



KEMENTERIAN PENDIDIKAN TINGGI,
SAINS, DAN TEKNOLOGI
UNIVERSITAS LAMPUNG

FAKULTAS KEGURUAN DAN ILMU PENDIDIKAN

Jalan Prof. Dr. Sumantri Brojonegoro No.1 Gedong Meneng - Bandar Lampung 35145

Telp./Fax: (0721) 704624 *e-mail*: fkip@unila.ac.id,

laman: <http://fkip.unila.ac.id>

Bachelor of Education in Physics

MODULE HANDBOOK

Module Name	Physics Instrumentation
Module Level, if Applicable	Bachelor
Code	KFI620107
Sub-Heading, (*if Applicable)	
Classes, (*if Applicable)	
Description	This course will cover various measuring instruments, such as multimeters, oscilloscopes, and digital sensors, as well as the working principles behind these instruments. Students will learn how to use measuring instruments to obtain accurate data on physical quantities, such as length, mass, time, temperature, and pressure. Hands-on labs will provide real-world experience in operating and analyzing data from measuring instruments, preparing students for applications in research and industry. The course also explores how physical measurement tools can contribute to solving societal issues, such as environmental monitoring and public health. For example, the use of measurement tools to analyze water and air quality can help identify health risks and the impacts of pollution. Discussions about the ethics of data use and the responsibilities of scientists in communicating information to the public will also be an important part of this course. In the context of TPACK, students will be taught how to utilize technology in teaching physics. By learning how to integrate measurement tools into the curriculum, students will understand the importance of technology in enhancing student understanding. Collaborative projects will encourage students to design learning experiences that utilize measurement tools, thus creating an interactive environment that supports active learning. This course also discusses



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	the basic nature of science, including the scientific way of acquiring knowledge. Students will be invited to understand how observations and experiments with measuring instruments can shape physical theories and how technological developments affect scientific research. Concrete examples, such as the use of sensors in monitoring climate change, will demonstrate the relevance of physics to global issues and challenges facing society. The application of physics instrumentation methodology is very relevant in everyday life. For example, simple measuring instruments such as thermometers and barometers are used to monitor the weather, which has a direct impact on daily activities. With the understanding gained from this course, students are expected to be able to contribute to the development of science-based solutions to real problems, such as natural resource management and public health, as well as become responsible and ethical scientists.
Semester	2nd
Module Coordinator	Prof. Dr. Agus Suyatna, M.Si.
Lecturers	Team Teaching of Physics Instrumentation
Language	Indonesian/English
Classification With in the Curriculum	Compulsory Courses in the first year (2nd semester) Bachelor Degree
Teaching Format/Class Hours Per Week During the Semester	Learning activity can be carried out in the form of lecture or students' response: a. Face to face : 50 minutes/SKS b. Structured activity : 60 minutes/SKS c. Independent activity : 60 minutes/SKS
Teaching methods	In class activity : Team Based Project Structured activity : Group Discussion using



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	Worksheet Independent activity : Individual task
Workload	1 CU (SKS) for bachelor degree equal to 2 work hours per week or 170 minutes. 2x50 minutes face to face, 2x60 minutes structured tasks, 2x60 minutes independent learning, for 16 weeks weeks (including midterm and final exam), a total of 90,6 hours/semester. One CU equals to 1.51 ECTS
Credit Points	2 (2-0) CP or 3.02 (ECTS)
Prerequisites Courses	
Course Outcomes (CO)	After completing this module, a student is expected to: 1. PLO 7 : Able to manage, use, and develop physics learning laboratory tools. 2. CO-1 : Students are able to understand and use the theory of uncertainty in measurement. 3. CO-2 : Students are able to explain the functions and working principles of length measuring instruments such as: meter, calipers, coupler micrometers, spherometers, altimeters, and have the skills to take measurements according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments. 4. CO-3 : Students are able to explain the functions and working principles of time and weight measuring instruments such as: various balance sheets, dynamometers, hydrometers, and have the skills to take measurements according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments.



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| | <ol style="list-style-type: none">5. CO-4 : Students are able to explain the functions and working principles of time measuring instruments such as: stop watch, ticker timer, scaler counter, and have the skills to take measurements according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments.6. CO-5 : Students are able to explain the functions and working principles of light measuring instruments such as: lux metres, spectrometers, and have the skills to take measurements according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments.7. CO-6 : Students are able to explain the functions and working principles of heat measuring instruments such as: thermometers, thermocouples, thermostats, calorimeters, and have the skills to take measurements according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments.8. CO-7 : Students are able to explain the functions and working principles of electrical measuring instruments such as: voltmeters, ammeters, multi testers, oscilloscopes, and have the skills to take measurements according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments.9. CO-8 : Students are able to explain the functions and working principles of sound measuring instruments such as: sound metre / dB metre, resonance device, sonometer; and other physics derivative magnitude measuring instruments such as hygrometers, and have the skills to take measurements |
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	according to procedures, read measuring results, write down measurement results according to applicable rules, and can calibrate measuring instruments.
Content	1. Measurement definition 2. Thoroughness and accuracy 3. Types of errors 4. Statistical analysis 5. Possible errors 6. Boundary error 7. Important numbers 8. Functions and working principle: meter, caliper, coupler micrometer, spherometer, altimeter. 9. How to measure, read, write results, and calibrate: meter, calipers, coupler micrometer, spherometer, altimeter. 10. Functions and principles of work: various balance sheets, dynamometers, hydrometers.. 11. Ways of measurement, reading, writing of results and calibration: various balance sheets, dynamometers, hydrometers. 12. Functions and working principle: stop watch, ticker timer, scaler counter. 13. How to measure, read, write results, and calibrate: stop watch, ticker timer, scaler counter. 14. Functions and working principle: lux metre, spectrometer. 15. Ways of measurement, reading, writing of results, and calibration: lux metre, spectrometer. 16. Functions and working principle: thermometer, thermocouple, thermostat, calorimeter.



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	17. Ways of measurement, reading, writing results and calibration: thermometer, thermocouple, thermostat, calorimeter. 18. Functions and working principle: voltmeter, ammeter, multimeter, oscilloscope. 19. Ways of measurement, reading, writing of results and calibration: voltmeter, ammeter, multimeter, oscilloscope. 20. Functions and working principle: sound meter/d B metre, resonance device, sonometer; and other physics derivative magnitude measuring instruments such as hygrometers 21. How to measure, read, write results, and calibrate: sound meter/d B metre, resonance device, sonometer; and other physics-derived magnitude measuring instruments such as hygrometers
Study/Exam Achievements	Participants are evaluated based on ; 1. Participation Activities (10%) 2. Project Assignment (20%) 3. Assignment (30%) 4. Final Semester Exam (20%) 5. Midterm exams (20%) The initial cut - off points for grades A, B+, B, C+ ,C, and D should not be less than 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, and 40%, respectively.
Examination Methods	1. Participation Activities The assessment for Participation Activities aims to assess the level of active involvement of students in the learning process.



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	Participation activities include discussions, group work, presentations, and in-class interactions. 2. Project Assignment ● Project assignment is given as group task in making some of simple experiment tools ● Project assignment is carried out for one semester and presented at the end of semester ● Project assignment is carried out to see the achievements of the PLO and CO which are in accordance with the characteristics of the Basic Earth and Space Sciences module. 3. Assignment ● Assignments are given as exercise in each meeting in the form of worksheet and independent task ● Assignments are about analyzing simple problems in physics and solving them with the concept of Physics Instrumentation ● Assignments are given as individual tasks or group tasks and submitted in a limited time. ● The assignments are carried out to see the achievements of the PLO and CO which are in accordance with the characteristics of the Physics Instrumentation 4. Midterm Exam (UTS) ● UTS is held at the 8th meeting ● UTS is a written test in the form of objective and essay, and carried out in the classroom with an implementation time of 120 minutes according to the module schedule
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	• UTS is carried out to see the achievements of the PLO and CO which are in accordance with the characteristics of the Physics Instrumentation module 5. Final Exam (UAS) • UAS is held at the 16th meeting • UAS is a written test in the form of objective and essay, and carried out in the classroom with an implementation time of 120 minutes which follows the UAS implementation schedule of the department • UAS is carried out to see the achievements of the PLO and CO which are in accordance with the characteristics of the Physics Instrumentation module.
Forms of Media	E-learning, e-book, video, LCD, whiteboard, and online resources
Literature	1. Agus Suyatna, and B. Anggit Wicaksono. 2018. Instrumentation of Physics. Yogyakarta: Graha Ilmu. 2. Cooper, D. William. 1980. Electronic Instrumentation and Measurement Techniques (translation of Sahat Pakpahan). Prentice-Hall. Washington, D.C. 3. Karyono, Dwi Satya Palupi, Suharyanto. 2008. Physics for High School and MA Class X Volume 1. Ministry of National Education Book Center. Jakarta. 4. Nishino. 1979. Measurement and Electrical measuring instruments. Pradnya Paramitha. Jakarta (Sudjana Safi'ie translation).



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PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11
CO 1							√				
CO 2							√				
CO 3							√				
CO 4							√				
CO 5							√				
CO 6							√				
CO 7							√				
CO 8							√				

