

## Syllabus

### Course description

|                          |   |
|--------------------------|---|
| <b>Course title</b>      | Physics I   |
| <b>Course code</b>       | 42145   |
| <b>Scientific sector</b> | FIS/01  |
| <b>Degree</b>            | Bachelor in Industrial and Mechanical Engineering |
| <b>Semester</b>          | II  |
| <b>Year</b>              | I   |
| <b>Academic Year</b>     | 2023/24   |
| <b>Credits</b>           | 8   |
| <b>Modular</b>           | //  |

|                              |  |
|------------------------------|--|
| <b>Total lecturing hours</b> | 60   |
| <b>Total lab hours</b>       | 0  |
| <b>Total exercise hours</b>  | 30   |
| <b>Attendance</b>            | Recommended  |
| <b>Prerequisites</b>         | Lectures and exercises of Mathematical Analysis I and Geometry |
| <b>Course page</b>           |  |

|  |   |
|--|---|
| <b>Specific educational objectives</b> | The student should understand the basic principles of mechanics and thermodynamics and be able to apply them. |
|--|---|

|  |   |
|--|---|
| <b>Lecturers</b>                         | Franco Cacialli<br><a href="mailto:franco.cacialli@unibz.it">franco.cacialli@unibz.it</a><br><br>Michele Larcher<br><a href="mailto:michele.larcher@unibz.it">michele.larcher@unibz.it</a>  |
| <b>Scientific sector of the lecturer</b> | FIS/03<br>ICAR/01   |
| <b>Teaching language</b>                 | English   |
| <b>Office hours</b>                      | After consultation and agreement with lecturer  |
| <b>Teaching assistant (if any)</b>       | -   |
| <b>Office hours</b>                      | -   |
| <b>List of topics covered</b>            | <ol style="list-style-type: none"> <li>1. Measurement and vectors: units, dimensions of physical quantities.</li> <li>2. Kinematics: Average and instantaneous velocity and acceleration. Uniformly accelerated movement.</li> <li>3. Dynamics: The three Newtonian axioms, work, energy, conservation of energy, oscillation, momentum.</li> <li>4. Statics: Static equilibrium, stress-strain, Young's modulus.</li> <li>5. Fluidics: Ideal fluids, Pascal's and Archimedes' principles, Bernoulli's equation.</li> </ol> |

|                        |  |
|------------------------|--|
|                        | 6. Thermodynamics: Thermal extension, kinetic gas theory, heat, ideal gases, first and second laws of thermodynamics, thermodynamic cycles, entropy. |
| <b>Teaching format</b> | The lessons are divided into theoretical classroom lessons and exercises on the blackboard.  |

|                                 |  |
|---------------------------------|--|
| <b>Learning outcomes (ILOs)</b> | <p>The learning outcomes need to refer to the Dublin Descriptors:</p> <p><u>Knowledge and understanding</u><br/>         Knowledge and understanding of physical laws of:<br/>         1. Mechanics<br/>         2. Thermodynamics</p> <p><u>Applying knowledge and understanding</u><br/>         3. Ability to apply knowledge for solving given problems, including solving them with numerical data, approximating significant numbers, and taking care of the notation of units.</p> <p><u>Making judgements</u><br/>         4. Ability to judge plausibility of results.</p> <p><u>Communication skills</u><br/>         5. Maturing of technical-scientific terminology.</p> <p><u>Ability to learn</u><br/>         6. Learning skills to independently study and apply methods of physics for specific applications beyond topics covered in this lecture.</p> |
|---------------------------------|--|

|  |  |   |                      |
|--|--|---|----------------------|
| <b>Assessment</b>  | <b>Formative assessment</b>  |   |                      |
|  | <b>Form</b>  | <b>Length /duration</b>                               | <b>ILOs assessed</b> |
|  | In-class exercises   | Continuously as part of course-accompanying exercises | 1-6                  |
|  | <b>Summative assessment</b>  |   |                      |
|  | <b>Form</b>  | <b>Length /duration</b>                               | <b>ILOs assessed</b> |
|  | Written  | 120 minutes   | 1-6                  |
| <b>Assessment language</b>                                 | English  |   |                      |
| <b>Evaluation criteria and criteria for awarding marks</b> | <p>The written exam consists of two parts: A first part (problem 1) with a series of general and/or conceptual questions, as well as a second part (problems 2-5) consisting of several (mostly) quantitative problems, distributed over all the topics listed above.</p> <p>Judged will be:</p> <ul style="list-style-type: none"> <li>the correctness of the approach and the mathematical steps of the solution, the calculation</li> </ul> |   |                      |

|  |  |
|--|--|
|  | <p>of numerical results and the correct use of physical quantities.</p> <ul style="list-style-type: none"> <li>• The correctness of the provided answers and arguments presented, and the terminology used.</li> </ul> |
|--|--|

| Required readings                    | Blackboard   |
|--------------------------------------|--|
| <p><b>Supplementary readings</b></p> | <ol style="list-style-type: none"> <li>1. Physics for Scientists and Engineers with Modern Physics, Douglas C. Giancoli, Pearson, 4th edition, 2008.</li> </ol> <p>Other languages:</p> <ol style="list-style-type: none"> <li>2. Physik, Douglas C. Giancoli, Pearson Studium, Pearson Deutschland GmbH, 3. Auflage, 2010 (based on 3rd edition "Physics for scientists and engineers with modern physics", 2000).</li> <li>3. Fisica. Con fisica moderna, Douglas C. Giancoli, terza edizione, 2017 (based on 7th edition "Physics. Principles with applications", 2014).</li> <li>4. Fundamentals of Physics, Halliday, Resnick, Walker, Wiley-VCH, 10<sup>th</sup> edition, 2013.</li> </ol> <p>Other languages:</p> <ol style="list-style-type: none"> <li>5. Physik, Halliday, Resnick, Walker, Wiley-VCH, 3. Auflage, 2018 (based on 10th edition of English version)</li> <li>6. Fondamenti di Fisica, Halliday, Resnick, Walker, CEA; 7 edizione, 2015 (based on 10th edition of English version)</li> <li>7. Physics for Scientists and Engineers. With Modern Physics, Paul A. Tipler, Gene Mosca, W.H. Freeman, 2008.</li> </ol> <p>Other languages:</p> <ol style="list-style-type: none"> <li>8. Physik für Wissenschaftler und Ingenieure, Paul A. Tipler, Gene Mosca, Spektrum Akademischer Verlag, 2015 (based on 6th edition of English version, 2008.)</li> <li>9. Corso di Fisica I - Meccanica, Onde, Termodinamica, Paul A. Tipler, Gene Mosca, Zanichelli, 4 edizione, 2009 (based on 6th edition of English version, 2008.)</li> </ol> |