# TQF 3 Course Specifications

## Section 1 General Information

1. Course code and course title
   - Thai ICPY101 Physics I
   - English ICPY101 ฟิสิกส์ ๑
2. Number of credits 4 (4-0-8)
3. Program and type of subject
   - 3.1 Program Undergraduate Degree (International Program)
   - 3.2 Type of Subject General Education
4. Course Coordinator and Course Lecturer
   - 4.1 Course Coordinator Tara Chalermsongsak
   - 4.2 Course Lecturer Tara Chalermsongsak
5. Trimester/ Year of Study
   - 5.1 Trimester All trimesters (including summer session)
   - 5.2 Course Capacity Approximately 30 students.
6. Pre-requisite N/A
7. Co-requisites N/A
8. Venue of Study Mahidol University, Salaya campus

## Section 2 Goals and Objectives

1. Course Goals

   Students should be able to
   1. Understand of the fundamental principles of physics and its applications with emphasis on Newtonian mechanics and fluid mechanics.
   2. Solve basic problems using fundamental physics equations.
   3. Apply fundamental principles of these fields of study to new situations

2. Objectives of Course Development/Revision

   2.1 Course Objectives
   1. Introduce how knowledge in Physics are relevant in daily life, and how it can improve our scientific knowledge.
   2. Learn about basic Physics concepts.

   2.2 Course-level Learning Outcomes: CLOs

   By the end of the course, students will be able to (CLOs)
   1. CLO1: Perform order of magnitude estimation.
   2. CLO2: Apply motion with constant acceleration to problems.
   3. CLO3: Apply Newton's law to problems.
   4. CLO4: Apply conservation of energy to problems.
   5. CLO5: Apply conservation of linear momentum to problems.
   6. CLO6: Apply the principles of circular motion to problems.

7. CLO7: Apply the principle of static equilibrium to problems.
8. CLO8: Apply the principle of fluid dynamics to problems.

## Section 3 Course Management

1. Course Description

(Thai) การวัด หน่วยและระนาบต่าง ๆ เวกเตอร์ การเคลื่อนที่ กฎของนิวตันเรื่องการเคลื่อนที่ งาน พลังงาน ศักย์ โมเมนตัมเชิงเส้น และกฎของการอนุรักษ์พลังงานและโมเมนตัม การเคลื่อนที่แบบหมุน สมดุล กลศาสตร์ของไหล

(English) Measurement, units and dimensions, vectors, description of motion, Newton's Laws of Motion, work kinetic energy theorem, potential energy, conservation of energy, linear momentum and it's Law of the Conservation, Rotational Motion, Static equilibrium and Fluid mechanics.

2. Credit hours per trimester

| Lecture (Hour(s)) | Laboratory/field trip/internship (Hour(s)) | Self-study (Hour(s)) |
|---|---|---|
| 48 | 0 | 96 |

3. Number of hours that the lecturer provides individual counseling and guidance.
2 hour/week

## Section 4 Development of Students' Learning Outcome

1. Short summary on the knowledge or skills that the course intends to develop in students (CLOs)

By the end of the course, students will be able to

1. CLO1: Perform order of magnitude estimation.
2. CLO2: Apply the principle of motion with constant acceleration to problems.
3. CLO3: Apply Newton's law to problems.
4. CLO4: Apply the principle of conservation of energy to problems.
5. CLO5: Apply the principle of conservation of linear momentum to problems.
6. CLO6: Apply the principles of circular motion to problems.
7. CLO7: Apply the principle of static equilibrium to problems.
8. CLO8: Apply the principle of fluid dynamics to problems.
9. CLO9: Describe everyday problem quantitatively using fundamental principles.

2. Teaching methods for developing the knowledge or skills specified in item 1 and evaluation methods of the course learning outcomes

| Course CLO | Teaching methods | Evaluation Methods |
|---|---|---|
| CLO 1 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO2 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO3 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO4 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO5 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO6 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO7 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO8 | Lecture, class discussion | Quiz, Written assignment, written examination |
| CLO9 | Lecture, class discussion | Quiz, Written assignment, written examination |

## Section 5 Teaching and Evaluation Plans

1. Teaching plan (see teaching plan addendum at the end of the document)

| Week | Topic | Number of Hours | | Teaching Activities/ Media | Lecturer |
|---|---|---|---|---|---|
| | | Lecture Hours | Lab/ Field Trip/ Internship Hours | | |
| 1 | Unit and Measurement. | 4 | 0 | Lecture, real-life examples, small-group discussion, class discussion, hands on demonstration. | Tara C. |
| 2 | Motion in 1 Dimension | 4 | 0 | | |
| 3 | Vector. | 4 | 0 | | |
| 4 | Projectile Motions. | 4 | 0 | | |
| 5 | Newton's Law | 4 | 0 | | |
| 6 | Work | 4 | 0 | | |
| 7 | Energy | 4 | 0 | | |
| 8 | Momentum | 4 | 0 | | |
| 9 | Rotational Motion | 4 | 0 | | |
| 10 | Static Equilibrium | 4 | 0 | | |
| 11 | Fluid Mechanics | 4 | 0 | | |
| 12 | Review | 4 | 0 | | |
| | Total | 48 | 0 | | |

2. Plan for Assessing Course Learning Outcomes

2.1 Assessing and Evaluating Learning Achievement

a. Formative Assessment

1. Class discussion
2. Reflective question
3. In-class examples

b. Summative Assessment

(1) Tools and Percentage Weight in Assessment and Evaluation

| Learning Outcomes | Assessment Methods | Assessment Ratio (percentage) | |
|---|---|---|---|
| CLO1: Perform order of magnitude estimation. | Exam | 4 | 5 |
| | Quiz and assignment | 1 | |
| CLO2: Apply the principle of motion with constant acceleration to problems | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO3: Apply Newton's law to problems. | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO4: Apply the principle of conservation of energy to problems. | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO5: Apply the principle of conservation of linear momentum to problems. | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO6: Apply the principles of circular motion to problems. | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO7: Apply the principle of static equilibrium to problems. | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO8: Apply the principle of fluid dynamics to problems. | Exam | 8 | 10 |
| | Quiz and assignment | 2 | |
| CLO9: Describe everyday problems quantitatively using fundamental principles. | Exam | 12 | 15 |
| | Quiz and assignment | 3 | |

| | | | |
|---|---|---|---|
| Total | | | 100 |

(2) Grading System

| Grade | Achievement | Final Score (% range) | GPA |
|---|---|---|---|
| A | Excellent | 90-100 | 4.0 |
| B+ | Very good | 85-89 | 3.5 |
| B | Good | 80-84 | 3.0 |
| C+ | Fairly good | 75-79 | 2.5 |
| C | Fair | 70-74 | 2.0 |
| D+ | Poor | 65-69 | 1.5 |
| D | Very poor | 60-64 | 1.0 |
| F | Fail | Less than 60 | 0.0 |

(3) Re-examination (If course lecturer allows to have re-examination)
N/A - (Not applicable with MUIC)

3. Student Appeals
N/A

## Section 6 Teaching Materials and Resources

1. Textbooks and/or other documents/materials
   a. Serway, and Jewette, Physics for Scientist and Engineer, Brooks Cole.
   b. Halliday, Resnick, Walker, Fundamentals of Physics, Wiley
2. Recommended textbooks and/or other documents/materials
   As posted on the course's e-learning site
3. Other Resources (If any)
   As posted on the course's e-learning site

## Section 7 Evaluation and Improvement of Course Management

1. Strategies for effective course evaluation by students
   1.1. Discussion between course instructor and students
   1.2. Questionnaire from students.
2. Evaluation strategies in teaching methods
   2.1. Evaluation of effectiveness based on student evaluation scores and comments

2.2. Evaluation through peer observations by co-instructor or other Division faculty

3. Improvement of teaching methods
   3.1. Adjustments based on student feedback, personal observations, comments from peer observations and discussions with supervisor and/or other Division faculty in one-on-one and/or group meetings as specified by MUIC guidelines.
4. Verification of students' learning outcomes.
   4.1. Verification through student performance on assessments based on MUIC/Division standards
5. Review and improvement for better outcome
   5.1. Course instructors (and coordinator/supervisor) will meet to discuss results of student evaluations and student performance based on learning outcomes in order to identify point for improvement
   5.2 Strategy for improvement set according to MUIC/Division guidelines

## Appendix

### Alignment between Course learning outcomes and Program learning outcome

Table 1. The relationship between course and Program Learning Outcomes (PLOs)

| Statistical Mechanics | Program Learning Outcomes (PLOs) | | | | |
|---|---|---|---|---|---|
| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 |
| ICPY 101 | I | I | | | |

Table 2 The relationship between CLOs and Program LOs (Number in table = sub Los)

| CLOs | Physics Program's Learning Outcomes | | | | |
|---|---|---|---|---|---|
| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 |
| CLO1: Perform order of magnitude estimation. | | 2.1, 2.2 | | | |
| CLO2: Apply the principle of motion with constant acceleration to problems | 1.1 | | | | |
| CLO3: Apply Newton's law to problems. | 1.1 | | | | |
| CLO4: Apply the principle of conservation of energy to problems. | 1.1 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| CLO5: Apply the principle of conservation of linear momentum to problems. | 1.1 | | | | |
| CLO6: Apply the principles of circular motion to problems. | 1.1 | | | | |
| CLO7: Apply the principle of static equilibrium to problems. | 1.1 | | | | |
| CLO8: Apply the principle of fluid dynamics to problems. | 1.1 | | | | |
| CLO9: Describe everyday problems quantitatively using fundamental principles. | 1.1 | | | | |

Table 3. Description of Program Los and Sub Los of the program

| LOs | SUB LOs |
|---|---|
| 1. Apply quantitative skills both analytical and computational to solve physics problems in various subject. | 1. Applying Classical Mechanics knowledge to solve relevant problems<br>2. Explaining motion and behavior of small object i.e. electrons.<br>3. Using Electro-Magneto static to solve problems<br>4. Explaining wave and oscillations phenomena.<br>5. Solving Thermodynamics Problems.<br>6. Understand Lorentz transformation for velocity, length, time, energy and momentum. |
| 2) Appraise Physics information critically | 1. Do order of magnitude estimation for daily life situations.<br>2. Analyze relevant data in a meaningful and effective way.<br>3. Critique and discuss on contemporary research publication.<br>4. Integrate knowledge from other scientific disciplines to evaluate the research questions. |
| 3) Demonstrate proficiency in oral and written communication of scientific concepts | 1. Be able to analyze data and display result in lab reports appropriately<br>2. Demonstrate proficiency in oral presentation. |
| 4) Apply scientific integrity and professionalism. | 1. Report experimental result and explain the discrepancy in the result sincerely and scientifically. |

| | |
|---|---|
| | 2. Execute experimental work using robust techniques<br>3. Work as a team with professional attitude. |
| 5) Conduct research or experiment to answer Physics problems quantitatively. | 1. Apply numerical method to solve scientific problems<br>2. Research or do experiment to answer a scientific problem<br>3. Innovate product that generates a solution for a problem. |

## 1. Lesson Plan (Addendum)

| Class | Topic/Details | Number of hours | | Online Sessions | On-Campus | Instructors | Note |
|---|---|---|---|---|---|---|---|
| | | Lecture sessions | Lab sessions | | | | |
| 1 | Tue 10.00-11.50 Units | 2 | | ✓ | | Tara C. | |
| 2 | Thu 10.00-11.50 Order of Magnitude approximation | 2 | | ✓ | | Tara C. | |
| 3 | Tue 10.00-11.50 Linear motion | 2 | | ✓ | | Tara C. | |
| 4 | Thu 10.00-11.50 acceleration | 2 | | ✓ | | Tara C. | |
| 5 | Tue 10.00-11.50 Vectors review 1 | 2 | | ✓ | | Tara C. | |
| 6 | Thu 10.00-11.50 Vectors review 2 | 2 | | ✓ | | Tara C. | |
| 7 | Tue 10.00-11.50 Projectile motion | 2 | | ✓ | | Tara C. | |
| 8 | Thu 10.00-11.50 Projectile motion (2) | 2 | | ✓ | | Tara C. | |
| 9 | Tue 10.00-11.50 Newton's Law | 2 | | ✓ | | Tara C. | |
| 10 | Thu 10.00-11.50 Newton's Law (2) | 2 | | ✓ | | Tara C. | |
| 11 | Tue 10.00-11.50 Work | 2 | | ✓ | | Tara C. | |
| 12 | Thu 10.00-11.50 Work (2) | 2 | | ✓ | | Tara C. | |
| 13 | Tue 10.00-11.50 | 2 | | ✓ | | Tara C. | |

| Class | Topic/Details | Number of hours | | Online Sessions | On-Campus | Instructors | Note |
|---|---|---|---|---|---|---|---|
| | | Lecture sessions | Lab sessions | | | | |
| | Energy | | | | | | |
| 14 | Thu 10.00-11.50<br>Energy (2) | 2 | | ✓ | | Tara C. | |
| 15 | Tue 10.00-11.50<br>Momentum | 2 | | ✓ | | Tara C. | |
| 16 | Thu 10.00-11.50<br>Momentum (2) | 2 | | ✓ | | Tara C. | |
| 17 | Tue 10.00-11.50<br>Rotational motion | 2 | | ✓ | | Tara C. | |
| 18 | Thu 10.00-11.50<br>Rotational motion (2) | 2 | | ✓ | | Tara C. | |
| 19 | Tue 10.00-11.50<br>Static Equilibrium | 2 | | ✓ | | Tara C. | |
| 20 | Thu 10.00-11.50<br>Static equilibrium (2) | 2 | | ✓ | | Tara C. | |
| 21 | Tue 10.00-11.50<br>Fluid Mechanics | 2 | | ✓ | | Tara C. | |
| 22 | Thu 10.00-11.50<br>Fluid Mechanics (2) | 2 | | ✓ | | Tara C. | |
| 23 | Tue 10.00-11.50<br>Review (1) | 2 | | ✓ | | Tara C. | |
| 24 | Thu 10.00-11.50<br>Review (2) | 2 | | ✓ | | Tara C. | |
| | Total | 48 | 0 | | | | |