**Quantum Physics**

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| Module Name : | Quantum Physics | |
| Module Level : | Undergraduate | |
| Code : | 32256033 | |
| Sub-heading, if applicable : | | |
| Classes, if applicable : | | |
| Semester : | 5th | |
| Module coordinator : | Dr. Teguh Budi Prayitno, M.Si | |
| Lecturer(s) : | Dr. Teguh Budi Prayitno, M.Si<br>Fauzi Bakri, 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 :<br>CLO128. Able to produce quantum formulations using physics concepts.<br>CLO129. Able to produce a formulation of the state function of a quantum. | |
| Content : | 1. The failure of the concepts of Classical Mechanics in explaining some phenomena Physics<br>• Stefan Boltzman's Law<br>• Wien's Shift Law<br>• Classical Model: Rayleigh and Jean and Wien<br>• Plank Model<br>2. Wave and particle dualism<br>• Wave properties of particles<br>• De Broglie hypothesis<br>• Heisenberg's uncertainty<br>3. Wave functions, probabilities, and operators<br>• Equations and wave functions<br>• Interpretation of probability<br>• Normalization calculation<br>• Energy operators<br>• Momentum operator<br>4. Schrodinger equation | |

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<tr><td></td><td>
<ul>
<li>Schrodinger equation</li>
<li>Free particle</li>
<li>Particle in a box</li>
</ul>
5. Eigenvalues, eigenfunctions, and Schrodinger Equation time-dependent/free Schrodinger Equation
<ul>
<li>Eigenvalues and eigenfunctions</li>
<li>time-dependent Schrodinger equation time.</li>
<li>Time-free Schrodinger equation time</li>
</ul>
6. One dimensional potential, barrier potential, and harmonic oscillator
<ul>
<li>One-dimensional potential</li>
<li>Barrier potential</li>
<li>Harmonic oscillator</li>
</ul>
7. Hamiltonian operators and vector spaces
<ul>
<li>Hamiltonian operators</li>
<li>Vector spaceData Processing</li>
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<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<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>Written test</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>
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<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Office, Zoom Meeting</td></tr>
<tr><td>Literatures :</td><td>
<ol>
<li>Giancoli, Douglas C. C. Physics: Principle with Applications 5th Edition. 2005. (Giancoli)</li>
<li>D. Haliday, R. Resnick, and J. Walker. Fundamental of Physics 7th Edition. 2005. (Dr. Haliday, Resnick and Walker)</li>
<li>Scheck, Florian. Quantum Physics. Springer: New York, 1965. (Scheck)</li>
<li>Stephen Gasiorowicz. Quantum Physics. 3rd, Wiley, 2003</li>
<li>Serway, R. A. and J. W. Jewett Jr. Physics for Scientists and Engineers with Modern Physics 6th Edition. 2004. (Serway and Jewett Jr)</li>
<li>Sutopo. Pengantar Fisika Kuantum. Malang: Jurusan Fisika FMIPA UM, 2005. (Sutopo)</li>
<li>Dereziński, J., & Gérard, C. (2013). Mathematics of quantization and quantum fields (p. 674). Cambridge University Press.</li>
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| | 8. Freire Jr, O., Bacciagaluppi, G., Darrigol, O., Hartz, T., Joas, C., Kojevnikov, A., & Pessoa Jr, O. (Eds.). (2022). The Oxford Handbook of the History of Quantum Interpretations. Oxford University Press. |