REPUBLIKA E SHQIPËRISË

"ISMAIL QEMALI" UNIVERSITY
FACULTY OF TECHNICAL AND NATURAL SCIENCES
COMPUTER SCIENCE DEPARTMENT

SYLLABUS
PHYSICS 1

Curriculum Developer		DR. ASTRIT DENAJ							
Credits and hours	Credits	Hour in the classroom						Individual study	Total
		Lectures	Seminars	Labs	Practise	Course project	Total		
	6 ECTS	45	30	0	0	0	75	75	150
Course Typology		A - Basic disciplines							
Academic year /semester		2025-2026/ First year, First semester							
Nature and requirement of the course		Mandatory course							
Study program		Bachelor in Computer Engineering							
Course Code		FIZ 151E							
Email of curriculum developer / lecturer		astrit.denaj@univlora.edu.al							

SUMMARY AND LEARNING OUTCOMES

Course Description	Physics 1 is an introductory course that covers the fundamental concepts of classical physics. This course focuses on the mechanics of rigid bodies, motion, forces, energy, momentum, and Newton's famous laws of motion. Topics explored in this course include gravity, work, and kinetic and potential energy. The course also covers phenomena such as elasticity, vibrations, waves, and the comprehensive set of physical laws that describe motion.
Course Objectives	● Understand and apply the fundamental concepts of mechanics. ● Use mathematical methods to solve problems related to forces and motion. ● Acquire experimental skills to measure and analyze the results of experimental measurements.
Expected Outcomes	By the end of the course, students will be able to: ● Apply the equations of motion in kinematics exercises. ● Apply Newton's laws in dynamics exercises. ● Apply the laws of conservation of mechanical energy and momentum. ● Apply the general equation of state for gases and the principles of thermodynamics in thermodynamics exercises.

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FUNDAMENTAL CONCEPTS

- Displacement, velocity, acceleration
- Equations of motion of a material point
- Laws of dynamics
- Laws of conservation of energy and momentum
- Equation of mechanical waves
- Principles of thermodynamics

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Week	COURSE TOPICS	Reference Literature	Teaching Methodology
I	***Topic 1**: Measurement System. Measurement Units. Unit Conversion. Dimensions of Physical Quantities.* ***Topic 2**: Exponential Expressions (Scientific Notation). Significant Figures and Order of Magnitude.* ***Topic 3**: Scalar and Vector Physical Quantities. Operations with Vectors.* ***Seminar 1**: Exercises with Vectors. Addition and Subtraction of Vectors.* ***Seminar 2**: Exercises with Vectors. Scalar Multiplication of a Vector. Scalar and Vector Product of Vectors.*	[1] page 7-17	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
II	***Topic 4**: Motion in One Dimension. Displacement and Average Velocity. Instantaneous Velocity. Acceleration.* ***Topic 5**: Motion with Constant Acceleration.* ***Topic 6**: Integration. Problems.* ***Seminar 3**: Exercises Applying the Equations of One-Dimensional Motion.* ***Seminar 4**: Exercises Applying the Equations of One-Dimensional Motion.*	[1] page 22-42	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
III	***Topic 7**: Motion in Two and Three Dimensions. Displacement Vector and Vector Addition. Determination of the Sum of Two Vectors Using Their Components. Unit Vectors and Vector Products. Velocity Vector.* ***Topic 8**: Acceleration Vector. Relative Velocity.* ***Topic 9**: Motion of Bodies. Circular Motion. Problems.* ***Seminar 5**: Exercises Applying the Equations of Motion for Two-Dimensional Motion.* ***Seminar 6**: Exercises Applying the Equations of Motion for Three-Dimensional Motion.*	[1] page 53-74	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
IV	***Topic 10**: Newton's Laws. Newton's First Law: The Principle of Inertia. Force, Mass, and Newton's Second Law. Gravitational Force and Weight.* ***Topic 11**: Newton's Third Law. Forces in Nature.* ***Topic 12**: Applications in Problem-Solving. Problems.* ***Seminar 7**: Applications of Newton's Laws in Physics Exercises.* ***Seminar 8**: Applications of Newton's Laws in Physics Exercises.*	[1] page 84-107	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*

V	***Topic 13**: Friction. Resistance Forces. Problems Involving Two or More Bodies.* ***Topic 14**: Fictitious Forces (Inertial Forces). Numerical Methods. Problems.* ***Topic 15**: Work and Energy. Work and Kinetic Energy, Motion in a Straight Line with Constant Forces. Work Done by a Variable Force. Work and Energy in Three Dimensions and the Scalar Product of Two Vectors.* ***Seminar 9**: Exercises on the Work of a Constant Force and the Work of a Variable Force.* ***Seminar 10**: Exercises on Kinetic Energy.*	[1] page 115-158	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
VI	***Topic 16**: Work and Energy of a System of Particles: Potential Energy. Potential Energy and Equilibrium in One Dimension. Conservation of Mechanical Energy.* ***Topic 17**: The Generalized Work-Energy Theorem. Conservation of Energy. Power. Problems.* ***Topic 18**: Systems of Particles and Conservation of Momentum. Center of Mass. Motion of the Center of Mass of a System of Particles. Conservation of Momentum. Center of Mass Reference Frame.* ***Seminar 11**: Exercises on the Work-Energy Theorem.* ***Seminar 12**: Exercises on the Law of Conservation of Mechanical Energy. Power.*	[1] page 163-214	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
VII	***Topic 19**: Kinetic Energy of a System of Particles. One-Dimensional Collisions. Three-Dimensional Collisions.* ***Topic 20**: Impulse of a Force and the Average Force over Time. Reaction Propulsion. Problems.* ***Topic 21**: Rotational Motion. Angular Velocity and Angular Acceleration. Torque and Moment of Inertia. Rotational Kinetic Energy.* ***Seminar 13**: Exercises on Elastic and Inelastic Collisions.* ***Seminar 14**: Exercises Applying the Equations of Rotational Motion.*	[1] page 216-253	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
VIII	***Topic 22**: Calculation of the Moment of Inertia. Angular Momentum. Rolling Motion. The Vector Nature of Rotational Quantities and the Vector Product of Two Vectors.* ***Topic 23**: Gyroscopic Motion. Static and Dynamic Imbalance. Problems.* ***Topic 24**: Static Equilibrium of a Rigid Body. Conditions for Equilibrium. Center of Gravity (or Centroid). Examples of Static Equilibrium.* ***Seminar 15**: Exercises on Moment of Inertia and Angular Momentum.* ***Seminar 16**: Exercises on the Equilibrium of Bodies.*	[1] page 255-307	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*

IX	***Topic 25**: Torque. Stability of Equilibrium. Problems.* ***Topic 26**: Gravitation (Universal Attraction). Kepler's Laws. Newton's Law of Universal Gravitation. Determination of the Universal Gravitational Constant. Gravitational Mass and Inertial Mass.* ***Topic 27**: Escape from Earth. Potential Energy, Total Energy, and Types of Orbits. Gravitational Field of a Spherical Shell and a Solid Sphere. Problems.* ***Seminar 17**: Exercises on Kepler's Laws and Newton's Law of Universal Gravitation.* ***Seminar 18**: Exercises on Potential Energy and Total Energy.*	[1] page 312-352	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
X	***Topic 28**: Mechanics of Rigid Bodies and Fluids. Density. Stress and Strain. Pressure in a Fluid. Archimedes' Principle and Buoyancy.* ***Topic 29**: Surface Tension and Capillarity. Fluid Motion and Bernoulli's Theorem. Viscous Fluid Flow. Problems.* ***Topic 30**: Oscillations. Simple Harmonic Motion: Motion of a Mass-Spring System. Simple Harmonic Motion and Uniform Circular Motion.* ***Seminar 19**: Exercises on Rigid Body Mechanics.* ***Seminar 20**: Exercises on Surface Tension, Bernoulli's Theorem, and Viscosity.*	[1] page 361-416	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
XI	***Topic 31**: Energy in Simple Harmonic Motion. A Mass Suspended from a Vertical Spring.* ***Topic 32**: The Pendulum. Motion Near the Equilibrium Position. Damped Oscillations. Damping and Resonance. Problems.* ***Topic 33**: Damped Oscillations. Damping and Resonance. Problems.* ***Seminar 21**: Exercises on Oscillatory Motion. Mathematical Pendulum. Damped Oscillations.* ***Seminar 22**: Exercises on Mechanical Waves. Wave Energy. Standing Waves.*	[1] page 418-453	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
XII	***Topic 34**: Waves on a String. Elastic Waves. Wave Propagation Speed. Harmonic Waves.* ***Topic 35**: Energy Transmitted by Waves. Superposition and Interference of Harmonic Waves. Standing Waves.* ***Topic 36**: Superposition of Standing Waves. Wave Equation (Optional). Problems.* ***Seminar 23**: Exercises on Wave Superposition and the Wave Equation.* ***Seminar 24**: Exercises on Sound Waves.*	[1] page 457-478	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*

XIII	***Topic 37**: Sound. Speed of Sound Waves. Harmonic Sound Waves.* ***Topic 38**: Three-Dimensional Waves: Intensity of a Wave. Interference, Beats.* ***Topic 39**: Stationary Sound Waves. Harmonic Analysis and Harmonic Synthesis. Wave Speed and Dispersion.* ***Seminar 25**: Exercises on Reflection, Refraction, and Diffraction. Doppler Effect.* ***Seminar 26**: Exercises on the General Equation of the Ideal Gas State. Kinetic Theory of Gases.*	[1] page 479-506	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
XIV	***Topic 40**: Reflection, Refraction, and Diffraction. Doppler Effect.* ***Topic 41**: Van der Waals Equation and Liquid-Vapor Isotherms. Phase Diagrams (or State Diagrams). Problems.* ***Topic 42**: Temperature and Kinetic Theory of Gases. Heat and the First and Second Laws of Thermodynamics. Heat Capacity and Specific Heat. Internal Energy of an Ideal Gas.* ***Seminar 27**: Exercises on Wave Reflection, Refraction, and the Doppler Effect.* ***Seminar 28**: Exercises on Heat Capacity.*	[1] page 510-603	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*
XV	***Topic 43**: The First and Second Laws of Thermodynamics. Work and the pV Diagram in a Gas. Heat Capacity and the Equipartition Theorem.* ***Topic 44**: Energy Usage. Heat Engines and the Second Law of Thermodynamics. Refrigerators and the Second Law of Thermodynamics. Entropy and Order. Entropy and Probability. Problems.* ***Topic 45**: Review. Preparation for the Final Exam.* ***Seminar 29**: Exercises on the Application of the First Law of Thermodynamics.* ***Seminar 30**: Exercises on Final Exam Preparation.*	[1] page 605-618	Lecture 1 hour Lecture 1 hour Lecture 1 hour *Seminar 1 hour* *Seminar 1 hour*

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KNOWLEDGE ASSESSMENT

ATTENDANCE	Attendance for lectures and seminars is mandatory at 75%. Otherwise, the student loses the right to take the exam. Absences are the personal responsibility of the student, as are any missed assignments or tests. A student who has less than 75% attendance for the period relevant to any partial exam, during which they will be tested, will not be allowed to take the corresponding exam and will be graded with an M (Missing). If the student has attended the course but does not show up for the next exam, they will be graded NP (Not Present).

	Assessment Method	*Assessment Time*	*Learning Topics to be Assessed*	*Maximum Points*	*Knowledge Testing Method*	*Test Content*
CONTINUOUS ASSESSMENT	Partial Exam	Week 7-8	1-15	25 points	Written exam	Concepts and exercises
	Final Exam	End of the semester	16-45	60 points	Written exam	Concepts and exercises
	Continuous Assessment* (Course Assignment*)	During the semester	-	15 points	Written raport and oral presentation	Exercises
	* Continuous Assessment – *The student will realize a project, that will start at the beginning of the semester.*					

The conversion of points to the final grade is as follows:

0 - 40 points	41 - 50 points	51 - 60 points	61 - 70 points	71 - 80 points	81 - 90 points	91 - 100 points
4	5	6	7	8	9	10

LITERATURE

Primary literature	[1] "Kursi i Fizikës I"; Për studentet e Inxhinerisë. Grup Autorësh [2] "Ushtrime të zgjidhura, Kursi i Fizikës 1", Partizan Malkaj.
Recommended literature	[1] University Physics with Modern Physics 15th Edition by Hugh Young (Author), Roger Freedman (Author), 2019, ISBN-10 0135159555.

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FINAL REMARKS FROM THE COURSE INSTRUCTOR	
Provisions	Students are expected to develop values and an ethics that reflect their interests and behavior from a professional perspective. Students must respect individual differences, be cooperative, and in accordance with ethical rules, they should respect ethnic differences and assist individuals with disabilities with inclusive and supportive attitudes.
Delays	Delays in lectures and seminars will not be tolerated.
Academic integrity and copyright	Each test or written work must be completely individual and original. Plagiarism (mixed combinations) or theft of information through various means will not be allowed.

HEAD OF DEPARTMENT OF COMPUTER SCIENCES
Dr. Alketa HYSO