



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

|                                 |                                                      |                                                                                                               |                                                   |     |
|---------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----|
| Attendance                      | Each lecture                                         | To know the number of students' Absences:<br>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<br>(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 Gêr 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:

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

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|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>- Ask for information of the monitor of the class: email, phone number.</li> <li>- Introduce about syllabus of the subject and Grading criteria</li> <li>- Guide students how to get good results and best studying method</li> </ul> <p>* <u>Students</u>:</p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Give out questions</li> </ul>                                                                                                                                                                                                                                                                                                         |   |   |   |
| 3 | <p><b>ONE DIMENSION MOTION</b></p> <p><b>3.1</b> From reality to model</p> <p><b>3.2</b> Calibrating the data</p> <p><b>3.3</b> Position and displacement</p> <p><b>3.4</b> Position-versus-time curves</p> <p><b>3.5</b> Average speed and average velocity</p> <p><b>3.6</b> Position and Displacement</p> <p><b>3.7</b> Scalars and vectors</p> <p><b>3.8</b> Velocity</p> <p><b>3.9</b> Uniform Motion</p> <p><b>3.10</b> Instantaneous velocity</p> | <p>* <u>Lecturer</u>:</p> <ul style="list-style-type: none"> <li>- Present; Explain; Analyze, Conclude</li> <li>- Give out Problems</li> <li>- Guide students to solve problems</li> <li>- Give out questions</li> <li>- Guide students to solve samples</li> <li>- Assign homework as following requirements: <ul style="list-style-type: none"> <li>+ Determine position, displacement, distance travel, velocity</li> <li>+ Calculate average speed, instantaneous speed based on position - time graphs</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p>* <u>Students</u>:</p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> </ul> | 3 | 3 | 3 |

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|   |                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>- Give out questions</li> <li>- Do Homework</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |   |
| 4 | <p><b>ACCELERATION</b></p> <p><b>4.1</b> Changes in velocity</p> <p><b>4.2</b> Falling and gravitation</p> <p><b>4.3</b> Free Fall</p> <p><b>4.4</b> Projectile motion</p> <p><b>4.5</b> Motion diagrams</p> <p><b>4.6</b> Motion with uniform acceleration</p> <p><b>4.7</b> Free-fall equations</p> <p><b>4.8</b> Inclined Planes</p> <p><b>4.9</b> Instantaneous acceleration</p> | <p><b>* Lecturer:</b></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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: <ul style="list-style-type: none"> <li>+ Determine average acceleration, instantaneous acceleration, properties of motion based on velocity - time graph</li> <li>+ Calculate the change in velocity; distance travel</li> <li>+ Determine the acceleration of a motion along an inclined plane</li> <li>+ Draw the graphs position – time graph</li> <li>+ Calculate the distance travel, speed for Free Fall.</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p><b>*Students:</b></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> </ul> | 3 | 3 | 4 |

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|   |                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>- Give out questions</li> <li>- Do homework</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |   |
| 5 | <p style="text-align: center;"><b>INERTIA</b></p> <p>5.1 Rest and motion</p> <p>5.2 Collisions</p> <p>5.3 What determine inertia?</p> <p>5.4 Inertia</p> <p>5.5 Linear momentum</p> <p>5.6 Conservation of linear momentum</p> | <p>* <u>Lecturer</u>:</p> <ul style="list-style-type: none"> <li>- Present; Explain; 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: <ul style="list-style-type: none"> <li>+ Distinguish between motion and rest; instantaneous at rest and rest</li> <li>+Applying inertia to explain some phenomena</li> <li>+ Applying conservation of linear momentum of colliding system to calculate the change in velocity and velocity</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p>*<u>Students</u>:</p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> | 2 | 3 | 2 |
| 6 | <p style="text-align: center;"><b>ENERGY</b></p> <p>6.1 Isolated system</p> <p>6.2 Classification of Collisions</p>                                                                                                            | <p>* <u>Lecturer</u>:</p> <ul style="list-style-type: none"> <li>- Present; Explain; Analyze, Conclude</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3 | 6 | 3 |

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|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|
|   | 6.3 Kinetic Energy<br>6.4 Internal Energy<br>6.5 Energy transfer and conversions<br>6.6 Elastic Collisions<br>6.7 Inelastic Collisions<br>6.8 Conservation of energy<br>6.9 Explosive Collision                                     | <ul style="list-style-type: none"> <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:             <ul style="list-style-type: none"> <li>+ Distinguishing isolated system and non-isolated system</li> <li>+ Determine type of collision. Calculate the <b>Coefficient of restitution</b> of the collision</li> <li>+ Calculate the change in kinetic energy of colliding system</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> |   |   |   |
| 7 | <p style="text-align: center;"><b>MOVING<br/>REFERENCE<br/>FRAMES</b></p> 7.1 Uniformly moving reference frames<br>7.2 Accelerating reference frames<br>7.3 Linear momentum and reference frames<br>7.4 Energy and reference frames | * Lecturer <ul style="list-style-type: none"> <li>- Present; Explain; 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</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 | 0 | 0 |

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|          | <p><b>7.5</b> Zero-momentum frame</p> <p><b>7.6</b> Relative motion</p> <p><b>7.7</b> Conservation of momentum</p> <p><b>7.8</b> Center of mass</p> <p><b>7.9</b> Convertible kinetic energy</p> <p><b>7.10</b> Conservation of energy</p>                                                                                                                                                                                                                                      | <p>samples</p> <ul style="list-style-type: none"> <li>- Discussing about good studying method for students</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |          |          |
| <b>8</b> | <p><b>INTERACTIONS</b></p> <p><b>8.1</b> The effects of interactions</p> <p><b>8.2</b> Potential energy</p> <p><b>8.3</b> Dissipation of energy</p> <p><b>8.4</b> Sources of energy</p> <p><b>8.5</b> Interaction range</p> <p><b>8.6</b> Fundamental interactions</p> <p><b>8.7</b> Interactions and accelerations</p> <p><b>8.8</b> Potential energy near the earth's surface</p> <p><b>8.9</b> Conservative interactions</p> <p><b>8.10</b> Nonconservative interactions</p> | <p><u>* Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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: <ul style="list-style-type: none"> <li>+ Determine type of collision</li> <li>+ Calculate the dissipation energy</li> <li>+ Calculate the Potential energy</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> | <b>2</b> | <b>2</b> | <b>2</b> |

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| 9  | <p style="text-align: center;"><b>FORCE</b></p> <p><b>9.1 Force</b><br/> <b>9.2</b> The reciprocity of forces<br/> <b>9.3</b> Identifying forces<br/> <b>9.4</b> Equilibrium<br/> <b>9.5</b> Free-body diagrams<br/> <b>9.6</b> Springs and tension<br/> <b>9.7</b> Equation of motion<br/> <b>9.8</b> Force of gravity<br/> <b>9.9</b> Hooke's law<br/> <b>9.10</b> Impulse<br/> <b>9.11</b> Nonisolated systems<br/> <b>9.12</b> Systems of many interacting particles</p> | <p><b>* Lecturer:</b></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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>+ Draw Free-body diagrams</li> <li>+ Calculate tension; Spring Force</li> <li>+ Determine Forces at Equilibrium <b>state</b></li> <li>+ Calculate impulse</li> <li>- Give out Solution of Homework</li> </ul> <p><b>*Students:</b></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> | 2 | 2 | 2 |
| 10 | <p style="text-align: center;"><b>WORK</b></p> <p><b>10.1</b> Force displacements<br/> <b>10.2</b> Positive and negative work<br/> <b>10.3</b> Work-energy diagrams<br/> <b>10.4</b> Choice of system<br/> <b>10.5</b> Dissipation of energy at a system boundary</p>                                                                                                                                                                                                        | <p><b>* Lecturer:</b></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3 | 3 | 3 |

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|           | <p><b>10.6</b> Particle subject to a constant force</p> <p><b>10.7</b> Power</p> <p><b>10.8</b> Work done on a two-particle system</p> <p><b>10.9</b> Work done on a many-particle system</p> <p><b>10.10</b> Work done by a variable force</p>                                                                                                                                                                                                              | <p>samples</p> <ul style="list-style-type: none"> <li>- Assign homework as following requirements:</li> <li>+ Calculate the Dissipation of energy at a system boundary</li> <li>+ Work done by a constant Force on a particle, system</li> <li>+ Total Work done on a particle, system</li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> |          |          |          |
| <b>11</b> | <p style="text-align: center;"><b>MOTION IN A PLANE</b></p> <p><b>11.1.</b> Straight is a relative term</p> <p><b>11.2</b> Vectors in a plan</p> <p><b>11.3</b> Decomposition of force vectors</p> <p><b>11.4</b> Friction</p> <p><b>11.5</b> Work and friction</p> <p><b>11.6</b> Vector algebra</p> <p><b>11.7</b> Work as the product of two vectors</p> <p><b>11.8</b> Work as the product of two vectors</p> <p><b>11.9</b> Coefficient of friction</p> | <p><u>* Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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>+ Finding components forces acting on an object (coordinate components, tangential component and perpendicular component to</li> </ul>                                                                             | <b>1</b> | <b>3</b> | <b>2</b> |

|    |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |   |
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|    |                                                                                                                                                                                                                                                                                                                | <p>the motion</p> <ul style="list-style-type: none"> <li>+ Finding velocity components; acceleration components for projectile motion in a plane</li> <li>+ Finding tangential acceleration; perpendicular acceleration</li> <li>+ Calculate Work done by friction.</li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> |   |   |   |
| 12 | <p><b>MOTION IN A CIRCLE</b></p> <p><b>12.1</b> Uniform circular motion</p> <p><b>12.2</b> Forces and uniform circular motion</p> <p><b>12.3</b> Rotational inertia</p> <p><b>12.4</b> Rotational kinematics</p> <p><b>12.5</b> Angular momentum</p> <p><b>12.6</b> Rotational inertia of extended objects</p> | <p><u>* Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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> </ul> <ul style="list-style-type: none"> <li>+ Finding Centripetal Force</li> <li>+ Finding the direction and magnitude of angular velocity and angular acceleration</li> </ul>                     | 3 | 0 | 3 |

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|    |                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>+ Calculate inertia moment for rotational motion</li> <li>+ Calculate kinetic energy for circular motion</li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul>                                                                                                                                                                                                                                                         |   |   |   |
| 13 | <p><b>TORQUE AND ROTATIONAL MOTION OF A RIGID BODY</b></p> <p>13.1 Torque</p> <p>13.2 Free rotations</p> <p>13.3 Extended free body diagrams</p> <p>13.5 Conservation of angular momentum</p> <p>13.6 Rolling motion</p> <p>13.7 Torque and energy</p> | <p><u>* Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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> </ul> <ul style="list-style-type: none"> <li>+ Determine Torque</li> <li>+ Draw Free-Body diagrams for extended object</li> <li>+ Finding Angular momentum</li> <li>+ Calculate angular velocity and acceleration; rotational kinetic energy</li> <li>+ Calculate work for rotational motion</li> <li>- Give out Solution of</li> </ul> | 2 | 2 | 3 |

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|    |                                                                                                                                                                                                                                                                                                                                 | <p>Homework</p> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |   |
| 14 | <p><b>GRAVITATION</b></p> <p><b>14.1</b> Universal gravitation</p> <p><b>14.2</b> Gravitation and angular momentum</p> <p><b>14.3</b> Weight</p> <p><b>14.4</b> Principle of equivalence</p> <p><b>14.5</b> Gravitational constant</p> <p><b>14.6</b> Gravitational potential energy</p> <p><b>14.7</b> Celestial mechanics</p> | <p><u>* Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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: <ul style="list-style-type: none"> <li>+ Calculate Gravitational potential energy</li> <li>+ Distinguishing Weight and gravity</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> | 1 | 0 | 1 |
| 16 | <p><b>PERIODIC MOTION</b></p> <p><b>16.1</b> Periodic motion and energy</p>                                                                                                                                                                                                                                                     | <p><u>* Lecturer:</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 | 0 | 1 |

|    |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |   |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|
|    | <p><b>16.2</b> Simple harmonic motion</p> <p><b>16.3</b> Fourier's theorem</p> <p><b>16.4</b> Linear restoring forces</p> <p><b>16.5</b> Equation of motion</p> <p><b>16.6</b> Simple harmonic oscillations with springs</p> <p><b>16.7</b> Restoring torques</p> <p><b>16.8</b> Damped oscillations</p> | <ul style="list-style-type: none"> <li>- Present; Explain; 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: <ul style="list-style-type: none"> <li>+ Problems of Simple harmonic motion</li> <li>+ Problems of Damped oscillations</li> </ul> </li> <li>- Give out Solution of Homework</li> </ul> <p><u>*Students:</u></p> <ul style="list-style-type: none"> <li>- Answer the questions</li> <li>- Solve problems + situations</li> <li>- Give out questions</li> <li>- Do homework</li> </ul> |   |   |   |
| 17 | <p><b>WAVES IN ONE DIMENSION</b></p> <p><b>17.1</b> Representation of waves</p> <p><b>17.2</b> Propagation of waves</p> <p><b>17.3</b> Superposition of waves</p> <p><b>17.4</b> Reflection and transmission</p>                                                                                         | <p><u>* Lecturer:</u></p> <ul style="list-style-type: none"> <li>- Present; Explain; 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> </ul>                                                                                                                                                                                                                                                                                                                                                 | 1 | 0 | 1 |

|    |                                                                                                                                               |                                                                                                                                                                                                                                                                        |           |           |           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|
|    |                                                                                                                                               | + Superposition of waves<br>+ Standing wave<br>- Give out Solution of Homework<br><u>*Students:</u><br>- Answer the questions<br>- Solve problems + situations<br>- Give out questions<br>- Do homework                                                                |           |           |           |
| 18 | <b>THERMODYNAMICS</b><br><b>18.1</b> Temperature and Heat<br><b>18.2</b> Heat Capacity<br><b>18.3</b> Work and Heat for thermodynamics system | * <u>Lecturer:</u><br>- Present; Explain; Analyze, Conclude<br>- Give out Problem<br>- Guide students to solve problem<br>- Give out questions for discussion<br>* <u>Students:</u><br>- Answer the questions<br>- Solve problems + situations<br>- Give out questions | 1         | 3         | 0         |
|    | <b>Total</b>                                                                                                                                  |                                                                                                                                                                                                                                                                        | <b>30</b> | <b>30</b> | <b>30</b> |

#### 10. Expected Learning outcomes of UPI:

| NO | Expected Learning outcomes of UPI                                                                                                                     | Expected Learning outcomes of respective training Programs                                                       |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1  | <b>Knowledge:</b><br>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 |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                       |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <p>problems relating to civil engineering and water resources engineering. Details:</p> <ul style="list-style-type: none"> <li>+ Describing a motion by its position –time curve, determining characteristic quantities of the motion such as velocity, acceleration at a instant time</li> <li>+ Describing the behavior of a particle under Force acting or after colliding</li> <li>+Understanding conservation and transfer energy</li> <li>+Describing and calculating characteristic quantities of rotational motion</li> <li>+ Understanding and applying the knowledge of mechanics, periodic, waves to study the major fundamental knowledge and major Specialized</li> </ul> | <p>the core knowledge and major Specialized</p> <ul style="list-style-type: none"> <li>- Applying the core knowledge to solve the core problems and major problems.</li> </ul>                                                                                                                                                                                                                        |
| 2 | <p>Ability:</p> <ul style="list-style-type: none"> <li>+ Ability to work independently and function in multi-disciplinary teams;</li> <li>+ Ability to self-study and life-long learning;</li> <li>+Ability to calculate, measurement conduct experiments and analyze, interpret data, report;</li> <li>+Ability to accept or reject theories based on Labs measurements</li> <li>+ An ability to identify, formulate, and solve mechanics problem</li> <li>+Ability to understand the thermodynamics concepts</li> </ul>                                                                                                                                                              | <p>Ability to work independently and in team;</p> <p>Ability to self-study and self-thinking;</p> <p>Ability to apply knowledge of science (mathematics, physics, chemistry), and engineering principles, with emphasis on applications for water resources engineering and civil engineering;</p> <p>Ability to identify, formulate, analyze and choose the best model for each reality problems</p> |

|   |                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                       |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                       |
| 3 | <p>Morality</p> <ul style="list-style-type: none"> <li>+ Having a high responsibility for work + Be honest, careful and persistent</li> <li>+ Willing to learn and discover new knowledge</li> <li>+ Having scientific thinking at work and scientific methods for learning and research</li> </ul> | <p>Have:</p> <ul style="list-style-type: none"> <li>+ Good personal and professional ethics;</li> <li>+ A spirit of learning and progress;</li> <li>+ Be responsible for work, community and society;</li> <li>+ Comply with the laws and regulations of the state, society and community.</li> </ul> |

### 11. Contact information of Physics Division

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*Hà Nội, ngày tháng năm 2021*

**DEAN OF  
DEPARTMENT**

**INTERNATIONAL  
TRAINING CENTER**

**HEAD OF PHYSICS  
DIVISION**

**Dr. Phan Văn Độ**