



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,

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Bachelor of Education in Physics

MODULE HANDBOOK

Module Name	Atomics Nuclear and Radioactivity
Module Level, if Applicable	Bachelor
Code	KFI620211
Sub-Heading, (*if Applicable)	-
Classes, (*if Applicable)	-
Description	The Atomics Nuclear and Radioactivity course aims to provide an in-depth understanding of the fundamental principles of Atomics Nuclear and Radioactivity in physics, as well as their linkages to Social Science Issues (SSI), Technological Pedagogical Content Knowledge (TPACK), and Nature of Science (NOS). In this course, students will learn fundamental concepts such as material consists of atomic model and nuclear structure, atomic theory, basic concepts of nuclear physics, properties of atomic nuclear, nuclear forces, nuclear models, radioactive decay, alpha, Beta, and Gamma particle decay, radioactive decay models, neutron interactions, and nuclear reactions, fission reactions, fusion reactions, Neutron Physics, Meson Physics, Particle Physics, and Applications of Nuclear Physics, as well as how applications of Atomics Nuclear and Radioactivity affect everyday life, for example in radiation leaks from nuclear facilities or radioactive waste dumps that contaminate the environment. In addition, students will be taught to integrate technology into learning, use simulation and analysis software to illustrate Atomics Nuclear and Radioactivity phenomena, and design interactive learning experiences. Through an understanding of NOS, students will understand how Historical and Philosophical Aspects (Evolution of understanding of atomic structure, Discovery of radioactivity, Changes in theory), Characteristics of Science (Use of experimental methods in the discovery of radioactivity and Theory development based on observations and empirical data),



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	Social Aspects (International collaboration in nuclear research and the impact of the discovery of radioactivity on society), Applications and Implications (Understanding radiation risks and safety protocols in handling radioactive materials, Medical applications such as cancer treatment and power generation nuclear.
Semester	5th
Module Coordinator	Dr. I Wayan Distrik, M.Si
Lecturers	Team Teaching of Atomics Nuclear and Radioactivity
Language	Indonesian/English
Classification With in the Curriculum	Study Program Compulsory Course
Teaching Format/Class Hours Per Week During the Semester	Learning activity can be carried out in the form of lecture or students' response: 1. Face to face: 50 minutes/SKS 2. Structured activity: 60 minutes/SKS 3. Independent activity: 60 minutes/SKS
Teaching methods	In class activity : Project-based learning, problem-based learning Structured activity : Brainstorming, discussion Independent activity : Questioning techniques and assignments
Workload	1 CU (SKS) for bachelor degree equal to 3 work hours per week or 170 minutes. 3x50 minutes face to face, 3x60 minutes structured tasks, 3x60 minutes independent learning. for 16 weeks (including midterm and final exam), a total of 136 hours/semester. One CU equals to 1.51 ECTS
Credit Points	3 CU (SKS) = 3 x 1.51 = 4.53 ECTS
Prerequisites Courses	Modern Physics
Course Outcomes (CO)	1. PLO1 : Demonstrate knowledge of the fundamentals of quantum, atomic and molecular, nuclear, elementary particle and solid state physics.



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	2. PLO2 : Formulate physical systems using mathematics to solve physics problems. 3. CO-1 : Students are able to explain and analyze atomic models according to experts and compare them with modern atomic models, analyze the differences between single and many-electron atomic nuclei. 4. CO-2 : Students are able to analyze and formulate atomic nuclei, atomic nucleus properties and nuclear forces. 5. CO-3 : Students are able to analyze and formulate models of the core and radioactive decay. 6. CO-4 : Students are able to explain, apply and analyze the decay of alpha, beta and gamma particles. 7. CO-5 : Students are able to explain, apply, formulate and analyze nuclear reactions and Neutron physics. 8. CO-6 : Students are able to explain, apply, formulate and analyze core fission and fusion. 9. CO-7 : Students are able to explain, apply, formulate and analyze Meson Physics and particles and the application of core physics.
Content	This course is a mandatory subject for the Physics Education study program which provides students with high level knowledge able to review the knowledge he has obtained in the introductory lecture on Modern Physics and can develop it in depth macroscopic studies. To achieve these competencies, the lecture material consists of: atomic model and nuclear structure, atomic theory, basic concepts nuclear physics, properties of atomic nuclear, nuclear forces, nuclear models, radioactive decay, alpha, Beta and Gamma particle decay, radioactive decay models, neutron interactions, and nuclear reactions, fission reactions, fusion reactions, Neutron Physics, Meson Physics, Particle Physics, and Applications of Nuclear Physics.



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Study/Exam Achievements	Midterm Exam 20% Final Exam 20% Assignment 10% Student participation in class 15% Project Assignment 35 % 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. 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 ✓ UTS is carried out to see the achievements of the PLO and CO which are in accordance with the characteristics of the Atomics Nuclear and Radioactivity module 2. Final Exam (UAS) ✓ UAS is held at the 16th meeting ✓ UAS is exam 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 Atomics Nuclear and Radioactivity module. 3. Project Assignment ✓ Project assignment is given as group task



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	✓ 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 Atomics Nuclear and Radioactivity module. 4. Assignments ✓ 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 Atomics Nuclear and Radioactivity ✓ 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 by the characteristics of the Atomics Nuclear and Radioactivity module
Forms of Media	LCD, whiteboard, and online resources
Literature	Yusman Wiyatmo. 2016. Fisika Nuklir dalam Telaah Klasik dan Kuantum. Yogyakarta: Pustaka Pelajar. Sutter, P. 2022. Radioactive Decay: Discovery, Process, and Causes. https://www.space.com/radioactive-decay. Yusman Wiyatmo, 2016. Fisika Atom dalam Perspektif Klasik, Semiklasik dan Kuantum. Yogyakarta: Pustaka Pelajar. Heering, P & Klassen, S. 2010. Doing it differently: attempts to improve Millikan's oil-drop experiment. Physics Education 2010, 45 (4), 382-393. https://doi.org/10.1088/0031-9120/45/4/010.



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	Barrete, J. 2021. Nucleus-nucleus scattering and the Rutherford experiment. Journal of the Royal Society of New Zealand. Volume 51, 2021 - Issue 3-4: Special issue: 150th.
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