<table>
<tr><td>Module Name</td><td>:</td><td>Modern Physics</td></tr>
<tr><td>Module Level</td><td>:</td><td>-</td></tr>
<tr><td>Code</td><td>:</td><td>02053243021</td></tr>
<tr><td>Subtitle</td><td>:</td><td>-</td></tr>
<tr><td>Courses</td><td>:</td><td>Modern Physics</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td>:</td><td>4th</td></tr>
<tr><td>Module Coordinator</td><td>:</td><td>Dwi Teguh Raharjo, S.Si,M.Si</td></tr>
<tr><td>Lecturer(s)</td><td>:</td><td>1. Dwi Teguh Rahardjo, M.Si.
2. Fairusy Fitria Haryani, M.Si.</td></tr>
<tr><td>Language</td><td>:</td><td>Bahasa Indonesia and English</td></tr>
<tr><td>Classification within the curriculum</td><td>:</td><td>Compulsory Courses</td></tr>
<tr><td rowspan="2">Teaching format/ class hours per week during the semester</td><td rowspan="2">:</td><td>Teaching format : Case Method, Discussion, Presentation and Team Based Project.</td></tr>
<tr><td>Lecture : 2 x 50 minutes/week = 100 minutes/week</td></tr>
<tr><td rowspan="4">Workload</td><td>:</td><td>16 effective weeks/semester</td></tr>
<tr><td></td><td>Lecture : 2 x 50 minutes/week x 16 weeks = 1600 minutes/semester</td></tr>
<tr><td></td><td>Structured assignments : 2 x 60 minutes/week x 16 weeks = 1920 minutes/semester</td></tr>
<tr><td></td><td>Private study : 2 x 60 minutes/week x 16 weeks = 1920 minutes/semester</td></tr>
<tr><td>Credit points</td><td>:</td><td>2 credit points (sks) = 3 ECTS</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>:</td><td>1. A minimum of 75% attendance to attend an exam
2. Further regulated in the Rector’s Decree No. 31/2020 Article 29 and 30
3. Final score is obtained from the score conversion as follows
<table>
<tr><th>Scale of 100</th><th>Score</th><th>Grade</th></tr>
<tr><td>S ≥ 85</td><td>4</td><td>A</td></tr>
<tr><td>80 ≤ S < 85</td><td>3.7</td><td>A-</td></tr>
<tr><td>75 ≤ S < 80</td><td>3.3</td><td>B+</td></tr>
<tr><td>70 ≤ S < 75</td><td>3</td><td>B</td></tr>
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<tr><td>65 ≤ S < 70</td><td>2.7</td><td>C+</td></tr>
<tr><td>60 ≤ S < 65</td><td>2</td><td>C</td></tr>
<tr><td>55 ≤ S < 60</td><td>1</td><td>D</td></tr>
<tr><td>S < 55</td><td>0</td><td>E</td></tr>
</table>
4. Students who have not achieved a minimum passing standard of 2.00 or (C), have the opportunity to improve their grades through remedial teaching given by the lecturer before giving the results of the assessment (yudisium).
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<tr><td>Prerequisites course(s)</td><td>:</td><td>1. Series and Complex Numbers
2. Differential and Integrals Vector</td></tr>
<tr><td>Program Learning Outcome(s)</td><td>:</td><td>PLO-1 To master the theoretical concepts of classical and modern physics (quantum)</td></tr>
<tr><td>Targeted Learning Outcome(s)</td><td>:</td><td>CLO-1 To master the concepts/principles/theories/laws of physics (physics content knowledge) in-depth, especially on topics that underlie study materials in the high school physics curriculum.
CLO-2 To apply the concepts and principles of Relativity and Quantum Theory in the paradigm of Modern Physics.</td></tr>
<tr><td>Content</td><td>:</td><td>BK-1 Theory of relativity: understanding inertial frames of reference, postulates of special relativity, Lorentz transformations, phenomena of special relativity: length contraction, time dilation, twin paradox, special relativity and electrodynamics, formulation of covariance.

BK-2 Experimental background: blackbody radiation, photoelectric effect experiment, Compton effect, electron diffraction (DavissonGermer experiment), pair production, wave-particle dualism, de Broglie hypothesis, Heisenberg uncertainty, atomic and molecular models.

BK-3 Doppler effect and relativistic Doppler effect of light.

BK-4 Thomson, Rutherford, and Bohr atomic model, transition energy according to vector atomic model, quantum mechanical atomic model, electron wave function in quantum mechanical atomic model, Zeeman effect.</td></tr>
<tr><td>Assessment and Evaluation</td><td>:</td><td>
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<tr><td>Participatory activity (Case Method)</td><td>20%</td></tr>
<tr><td>Project Product (Team-based project)</td><td>40%</td></tr>
<tr><td>Knowledge</td><td>Tugas : 0
Quiz : 0
Mid-term Exam : 20 %
Final Term Exam : 20 %</td></tr>
</table>
The evaluation of the courses is carried out by the lecturer and the results of the questionnaires are filled in by the students (Reliability,
</td></tr>
</table>

		Responsiveness, Assurance, Empathy, Tangible)
Forms of Media	:	Video Conference, LMS, Slide Presentation, Proyektor, Whiteboard
References	:	Arthur Beiser, (1986), Modern Physics, Becchi, C.M., (2007), “Introduction to the Basic Concepts of Modern Physics”, Genova : Springer-Verlag Harris, R., (2007), “Modern Physics”, 2nd Edition, California : Adison Wesley Serway, R.A., (2005), “Modern Physics” 3rd edition, Belmont California : Thomson Learning, Inc. Other relevant sources include national and international scientific journals as learning sources