# Physics and Its application

**Basic Physics I**

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| Module Name : | Basic Physics I | |
| Module Level : | Undergraduate | |
| Code : | 32250683 | |
| Sub-heading, if applicable : | | |
| Classes, if applicable : | | |
| Semester : | 1st | |
| Module coordinator : | Dwi Susanti, M.Pd. | |
| Lecturer(s) : | Dwi Susanti, M.Pd.<br>Dr. Anggara, M.Si.<br>Prof. Dr. I Made Astra, 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>CLO50. Able to analyze and criticize the concepts of the basics of physics.<br>CLO51. Able to build an understanding of the basics of physics<br>CLO52. Able to implement the basics of physics.<br>CLO53. Able to design the basics of Physics experiments. | |
| Content : | 1. Physics, Quantities, Units, and Vectors<br>• The development of physics<br>• Quantities and SI units<br>• Measurement and uncertainty<br>• Vectors<br>2. Motion in One Dimension<br>• Particle motion<br>• Velocity and acceleration<br>• Equations of particle motion<br>• Free-fall motion<br>3. Motion in Two Dimensions | |

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| | • Position, displacement, velocity, and acceleration vectors in two dimensions<br>• Projectile motion<br>• Circular motion<br>4. Newton's Laws and Their Applications<br>• Newton's laws of motion<br>• Friction and normal force<br>• Acceleration in circular motion<br>5. Work and Energy<br>• Work done by constant and non-constant forces<br>• Work-energy theorem<br>• Conservative forces<br>• Potential energy<br>• Conservation of mechanical energy<br>6. Momentum and Collisions<br>• Momentum and impulse<br>• Center of mass<br>• Linear momentum of a particle system<br>• Law of conservation of momentum<br>• Collisions<br>• Systems with changing mass and rocket motion<br>7. Rotational Motion of Rigid Bodies<br>• Kinematic equations of rotational motion<br>• The kinetic energy of rotation<br>• Torque and moment of inertia<br>• Newton's Second Law for rotational motion<br>• Angular momentum and conservation of angular momentum<br>• Rolling motion<br>8. Equilibrium of Rigid Bodies<br>• Forces and moments of forces<br>• Conditions for an equilibrium of bodies and their applications<br>9. Gravitation<br>• Newton's law of gravitation<br>• Gravitational acceleration near the Earth's surface<br>• Gravitational potential energy<br>• The motion of planets and satellites<br>• Kepler's laws of planetary motion<br>10. Fluid Mechanics<br>• Hydrostatic pressure<br>• Pascal's law<br>• Buoyant force and Archimedes' principle<br>• Fluid flow and the continuity equation |

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<tr><td></td><td>
<ul><li>Bernoulli's equation</li></ul>
11. Oscillations
<ul><li>Harmonic motion</li><li>The energy of harmonic motion</li><li>Resonance</li></ul>
12. Mechanical Waves
<ul><li>Waves and their characteristics</li><li>Wave equation</li><li>Wave speed</li><li>Standing waves</li></ul>
13. Sound
<ul><li>Sound waves</li><li>Intensity of sound</li><li>Interference of sound waves</li><li>Resonance and sound resonance</li><li>Tones from pipes, organs, and strings</li><li>Doppler effect</li></ul>
14. Heat and Temperature
<ul><li>Temperature and thermal equilibrium</li><li>Heat and phase changes</li><li>Expansion of substances and gases</li><li>Heat transfer</li><li>Ideal gases and gas laws</li><li>Kinetic theory of ideal gases</li></ul>
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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>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
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</td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>1. David Halliday, Robert Resnick, dan Jearl Walker (2014) Fundamentals of Physics, 10th Ed., John Wiley & Sons<br>2. Douglas C. Giancoli (2016), Physics: Principles With Applications, Publisher: Pearson<br>3. Hugh D. Young dan Roger A. Freedman (2016) University Physics 14th Ed., Pearson Education.<br>4. Physics Tutorial: http://www.masteringphysics.com/<br>5. Physics Simulation: http://phet.colorado.edu/en/simulations/category/physics</td></tr>
</table>

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| | 6. Youtube Physics Channel: http://www.youtube.com/user/univphys Artikel<br>7. Umiatin, dkk, The bone microstructure identification model based on backscatter mode of ultrasound, Spektra : Jurnal Fisika dan Aplikasinya. Vol 6 Issue : 1. http://journal.unj.ac.id/unj/index.php/spektra/article/view/16424<br>8. Umiatin, dkk. Studi karakteristik kavitasi larutan menggunakan metode gelombang berdiri ultrasonic, Prosiding Seminar Nasional Fisika SNF 2020, Vol 9 (2020) http://journal.unj.ac.id/unj/index.php/prosidingsnf/article/view/2030<br>9. Umiatin, dkk. Design of bone density identification method using transmission quantitative ultrasound, AIP Conference Proceedings 2169, 030012 (2019); https://aip.scitation.org/doi/10.1063/1.5132662<br>10. Umiatin, dkk. Design baby mass and height monitoring system based on Arduino and Android application, AIP Conference Proceedings 2169, 030013 (2019); https://doi.org/10.1063/1.5132663<br>11. A S Budi, 2020, Kajian Koefisien Redaman Melalui Percobaan Laboratorium Osilasi Harmonis Untuk Pembelajaran Fisika.<br>12. E Budi, 2021, Analisis Osilasi Harmonis Melalui Percobaan Dan Simulasi Untuk Pembelajaran Fisika Jarak Jauh.<br>13. E Budi, 2020, Kajian Tetapan Elastisitas Melalui Percobaan Laboratorium Hukum HOOKE Untuk Pembelajaran Fisika.<br>14. I Sugihartono, 2022, Membangun Literasi Sains Melalui Pendekatan Bermain Menggunakan Perangkat Sederhana.<br>15. A B Susila, 2020, Pelatihan Desain Alat peraga Pembelajaran Fisika Di Islamic Boarding School Dwiwarna Desa Pamegarsari, Kecamatan Parung, Kabupaten Bogor Provinsi Jawa Barat.<br>16. T B Prayitno, 2020, Pembelajaran Sederhana Konsep Teori Relativitas Umum untuk Pelajar SMA.<br>17. H Nasbey, 2022, Pelatihan Pembuatan Alat Praktikum Sederhana Materi Fisika Berbasis Project-based Learning di MAN 2 Jakarta.<br>18. M A Marpaung, 2020, Pelatihan Pembuatan Mikrohidro Untuk Pembangkit Listrik Daya Rendah Di Daerah Parung Kabupaten Bogor Provinsi Jawa Barat.<br>19. H Nasbey, 2021, Rancang Bangun Sistem Wind Tunnel Sebagai Instrumen Pengukuran Karakteristik Turbin Angin Pembangkit Listrik Tenaga Angin.<br>20. H Nasbey, 2020, Rancang Bangun Sistem Pembangkit Listrik Hybrid (Gabungan Energi Angin Dan energi Surya) Sebagai Energi Alternatif Di FMIPA UNJ.<br>21. H Nasbey, 2020, Pelatihan Pembuatan Mini Microhidro Bagi Pelajar SMA. |