Modern Physics

Module Name :	Modern Physics
Module Level :	Undergraduate
Code :	32255013
Sub-heading, if applicable :	
Classes, if applicable :	
Semester :	3rd
Module coordinator :	Dr. Esmar Budi, M.T.
Lecturer(s) :	Dr. Esmar Budi, M.T. Fauzi Bakri, M.Si Dr. Hadi Nasbey, S.Pd., M.Si
Language :	Indonesian
Classification within the curriculum :	Compulsory course
Type of Teaching	Contact hours per week during the semester: Class Size
Lecture (Expository, discussion, exercise)	150 minutes: 40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.
Credit points :	4,5 ECTS
Prerequisite course(s) :	-
Course Outcomes :	After taking this course the student have ability to : CLO1. Able to study the concepts and theories of modern physics. CLO2. Able to apply the concepts and theories of Modern Physics to solve atomic physics and relativity problems.

	CLO3. Able to design Modern Physics experiments. Able to produce vibration system design.
Content :	1. Weaknesses of Classical Physics ● Classical Physics Review ● The weaknesses of classical physics in the concept of space-time ● Weaknesses of classical theory in the concept of particle statistics 2. Special Theory of Relativity ● Classical relativity ● Michelson-Morley experiment ● Einstein's postulates ● Lorentz transformation 3. Particle like nature of radiation Electromagnetic ● Review of electromagnetic waves ● Photoelectric effect ● Thermal radiation ● Compton effect 4. Wave nature of particles. ● De'Broglie hypothesis and evidence Experiment ● Uncertainty relationship in classical ● Heisenberg uncertainty ● Wave packet 5. Schrodinger equation ● Wave properties on the boundary plane ● Schrodinger equation ● Applications of Schrodinger Equation ● Simple harmonic oscillator 6. Atomic Model ● Basic properties of atoms ● Scattering and Thomson Model ● Rutherford's atomic nucleus ● Line spectra ● Bohr's Atomic Model ● Frank-Hertz experiment 7. Many-electron atoms ● Pauli exclusion principle ● Electronic states in atoms many electrons ● Optical transitions ●
Study/exam achievements:	Examination are conducted as unit test, as following

<table>
<tr><td></td><td>
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written test</td><td>10%</td></tr>
<tr><td>2</td><td>Group Paper</td><td>Presentation</td><td>10%</td></tr>
<tr><td>3</td><td>Group Presentation</td><td>Discussion</td><td>10%</td></tr>
<tr><td>4</td><td>Midterm Test</td><td>Written test</td><td>35%</td></tr>
<tr><td>5</td><td>Final Test</td><td>Written test</td><td>35%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Office, Zoom Meeting</td></tr>
<tr><td>Literatures :</td><td>

Thomton, S. T. and Rex, A. Modern Physics for Scientists and Engineers 3rd Edition. Singapore: Thomson, 2006. (Thomton and Rex)
Krane, K. Modern Physics 2nd Edition. New York: John Wiley & Sons, 1996. (Krane)
Beiser, A. Concept of Modern Physics 5th Edition. New York: Mc Graw Hill, 1995. (Beiser)
Salasnich, L. (2022). Modern Physics: Introduction to Statistical Mechanics, Relativity, and Quantum Physics. Springer Nature.
Salasnich, L., & Salasnich, L. (2017). The Origins of Modern Physics. Quantum Physics of Light and Matter: Photons, Atoms, and Strongly Correlated Systems, 1- 20.
Heilbron, J. L. (2022). Elements of early modern physics. Univ of California Press.
Planck, M. (2022). The universe in the light of modern physics. DigiCat

</td></tr>
</table>