Course Specification

Section 1 General Information

1. Course Code and Title

In Thai ICCH 103 ปฏิบัติการแบบบูรณาการทางเคมี

In English ICCH 103 Integrated Laboratory in Chemistry

2. Number of Credits

2 (0-4-2) (Lecture/Lab/Self-study)

(Theory 0 hrs. Practice 48 hrs. Self-Study 2 hrs./week)

3. Curriculum and Course Type

3.1 Program Bachelor of Science (Chemistry)

3.2 Course Type Specific Course ☑ Compulsory Course ☐ Elective Course

4. Course Coordinator and Instructor

4.1 Course Responsible Instructor Taweetham Limpanuparb, PhD

4.2 Instructors Chaleena Pimpasri, PhD

5. Semester/Class Level

5.1 Semester All trimesters (excluding summer session) / for all students in all International College Undergraduate Programs

5.2 Number of Students Allowed Approximately 20 students per session

6. Prerequisites

MU Labpass or lecturer permission

7. Co-requisites

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Section 2 Course Goals and Course Description

1. Course Goals

To provide laboratory experience of various techniques in chemistry both in skill-building approach, where students follow well-define procedures to master techniques, which reinforce the principles, and in inquiry-based approach, where students self-design, complete experiments, and draw conclusions to answer certain research-like questions.

2. Course Description

(In Thai) ปฏิบัติการทางเคมีสำหรับเคมีทั่วไป การวัด ปริมาณสารสัมพันธ์ ของแข็ง ของเหลว ก๊าซ อุณหพลศาสตร์ สมดุล กรด-เบส ไฟฟ้าเคมี จลนพลศาสตร์

(In English) Laboratory practicals for general chemistry: measurements; stoichiochemistry; solids, liquids and solutions; gases; thermochemistry; equilibrium; acids and bases; electrochemistry; kinetics; chemical safety practice and regulations

Section 3 Course Objectives, Course-level Learning Outcomes and Course Implementation

1. Course Objectives

Having a lab experience is essential for science majors preparing for both academic research, and for careers in industries. This course aims to offer experience in chemistry experiments, including measurements; stoichiochemistry; solids, liquids and solutions; gases; thermochemistry; equilibrium; acids and bases; electrochemistry; kinetics; chemical safety practice and regulations

2. Course-level Learning Outcomes: CLOs

On completion of the course, the students will be able to (CLOs)

1) CLO1 Use standard laboratory practice in chemistry

2) CLO2 Conduct experimental confirmation of basic chemical theories/phenomenon/properties.

3) CLO3 Communicate their experiments with appropriate data, graphs, and written documents

3. How to organize learning experiences to develop the knowledge or skills stated in number 2 and how to measure the learning outcomes

ICCH 103	Teaching methods	Evaluation Methods
CLO1	Demonstration, Laboratory experiments, discussion	Notebook, Report, Examination, Peer evaluation
CLO2	Demonstration, Laboratory experiments, discussion	Notebook, Report, Examination, Peer evaluation
CLO3	Demonstration, Laboratory experiments, discussion	Notebook, Report, Examination, Peer evaluation

Section 4 Lesson Plan and Evaluation

1. Lesson Plan

Week	Topic	Number of Hours		Teaching Activities/ Media	Lecturer
		Lecture Hours	Lab/Field Trip/Internship Hours		

1	Introduction/Laboratory safety	0	4	Reading assignments, quizzes, lab briefing, demonstration & experiment, discussion	Dr. Chaleena Pimpasri
2	Measurement	0	4		
3	Electrochemistry	0	4		
4	Stoichiometry of Baking Soda	0	4		
5	Chemical Detectives	0	4		
6	Introduction to Molecular Modelling	0	4		
7	Practical Exam 1	0	4		
8	Equilibrium	0	4		
9	Spectrophotometric Analysis	0	4		
10	Gas Laws (Boyle's law & Charles's law)	0	4		
11	Kinetics	0	4		
12	Practical Exam 2	0	4		
	Total	0	48		

2. Plan for Assessment of Expected Course-Level Learning Outcomes (CLOs)

2.1 Measurement and Evaluation of learning achievement

A. Formative Assessment

- Class discussion
- Group discussion

B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes	Assessment Methods	Assessment Ratio (Percentage)	
CLO1 Use standard laboratory practice in chemistry	In class activities including reports	20	35
	Examination	15	

CLO2 Conduct experimental confirmation of basic chemical theories/phenomenon/properties.	In class activities including reports	20	35
	Examination	15	
CLO3 Communicate their experiments with appropriate data, graphs, and written documents	In class activities including reports	20	30
	Examination	10	
			100

(2) Grading Rules

Assessment	Marking
Quiz (10%)	• Quiz will be taken from **8.00-8.15 for session 1** and **13.00-13.10 for session 2**.
Attendance (5%)	• If you come between 8:15-8:30/13:15-13:30 (after quiz), 5 points will be deducted (on that day). • If you come after 8:30/13:30, ZERO point will be given on that day (considered absent), but you may be allowed to perform an experiment.
Lab planning (10%)	Simple diagram/graphic and easy to follow in 1-2 pages only (5) • Other students or researchers can replicate your lab plans to perform their experiments (5)
Lab report (30%)	• Data Collection: completion, significant figures of the data (10) • Calculation: details on calculation, significant figures (10)

	• Discussion and conclusion: a concise summary of the obtained results including the method used for the experiment and discussing any error that might occur during the experiment (10)
Performance and safety (10%)	• Safety Practice and Responsibility (5) • Lab Skills and Waste Management (5)
Practical exam (20%)	• Evaluate on students' performance
Portfolio (5%)	• Compilation of ALL classwork and feedback submitted during the last class (5)
Final written examination (20%)	• Evaluate on students' performance in the exam
Chemical risk assessment (Need approval)	• A chemical risk assessment form needs to be filled out and approved online. • Ideally students should submit the form at the beginning of the week. • Last approval will be on **Friday at 17.00 pm** before the lab start. • **Students are not allowed to perform an experiment without an approved chemical assessment.**

(3) Measurement and Evaluation

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

2.2 Re-examination (if the course allows any.)

N/A - (Not applicable with MUIC)

3. Students' Appeal

According to OAA standard protocols

Section 5 Teaching Resources

1. Required Texts

1) Laboratory manuals prepared by the instructor.
2) Laboratory manual: chemistry: a molecular approach/John B. Vincent and Livingston
3) (ISBN: 9780136006961, LISC QD453.2 V772L 2009)

2. Suggested Materials

Selected readings from pertinent scientific journals and textbooks or video clips, as posted on the course's e-learning site

3. Other Resources (if any)

N/A

Section 6 Evaluation and Improvement of Course Implementation

1. Analysis and Evaluation of Course Implementation

A. Data for Analysis

Student feedback of instructors, teaching methods and materials, and course content through MUIC student evaluation forms

B. Course Effectiveness Evaluation

- Evaluation of effectiveness based on student evaluation scores and comments
- Evaluation through peer observations by co-instructor or other Division faculty

2. Revision Process and Improvement Plan for Course Effectiveness

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

3. The self-assessment report of the course

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

Appendix

1. Relations between the course and the program

Table 1 Relations between the course and the PLOs

Integrated Laboratory in Chemistry	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
ICCH103			P	P	P	P

Note: Indicate the level of CLOs by letter I, R, P or M. Using the information as shown in the Curriculum Mapping of TQF2.

Table 2 Relation between CLOs and PLOs

ICCH103	Learning Outcomes in the Chemistry Program (CH-PLOs)					
	1	2	3	4	5	6
CLO1 Use standard laboratory practice in chemistry				4.1	5.1 5.2 5.3	
CLO2 Conduct experimental confirmation of basic chemical theories/phenomenon/properties.			3.1 3.3			
CLO3 Communicate their experiments with appropriate data, graphs, and written documents						6.3

Table 3 PLOs and SubPLOs that the course is responsible for

LOs	Sub LOs
1. Apply appropriate chemistry knowledge and technical skills to solve problems	1.1 Identify and apply concepts related to physical chemistry to solve problems 1.2 Identify and apply concepts related to organic chemistry to solve problems 1.3 Identify and apply concepts related to analytical chemistry to solve problems 1.4 Identify and apply concepts related to inorganic chemistry to solve problems 1.5 Identify and apply concepts related to biochemistry to solve problems 1.6 Use appropriate technical skills to solve problems 1.7 Synthesize information to arrive at logical reasoning in the context of chemistry
2. Appraise scientific information critically	2.1 Retrieve information independently 2.2 Draw meaningful conclusion from the learning materials 2.3 Assess the relevance of the information 2.4 Manage scientific literatures using reference management software
3. Demonstrate proficiency in oral and written communication of scientific concepts	3.1 Communicate/present ideas effectively both oral & written forms, proper to audience groups 3.2 Prepare a purposeful oral presentation 3.3 Prepare written documents to communicate information/ideas

LOs	Sub LOs
4. Apply scientific integrity and professionalism	4.1 Demonstrate moral and appropriate behavior 4.2 Recognize ethical issues related to chemistry 4.3 Identify national & global current issues and their relations to chemistry 4.4 Apply accepted ethical standards to resolve issues 4.5 Collaborate effectively with others as a responsible team member
5. Apply standard chemical safety and practice in research and industry	5.1 Use proper PPE 5.2 Identify potential hazards associated to chemicals 5.3 Assess risks associated, plan for prevention and mitigation
6. Formulate solutions for novel situations	6.1 Connect, synthesize and/or transform ideas or solutions within a particular framework 6.2 Integrate alternative, divergent, or contradictory perspectives or ideas in the solution of a problem or question 6.3 Create an original explanation or solutions to the situations/problems 6.4 Articulate the rationale for and consequences of his/her solution

2. Rubric scoring*

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