TQF 3 Course Specifications

Section 1 General Information

1. Course code and course title
   - Thai ICPY 342 ปฏิบัติการแบบบูรณาการทางฟิสิกส์ ๒
   - English ICPY 342 Integrated Laboratory in Physics II
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 Dr. Weerapong Phadungsukanan, Science Division, Mahidol University International College, weerapong.pha@mahidol.ac.th
   - 4.2 Course Lecturer Dr. Ratchapak Chitaree, Department of Physics, Faculty of Science, Mahidol University, rachapak.chi@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 10 students (limited by lab space)
6. Pre-requisite N/A
7. Co-requisites N/A

Section 2 Goals and Objectives

1. Course Goals

   Students should be able to

   1. Do experiments to prove phenomena predicted by mathematical models.
   2. Analyze the data in a meaningful way.
   3. Write a coherence lab report.

2. Objectives of Course Development/Revision

   2.1 Course Objectives

   1. To revise course contents
   2. To include a well defined course-level learning outcomes.

   2.2 Course-level Learning Outcomes: CLOs

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

   1. CLO1: Prepare an experiment setup with provided equipment to do experiment with minimum guidance.
   2. CLO2: Analyze data and propagate the errors from measurements to the final result.

3. CLO3: Write down a coherent lab report
4. CLO4: Work as a team productively.

Section 3 Course Management

1. Course Description

การวัด และ ความไม่แน่นอนจากการวัด, วิธีพิสูจน์แบบจำลองทางวิทยาศาสตร์, การทดลองพื้นฐานทางทัศนศาสตร์ ความร้อน แม่เหล็กและฟิสิกส์อนุภาค

Measurements and propagation of errors, how to prove phenomena predicted by mathematical models, Fundamental experiments in optics, thermal physics, Magnetism and particle physics.

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: Prepare an experiment setup with provided equipment to do experiment with minimum guidance.
   2. CLO2: Analyze data and propagate the errors from measurements to the final result.
   3. CLO3: Write down a coherent lab report
   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	Lab report, quiz.

Section 5 Teaching and Evaluation Plans

1. Teaching plan

Week	Date	Topic	Number of Hours		Teaching Activities/ Media	Lecturer
			Lecture Hours	Lab/ Field Trip/ Internship Hours		
1-2	11/01/22 18/01/22	Oscilloscope and Function generator	0	4	Group Discussion, Demonstration, Hands on Experiment	R Chitaree
3-4	25/01/22 8/02/22	Optics Lab 1	0	4		
5-6	15/02/22 22/02/22	Optics Lab 2	0	4		
7-8	1/03/22 8/03/22	Thermal Physics Lab	0	4		
9-10	15/03/22 22/03/22	Magnetism Lab	0	4		
11-12	29/03/22 5/04/22	Particle Physics Lab	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: Prepare an experiment setup with provided equipment to do experiment with minimum guidance.	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: Write down a coherent lab report	Quiz	5	30
	Lab report	25	
CLO4: Work as a team productively.	Participation	10	10
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 II	Program Learning Outcomes (PLOs)				
	PLO1	PLO2	PLO3	PLO4	PLO5
ICPY 342		R	R	R	R

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: Prepare an experiment setup with provided equipment to do experiment with minimum guidance.					5.2
CLO2: Analyze data and propagate the errors from measurements to the final result.			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

LOs	Sub LOs
1. Apply quantitative skills both analytical and computational to solve physics problems in various subject.	1. Applying Fundamental Physics knowledge to analyze relevant problems 2. Explaining motion and behavior of small object i.e. electrons. 3. Explaining thermal expansion. 4. Explaining optics and relevant phenomena.

2) Appraise Physics information critically	1. Do order of magnitude estimation for daily life situations. 2. Analyze relevant data in a meaningful and effective way. 3. Critique and discuss on contemporary research publication. 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 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 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 2. Research or do experiment to answer a scientific problem 3. Innovate product that generates a solution for a problem.