

## THUY LOI UNIVERSITY INTERNATIONAL TRAINING CENTER

**SYLLABUS**Degree training: Bachelor

#### PHYSICS DIVISION

UNIVERSITY PHYSICS I Code: PHYCS 2013

**1. Credit Amount**: 4 (2.1.1)

**2. Number of hours**: 60 standard hours;

Lecture (2 credits): 2 hours a week, lasting within 15 weeks

HW (1 credit): 2 hours a week, lasting within 15 weeks

Lab (1 credit): 6 hours a week, lasting within 5 weeks

#### 3. Belongs to the training program

- compulsory subject for civil engineering and water resources engineering

- Optional subject : No

## 4. Method for Students Grading:

Form	Times	Description	Time	Percentage
Homework (Online HW + Long HW)	1 per week	Due EVERY lecture day and get turned in at the beginning of the first lecture of each week	During the course	25%
Quiz Test (Multiple choice)	1 per week	At the end of each Lecture	During the course	5%
03 Test (multiple-cho ice as well as free-response questions)	1 per month	Students can take Test in 60 minutes at the end of the 4 <sup>th</sup> week per month	During the course	30%

Attendance	Each lecture	To know the number of students' Absences: Absences > 20% of 45 hours, will bi banned from taking final exam	During the course	
Experiment	10 experiments, 1 experiment is lasting for 3 hours	Students do Experiment in General Physics Lab ( miss > 2 Labs : fail the course)	Lasting for 5 weeks or 10 weeks during the course	20%
Final Exam (Multiple -Choice)	1	90 minutes - 40 questions	1-2 weeks after the end of the course	20%

## Structure of the final exam (according to Bloom scale):

Level	Remember	Understand	Application	Analysi	Synthetic	Creation
				S		
Number of question	15 MCQ	15 MCQ	10 MCQ			
Percentage	37,5%	37,5%	25%			

### **5. Binding conditions of the course:**

- Prerequisites: Not require

- Previous subject: Math 1

- Parallel subject: Not require

#### 6. Summary content of the course:

The course includes Mechanics and Thermodynamics. The focus of University Physics I (UPI) is the Mechanics section: studying the principles of mechanical motion of a particle and mechanics systems; Work and energy in mechanics; Motion of Solids; Waves and Oscillations. The Thermodynamics section only includes an introduction to

the basic concepts of Thermodynamics. UP I is a prerequisite subject of UP II subject and may be a prerequisite subject of some other subjects in the training program.

# **MECHANICS**

Acceleration

• One Dimension Motion, Velocity

• Waves in one Dimension

Temperature and heat

**THERMODYNAMICS** 

<ul> <li>Inertia</li> </ul>
• Energy
<ul> <li>Moving Reference Frames</li> </ul>
<ul> <li>Interactions</li> </ul>
<ul><li>Force</li></ul>
<ul><li>Work</li></ul>
<ul> <li>Motion in a Plane</li> </ul>
<ul> <li>Motion in a Circle</li> </ul>
<ul> <li>Torque , Rotational motion of a rigid body</li> </ul>
<ul> <li>Gravitation</li> </ul>
<ul> <li>Periodic Motion</li> </ul>

- Heat Capacities and Equations of State
- Work and Heat

<u>In Lab</u>, each student must do 10 experiments as required in the instructor's policy and schedule.

#### 7. Instructors:

NO	Full Name	Academic degree	Phone number	Email	Position
1	Đặng Thị Minh Huệ	Ph.D	0904769679	dtmhue@tlu.edu.vn	Main Lecturer
2	Phạm Thị Thanh Nga	Ph.D	0916103796	nga_ppt@tlu,edu.vn	Main Lecturer
3	Lương Duy Thành	Associate Professor, Ph.D	0936946975	thanh_lud@tlu.edu.v n	Senior

#### 8. Text book:

- [1] Principles, Eric Mazur, Harvard University, US, 2000.
- [2] Physics for Scientists and Engineers with Modern Physics (six edition), Paul A. Tipler and Gên Mosca, W. H. Freeman and Company, New York, 2000.

#### References:

- [1] General Physics, Volume 1, Lương Duyên Bình et all (1998).
- [2] University Physics with Modern Physics, H.D.Young R.A.Freedman, 12ED.

#### 9. Content in details:

		Teaching and Learning	Н	ours	
Chapter	Content	Activities, Level of HW requirements	Lecture	Lab	H W
0	INTRODUCTIONS	*Lecturer	1	0	0
		- Introduce: full name, position, expertise and email, cell phone number and Course Website			

		<ul> <li>Ask for information of the monitor of the class: email, phone number.</li> <li>Introduce about syllabus of the subject and Grading critiria</li> <li>Guide students how to get good results and best studying method</li> <li>* Students:</li> <li>Answer the questions</li> <li>Give out questions</li> </ul>			
3	ONE DIMENSION MOTION 3.1From reality to model 3.2 Calibrating the data 3.3 Position and displacement 3.4 Position-versus-time curves 3.5 Average speed and average velocity 3.6 Position and Displacement 3.7 Scalars and vectors 3.8 Velocity 3.9 Uniform Motion 3.10 Instantanenuos velocity	* Lecturer: - Present; Explain; Analyze, Conclude - Give out Problems - Guide students to solve problems - Give out questions - Guide students to solve samples - Assign homework as following requirements: + Determine position, displacement, distance travel, velocity + Calculate average speed, instantaneous speed based on position - time graphs - Give out Solution of Homework * Students: - Answer the questions - Solve problems + situations	3	3	3

- Do Homework  4 ACCELERATION * Lecturer: 3 3 3  4.1 Changes in velocity - Present; Explain; Analyze, Conclude	
4.1 Changes in velocity  - Present; Explain;	
gravitation 4.3 Free Fall 4.4 Projectile motion 4.5 Motion diagrams 4.6 Motion with uniform acceleration 4.7 Free-fall equations 4.8 Inclined Planes 4.9 Instantaneous acceleration  4.9 Letermine average acceleration, instantaneous acceleration, instantaneous acceleration, properties of motion based on velocity - time graph  + Calculate the change in velocity; distance travel + Determine the acceleration of a motion along an inclined plane + Draw the graphs position – time graph + Calculate the distance travel, speed for Free Fall Give out Solution of Homework  *Students: - Answer the questions	4

		- Give out questions			
		- Do homework			
5	INERTIA 5.1 Rest and motion 5.2 Collisions 5.3 What determine inertia? 5.4 Inertia 5.5 Linear momentum 5.6 Conservation of linear momentum	* Lecturer: - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve samples - Assign homework as following requirements: + Distinguish between motion and rest; instantaneous at rest and rest + Applying inertia to explain some phenomena + Applying conservation of linear momentum of colliding system to calculate the change in velocity and velocity - Give out Solution of Homework  *Students: - Answer the questions - Solve problems + situations - Give out questions - Give out questions - Give out questions - Give out questions - Do homework	2	3	2
6	ENERGY 6.1 Isolated system 6.2 Classification of Collisions	* <u>Lecturer</u> : - Present; Explain; Analyze, Conclude	3	6	3

	6.3 Kinetic Energy	- Give out Problem			
	6.4 Internal Energy	- Guide students to solve			
	6.5 Energy transfer and conversions	problem			
	6.6 Elastic Collisions	- Give out questions			
	6.7 Inelastic Collisions	- Guide students to solve			
	6.8 Conservation of	samples			
	energy	- Assign homework as			
	6.9 Explosive Collision	following requirements:			
		+ Distinguishing isolated			
		system and non-isolated			
		system			
		+ Determine type of collision.			
		Calculate the Coefficient of			
		restitution of the collision			
		+ Calculate the change in			
		kinetic energy of colliding			
		system			
		- Give out Solution of			
		Homework			
		*Students:			
		- Answer the questions			
		- Solve problems +			
		situations			
		- Give out questions			
		- Do homework			
7	MOVING	* Lecturer	1	0	0
	REFERENCE	- Present; Explain;			
	FRAMES	Analyze, Conclude			
	<b>7.1</b> Uniformly moving reference frames	- Give out Problem			
	7.2 Accelerating	- Guide students to solve			
	reference frames	problem			
	<b>7.3</b> Linear momentum and reference frames	- Give out questions			
	7.4 Energy and	- Guide students to solve			
	reference frames	Guide students to solve			

	<ul> <li>7.5 Zero-momentum frame</li> <li>7.6 Relative motion</li> <li>7.7 Conservation of momentum</li> <li>7.8 Center of mass</li> <li>7.9 Convertible kinetic energy</li> <li>7.10 Conservation of energy</li> </ul>	- Discussing about good studying method for students  *Students: - Answer the questions - Solve problems + situations - Give out questions			
8	INTERACTIONS 8.1 The effects of interactions 8.2 Potential energy 8.3 Dissipation of energy 8.4 Sources of energy 8.5 Iinteraction range 8.6 Fundamental interactions 8.7 Interactions and accelerations 8.8 Potential energy near the earth's surface 8.9 Conservative interactions 8.10 Nonconservative interactions	* Lecturer: - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve samples - Assign homework as following requirements: + Determine type of collision + Calculate the dissipation energy + Calculate the Potential energy - Give out Solution of Homework *Students: - Answer the questions - Solve problems + situations - Give out questions - Give out questions - Do homework	2	2	2

9	FORCE	* <u>Lecturer</u> :	2	2	2
	9.1 Force	- Present; Explain;			
	<b>9.2</b> The reciprocity of forces	Analyze, Conclude			
	<b>9.3</b> Identifying forces	- Give out Problem			
	<ul><li>9.4 Equilibrium</li><li>9.5 Free-body diagrams</li></ul>	- Guide students to solve			
	9.6 Springs and tension	problem			
	9.7 Equation of motion	- Give out questions			
	<ul><li>9.8 Force of gravity</li><li>9.9 Hooke's law</li></ul>	- Guide students to solve			
	9.10 Iimpulse	samples:			
	<b>9.11</b> Nonisolated systems	- Assign homework as			
	<b>9.12</b> Systems of many	following requirements:			
	interacting particles	+ Draw Free-body diagrams			
		+ Calculate tension; Spring			
		Force			
		+Determine Forces at Equilibrium <b>state</b>			
		+ Calculate impulse			
		- Give out Solution of			
		Homework			
		*Students:			
		- Answer the questions			
		- Solve problems +			
		situations			
		- Give out questions			
		- Do homework			
10	WORK	* <u>Lecturer</u> :	3	3	3
	<b>10.1</b> Force displacements	- Present; Explain;			
	10.2 Positive and	Analyze, Conclude			
	negative work <b>10.3</b> Work-energy	- Give out Problem			
	diagrams	- Guide students to solve			
	<b>10.4</b> Choice of system <b>10.5</b> Dissipation of	problem			
	energy at a system	- Give out questions			
	boundary	- Guide students to solve			

	10.6 Particle subject to a constant force 10.7 Power 10.8 Work done on a two-particle system 10.9 Work done on a many-particle system 10.10 Work done by a variable force	- Assign homework as following requirements:  + Calculate the Dissipation of energy at a system boundary  + Work done by a constant Force on a particle, system  + Total Work done on a particle, system  - Give out Solution of Homework  *Students:  - Answer the questions  - Solve problems + situations  - Give out questions  - Do homework			
11	MOTION IN A PLANE  11.1. Straight is a relative term  11.2 Vectors in a plan  11.3 Decomposition of force vectors  11.4 Friction  11.5 Work and friction  11.6 Vector algebra  11.7 Work as the product of two vectors  11.8 Work as the product of two vectors  11.9 Coefficient of friction	* Lecturer: - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve samples - Assign homework as following requirements: + Finding components forces acting on an object (coordinate components, tangential component and perpendicular component to	1	3	2

		the motion  + Finding velocity components; acceleration components for projectile motion in a plane  + Finding tangential acceleration; perpendicular acceleration  + Calculate Work done by friction.  - Give out Solution of Homework  *Students:  - Answer the questions  - Solve problems + situations  - Give out questions  - Do homework			
12	MOTION IN A CIRCLE  12.1 Uniform circular motion  12.2 Forces and uniform circular motion  12.3 Rotational inertia  12.4 Rotational kinematics  12.5 Angular momentum  12.6 Rotational inertia of extended objects	* Lecturer:  - Present; Explain; Analyze, Conclude  - Give out Problem  - Guide students to solve problem  - Give out questions  - Guide students to solve samples  - Assign homework as following requirements:  + Finding Centripetal Force  + Finding the direction and magnitude of angular velocity and angular acceleration	3	0	3

		+ Calculate inertia moment for rotational motion + Calculate kinetic energy for circular motion - Give out Solution of Homework *Students: - Answer the questions - Solve problems + situations - Give out questions - Do homework			
13	TORQUE AND ROTATIONAL MOTION OF A RIGID BODY  13.1 Torque 13.2 Free rotations 13.3 Extended free body diagrams 13.5 Conservation of angular momentum 13.6 Rolling motion 13.7 Torque and energy	* Lecturer: - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve samples - Assign homework as following requirements: + Determine Torque + Draw Free-Body diagrams for extended object +Finding Angular momentum +Calculate angular velocity and acceleration; rotational kinetic energy + Calculate work for rotational motion - Give out Solution of	2	2	3

		Homework			
		*Students:			
		- Answer the questions			
		- Solve problems +			
		situations			
		- Give out questions			
		- Do homework			
1.4			1	0	1
14	GRAVITATION	* <u>Lecturer</u> :	1	0	1
	<b>14.1</b> Universal gravitation	- Present; Explain;			
	14.2 Gravitation and	Analyze, Conclude			
	angular momentum	- Give out Problem			
	14.3 Weight	- Guide students to solve			
	<b>14.4</b> Principle of	problem			
	equivalence	- Give out questions			
	<b>14.5</b> Gravitational constant	- Guide students to solve			
	14.6 Gravitational	samples			
	potential energy	- Assign homework as			
	<b>14.7</b> Celestial mechanics	following requirements:			
		+ Calculate Gravitational			
		potential energy			
		+ Distinguishing Weight and			
		gravity			
		- Give out Solution of			
		Homework			
		*Students:			
		- Answer the questions			
		- Solve problems +			
		situations			
		- Give out questions			
		- Do homework			
16	PERIODIC MOTION	* <u>Lecturer</u> :	1	0	1
	<b>16.1</b> Periodic motion and energy				

	16.2 Simple harmonic motion 16.3 Fourier's theorem 16.4 Linear restoring forces 16.5 Equation of motion 16.6 Simple harmonic oscillations with springs 16.7 Restoring torques 16.8 Damped oscillations	<ul> <li>Present; Explain;</li> <li>Analyze, Conclude</li> <li>Give out Problem</li> <li>Guide students to solve problem</li> <li>Give out questions</li> <li>Guide students to solve samples</li> <li>Assign homework as following requirements:</li> <li>Problems of Simple harmonic motion</li> <li>Problems of Damped oscillations</li> <li>Give out Solution of Homework</li> <li>*Students:</li> <li>Answer the questions</li> <li>Solve problems + situations</li> <li>Give out questions</li> </ul>			
17	WAVES IN ONE DIMENSION  17.1 Representation of waves  17.2 Propagation of waves  17.3 Superposition of waves  17.4 Reflection and transmission	- Do homework  * Lecturer: - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve samples - Assign homework as following requirements:	1	0	1

	+ Superposition of waves + Standing wave - Give out Solution of Homework  *Students: - Answer the questions - Solve problems + situations - Give out questions - Do homework			
18.1 Temparature and Heat 18.2 Heat Capacity 18.3 Work and Heat for thermodynamics system	* Lecturer:  - Present; Explain; Analyze, Conclude  - Give out Problem  - Guide students to solve problem  - Give out questions for discussion  *Students:  - Answer the questions  - Solve problems + situations  - Give out questions	1	3	0
Total		30	30	30

# 10. Expected Learning outcomes of UPI:

NO	Expected Learning outcomes of UPI	Expected Learning outcomes of respective training Programs
1	Knowledge: Understanding and applying the knowledge of the subject for calculating, simulating,	-Applying the knowledge of general subjects to study, calculate, and solve problems
	analyzing, evaluating and synthesising some	ralating to the knowledge of

problems relating to civil engineering and water resources engineering. Details:

- + Descripting a motion by its position –time curve, determing characteristic quantities of the motion such as velocity, acceleration at a instant time
- + Descripting the behavior of a particle under Force acting or after colliding
- +Understanding conservation and transfer energy
- +Descripting and calculating characteristic quantities of rotational motion
- + Understanding and applying the

knowledge of mechanics, periodic, waves to study the major fundermential knowledge and major Specilalized the core knowledge and major Specilalized

- Applying the core knowledge to solve the core problems and major problems.

## 2 Ability:

- + Ability to work independently and function in multi-disciplinary teams;
- + Ability to self-study and life-long learning;
- +Ability to calculate, measurement conduct experiments and analyze, interpret data, report;
- +Ability to accept or reject theories based on Labs measurements
- + An ability to identify, formulate, and solve mechanics problem
- +Ability to understand the thermodynamics concepts

Ability to work independently and in team;

Ability to self-study and self-thinking;

Ability to aply knowledge of

science (mathematics, physics, chemistry), and engineering principles, with emphasis on applications for water resources engineering and civil engineering;

Ability to identify, formulate, analyze and choose the best model for each reality problems

3	Morality + Having a high responsibility for work + Be honest, careful and persistent + Willing to learn and discover new knowledge + Having scientific thinking at work and scientific methods for learning and research	Have:  + Good personal and professional ethics;  + A spirit of learning and progress;  + Be responsible for work, community and society;  +Comply with the laws and regulations of the state, society and community.

## 11. Contact information of Physics Division

Address: Room 301 - A1, Thủy lợi University

Head of physics division : Dr. Phan Văn Độ

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Hà Nội, ngày tháng năm 2021

DEAN OF INTERNATIONAL HEAD OF PHYSICS DEPARTMENT TRAINING CENTER DIVISION

Dr. Phan Văn Độ