	<ol style="list-style-type: none"> <li>Students can: Understand the definition of work/work and the effect of work on the speed of an object</li> <li>kinetic energy, potential energy and mechanical energy</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>Full marks are obtained if you do all the questions correctly</li> <li>The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> business / work</p> <p><b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	5%
10	Students are able to understand and communicate their understanding of work and energy	<ol style="list-style-type: none"> <li>Students are able to understand and communicate their understanding of kinetic energy, potential energy and mechanical energy</li> <li>Students are able to work on questions about kinetic energy, potential energy and mechanical energy</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>Full marks are obtained if you do all the questions correctly</li> <li>The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> energy</p> <p><b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	5%

11	Students are able to understand and communicate their understanding of momentum	<ol style="list-style-type: none"> <li>1.law of momentum immunity</li> <li>2.Momentum of Many Objects</li> <li>3.Convey ideas/questions</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Full marks are obtained if you do all the questions correctly</li> <li>2.The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> momentum <b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	5%
12	Students are able to understand and communicate their understanding of momentum	<ol style="list-style-type: none"> <li>1.Students are able to understand and communicate their understanding of impulses</li> <li>2.Convey ideas/questions</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Full marks are obtained if you do all the questions correctly</li> <li>2.The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> impulse <b>Reader:</b> <i>Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley &amp; Son.</i></p>	2%
13	Students are able to understand and communicate their understanding of Elasticity	<ol style="list-style-type: none"> <li>1.Students are able to understand and communicate their understanding of the modulus of elasticity</li> <li>2.Convey ideas/questions</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Full marks are obtained if you do all the questions correctly</li> <li>2.The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> elasticity <b>Library:</b></p>	5%
14	Students are able to understand and communicate their understanding of temperature and heat	<ol style="list-style-type: none"> <li>1.Students are able to understand and communicate their understanding of temperature,</li> <li>2.conversion between temperature scales</li> </ol>	<p><b>Criteria:</b> Full marks are obtained if you do all the questions correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> temperature and heat <b>Reference:</b> <i>Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, tenth edition. Erlangga.</i></p>	5%

15	Students are able to understand and communicate their understanding of temperature and heat	<ol style="list-style-type: none"> <li>1. Students can: Differentiate the meanings of temperature and heat with case examples.</li> <li>2. Understand expansion in solids, liquids and gases with examples.</li> <li>3. Understand that heat given to a substance can increase the temperature and/or change the state of the substance using case examples.</li> <li>4. Using the law of conservation of energy (Black's principle) to solve simple problems.</li> <li>5. Distinguish between heat transfer by conduction, convection and radiation with case examples.</li> <li>6. about heat capacity and specific heat</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Full marks are obtained if you do all the questions correctly</li> <li>2. The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lectures, discussions and questions and answers 2 X 50		<p><b>Material:</b> heat and temperature <b>Reader:</b> <i>Mikrajuddin Abdullah. 2016. Basic Physics 1. Bandung Institute of Technology.</i></p>	2%
16	Final Semester Examination (UAS)	<ol style="list-style-type: none"> <li>1. The mark is not full if there is an answer to the question that is not correct, and the mark is based on the score per point on the question</li> <li>2. Full marks if all answers are appropriate and correct</li> </ol>	<p><b>Form of Assessment :</b> Test</p>	written exam 2 X 50			25%

#### Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	50%
2.	Test	50%
		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** 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.