Specific course
Course Title: General Chemistry I
Course Code: SCCH 151

Degree ☑ *Bachelor* ☐ Master ☐ Doctoral
Faculty of Science
Department of Chemistry

TQF 3 Course Specification

Section 1 General Information

1. Course Code and Course Title

SCCH 151 General Chemistry I

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2. Number of Credits 3 (3 - 0 - 6) (Theory 3 hours Practice 0 hour Self-study 6 hours/week)

3. Curriculum and Course Type

3.1 Name of curriculum Undergraduate level (International Program)

3.2 Type of Course Specific course

4. Course Coordinator and Instructor

4.1 Course coordinator Dr. Tinnakorn Tiensing

Department of Chemistry Faculty of Science

Phone: 02-2015110 email: tinnakorn.tie@mahidol.ac.th

4.2 Instructor Dr. Tinnakorn Tiensing

email: tinnakorn.tie@mahidol.ac.th, tinnakorn.tie@mahidol.edu

5. Semester / Class Level

5.1 Semester 1st Semester / 1st year

5.2 Number of Students Approximately 100 students

6. Pre-requisite none

7. Co-requisite none

8. Study Site Location

Salaya Campus Faculty of Science

9. Date of Preparation/Latest Revision of the Course Specification 4 July 2023

Section 2 Goals and Objectives

1. Course Goals

After completion of this course, student should be able to describe and understand knowledge of principles and theories in the topics of stoichiometry, atomic structure, chemical bonding theory, periodic table of representative and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry. Student should be able to apply principle concepts in this course in their studying field which corresponds to the assigned program.

2. Objectives of Courses

2.1 Course Objectives Improvement knowledeg and learning skill, student will be able to:

1) Describe principles and theories in the following topics of chemistry I including stoichiometry, atomic structure, chemical bonding theory, periodic table of representative and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry.
2) Define terms and definition of atomic structure (i.e., atom, molecule, ions, matter and compound), chemical bonding theory (i.e., valence shell, valence shell electron pair repulsion (VSEPR), hybridization, molecular geometry), representative and transition elements, IUPAC name, radionuclides, radioactive element.
3) Write and read IUPAC name of organic compound and classify its functional group
4) Demonstrate problem solving in the following topics of stoichiometry (concentration units and reagent preparation solution), atomic structure, chemical bonding theory, nuclear chemistry (carbon dating), environmental chemistry (environmental pollution e.g., air and water).
5) Integrate and apply knowledge in related field

2.2 Course-Level Learning Outcomes: CLOs

After completion of this course, student should be able to describe and understand principle knowledge as shown in course learning outcomes (CLOs);

1) CLO1 Write and name chemical symbols in which represent atoms, molecules, ions, matter and compounds correctly
2) CLO2 Describe principles and theories in the following topics of chemistry I including stoichiometry, atomic structure, chemical bonding theory, periodic table of representative and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry.
3) CLO3 Define terms and definition of atomic structure (i.e., atom, molecule, ions and matter), chemical bonding theory (i.e., valence shell, valence shell electron pair repulsion (VSEPR), hybridization, molecular geometry), representative and transition elements, IUPAC name, radionuclides and radioactive element.
4) CLO4 Write and read IUPAC name of organic compound and classify its functional group correctly
5) CLO5 Solve problems in the following topics of stoichiometry (concentration units and reagent preparation solution), atomic structure, chemical bonding theory, nuclear chemistry (carbon dating), environmental chemistry (environmental pollution e.g., air and water)

Section 3 Course Description and Implementation

1. Course Description

ปริมาณสารสัมพันธ์ โครงสร้างอะตอม ทฤษฎีพันธะเคมี เคมีของธาตุในหมู่หลักและทรานซิชัน เคมีอินทรีย์ เคมีนิวเคลียร์ เคมีสิ่งแวดล้อม

Stoichiometry; atomic structure; chemical bonding; theory representative and transition metal elements; organic chemistry; nuclear chemistry; environmental chemistry

2. Number of Hours per Semester

Lecture (hour)	Practical Laboratory (hour)	Self-study (hour)
45	0	90

3. Number of Hours per Week for Individual Advice

1 hour/week depends on studying topic which can be arranged by instructor via e-mail or other communication system.

Section 4 Development of Students' Learning Outcomes

1. A brief summary of the knowledge or skills expected to develop in students; the course-level expected learning outcomes (CLOs).

By the end of the course, students who successfully complete the course will be able to:

1) CLO1 Write and name chemical symbols in which represent atoms, molecules, ions, matter and compounds correctly
2) CLO2 Describe principles and theories in the following topics of chemistry I including stoichiometry, atomic structure, chemical bonding theory, periodic table of representative and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry.
3) CLO3 Define terms and definition of atomic structure (i.e., atom, molecule, ions and matter), chemical bonding theory (i.e., valence shell, valence shell electron pair repulsion (VSEPR), hybridization, molecular geometry), representative and transition elements, IUPAC name, radionuclides and radioactive element.
4) CLO4 Write and read IUPAC name of organic compound and classify its functional group correctly
5) CLO5 Solve problems in the following topics of stoichiometry (concentration units and reagent preparation solution), atomic structure, chemical bonding theory, nuclear chemistry (carbon dating), environmental chemistry (environmental pollution e.g., air and water).

2. How to organize learning experiences to develop the knowledge or skills stated in number 1 and how to measure the learning outcomes

Course Code	Teaching and learning experience management				Learning outcomes measurements			
SCCH 151 General Chemistry I	**Lecture**	Exercise/Home work	Discussion / Solving problems report	Self-study	**Midterm exam:** MCQ / written	**Final exam:** MCQ / written	Quiz	Evaluate from attention / Exercise / Homework /discussion /solving problems report
CLO1 Write and name chemical symbols in which represent atoms, molecules, ions, matter and compounds correctly	✓	✓		✓	✖		✖	
CLO2 Describe principles and theories in the following topics of chemistry I including stoichiometry, atomic structure, chemical bonding theory, periodic table of representative	✓	✓		✓	✖	✖	✖	

Course Code	Teaching and learning experience management				Learning outcomes measurements			
SCCH 151 General Chemistry I	**Lecture**	Exercise/Home work	Discussion / Solving problems report	Self-study	**Midterm exam**: MCQ / written	**Final exam:** MCQ / written	Quiz	Evaluate from attention / Exercise / Homework /discussion /solving problems report
and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry.								
CLO3 Define terms and definition of atomic structure (i.e., atom, molecule, ions and matter), chemical bonding theory (i.e., valence shell, valence shell electron pair repulsion (VSEPR), hybridization, molecular geometry), representative and transition elements, IUPAC name, radionuclides and radioactive element.	✓	✓	✓	✓	✖	✖	✖	✖
CLO4 Write and read IUPAC name of organic compound and classify its functional group correctly	✓	✓	✓	✓		✖	✖	✖
CLO5 Solve problems in the following topics of stoichiometry (concentration units and reagent preparation solution), atomic structure, chemical bonding theory, nuclear chemistry (carbon dating), environmental chemistry (environmental pollution e.g., air and water)	✓	✓	✓	✓	✖	✖	✖	✖

Section 5 Lesson Plan and Evaluation

1. Lesson Plan

Week	Topics/Details	Number of hours		Teaching activities/ media	Instructors
		Classroom sessions	Practice sessions		
1	**Concept of Chemistry, Unit of Measurement, Naming chemical compounds**	3	0	Teaching activities (1) Lecture (2) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
2	**Concept of Chemistry, Unit of Measurement, Naming chemical compounds**	3	0	Teaching activities (1) Lecture (2) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
3	**Stoichiometry:** concentration units, calculation the concentration of solution	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
4	**Stoichiometry:** concentration units, calculation the concentration of solution	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
5	**Atomic structure and atomic theory:** structure of atom and theory, quantum theory, atomic orbitals, and electron configuration	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
6	**Chemical bonding theory:** Lewis structure, drawing molecular structure, concept of resonance, valence electron,	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
7	**Chemical bonding theory:**	3	0	Teaching activities	Dr. Tinnakorn Tiensing

Week	Topics/Details	Number of hours		Teaching activities/ media	Instructors
		Classroom sessions	Practice sessions		
	molecular geometry, valence bond theory, VSEPR, hybridization of atomic orbitals, molecular orbital theory			(1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	
8	**Periodic table of representative and transition elements**	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
9	**Periodic table of representative and transition elements**	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
10	**Basic Organic chemistry**: IUPAC name of organic compounds and functional group	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
11	**Basic Organic chemistry**: Organic compounds in the nature and related applications	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
12	**Nuclear chemistry**:	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
13	**Nuclear chemistry**:	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise	Dr. Tinnakorn Tiensing

Week	Topics/Details	Number of hours		Teaching activities/ media	Instructors
		Classroom sessions	Practice sessions		
				Teaching media - PowerPoint slides	
14	**Environmental chemistry**	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
15	**Environmental chemistry**	3	0	Teaching activities (1) Lecture (2) Discussion (3) Exercise Teaching media - PowerPoint slides	Dr. Tinnakorn Tiensing
	Total	**45**	**0**		

2. Evaluation of the CLOs

2.1 Measurement and Evaluation of learning achievement

a. Formative Assessment

The formative assessment methods for improving learning skill in which evaluation results are not included in the final score after completion the course are:

- Ask questions in the classroom
- Demonstrate examples for problem solving in the related topics of studying

b. Summative Assessment

(1) Tool and weight for measurement and evaluation

Course Code **SCCH 151 General Chemistry I**	Learning outcomes measurements				Weight (%)
	Midterm exam: MCQ / written	**Final exam:** MCQ / written	Quiz	Evaluate from attention / Exercise / Homework /discussion /solving problems report	
CLO1 Write and name chemical symbols in which represent atoms, molecules, ions, matter and compounds correctly	5		3		8
CLO2 Describe principles and theories in the following topics of chemistry I including stoichiometry, atomic structure, chemical bonding theory, periodic table of representative and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry.	5	5	3		13
CLO3 Define terms and definition of atomic structure (i.e., atom, molecule, ions and matter), chemical bonding theory (i.e., valence shell, valence shell electron pair repulsion (VSEPR), hybridization, molecular geometry), representative and transition elements, IUPAC name, radionuclides and radioactive element.	10	10	3	3	26
CLO4 Write and read IUPAC name of organic compound and classify its functional group correctly		10	3	3	16
CLO5 Solve problems in the following topics of stoichiometry (concentration units and reagent preparation solution), atomic structure, chemical bonding theory, nuclear chemistry (carbon dating), environmental chemistry (environmental pollution e.g., air and water)	15	10	3	9	37
Total	**35**	**35**	**15**	**15**	**100**

(2) Grading policy

Criteria and conditions for measurement and evaluation are to be enforced in accordance with Mahidol University Regulation on Diploma and Undergraduate Study and recently Announcement, the Faculty of Science on Undergraduate Study, by using symbols showing results with assigned scores as shown in the table:

Score(percentage)	Symbols
80 – 100	**A**
70 – 79	B+
65 – 69	B
60 – 64	C+
55 – 59	C
50 – 54	D+
45 – 49	D
0 – 44	F

Symbol with D means pass in this course.

(3) Re-examination (if any)

Follow the Announcement, the Faculty of Science on Undergraduate Study on Re-examination which can be done in the following conditions;

- Student received F or U
- Student taken that course fail less than 15 students, and
- That course would not open in the summer semester.

3. Student Academic Appeal

Students may submit formal complaint or academic appeal directly to

International Education and Administration Unit, Division of Salaya Campus

Room SC1-116, SC1-Building, Faculty of Science (Salaya Campus), Mahidol University

999 Phuttamonthon 4 Road, A. Phuttamonthon, Nakhon Pathom 73170, Thailand

E-mail: scsim@mahidol.ac.th; Phone: +66 2 4419820 ext. 1199

If it considered that a case exists, the matter will be investigated in accordance with the procedures, and the complainant informed of the outcome.

Section 6 Teaching Resources

1. Required Texts and Main Documents

1) ทวีชัย อมรศักดิ์ชัย และคณะ. เคมี 1 และ เล่ม 2 กรุงเทพฯ: แมคกรอฮิลล์; 2550. (แปลและเรียบเรียงจาก Chang, R. Chemistry. 9th, 10th, 11th ed. USA: McGraw-Hill, Inc.; 2007.)

2) Chang, R. Chemistry 9th, 10th, 11thed. (International ed.). USA: McGraw-Hill, Inc.; 2007.

3) Olmsted, J. A. and Williams, G. W. *Chemistry*. 4th ed. USA: John Wiley & Sons, Inc.; 2005.

4) McMurry, J. and Fay, R.C. *Chemistry*. 4th ed. USA: Prentice Hall; 2004.

5) Oxtoby, D. W.; Gillis, H. P. and Campoin, A. *Principles of Modern Chemistry*. 7th ed. USA: Thomson Brooks; 2012.

6) Hill, J.W. and Petrucci, R.H. General Chemistry, An Integrated Approach. 3rd edition. USA: Prentice Hall; 2002.

7) Atkin, P.W. Atkin's Molecules. 2nd edition. UK: Cambridge University Press. 2003.

8) Middlecamp, C.H. et al. Chemistry in Context: Applying Chemistry to Society. 7th edition. USA: McGraw-Hill. 2012.

2. Suggested Materials

1) All teaching documents

2) Books in General Chemistry

3) Websites; http://www.rsc.org/

3. Other Resources (if any) none

Section 7 Evaluation and Improvement of Course Implementation

1. Strategy for Course Effectiveness Evaluation by Students

On-line evaluation form (i.e., instructor/lecturer and overall of the course) can be done by student which is easily assessed by the internet. Contents of the evaluation consist of topics, management, grading evaluation, satisfaction of the course and method usage and teaching method of the course.

2. Strategy for Teaching Evaluation

Skill, knowledge, teaching strategy and learning media in that course can be evaluated by student and also co-course instructor.

3. Teaching Improvement

Teaching Improvement methods can be done by meeting/seminar all lecturers in the course for improving teaching and learning methods that will be applied in the next academic year from all sources of information such as;

- grading results
- evaluation of the subject; teaching method / student learning
- recording from lecturer on performance and behavior student class
-

4. Verification Standard of Learning Outcome for the Course

The verification processes will be conducted by instructors based on student score, grading system and course evaluation results in that course for revision and verification standard LOs for the course.

5. Revision Process and Improvement Plan for Course Effectiveness

At the end of academic year, course instructor will summaries and do the report for teaching and subject evaluation results and information in the form of TQF.5 to the program administrative committee for future vision and improvement plan.

Appendix

Concordance between Specific Course and Program

Table 1 Relations between the course and the PLOs

Course name General Chemistry I	**PLOs**					
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
Course code SCCH 151						

Remarks: Show the level of the course management with the symbols I, R, P, and M. This must correspond to the curriculum mapping written in the TQF2.

Table 2 Relations between CLOs and PLOs

Course code SCCH 151	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1 Write and name chemical symbols in which represent atoms, molecules, ions, matter and compounds correctly						
CLO2 Describe principles and theories in the following topics of chemistry I including stoichiometry, atomic structure, chemical bonding theory, periodic table of representative and transition elements, basic organic chemistry, nuclear chemistry, environmental chemistry.						
CLO3 Define terms and definition of atomic structure (i.e., atom, molecule, ions and matter), chemical bonding theory (i.e., valence shell, valence shell electron pair repulsion (VSEPR), hybridization, molecular geometry), representative and transition elements, IUPAC name, radionuclides and radioactive element.						
CLO4 Write and read IUPAC name of organic compound and classify its functional group correctly						

Course code SCCH 151	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO5 Solve problems in the following topics of stoichiometry (concentration units and reagent preparation solution), atomic structure, chemical bonding theory, nuclear chemistry (carbon dating), environmental chemistry (environmental pollution e.g., air and water)						

Remarks:

a. Each CLO should clearly correspond to the PLO at the SubPLO level to show a clear connection.

b. Describe the PLOs and SubPlos only referred to in the course in "Table 3 PLOs that the course is responsible for".

Table 3 Description of Program Learning Outcomes (PLO) and sub PLOs of your responsible course

PLOs	**Sub PLOs**
PLO1	1.1
	1.2
PLO2	2.1
	2.2
PLO3	3.1
	3.2