



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

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date
Research methodology	4520103144	Compulsory Study Program Subjects	T=3 P=0 ECTS=4.77	4	July 17, 2024
AUTHORIZATION	SP Developer		Course Cluster Coordinator	Study Program Coordinator	
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Learning model	Project Based Learning
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Program Learning Outcomes (PLO)	PLO study program that is charged to the course																
	PLO-5	Able to demonstrate as a good scientist, critical thinking skills and innovation in research and professional fields.															
	PLO-12	Have the ability to improve their knowledge and be able to continue their studies to a higher level.															
	PLO-13	Demonstrate knowledge of Classical Physics and Modern Physics															
	Program Objectives (PO)																
	PO - 1	Demonstrating logical and critical thinking in using appropriate concepts for analyzing physics phenomena.															
	PO - 2	Implementing High Order Thinking Skills (HOTS) in solving physics problems through inductive and deductive approaches.															
	PO - 3	Understanding digital technology for searching sources and strengthening concepts relevant to recent research in physics.															
	PLO-PO Matrix																
		P.O	PLO-5	PLO-12	PLO-13												
		PO-1															
		PO-2															
	PO-3																
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																

Short Course Description	Research Methodology discusses how a particular research is designed, carried out, and reported in a formal report in the form of a manuscript ready for publication. Class discussions include the introduction of scientific investigation into physics problems that is performed in structured and systematic methods on the basis of data collection and processing, data acquisition and analysis, reliably for producing appropriate findings as part of problem solving in physics. Within this context, reliable data are those obtained from any of physics measurements, which meet scientific criteria: objective, original, accurate, and precise. During the course, students are introduced to types of research in physics, corresponding methods usually used and analysis of possible errors and uncertainties in measurements. Students are also given a chance to explore some recent publications in physics by summarizing and presenting it in class.
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References	<p>Main :</p> <ol style="list-style-type: none"> 1. Kirkup, L and Frenkel, R. B. 2006. An Introduction to Uncertainty in Physics Measurements. Cambridge Uni Press 2. Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work. 3. Abdullah, M. 2011. Tuntunan Praktis Menulis Makalah Untuk Jurnal Ilmiah Internasional. Unpublished work. <p>Supporters:</p>
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	1. Some power point files and/or course materials relevant to Research Methodology from the internet						
Supporting lecturer	Dr. Zainul Arifin Imam Supardi, M.Si. Prof. Tjipto Prastowo, Ph.D. Dr. Eng. Evi Suaebah, M.Si., M.Sc.						
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	Being able to understand definition and scope of research methodology	Students can understand definition and scope of research methodology	Criteria: Quantitative Form of Assessment : Participatory Activities, Portfolio Assessment	Presentation, Discussion and Question and Answer 3 x 50	Presentation, Discussion and Question and Answer 3 x 50	Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i>	2%
2	Being able to undertand types of research in physics and associated formal reports	Students can undertake types of research in physics and associated formal reports	Criteria: Description on student assignments: 1. Short article (by a group) describing issues in recent physics research 2. Corresponding poster or ppt file (by a group) 3. Individual presentation Form of Assessment : Participatory Activities, Portfolio Assessment	Presentation, Discussion and Question and Answer 3 x 50	Presentation, Discussion and Question and Answer 3 x 50	Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i>	3%
3	Being able to understand laboratory-based research and related work	Students can undertake types of research in physics and associated formal reports	Criteria: Description on student assignments: 1. Short article (by a group) describing issues in recent physics research 2. Corresponding poster or ppt file (by a group) 3. Individual presentation Form of Assessment : Participatory Activities, Portfolio Assessment	Contextual Learning Class discussion Q & A 3 x 50	Contextual Learning Class discussion Q & A 3 x 50	Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i>	2%
4	Being able to understand calibration techniques for producing accurate, precise data to reduce errors and uncertainty in measurements	Students can understand calibration techniques for producing accurate, precise data to reduce errors and uncertainty in measurements	Criteria: Description on student assignments: 1. Short article (by a group) describing issues in recent physics research 2. Corresponding poster or ppt file (by a group) 3. Individual presentation Form of Assessment : Participatory Activities, Portfolio Assessment	Contextual Learning Class discussion Q & A 3 x 50	Contextual Learning Class discussion Q & A 3 x 50	Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i>	3%

5	Being able to understand calibration techniques for producing accurate, precise data to reduce errors and uncertainty in measurements	Students can understand calibration techniques for producing accurate, precise data to reduce errors and uncertainty in measurements	<p>Criteria: Description on student assignments: 1. Short article (by a group) describing issues in recent physics research 2. Corresponding poster or ppt file (by a group) 3. Individual presentation</p> <p>Form of Assessment : Participatory Activities, Portfolio Assessment</p>	Contextual Learning Class discussion Q & A 3 x 50	Contextual Learning Class discussion Q & A 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p>	5%
6	Being able to understand numerical-based research for physics computation and modeling using specific algorithms	Students can understand numerical-based research for physics computation and modeling using specific algorithms	<p>Criteria: Student assignment 1 (short article): handed in Criteria for assessment are available</p> <p>Form of Assessment : Participatory Activities, Portfolio Assessment</p>	Contextual Learning Class discussion Q & A 3 x 50	Contextual Learning Class discussion Q & A 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p>	5%
7	Being able to understand numerical-based research for physics computation and modeling using specific algorithms	Students can understand numerical-based research for physics computation and modeling using specific algorithms	<p>Criteria: Student assignment 1 (short article): handed in Criteria for assessment are available</p> <p>Form of Assessment : Participatory Activities, Portfolio Assessment</p>	Contextual Learning Class discussion Q & A 3 x 50	Contextual Learning Class discussion Q & A 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p>	5%

8	Mid-Semester (combined sub-cpmk 1 to 7) at the 1st to 7th meeting.	Students can understand numerical-based research for physics computation and modeling using specific algorithms	<p>Criteria: Student assignment 1 (short article): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Written test 3 x 50	Written test 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p> <hr/> <p>Material: research methods and strategies in the field of science Library: <i>Some power point files and/or course materials relevant to Research Methodology from the internet</i></p>	20%
9	Being able to understand research motivation behind a particular research topic, research design and associated methods	Students can understand research motivation behind a particular research topic, research design and associated methods	<p>Criteria: Student assignment 1 (short article): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%

10	Being able to understand research instruments, procedures for measurements, mechanisms of data collection and processing, data analysis and interpretation, description on research report	Students can understand research instruments, procedures for measurements, mechanisms of data collection and processing, data analysis and interpretation, description on research report.	<p>Criteria: Student assignment 1 (short article): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%
11	Being able to understand research instruments, procedures for measurements, mechanisms of data collection and processing, data analysis and interpretation, description on research report	Students can understand research instruments, procedures for measurements, mechanisms of data collection and processing, data analysis and interpretation, description on research report.	<p>Criteria: Student assignment 2 (relevant poster or ppt file): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%

12	Being able to understand current research topics in physics, published in reputable journals indexed by Scopus, Schimago and WoS	Students can understand current research topics in physics, published in reputable journals indexed by Scopus, Schimago and WoS	<p>Criteria: Student assignment 2 (relevant poster or ppt file): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%
13	Being able to understand good references from reputable journals, relevant to a particular topic examined	Students can understand good references from reputable journals, relevant to a particular topic examined	<p>Criteria: Student assignment 2 (relevant poster or ppt file): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%

14	Being able to write a short summary from internal publications and present it in class	Students can write a short summary from internal publications and present it in class	<p>Criteria: Student assignment 3 (relevant clips): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%
15	Being able to write a short summary from internal publications and present it in class	Students can write a short summary from internal publications and present it in class	<p>Criteria: Student assignment 3 (relevant clips): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentations, discussions and questions and answers 3 x 50	Presentations, discussions and questions and answers 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <hr/> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p>	5%

16	Final Exam	Students can write a short summary from internal publications and present it in class	<p>Criteria: Student assignment 3 (relevant clips): handed in Criteria for assessment are available</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Tests</p>	Presentation, discussion and questions and answers: Final Project 3 x 50	Presentation, discussion and questions and answers: Final Project 3 x 50	<p>Material: definition and scope of research methodology Reference: <i>Prastowo, T. 2013. Lecture Notes on Research Methodology for Physics Students. Unpublished work.</i></p> <p>Material: structure of scientific writing Reference: <i>Abdullah, M. 2011. Practical Guide to Writing Papers for International Scientific Journals. Unpublished work.</i></p> <p>Material: research methods and strategies in the field of science Library: <i>Some power point files and/or course materials relevant to Research Methodology from the internet</i></p>	20%
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Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	31.25%
2.	Project Results Assessment / Product Assessment	18.75%
3.	Portfolio Assessment	31.25%
4.	Test	18.75%
		100%

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.

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.