



**THUY LOI UNIVERSITY
INTERNATIONAL TRAINING
CENTER
PHYSICS DIVISION**

SYLLABUS
Degree training: Bachelor

**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 th week per month	During the course	30%

Attendance	Each lecture	To know the number of students' Absences: Absences >20% of 45 hours, will be 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	Analyses	Synthetic	Creation
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

- One Dimension Motion, Velocity
- Acceleration
- Inertia
- Energy
- Moving Reference Frames
- Interactions
- Force
- Work
- Motion in a Plane
- Motion in a Circle
- Torque , Rotational motion of a rigid body
- Gravitation
- Periodic Motion
- Waves in one Dimension

THERMODYNAMICS

- Temperature and heat

- Heat Capacities and Equations of State
- Work and Heat

In Lab, 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.vn	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 Gene Mosca , W. H. Freeman and Company, New York, 2000.

References:

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

9. Content in details:

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

		- Ask for information of the monitor of the class: email, phone number. - Introduce about syllabus of the subject and Grading criteria - Guide students how to get good results and best studying method * <u>Students</u>: - Answer the questions - Give out questions			
3	ONE DIMENSION MOTION 3.1 From 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 Instantaneous velocity	* <u>Lecturer</u>: - 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 * <u>Students</u>: - Answer the questions - Solve problems + situations	3	3	3

		- Give out questions - Do Homework			
4	ACCELERATION 4.1 Changes in velocity 4.2 Falling and 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	* <u>Lecturer</u>: - 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 average 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 *<u>Students</u>: - Answer the questions - Solve problems + situations	3	3	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	* <u>Lecturer</u>: - 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 *<u>Students</u>: - Answer the questions - Solve problems + situations - 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 6.4 Internal Energy 6.5 Energy transfer and conversions 6.6 Elastic Collisions 6.7 Inelastic Collisions 6.8 Conservation of energy 6.9 Explosive Collision	- Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve samples - Assign homework as 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 <u>*Students:</u> - Answer the questions - Solve problems + situations - Give out questions - Do homework			
7	MOVING REFERENCE FRAMES 7.1 Uniformly moving reference frames 7.2 Accelerating reference frames 7.3 Linear momentum and reference frames 7.4 Energy and reference frames	* Lecturer - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions - Guide students to solve	1	0	0

	7.5 Zero-momentum frame 7.6 Relative motion 7.7 Conservation of momentum 7.8 Center of mass 7.9 Convertible kinetic energy 7.10 Conservation of energy	samples - Discussing about good studying method for students <u>*Students:</u> - 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 Interaction 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	<u>* Lecturer:</u> - 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 <u>*Students:</u> - Answer the questions - Solve problems + situations - Give out questions - Do homework	2	2	2

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

	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	samples - 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 <u>*Students:</u> - 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	<u>* Lecturer:</u> - 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 <u>*Students:</u> - 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	<u>* Lecturer:</u> - 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 <u>*Students:</u> - 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	<u>* Lecturer:</u> - 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 <u>*Students:</u> - Answer the questions - Solve problems + situations - Give out questions - Do homework			
14	GRAVITATION 14.1 Universal gravitation 14.2 Gravitation and angular momentum 14.3 Weight 14.4 Principle of equivalence 14.5 Gravitational constant 14.6 Gravitational potential energy 14.7 Celestial mechanics	<u>* Lecturer:</u> - 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: + Calculate Gravitational potential energy + Distinguishing Weight and gravity - Give out Solution of Homework <u>*Students:</u> - Answer the questions - Solve problems + situations - Give out questions - Do homework	1	0	1
16	PERIODIC MOTION 16.1 Periodic motion and energy	<u>* Lecturer:</u>	1	0	1

	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	- 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: + Problems of Simple harmonic motion + Problems of Damped oscillations - Give out Solution of Homework <u>*Students:</u> - Answer the questions - Solve problems + situations - Give out questions - Do homework			
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	<u>* Lecturer:</u> - 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 <u>*Students:</u> - Answer the questions - Solve problems + situations - Give out questions - Do homework			
18	THERMODYNAMICS 18.1 Temperature and Heat 18.2 Heat Capacity 18.3 Work and Heat for thermodynamics system	* <u>Lecturer:</u> - Present; Explain; Analyze, Conclude - Give out Problem - Guide students to solve problem - Give out questions for discussion * <u>Students:</u> - 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, analyzing, evaluating and synthesising some	-Applying the knowledge of general subjects to study, calculate, and solve problems relating to the knowledge of

	problems relating to civil engineering and water resources engineering. Details: + Describing a motion by its position –time curve, determining characteristic quantities of the motion such as velocity, acceleration at a instant time + Describing the behavior of a particle under Force acting or after colliding +Understanding conservation and transfer energy +Describing and calculating characteristic quantities of rotational motion + Understanding and applying the knowledge of mechanics, periodic, waves to study the major fundamental knowledge and major Specialized	the core knowledge and major Specialized - 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 apply 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

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Hà Nội, ngày tháng năm 2021

**DEAN OF
DEPARTMENT**

**INTERNATIONAL
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**HEAD OF PHYSICS
DIVISION**

Dr. Phan Văn Độ