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| UNIVERSITY OF TECHNOLOGY AND EDUCATION HOCHIMINH CITY  **Faculty of Applied Sciences** | **Major: Engineering branches**  **Level: Undegraduate**  **Program: High quality training** |

**COURSE SYLLABUS**

1. **Vietnamese name: Vật lý 1 Course** **number: PHYS130402**
2. **English name: Principles of Physics 1**
3. **Credit number: 3** credits (3/0/6) (3 credits in class, 0 credit in laboratory, 6 credits at home)

Contribute to 15 weeks (3 hours in class /week + 6 hours self–study /week)

1. **Instructors:**

1/ Main Lecturer: Do Quang Binh, Vo Thanh Tan, Phan Gia Anh Vu, Tran Tuan Anh, Luu Viet Hung, Pham Thanh Trung.

2/ List of the other lecturers: Huynh Quang Chien, Tran Thien Huan, Le Son Hai, Huynh Hoang Trung, Nguyen Thuy Ngoc Thuy, Nguyen Le Van Thanh, Tran Thi Khanh Chi, Tran Thi Ngoc Lam, Truong Thi Tran Chau.

1. **Prerequisites**

Prerequisite courses: Mathematics 1

1. **Course Description**

This course provides students with the fundamental physics including mechanics and thermodynamics as a basic knowledge for approaching major college subjects of study in science, engineering and technology.

Our students will be trained with the physical knowledge in order to interpret the movement, the energy and the other physical phenomena related to objects in the nature with a size from molecular to planet. After this course, they can apply the studied knowledge in scientific research as well as in engineering development and advanced technology.

The content of this subject consists of chapters from 1 to 22 in the book “Physics for Scientists and Engineers with Modern Physics”, 9th Edition of R.A. Serway and J.W. Jewett.

The goal of this subject helps our students to be familiar with the scientific method, the fundamental laws of physics, interpretation of scientific knowledge in general physics and logical reasoning skills as well as strategies in preparation for learning major subjects according to the bachelor program for engineers. In order to achieve this goal, this course will focus on the combination between an understanding of the concepts and necessary skills for solving many different forms of standard problems (homework) at the end of each chapter.

Besides that, this course will also help our students to understand how to build mathematical models based on experimental results and know how to analyze, to write, to present as well as to develop a specific model based on the recorded data. They can use this model to predict the results of other experiments. Simultaneously, they will know limits of the model and can use it in the prediction.

1. **Course Goals**

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| **Goals** | **Goal description**  *This course provides students:* | **Expected Learning Outcome of Program** |
| **G1** | The knowledge of classical mechanics; mechanical oscillations and waves; thermodynamics. | **1.1** |
| **G2** | The ability of analysis, interpretation and classification the physical phenomena related to mechanical, mechanical oscillations and waves, thermodynamics. | **2.1** |
| **G3** | Teamwork and communication skills | **3.1** |

1. **Course objectives and ELO**

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| **Course objectives** | | **Description**  *(Upon successful completion of this course, students will be able to)* | **ELO of Program** |
| **G1** | **1** | Understand the concepts, theorems, laws related to classical mechanics and fluid mechanics. | **1.1** |
| **2** | Understand the concepts, phenomena related to mechanical oscillations and waves. | **1.1** |
| **3** | Understand the concepts, the process of change and the principles of thermodynamics. | **1.1** |
| **G2** | **1** | Applying the knowledge and skills required to solve the problems in mechanics. | **2.1.1** |
| **2** | Applying the knowledge of the mechanical oscillations and waves to explain the phenomena and solve the related problems. | **2.1.1** |
| **3** | Applying the knowledge of thermodynamics to explain the phenomena related to the temperature and solve the related problems. | **2.1.1** |
| **G3** | **1** | To express the learned knowledge by problem solving capability and answer questions related to the concepts learned. | **3.1** |
| **2** | Clearly explain the concepts learned to another person. | **3.1** |
| **3** | Ability to work in groups to discuss and solve problems related to physics. | **3.2** |

1. **References**

**-** Textbooks:

1. R.A. Serway & J.W. Jewett; *Physics for Scientists and Engineers with Modern Physics*, 9th Edition; ISBN for bundle 9781285143811.

2. Physics 1 lectures summary, University of Technology and Education, HCMC.

**-** Others:

1. D. Hallyday et al, **Fundamentals of Physics**, John Willey & Sons,1999.
2. Tran Ngoc Hoi and Pham Van Thieu: General physics: Principles and Applications, Volume 1, Viet Nam Education Publishing House, 2006.
3. Huynh Quang Chien and Tran Thi Thien Huong, General physics **A1:** Mechanics-Thermodynamics**,** University of Technology and Education, HCMC, 2005.
4. Tran Thi Thien Huong and Vo Thanh Tan, General physics workbook **A1:** Mechanics-Thermodynamics**,** University of Technology and Education, HCMC, 2005.
5. Luong Duyen Binh et al., General physics, volume 1: Mechanics-Thermodynamics, Viet Nam Education Publishing House, 1995.
6. Luong Duyen Binh et al., General physics workbook, volume 1: Mechanics-Thermodynamics, Viet Nam Education Publishing House, 1994.
7. Luong Duyen Binh et al., General physics workbook, volume 2: Electricity – Oscillations and Mechanical waves, Viet Nam Education Publishing House, 2006.
8. Nguyen Nhat Khanh, lectures on mechanics and thermodynamics, university of natural sciens, HCMC, 1998.
9. **Assessment**

Learning outcomes of students will be evaluated through the implementation of questions selected from homework; tests and final test.

- Grade scale: **10**

- Plan for assessments:

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| **Methods for assessments** | **Content** | **Time** | **Methods** | **ELO** | **Rated of grade (%)** |
| **Midterm** | | | |  | **50** |
| Test #1 | Qualitative and quantitative exercises on kinetics and dynamics of particles and objects. | Week 6th | Paper test in class |  | 20 |
| Test #2 | Qualitative and quantitative exercises on the application of conservation laws. | Week 11th | Paper test in class |  | 20 |
| Test online |  |  |  |  | 5 |
| Diligence |  |  |  |  | 5 |
| **Final exam** | | |  |  | **50** |
|  | - Including most course objectives.  - Test time 90 minutes. | Week 17th or 18th | Paper test |  | 50 |

1. **Contents and tentative schedule**

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| **Week** | **Content** | **Expected Learning Outcomes** |
|  | ***Chapter 1: Physics and Measurement + Chapter 2: Motion in One Dimension*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods***: (3)*  **Content of lecture:**  ***Chapter 1: Physics and Measurement***  1.1 Standards of Length, Mass, and time 1.2 Matter and Model Building 1.3 Dimensional analysis  ***Chapter 2: Motion in One Dimension***  2.1 Position, Velocity, and Speed 2.2 Instantaneous Velocity and Speed 2.3 Analysis Model: Particle Under Constant Velocity  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/*** **Tasks for students at home** *(6)*  1.4 Conversion of Units 1.5 Estimates and Order-of Magnitude Calculations 1.6 Significant Figures  Chapter 1 exercises | **G1.1, G2.1** |
| 2 | ***Chapter 2: Motion in One Dimension (continued)+ Chapter 3: Vectors*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 2: Motion in One Dimension***  2.4 Acceleration 2.5 Motion Diagrams 2.6 Analysis Model: Particle Under Constant Acceleration 2.7 Freely Falling Objects 2.8 Kinematic Equations Derived from Calculus    ***Chapter 3: Vectors***  3.1 Coordinate Systems 3.2 Vector and Scalar Quantities 3.3 Some Properties of Vectors 3.4 Components of a Vector and Unit Vectors  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  2.5 Motion Diagrams 2.8 Kinematic Equations Derived from Calculus  3.3 Some Properties of Vectors  Chapter 2 exercises | **G1.1, G2.1,** |
| 3 | ***Chapter 4: Motion in Two Dimension*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  4.1 The Position, Velocity, and Acceleration Vectors 4.2 Two-Dimensional Motion with Constant Acceleration 4.3 Projectile Motion 4.4 Analysis Model: Particle in Uniform Circular Motion 4.5 Tangential and Radial Acceleration 4.6 Relative Velocity and Relative Acceleration  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  Chapter 4 exercises | **G1.1, G2.1,** |
| 4 | ***Chapter 5: The Laws of Motion+ Chapter 6: Circular Motion and Other Applications of Newton’s Laws (3/0/6)*** |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 5: The Laws of Motion***  5.1 The Concept of Force 5.2 Newton’s First Law and Inertial Frames 5.3 Mass 5.4 Newton’s Second Law 5.5 The Gravitational Force and Weight 5.6 Newton’s Third Law 5.7 Analysis Models Using Newton’s Second Law 5.8 Forces of Friction  ***Chapter 6: Circular Motion and Other Applications of Newton’s Laws***  6.1 Extending the Particle in Uniform Circular Motion Model 6.2 Nonuniform Circular Motion 6.3 Motion in Accelerated Frames 6.4 Motion in the Presence of Resistive Forces  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  Chapters 5 and 6 exercises | **G1.1, G2.1,** |
| 5 | ***Chapter 7: Energy of a System*** *(3/0/6)* | |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 7: Energy of a System***  7.1 Systems and Environments 7.2 Work Done by a Constant Force 7.3 The Scalar Product of Two Vectors 7.4 Work Done by a Varying Force 7.5 Kinetic Energy and the Work–Kinetic Energy Theorem 7.6 Potential Energy of a System 7.7 Conservative and Nonconservative Forces 7.8 Relationship Between Conservative Forces and Potential Energy 7.9 Energy Diagrams and Equilibrium of a System  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  7.3 The Scalar Product of Two Vectors 7.9 Energy Diagrams and Equilibrium of a System  Chapter 7 exercises | **G1.1, G2.1** |
| 6 | ***Chapter 8: Conservation of Energy*** *(3/0/6)* | |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  8.1 Analysis Model: Nonisolated System (Energy) 8.2 Analysis Model: Isolated System (Energy) 8.3 Situations Involving Kinetic Friction 8.4 Changes in Mechanical Energy for Nonconservative Forces 8.5 Power  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  8.3 Situations Involving Kinetic Friction  Chapter 8 exercises | **G1.1, G2.1** |
| 7 | ***Chapter 9: Linear Momentum and Collisions***  *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 9: Linear Momentum and Collisions***  9.1 Linear Momentum 9.2 Analysis Model: Isolated System (Momentum) 9.3 Analysis Model: Nonisolated System (Momentum) 9.4 Collisions in One Dimension 9.5 Collisions in Two Dimensions 9.6 The Center of Mass 9.7 Systems of Many Particles 9.8 Deformable Systems 9.9 Rocket Propulsion  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  9.8 Deformable Systems 9.9 Rocket Propulsion  Chapter 9 exercises | **G1.1, G2.1** |
| 8 | ***Chapter 10: Rotation of a Rigid Object About a Fixed Axis (3/0/6)*** |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  10.1 Angular Position, Velocity, and Acceleration  10.2 Analysis Model: Rigid Object Under Constant Angular Acceleration  10.3 Angular and Translational Quantities  10.4 Torque  10.5 Analysis Model: Rigid Object Under a Net Torque  10.6 Calculation of Moments of Inertia  10.7 Rotational Kinetic Energy  10.8 Energy Considerations in Rotational Motion  10.9 Rolling Motion of a Rigid Object  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  Chapter 10 exercises | **G1.1, G2.1** |

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| 9 | ***Chapter 11: Angular Momentum + Chapter 12: Static Equilibrium and Elasticity (3/0/6)*** |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 11: Angular Momentum***  11.1 The Vector Product and Torque 11.2 Analysis Model: Nonisolated System (Angular Momentum) 11.3 Angular Momentum of a Rotating Rigid Object 11.4 Analysis Model: Isolated System (Angular Momentum) 11.5 The Motion of Gyroscopes and Tops  ***Chapter 12: Static Equilibrium and Elasticity***  12.1 Analysis Model: Rigid Object in Equilibrium 12.2 More on the Center of Gravity 12.3 Examples of Rigid Objects in Static Equilibrium 12.4 Elastic Properties of Solids  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  11.5 The Motion of Gyroscopes and Tops  12.2 More on the Center of Gravity  Chapters 11 and 12 exercises | **G1.1, G2.1,** |

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| 10 | ***Chapter 13: Universal Gravitation*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  13.1 Newton’s Law of Universal Gravitation 13.2 Free-Fall Acceleration and the Gravitational Force 13.3 Analysis Model: Particle in a Field (Gravitational) 13.4 Kepler’s Laws and the Motion of Planets 13.5 Gravitational Potential Energy 13.6 Energy Considerations in Planetary and Satellite Motion  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(8)*  13.3 Analysis Model: Particle in a Field (Gravitational) 13.6 Energy Considerations in Planetary and Satellite Motion  Chapter 13 exercises | **G1.1, G2.1,** |

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| 11 | ***Chapter 14: Fluid Mechanics*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  14.1 Pressure 14.2 Variation of Pressure with Depth 14.3 Pressure Measurements 14.4 Buoyant Forces and Archimedes’s Principle 14.5 Fluid Dynamics 14.6 Bernoulli’s Equation 14.7 Other Applications of Fluid Dynamics  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  14.7 Other Applications of Fluid Dynamics Chapter 14 exercises | **G1.1, G2.1,** |

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| 12 | ***Chapter 15: Oscillatory Motion + Chapter 16: Wave Motion*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 15: Oscillatory Motion***  15.1 Motion of an Object attached to a Spring  15.2 analysis Model: particle in Simple Harmonic Motion  15.3 Energy of the Simple Harmonic Oscillator  15.4 Comparing Simple Harmonic Motion with Uniform Circular Motion  15.5 the pendulum  15.6 Damped Oscillations  15.7 Forced Oscillations  ***Chapter 16: Wave Motion***  16.1 Propagation of a Disturbance 16.2 Analysis Model: Traveling Wave 16.3 The Speed of Waves on Strings 16.4 Reflection and Transmission 16.5 Rate of Energy Transfer by Sinusoidal Waves on Strings 16.6 The Linear Wave Equation  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  15.6 Damped Oscillations  15.7 Forced Oscillations  Chapters 15 and 16 exercises | **G1.1, G2.1,** |

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| 13 | ***Chapter 17: Sound Waves + Chapter 18: Superposition and Standing Waves*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 17: Sound Waves***  17.1 Pressure Variations in Sound Waves 17.2 Speed of Sound Waves 17.3 Intensity of Periodic Sound Waves 17.4 The Doppler Effect  ***Chapter 18: Superposition and Standing Waves***  18.1 Analysis Model: Waves in Interference 18.2 Standing Waves 18.3 Analysis Model: Waves Under Boundary Conditions 18.4 Resonance 18.5 Standing Waves in Air Columns 18.6 Standing Waves in Rods and Membranes 18.7 Beats: Interference in Time 18.8 Nonsinusoidal Wave Patterns  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  18.5 Standing Waves in Air Columns 18.6 Standing Waves in Rods and Membranes 18.7 Beats: Interference in Time 18.8 Nonsinusoidal Wave Patterns  Chapters 17 and 18 exercises | **G1.1, G2.1,** |

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| 14 | ***Chapter 19: Temperature + Chapter 20: The First Law of Thermodynamics*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 19:* *Temperature***  19.1 temperature and the Zeroth Law of thermodynamics 19.2 thermometers and the Celsius temperature Scale 19.3 the Constant-Volume Gas thermometer and the Absolute temperature Scale 19.4 thermal Expansion of Solids and Liquids 19.5 Macroscopic Description of an Ideal  ***Chapter 20:* *The First Law of Thermodynamics***  20.1 Heat and Internal Energy 20.2 Specific Heat and Calorimetry 20.3 Latent Heat 20.4 Work and Heat in Thermodynamic Processes 20.5 The First Law of Thermodynamics 20.6 Some Applications of the First Law of Thermodynamics 20.7 Energy Transfer Mechanisms in Thermal Processes  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(8)*  20.3 Ẩn nhiệt  Chapters 19 and 20 exercises | **G1.1, G2.1,** |

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| 15 | ***Chapter 21: The Kinetic Theory of Gases + Chapter 22: Heat Engines, Entropy, and the Second Law of Thermodynamics*** *(3/0/6)* |  |
| ***A/* Content of lecture and Teaching methods:** *(3)*  **Content of lecture:**  ***Chapter 21:* *The Kinetic Theory of Gases***  21.1 Molecular Model of an Ideal Gas 21.2 Molar Specific Heat of an Ideal Gas 21.3 The Equipartition of Energy 21.4 Adiabatic Processes for an Ideal Gas 21.5 Distribution of Molecular Speeds  ***Chapter 22:* *Heat Engines, Entropy, and the Second Law of Thermodynamics***  22.1 Heat Engines and the Second Law of Thermodynamics 22.2 Heat Pumps and Refrigerators 22.3 Reversible and Irreversible Processes 22.4 The Carnot Engine 22.5 Gasoline and Diesel Engines 22.6 Entropy 22.7 Changes in Entropy for Thermodynamic Systems 22.8 Entropy and the Second Law  **Teaching menthods** :   * Lecture * Slideshow * Focus group discussion (FGD) | **G1.1, G2.1, G3** |
| ***B/ Tasks for students at home***: *(6)*  22.5 Gasoline and Diesel Engines 22.8 Entropy and the Second Law  Chapters 21 and 22 exercises | **G1.1, G2.1** |

1. **Ethics in science**

All exercises in the class and homework must be done by students. If there is any plagiarism, their assignments will not be evaluated.

1. **Date of first approval:**
2. **Approval:**

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| **Dean of faculty** | **Head of Department** | **Editors** |
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1. **Updated history**

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| **1st updated** : 17 Jannuary 2016 | **Editor**  **Head of Department** |