TQF 3 Course Specifications

Section 1 General Information

1. Course code and course title
   - Thai ICPY105 ปฏิบัติการแบบบูรณาการทางฟิสิกส์ ๑
   - English ICPY105 Integrated Laboratory in Physics I
2. Number of credits 2 (0-4-2)
3. Program and type of subject
   - 3.1 Program Undergraduate Degree (International Program)
   - 3.2 Type of Subject Required Major Class
4. Course Coordinator and Course Lecturer
   - 4.1 Course Coordinator Tara Chalermsongsak, Science Division, Mahidol University International College, tara.cha@mahidol.ac.th
   - 4.2 Course Lecturer Tara Chalermsongsak, tara.cha@mahidol.ac.th
5. Trimester/ Year of Study
   - 5.1 Trimester All trimesters (including summer session) / for all students in all International College Undergraduate Programs
   - 5.2 Course Capacity Approximately 20 students (limited by lab space)
6. Pre-requisite ICPY 101 Physics I
7. Co-requisites N/A
8. Venue of Study Mahidol University, Salaya campus

Section 2 Goals and Objectives

1. Course Goals

Student should apply knowledge in physics to carry out basic experiment in mechanics to prove some basic equations governing motions of objects in various situation. The students should also be able to determine errors associated measurements and understand how the errors propagate to the experiments' results.

2. Objectives of Course Development/Revision

2.1 Course Objectives

1. Do experiments to prove phenomena predicted by simple equations.
2. Analyze the observed data in a meaningful way.
3. Write a coherence lab report.
4. Learn to work as a team in academic environment

2.2 Course-level Learning Outcomes: CLOs

By the end of the course, students will be able to (CLOs)

1. CLO1: Use basic measuring instruments to record data and carry out experiments successfully.
2. CLO2: Analyze data and propagate the errors from measurements to the final result.

3. CLO3: Produce a coherent lab report with effective usage of plots to explain experimental results.
4. CLO4: Work as a team productively.

Section 3 Course Management

1. Course Description

การวัด และ ความไม่แน่นอนจากการวัด, วิธีพิสูจน์แบบจำลองทางวิทยาศาสตร์, การทดลองทางกลศาสตร์เบื้องต้น

Measurements and propagation of errors, how to prove phenomena predicted by mathematical models, basic experiments in mechanics.

2. Credit hours per trimester

Lecture (Hour(s))	Laboratory/field trip/internship (Hour(s))	Self-study (Hour(s))
0	48	24

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: Use basic measuring instruments to record data and carry out experiments successfully.
   2. CLO2: Analyze data and propagate the errors from measurements to the final result.
   3. CLO3: Produce a coherent lab report with effective usage of plots to explain experimental results.
   4. CLO4: Work as a team productively.

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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	Demonstration, hands on experiment	Lab report, quiz.
CLO 2	Demonstration, hands on experiment	Lab report, quiz.
CLO 3	Demonstration, hands on experiment	Lab report, quiz.
CLO 4	Group discussion, demonstration.	Participation.

Section 5 Teaching and Evaluation Plans

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

Week	Topic	Number of Hours		Teaching Activities/ Media	Lecturer
		Lecture Hours	Lab/ Field Trip/ Internship Hours		
1	Measurements and propagation of errors	0	4	Group Discussion, Demonstration, Hands on Experiment	Tara C.
2	Simple Pendulum	0	4		
3	Physical Pendulum	0	4		
4	Rolling down incline plane	0	4		
5	Refractive	0	4		
6	Diffraction	0	4		
7	Resonance of Sound	0	4		
8	Newton's law of cooling	0	4		
9	Mass-Spring	0	4		
10	Lenz' law	0	4		
11	Resistor-Capacitor circuit	0	4		
12	Review	0	4		
	Total	0	48		

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: Use basic measuring instruments to record data and carry out experiments successfully.	Quiz	5	30
	Lab Report	25	
CLO2: Analyze data and propagate the errors from measurements to the final result.	Quiz	5	30
	Lab Report	25	
CLO3: Produce a coherent lab report with effective usage of plots to explain experimental results.	Lab report	30	30
CLO4: Work as a team productively.	Participation	5	10
	Peer evaluation	5	
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
   N/A
2. Recommended textbooks and/or other documents/materials
   Course's lab manual provided by the instructor
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)

Integrated Laboratory in Physics I	Program Learning Outcomes (PLOs)				
	PLO1	PLO2	PLO3	PLO4	PLO5
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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: Analyze data and propagate the errors from measurements.	1.1, 1.4				
CLO2: Display data set using a plot effectively.			3.1		
CLO3: Write down a coherent lab report				4.1	
CLO4: Work as a team productively.				4.3	

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

PLO	Sub PLO
1) Apply knowledge to solve physics problems in four mains physics branches: 1) classical mechanics 2) quantum mechanics, 3) electromagnetism, and 4) thermodynamics and statistical mechanics.	1) Apply Classical Mechanics knowledge to solve relevant problems 2) Explain motion and behavior of small object i.e. electrons in different potential. 3) Determine solutions for static electric and magnetic fields and potentials in vacuum and dielectric matters. 4) Explain wave, both mechanical and electromagnetic wave, and oscillations phenomena including interference, diffraction, reflection, refraction, dispersion, and dissipation in media. 5) Relate microscopic behavior of systems (i.e. ideal gas, paramagnet, Einstein solid, Fermi gas, photon gas) to their thermal properties via Boltzmann and Quantum statistic. 6) Apply Lorentz transformation for velocity, length, time, energy and momentum in relativistic limit.
2) Judge the validity and credibility of scientific information and arguments from sources such as news articles, social media, magazines, and scientific literature.	1) Do order of magnitude estimation for real-life situations. 2) Analyze relevant data in a meaningful and effective way with mathematical models and associated physics concepts. 3) Critique and discuss on contemporary research publication. 4) Evaluate credibility of commercial innovations with integrated knowledge.
3) Demonstrate proficiency in oral and written communication of scientific concepts toward colleagues.	1) Analyze data and display result in coherent lab reports. 2) Demonstrate proficiency in oral presentations.

4) Use scientific integrity and professionalism in collaboration, research methodology, and publication suitable for academic environment	1) Report experimental result and explain the discrepancy in the result sincerely and scientifically. 2) Execute experimental work using robust techniques. 3) Work as a team with professional attitude and behavior.
5) Conduct experiments independently to answer or provide solutions to real-life situations.	1) Apply numerical method to solve scientific problems 2) Research or do experiment to answer scientific problems. 3) Innovate a product as a solution for a problem.

Addendum for teaching Plan

Class	Topic/Details	Number of hours		Online Sessions	On-Campus	Instructors	Note
		Lecture sessions	Lab sessions				
1	Friday 8:00-11:50 Error from measurement and propagation of error.		4	✓		Tara C.	
2	Friday 8:00-11:50 Simple Pendulum: How to analyze data and write a lab report		4	✓		Tara C.	
3	Friday 8:00-11:50 Physical Pendulum		4		✓	Tara C.	
4	Friday 8:00-11:50 Incline Plane		4		✓	Tara C.	
5	Friday 8:00-11:50 Refraction		4		✓	Tara C.	
6	Friday 8:00-11:50 Diffraction		4		✓	Tara C.	
7	Friday 8:00-11:50 Resonance of Sound		4		✓	Tara C.	
8	Friday 8:00-11:50 Newton's law of cooling		4		✓	Tara C.	
9	Friday 8:00-11:50 Mass-Spring oscillation		4		✓	Tara C.	

Class	Topic/Details	Number of hours		Online Sessions	On-Campus	Instructors	Note
		Lecture sessions	Lab sessions				
10	Friday 8:00-11:50 Lenz's Law		4		✓	Tara C.	
11	Friday 8:00-11:50 Resistor-Capacitor circuit		4		✓	Tara C.	
12	Friday 8:00-11:50 Review		4		✓	Tara C.	
	Total	0	48				