# PHYSICS 1 AND EXPERIMENT

## Course Syllabus

### 1. General Information

**Course name:** **Physics 1 and Experiment**

**Course code:** **BAS 1 2 24**

**Number of credits**: 4

### 2. Objectives

The aim of this course will provide basic knowlege about the motions and matter interactions in order for student to get better understanding about basic technical and major subjects, to form scientific thinking and worldview.

### 3. Abstract

Understanding the the notions and definitions of general physcis, applying physics techniques and skills with basic and modern equipments to measure some basic Physics quantities

On completion of this course students will be able to solve their major problems, analyse their experimental data, compare with theory and able to describe the problem solution strategy.

### 4. Teaching and learning methods

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| Lectures: | 42 *(hours)* |
| Solving problem: | 6 *(hours)* |
| Experiment: | 8 (*hours*) |
| Self-study : | 4 *(hours)* |

### 5. Prerequisites

Calculus 1 and 2, Algebra

### 6. Learning Outcomes

On successful completion of this course a student will:

1. To understand the notions and definitions of general physcis
2. To grasp the contents of general physcis
3. Can apply the object-oriented finding, writing, solving, analysis, practicing and understanding the problems of physics

### 7. Assessment Criteria

| **Learning outcomes On successful completion of this course a learner will:** | **Assessment criteria for pass The learner can:** |
|---|---|

| **Learning outcomes On successful completion of this course a learner will:** | **Assessment criteria for pass The learner can:** |
|---|---|
| LO1 To understand the notions and definitions of general physcis | - Velocity, acceleration and momentum<br>- Center of mass, translational and rotational motions<br>- Work, power, energy, kinetic energy and potential energy<br>- Gravitational field<br>- Temperature, internal energy, work and heat<br>- Heat engines, refrigerators, and entropy<br>- Electric field, electric field strength, electric flux and electric potential<br>- Conductor, capacitor and capacitance<br>- Dielectrics and bound charges<br>- Magnetic field, magnetic field strength, and magnetic flux<br>- the phenomenon of electromagnetic induction<br>- Ferromagnetism, paramagnetism and diamagnetism<br>- Electromagnetic field, electromagnetic oscillations and electromagnetic wave |
| LO2 To grasp the contents of general physcis | - Newton's laws of motion<br>- Conservation laws of energy and mechanical energy in conservative force field<br>- The conservation laws of energy and mechanical energy in conservative force field<br>- Newton's law of universal gravitation<br>- The first law of thermodynamics<br>- The second law of thermodynamics, the increasing principle of entropy<br>- Coulomb's law and O-G's law, and the relation between electric field and electric potential<br>- Induced electricity and electric field energy<br>- Dielectric polarization, properties of special dielectrics<br>- Ampere's law, O-G's law, Ampere's principle on total current<br>- Laws of electromagnetic induction and self-inductance<br>- Special properties of ferromagnetism and explain |

| Learning outcomes On successful completion of this course a learner will: | Assessment criteria for pass The learner can: |
|---|---|
| | - Two Maxwell's viewpoints and Maxwell's equations |
| LO3 Can apply the object-oriented finding, writing, solution, analysis, practice and understanding the problems of physics | - The relative motion and Galileo's relative principle<br>- Equation of rotational motion in particular problems<br>- The mechanical problems by using conservation law of energy<br>- The escape velocities (I and II levels)<br>- The cons of the first law of thermodynamics<br>- Heat engine and refrigerator<br>- The electric field and electric potential of symmetrically charged objects<br>- Many connected conductors<br>- Bound charge density in particular problems<br>- The effect of magnetic field on electric current and moving charged particle<br>- Particular electric circuit<br>- The special properties of ferromagnetism in practical uses<br>- The transmission of electromagnetic wave |

**8. Outlines**

**Part 1 MECHANICS**

**Chapter 1: Dynamics of a single particle**

1.1 Kinetics of a single particle

1.1.1 Basic concepts

1.1.2 Velocity and acceleration

1.2 Dynamics of a single particle

1.2.1 Newton's laws of motion

1.2.2 Linear momentum

1.2.3 Angular momentum

1.2.4 Relative motion and Galileo's principle of relativity

**Chapter 2: Dynamics of a system of particles – rigid body**

2.1 Centre of mass

2.2 Law of conservation of linear momentum

2.3 Rotational equation of motion of rigid body

2.4 Law of conservation of angular momentum

**Chapter 3: Mechanical Energy**

3.1 Work and power

3.2 Mechanical Energy and law of conservation of mechanical energy

3.3 Kinetic energy

3.4 Potential energy

**Chapter 4: Gravitational field**

4.1 Newton's law of universal gravitational force

4.2 Gravitational field

**Part II: THERMOLOGY**

**Chapter 5: Principle I of thermodynamics (*self study*)**

5.1 Some basic concepts

5.2 Internal energy of a thermodynamic system. Work and heat.

5.3 Principle I of thermodynamics

**Chapter 6: Principle II of thermodynamics (*self study*)**

6.1 Thermal engines and refrigerators. Principle II of thermodynamics

6.2 Carnot cycle and Carnot theorem. Expression of principle II.

6.3 The entropy and the principle of increase of entropy. Nernst heat theorem.

**Part III: Electricity – Electromagnetism**

**Chapter 7: Electrostatic field**

7.1 Basic concepts

7.2 Coulomb's law

7.3 Electric field and vector of electric field strength

7.4 Electric flux and Gauss's theorem for electric field

7.5 Electric potential and equipotential surface

7.6 Relation between vector of electric field strength and electric potential

**Chapter 8: Conductor**

8.1 Conditions and properties of conductors in electrostatic equilibrium

8.2 Phenomenon of electrostatic induction

8.3 Capacitance of an isolated conductor, Capacitor

8.4 Electric energy

**Chapter 9: Dielectrics**

9.1 Dielectric polarization

9.2 Polarization vector of dielectrics

9.3 Composite electric field in dielectrics

9.4 Special dielectrics

**Chapter 10: Magnetic field of a direct current**

10.1 Ampere's law of magnetic interaction of electric current.

10.2 Magnetic field and magnetic induction vector

10.3 Magnetic flux and O-G's theorem for magnetic field

10.4 Ampere's theorem of total electric current

10.5 Effect of magnetic field on an electric current and a moving electric charge

**Chapter 11: The phenomenon of electromagnetic induction**

11.1 Laws of electromagnetic induction phenomenon

11.2 Self induction phenomenon

11.3 Mutual induction phenomenon

11.4 Magnetic energy

**Chapter 12: Magnetic materials (*self study*)**

12.1 Atoms in external magnetic field

12.2 Diamagnetic and paramagnetic materials

12.3 Ferromagnetic materials

**Chapter 13: Electromagnetic field**

13.1 Maxwell's viewpoint I

13.2 Maxwell's viewpoint II

13.3 Electromagnetic field and Maxwell's equations

13.4 Electromagnetic oscillations and waves

**Part IV** UNITS OF PHYSICS EXPERIMENTS

Unit 1. Explore the change of electric field in time

Unit 2. Explore the magnetic field in curent-carying straight solenoid

Unit 3. Explore electron in electromagnetic field

Unit 4. Explore circuit of electromagnetic osillations

**9. Required Textbooks**

1. Le Minh Thanh, Hoang Lan Huong, Vu Hong Nga, Lectures of Physics 1 and experiment, 2010, Library of the PTIT.

2. Physics experiments of the Institute of Post and Telecommunication Technology, 2011, Library of the PTIT.

**10. Suggested Textbooks**

1. Luong Duy Binh, General physics episode I, II. Education Publishing House, 1995, Library of the PTIT.

2. Luong Duyen Binh, General physics exercises episode I, II. Education Publishing House, 1995, Library of the PTIT.

3. Physics experiments of Hanoi University of Science and Technology, Department of Physics

4. Nguyen Xuan Chi, Dang Quang Khang. General physics episode I, II. Publisher of Hanoi University of Science and Technology, 2001.
5. Halliday, Resnick, Walker, Fundamentals of Physics I,II,III,IV,V, Education Publishing House, 1998, Library of the PTIT.
6. Halliday, Resnick, Walker, Fundamentals of Physics, John Wiley & Sons, Inc, 9th edition.

**12. Grading Policy**

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| Attendance: | 10 % |
| Average of mini mid term tests (ind): | 10 % |
| Practical experiments | 20 % |
| Final exam : | 60 % |

**Lecturer** **Head of Department of Physic**

**Dr. Lê Minh Thanh** **Dr. Lê Minh Thanh**