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| <b>Identification</b>                     | <b>Subject</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PHSC150 Physics 1, 6 ECTS credits                                                                                                                            |
|                                           | <b>Department</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Physics and Electronics                                                                                                                                      |
|                                           | <b>Program<br/>(Undergraduate,<br/>Graduate)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Undergraduate                                                                                                                                                |
|                                           | <b>Term</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fall 2026                                                                                                                                                    |
|                                           | <b>Instructor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Aytaj Iskandarova                                                                                                                                            |
|                                           | <b>Email:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <a href="mailto:aytaj.isgandarova@khazar.org">aytaj.isgandarova@khazar.org</a><br><a href="mailto:aytajiskandarova@gmail.com">aytajiskandarova@gmail.com</a> |
|                                           | <b>Classroom/hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 408 Elshan Mehdiyev str. (Bakikhanov campus),<br>Monday–Wednesday, 15:00–19:00                                                                               |
| <b>Prerequisites</b>                      | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                              |
| <b>Language</b>                           | English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                              |
| <b>Compulsory/Elective</b>                | Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                              |
| <b>Textbooks and<br/>course materials</b> | Textbooks:<br>[1] - Fundamentals of Physics, Extended (10th ed.), Wiley - Halliday, D., Resnick, R., and Walker, J. - 2013<br>[2] - Physics for Scientists and Engineers with Modern Physics (10th ed.), Cengage Learning - Serway, R. A., and Jewett, J. W. Jr. - 2018<br>[3] - University Physics with Modern Physics (15th ed.), Pearson - Young, H. D., Freedman, R. A. – 2018<br>[4] - University Physics Volume 1. OpenStax - Ling, S. J., Sanny, J., and Moebs, W. - 2016                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                              |
| <b>Course description</b>                 | <p>This course offers a conceptually grounded introduction to the fundamental principles that govern the physical world. It explores the key concepts and processes associated with motion, forces, energy, heat, and thermodynamics, providing students with a structured framework for interpreting and understanding physical phenomena.</p> <p>The course combines theoretical concepts with systematic problem-solving methods, enabling students to examine physical systems, develop quantitative reasoning skills, and apply fundamental principles to practical and real-world contexts. The main topics include kinematics, Newton’s laws of motion, work and energy, momentum, rotational dynamics, oscillatory motion, and the laws of thermodynamics. Together, these topics provide a strong foundation in classical mechanics and molecular physics/thermodynamics.</p> |                                                                                                                                                              |
| <b>Course objectives</b>                  | <p>The main objective of this course is to provide students with a strong foundation in the fundamental principles and laws of classical mechanics, molecular physics, and thermodynamics. The course aims to:</p> <ul style="list-style-type: none"> <li>• Develop a clear understanding of the fundamental laws of mechanics and the physical phenomena associated with motion, forces, energy, and momentum.</li> <li>• Introduce the basic principles of molecular physics and thermodynamics, including the microscopic description of matter, temperature, heat, and the laws governing thermodynamic processes.</li> </ul>                                                                                                                                                                                                                                                      |                                                                                                                                                              |

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|                            | <ul style="list-style-type: none"> <li>• Develop students' ability to quantitatively analyze one- and two-dimensional motion and apply Newton's Laws of Motion to physical systems.</li> <li>• Strengthen analytical thinking and problem-solving skills through the mathematical modeling of mechanical and thermodynamic processes.</li> <li>• Provide students with the essential theoretical background necessary for further study of physics, particularly in the areas of mechanics, molecular physics, and thermodynamics.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                  |                                     |
| <b>Learning Outcomes</b>   | <p>By the end of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Describe and mathematically represent different types of motion, including one-dimensional, projectile, and uniform circular motion.</li> <li>• Apply Newton's Laws of Motion to identify and analyze contact and non-contact forces in mechanical systems.</li> <li>• Explain the fundamental principles of simple harmonic motion and analyze common oscillatory systems, including pendulums.</li> <li>• Determine and interpret basic thermodynamic state variables, particularly temperature and pressure.</li> <li>• Explain the principles of fluid statics and apply Archimedes' Principle to problems involving buoyancy.</li> <li>• Apply the concepts of work, energy, and conservation of energy to analyze mechanical systems and selected fluid-related processes.</li> <li>• Use appropriate mathematical and physical methods to analyze and solve theoretical and practical problems of varying complexity.</li> <li>• Demonstrate an integrated understanding of the fundamental concepts covered in mechanics, molecular physics, and thermodynamics through quizzes, midterm assessment, and final examination.</li> </ul> |                                  |                                     |
| <b>Teaching methods</b>    | <b>Case analysis</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                  | <input checked="" type="checkbox"/> |
|                            | <b>Group discussion</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  | x                                   |
|                            | <b>Lecture</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  | <input checked="" type="checkbox"/> |
|                            | <b>Simulation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                  | x                                   |
| <b>Evaluation Criteria</b> | <b>Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Date/deadlines</b>            | <b>Percentage (%)</b>               |
|                            | <b>Midterm Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>TBA</b>                       | 30                                  |
|                            | <b>Quizzes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Four quizzes during the semester | 20                                  |
|                            | <b>Practical Assignments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -                                | 0                                   |
|                            | <b>Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | During the semester              | 5                                   |
|                            | <b>Attendance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | At each lesson                   | 5                                   |
|                            | <b>Final Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>TBA</b>                       | 40                                  |
|                            | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                  | 100                                 |
| <b>Class Policy</b>        | <p><b>Preparation for class</b><br/> The pedagogical structure of this course necessitates diligent individual study and external preparation. Course sessions are designed to emphasize the primary theoretical frameworks introduced in the text. Pre-class engagement with assigned chapters is essential to facilitate a comprehensive understanding of the material. Subsequent to each session, students should synthesize their notes and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                  |                                     |

| <p>resolve pertinent problems, case studies, and sample examination questions located at the conclusion of each chapter.</p> <p><b>Withdrawal (pass/fail)</b><br/>This course strictly adheres to the grading ordinances of the School of Science and Engineering. Consequently, students are required to achieve a minimum threshold of 60% to secure a passing grade. In the event of an unsatisfactory result, the student will be mandated to repeat the course in the following academic term or year.</p> <p><b>Cheating/plagiarism</b><br/>Any instance of academic dishonesty or plagiarism during Quizzes, Midterms, or Final Examinations will result in the immediate nullification of the assessment. In such cases, the student will automatically be assigned a score of zero (0) without further consideration.</p> <p><b>Generative AI Policy</b><br/>The use of Generative Artificial Intelligence (GAI) tools is partially permitted in this course. Students may use GAI tools for learning purposes, such as obtaining explanations of course concepts, organizing information, generating practice questions, and supporting their understanding of the course material. GAI tools may not be used to complete or generate answers for quizzes, midterm examinations, final examinations, or other assessed work unless explicitly authorized by the instructor. Students are responsible for the accuracy of any information obtained through GAI tools and must ensure that their submitted work reflects their own understanding, analysis, and intellectual contribution. Any use of GAI in accordance with the permitted purposes should be appropriately acknowledged by the student.</p> <p><b>Professional behavior guidelines</b><br/>Students are expected to conduct themselves in a manner that fosters a constructive academic and professional environment during instructional hours. Unauthorized discourse and unethical behavior are strictly prohibited.</p> <p><b>Attendance</b><br/>Students who maintain full attendance for the duration of the course will be awarded 5 marks. Conversely, for every three absences recorded, the student will incur a deduction of 1 mark.</p> <p><b>Quizzes</b><br/>Four quizzes will be administered throughout the semester, with formal announcements made in class two weeks prior to the assessment date. The content of each quiz is based on assigned homework problems, which are curated from the questions and problems at the end of each chapter.</p> <p><b>Activity</b><br/>Students who demonstrate active engagement during the review of previous lessons and proficiently solve problems during seminar sessions will be awarded one activity mark.</p> |                             |                                                                       |                                      |
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| <b>Tentative Schedule</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                                                                       |                                      |
| <b>Week</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Date/Day (tentative)</b> | <b>Topics</b>                                                         | <b>Textbook/Assignments</b>          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 16-09-2026                  | Measurement, vectors. Motion along a straight line<br>Problem solving | [1] – p. 1-8, 13-31<br>[2] – p. 1-16 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 23-09-2026                  | Motion in Two and Three Dimensions: Kinematics<br>Problem solving     | [1] – p. 62-82<br>[2] – p. 68-89     |

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| 3  | 30-09-2026 | Fundamental Principles of Classical Dynamics<br>Quiz 1 – Lecture 1, Lecture 2                            | [1] – p. 94-114<br>[4] – Ch. 5       |
| 4  | 07-10-2026 | Friction. The Drag force and terminal speed<br>Problem solving                                           | [1] – p. 124-138<br>[4] – Ch. 6      |
| 5  | 14-10-2026 | Work–Energy Principles and Kinetic Energy<br>Problem solving                                             | [1] – p. 149-168                     |
| 6  | 21-10-2026 | Potential Energy and the Principle of Energy<br>Conservation<br>Quiz 2 – Lecture 3, Lecture 4, Lecture 5 | [1] – p. 177-200                     |
| 7  | 28-10-2026 | Linear momentum, impulse and collisions<br>Problem solving                                               | [1] – p. 214-244<br>[3] – p. 237-262 |
|    | TBC        | <b>Midterm exam</b>                                                                                      |                                      |
| 8  | 04-11-2026 | Rotational Motion and the Dynamics of Rigid Bodies<br>Problem solving                                    | [1] – p. 257-285<br>[2] – p. 287-297 |
| 9  | 11-11-2026 | Equilibrium and elasticity<br>Problem solving                                                            | [1] – p. 327-343                     |
| 10 | 18-11-2026 | Gravitational Interactions and Orbital Dynamics<br>Quiz 3 - Lecture 8, Lecture 9                         | [1] – p. 354-377<br>[4] – Ch. 13     |
| 11 | 25-11-2026 | Fluid Statics and Dynamics<br>Problem solving                                                            | [1] – p. 386-405<br>[4] – Ch. 14     |
| 12 | 02-12-2026 | Oscillatory Motion<br>Problem solving                                                                    | [1] – p. 413-434                     |
| 13 | 09-12-2026 | Temperature, heat, the first law of thermodynamics<br>Quiz 4 - Lecture 11, Lecture 12                    | [1] – p. 514-539                     |
| 14 | 16-12-2026 | The kinetic theory of gases<br>Problem solving                                                           | [1] – p. 549-576                     |
| 15 | 23-12-2026 | Entropy and the second law of thermodynamics<br>Problem solving                                          | [1] – p. 583-603                     |
|    | TBC        | <b>Final exam</b>                                                                                        |                                      |