

Doctor of Philosophy Program in Chemistry
(International Program)
Revised Program 2023

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Name of Institution Mahidol University
Campus/Faculty/Department Department of Chemistry, Faculty of Science

Section 1 General Information

1. Curriculum Name

Thai : หลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาเคมี (หลักสูตรนานาชาติ)
English : Doctor of Philosophy Program in Chemistry (International Program)

2. Name of Degree and Section

Full Name **Thai** : ปรัชญาดุษฎีบัณฑิต (เคมี)
English : Doctor of Philosophy (Chemistry)

Abbreviation **Thai** : ปร.ด. (เคมี)
English : Ph.D. (Chemistry)

3. Major Subjects : None

4. Required Credits

- 4.1 Plan 1.1 and Plan 2.1; for students holding M.Sc. degree: not less than 48 credits
- 4.2 Plan 2.2; for students holding B.Sc. degree: not less than 72 credits

5. Curriculum Characteristics

- 5.1 Curriculum Category : Doctoral degree
- 5.2 Language : English
- 5.3 Enrollment : Both Thai and international students
- 5.4 Cooperation with Other Universities : None
- 5.5 Degrees Offered to the Graduates : One degree

6. Status and Approval of the Curriculum

6.1 Program was revised in 2023.

6.2 Starting in the first semester of academic year 2023

6.3 Curriculum screening committee approved the program in its meeting 46/2565 on October 17, 2022

6.4 The Mahidol University Council approved the program in its meeting 586 on November 16, 2022

7. Readiness to Implement and Promote the Curriculum

The curriculum from the program is readily implemented and promoted its quality and standard according to criteria set by Thai Qualification Framework for Higher Education in academic year 2025 (2 years after implementation).

8. Opportunities for the Graduates

Graduates of the program can work in the following capacity:

8.1 Researchers in commercial sector and in academia;

8.2 Research scientists and advanced specialists in the government sector

9. Name, ID Number, Title and Degree of the Faculty in Charge of the Program

No.	Identification Card Number Academic Position - Name Surname	Degree (Field of Study) University: Year of Graduate	Department
1	x-xxxx-xxxxx-xx-x Associate Professor Dr.Ekasith Somsook	Ph.D. (Chemistry) University of Wisconsin-Madison, USA: 2001 B.Sc. (Chemistry) Mahidol University: 1994	Department of Chemistry Faculty of Science
2	x-xxxx-xxxxx-xx-x Associate Professor Dr.Jonggol Tantirungrotechai	Ph.D. (Chemistry) University of California, Berkeley, USA: 2004 A.B. (Chemistry) Princeton University, USA: 1998	Department of Chemistry Faculty of Science
3	x-xxxx-xxxxx-xx-x Associate Professor Dr. Sirilata Yotphan	Ph.D. (Chemistry) University of California, Berkeley, USA: 2010 B.Sc. (Chemistry) McGill University, Canada: 2006	Department of Chemistry, Faculty of Science
4	x-xxxx-xxxxx-xx-x Associate Professor Dr.Siwaporn Meejoo Smith	Ph.D. (Chemistry) University Birmingham, UK: 2003 B.Sc. (Chemistry) Mahidol University: 1997	Department of Chemistry Faculty of Science
5	x-xxxx-xxxxx-xx-x Associate Professor Dr.Supavadee Kiatisevi	Dr.rer.nat. (Chemie) Universität Stuttgart, Germany: 2004 Diplom-Chemikerin Universität Stuttgart, Germany: 2000 B.Sc. (Chemistry) Mahidol University: 1995	Department of Chemistry Faculty of Science

6	x-xxxx-xxxxx-xx-x Assistant Professor Dr.Soraya Pornsuwan	Ph.D. (Chemistry) University of Pittsburgh, USA: 2007 M.S.(Chemistry) University of Wisconsin-Madison, USA: 2001 B.Sc. (Chemistry) Mahidol University: 1997	Department of Chemistry Faculty of Science
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10. Location

Department of Chemistry, Faculty of Science, Mahidol University, Phayathai Campus and Salaya Campus.

11. External Factors Contributing to the Curriculum Planning

11.1 Economic Situation/Development

The COVID-19 crisis has shown a big impact on the global economy and it speeds up the disruptive technology for future productions. Together with an increasing influence of climate change, which constantly changes the landscape of natural resources and social challenges, contemporary chemistry education clearly needs an update in a timely manner.

The Ph.D. Program in Chemistry just completed its tenth year after its first use in 2013 and the first revision in 2018. With all the factors mentioned above, it is now a high time for a careful revision of the program. As reflected in this document, such a revision is designed to not only cultivate students with in-depth knowledge in chemistry and related disciplines, but it also prepares them with skills and perspectives that bode well for their future career in a changing world.

11.2 Social and Cultural Situation/Development

The joint endeavor in the region set up by the Association of Southeast Asian Nations (ASEAN) and increasing flow of the workforce across the globe introduce both opportunities and challenges to future graduates. To make the most of a powerful trend of globalization, new graduates need to have sufficient intellectual foundation of

knowledge, with competent communication skills that will allow them to perform to full potential in various international settings.

Aside from the ASEAN network and other international collaborations, the Eastern Economic Corridor (EEC), a pilot project of the economic development of Thailand's Eastern Seaboard, recently announced by the Thai government will also reshape the demands for high-quality human resource.

In addition, the ever-increasing development of the open-border policy shared by many countries around the world also means that the future graduates will likely have to work within a community of diverse culture and ethnicity. To prepare the students for this social change, it is imperative that the student community within the program should learn to live and work under multicultural environment. Therefore, the program aims to actively recruit applicants from other countries, such as those of the ASEAN members. In addition, many courses and activities provided by the program are administered with full conscience of social and cultural diversity.

12. The Effects of Factors Mentioned in 11.1 and 11.2 on the Curriculum Development and Their Relevance to the Missions of the University

12.1 Curriculum Development

With an advent of interconnected society and increasing emphasis on innovation and new technologies, it is necessary for the program to provide in-depth knowledge that instills expertise of relevant fields for the students. At the same time, the training in the program should also cover a broader aspect of personal development, such as communication and interpersonal skills. A good understanding of cultural differences would prepare the students well for working in a diverse society.

12.2 Their Relevance to the Missions of the University

Mahidol University is known for its academic rigor especially in basic sciences, research, and development. Nevertheless, with a changing environment in many social and economic aspects both within and outside the country, the formal training at Mahidol University needs to integrate soft skill teaching in order to best prepare new graduates for modern-day workforce. All curriculums at the university are an integration of the seven core values: Mastery, Altruism, Harmony, Integrity, Determination, Originality, and Leadership. The resulting education is expected to provide new graduates with

comprehensive knowledge and sensible understanding that will guide them well in their future endeavors.

13. Cooperation with Other Curriculums of the University

None

Section 2 Information of the Curriculum

1. Philosophy, Justification, and Objectives of the Curriculum

1.1 Philosophy and Justification of the Curriculum

The doctoral program in Chemistry is designed to endow our students with ability to tackle fundamental scientific questions from chemical perspective. The core principle of our program is to provide students with an education of high quality, equivalent to international standards. To equip our graduates with a strong foundation in chemistry, advanced courses, scientific discussions, and, most importantly, research programs guided by a faculty mentor in the fields of organic chemistry, analytical chemistry, inorganic chemistry, physical chemistry and chemical physics, chemistry for natural resources and waste, and catalysis science and technology are offered. The program is conducted to reinforce students to acquire excellent proficiency in a focused area of expertise as well as a broad base of problem-solving skills and exposure to interdisciplinary science. The education of high quality along with general skills establish our graduates with professional capability, personal quality, life long learning that are demanded in the employment market and the society at large. Research ethics, academic principles, and moral standards are emphasized in the teaching to ensure that our graduates can fulfill Mahidol University's philosophical view of higher education, namely, "True success is not in the learning, but in its application to the benefit of mankind."

1.2 Objectives

By the end of the study, students are able to

- 1.2.1 Graduates have good moral understanding and conform to scientific ethics and social responsibility.
- 1.2.2 Graduates possess comprehensive knowledge and experience in chemistry.
- 1.2.3 Graduates show analysis and synthesis thinking, problem solving, and original work creation.
- 1.2.4 Graduates show good human relations, leadership, and responsibility.
- 1.2.5 Graduates attain analytical, communication, and information technology skills.

1.3 Program Learning Outcomes (PLOs)

1.3.1 Graduates must be concerned about the ethical and social aspects when applying chemical knowledge.

1.3.2 Graduates are capable of describing chemical knowledge, designing chemical research and conducting experiments safely for the benefit of mankind.

1.3.3 Graduates are capable of working with others in the global enterprises.

1.3.4 Graduates are capable of adapting themselves to the latest chemical skills and knowledge to become life-long learners.

1.3.5 Graduates are capable of strengthening the competitiveness of their work by means of digital technologies and/or automation.

1.3.6 Graduates are capable of working as independent researchers.

2. Plan for Development and Improvement

Plan for Development/Revision	Strategies	Indexes
1. To maintain high quality of the curriculum	1. Encourage collaboration across disciplines within the program. 2. Provide a platform for the critique of the curriculum by external experts. 3. Revise the curriculum once every five years. 4. Build partnership with other domestic and international institutions.	1. Number of co-publications across disciplines 2. Record of the meeting for the critique of the curriculum 3. The curriculum report 4. Documents declaring partnership with other institutions
2. To revise curriculum according to stakeholders	1. Survey employers' opinion about the graduates.	1. Report of employers' opinion especially on curriculum content

and social and economic changes	<ol style="list-style-type: none"> 2. Revise the curriculum once every five years. 3. Develop research collaboration with public and private sectors. 	<ol style="list-style-type: none"> 2. Document of the curriculum revision 3. Document of research network
3. To foster high-quality research skills in chemistry	<ol style="list-style-type: none"> 1. Encourage students to conduct short-term research visits at respectable institutions 2. Support students to present their works at academic conferences. 3. Require students to publish their findings in quality journals. 	<ol style="list-style-type: none"> 1. Number of students conducting short-term research visits 2. Number of students participating academic conferences, both domestic and international 3. Number of publications in quality journals

Section 3 Educational Management System, Curriculum Implementation, and Structure

1. Educational Management System

1.1 System **Credit and Semester system.** Two semesters in one academic year.

Each semester is 15 weeks long.

1.2 Summer Session Summer session is not offered

1.3 Credits Equivalent to Trimester System No equivalency

2. Curriculum Implementation

2.1 Teaching Schedule Classes take place during regular working hours.

First semester August – December

Second semester January - May

2.2 Qualifications of Prospective Students

Plan 1.1

2.2.1 Obtained M.Sc. in chemistry or related fields and attested by the the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation

2.2.2 Obtained a minimum GPA of 3.50,

2.2.3 Also produced research publication as the first author and passed a placement test organized by the program;

2.2.4 Obtained an English Proficiency Examination score as required by the Faculty of Graduate Studies;

2.2.5 Applicants whose credentials differ from qualification in 2.2.2, 2.2.4 maybe able to apply to the program if the permission is granted by the Program Administrative Committee and the Dean of the Faculty of Graduate Studies.

Plan 2.1

2.2.1 Obtained M.Sc. in chemistry or related fields and attested by the the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation

2.2.2 Obtained a minimum GPA of 3.50;

2.2.3 Obtained an English Proficiency Examination score as required by the Faculty of Graduate Studies;

- 2.2.4 Applicants whose credentials differ from qualification in 2.2.2 and 2.2.3 maybe able to apply to the program if the permission is granted by the Program Administrative Committee and the Dean of the Faculty of Graduate Studies.

Plan 2.2

- 2.2.1 Obtained B.Sc. in chemistry or related fields and attested by the the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation
- 2.2.2 Obtained a minimum GPA of 3.50,
- 2.2.3 Obtained an English Proficiency Examination score as required by the Faculty of Graduate Studies;
- 2.2.4 Applicants whose credentials differ from qualification in 2.2.2 and 2.2.3 maybe able to apply to the program if the permission is granted by the Program Administrative Committee and the Dean of the Faculty of Graduate Studies.

2.3 Problems That New Students Encounter When They Start the Program

- 2.3.1 English and communication skills
- 2.3.2 Chemistry background
- 2.3.3 Adaptation to graduate study and the atmosphere

2.4 Strategies to Solve Problems in 2.3

Problems of New Students	Strategies for Problem Solving
English and communication skills	Provide a required course on English and communication skills, as well as regular English workshops to provide continuous development.
Chemistry background	Recommend a student to review basic chemical knowledge when necessary under the supervision of an advisor.
Adaptation to graduate study and the atmosphere	Arrange student-organized events, such as off-campus orientation camp, and promote peer-to-peer mentoring system among students.

2.5 Five-Year Plan for Enrollment and Graduation of Students

2.5.1 Plan 1.1 for Students Holding M.Sc. Degree

Academic Year	2023	2024	2025	2026	2027
1 st	3	3	3	3	3
2 nd	-	3	3	3	3
3 rd	-	-	3	3	3
Cumulative number	-	6	9	9	9
Expected number of students graduated	-	-	3	3	3

2.5.2 Plan 2.1 for Students Holding M.Sc. Degree

Academic Year	2023	2024	2025	2026	2027
1 st	4	4	4	4	4
2 nd	-	4	4	4	4
3 rd	-	-	4	4	4
Cumulative number	-	8	12	12	12
Number of students graduated	-	-	4	4	4

2.5.3 Plan 2.2 for Students Holding B.Sc. Degree

Academic Year	2023	2024	2025	2026	2027
1 st	4	4	4	4	4
2 nd	-	4	4	4	4
3 rd	-	-	4	4	4
4 th	-	-	-	4	4
Cumulative number	-	8	12	16	16
Number of students graduated	-	-	-	4	4

2.6 Budget

2.6.1 Plan 1.1 for Students Holding M.Sc. Degree

Estimates of Expenses in the Program

Income from enrollment

Registration	Credit	Baht per credit	Total
Dissertation	48	xxxx	xxxxxx
Research fee			xxxxxx
Income incurred per student			xxxxxxx

Expense

Expenses per student

Contribution paid to the faculty and the university	xxxxx
Committees for qualification exam, advising, and thesis defense	xxxxx
Expense incurred per student	xxxxxx

Expenses for program management

Salary for program's officer (10,000 baht/month)	xxxxxxx
Public utility (3,100 baht/month)	xxxxxxx
Supplies (39,000 baht/semester)	xxxxxxx
Equipment (150,000 baht/semester)	xxxxxxx
Others (e.g., equipment maintenance, renovation of classrooms and labs, and workshops)	xxxxxxx

Expense incurred for program management 1,743,600

Number of students for a balanced sheet: 6 students

Expenses until graduation per student (assuming 6 students): 330,400 baht
(110,133.33 baht/year)

2.6.2 Plan 2.1 for Students Holding M.Sc. Degree

Estimates of Expenses in the Program

Income from enrollment

Registration	Credit	Baht per credit	Total
Courses	12	xxxx	xxxxxx
Dissertation	36	xxxx	xxxxxx
Research fee			xxxxxx
Income incurred per student			xxxxxxx

*Expense**Expenses per student*

Contribution paid to the faculty and the university	xxxxx
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Committees for qualification exam, advising, and thesis defense	xxxxx
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Expense incurred per student	xxxxx
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Expenses for program management

Salary for program's officer (xxxxx baht/month)	xxxxxx
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Remuneration for invited lecturers (3 credits/semester, xxxx baht/hr)	xxxxxx
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Public utility (xxxx baht/month)	xxxxxx
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Supplies (xxxxx baht/semester)	xxxxxx
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Equipment (xxxxx baht/semester)	xxxxxx
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Others (e.g., equipment maintenance, renovation of classrooms	xxxxxx
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and labs, workshops, and travel expenses for invited lecturers)	
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Expense incurred for program management	1,899,600
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Number of students for a balanced sheet:	6 students
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Expenses until graduation per student (assuming 6 students):	356,400 baht
(118,800 baht/year)	

2.6.3 Plan 2.2 for Students Holding B.Sc. Degree**Estimates of Expenses in the Program***Income from enrollment*

Registration	Credit	Baht per credit	Total
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Courses	24	xxxx	xxxxxx
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Dissertation	48	xxxx	xxxxxx
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Research fee			xxxxxx
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Income incurred per student	xxxxxx
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*Expense**Expenses per student*

Contribution paid to the faculty and the university	xxxxx
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Committees for qualification exam, advising, and thesis defense	xxxxx
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Expense incurred per student	xxxxx
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Expenses for program management

Salary for program's officer (xxxxx baht/month)	xxxxxx
Remuneration for invited lecturers (3 credits/semester, xxxx baht/hr)	xxxxxx
Public utility (xxxx baht/month)	xxxxxx
Supplies (xxxxx baht/semester)	xxxxxx
Equipment (xxxxx baht/semester)	xxxxxx
Others (e.g., equipment maintenance, renovation of classrooms and labs, workshops, and travel expenses for invited lecturers)	xxxxxx
Expense incurred for program management	2,536,800
Number of students for a balanced sheet:	5 students
Expenses until graduation per student (assuming 7 students):	579,360 baht
(144,480 baht/year)	

2.7 Educational System

Classroom style

2.8 Transfer of Credits, Courses, and Cross University Registration

Credits transferring must be in compliance with Mahidol University's regulations on Graduate Studies..

3. Curriculum and Lecturers**3.1 Curriculum****3.1.1 Number of Credits**

(1) Plan 1.1 and Plan 2.1; for students holding M.Sc. degree: at least 48 credits

(2) Plan 2.2; for students holding B.Sc. degree: at least 72 credits

3.1.2 Curriculum Structure**(1) Plan 1.1**

The curriculum structure complies with the Thai Qualifications Framework for Higher Education (TQF) 2015 as detailed below.

For Students Holding M.Sc. Degree in Chemistry or Related Fields

Dissertation	48	credits
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(2) Plan 2

The curriculum structure complies with the Thai Qualifications Framework for Higher Education (TQF) 2015 as detailed below.

(Plan 2.1) For Students Holding M.Sc. Degree in Chemistry

Required courses	6 credits
Elective courses* not less than	6 credits
Dissertation	36 credits
Total not less than	48 credits

* For students already holding M.Sc. degree in Chemistry or other fields from the Department of Chemistry, Faculty of Science, Mahidol University, no more than 3 credits can be transferred from the M.Sc. program. In addition, any course registered in this program must have never been taken before in the M.Sc. program.

(Plan 2.2) For Students Holding B.Sc. Degree in Chemistry or**Related Fields**

Required courses	15 credits
Elective courses not less than	9 credits
Dissertation	48 credits
Total not less than	72 credits

3.1.3 Course List**(1) Required Courses**

(1.1) For Students Holding B.Sc. Degree (Plan 2.2): (15 credits)

Credit (lecture-practice-self study)

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
วทคม ๗๐๑	เคมีแนวหน้า	
SCCH 702	Chemical Safety and Risk Management	1 (1-0-2)
วทคม ๗๐๒	ความปลอดภัยทางเคมีและการจัดการความเสี่ยง	
SCCH 703	Scientific Communications	1 (1-0-2)
วทคม ๗๐๓	การสื่อสารทางวิทยาศาสตร์	
SCCH 709#	State-of-the-Art of Instrumentation	3 (3-0-6)
วทคม ๗๐๙	การใช้เครื่องมือที่ทันสมัย	

SCCH 710#	Business Models of Chemical Industries	1 (1-0-2)
วทคม ๗๑๐	แบบจำลองธุรกิจของอุตสาหกรรมเคมี	
SCCH 887#	Research Project Development II	2 (2-0-4)
วทคม ๘๘๗	การพัฒนาโครงการวิจัย ๒	
SCCH 888#	Innovations in Chemistry	3 (3-0-6)
วทคม ๘๘๘	นวัตกรรมทางเคมี	
SCCH 889#	Seminar in Chemistry II	1 (1-0-2)
วทคม ๘๘๙	สัมมนาทางเคมี ๒	

(1.2) Plan 2.1 for Students Holding M.Sc. Degree in Chemistry or Related

Fields: (6 credits)

SCCH 887#	Research Project Development II	2 (2-0-4)
วทคม ๘๘๗	การพัฒนาโครงการวิจัย ๒	
SCCH 888#	Innovations in Chemistry	3 (3-0-6)
วทคม ๘๘๘	นวัตกรรมทางเคมี	
SCCH 889#	Seminar in Chemistry II	1 (1-0-2)
วทคม ๘๘๙	สัมมนาทางเคมี ๒	

(2) Elective Courses

SCCH 711	Organic Structure Determination	3 (3-0-6)
วทคม ๗๑๑	การหาโครงสร้างของสารอินทรีย์	
SCCH 712	Molecular Structures and Functions	3 (3-0-6)
วทคม ๗๑๒	โครงสร้างและหน้าที่ระดับโมเลกุล	
SCCH 713	Advanced Organic Synthesis	3 (3-0-6)
วทคม ๗๑๓	เคมีอินทรีย์สังเคราะห์ขั้นสูง	
SCCH 714	Advanced Organic Reaction Mechanism	3 (3-0-6)
วทคม ๗๑๔	กลไกปฏิกิริยาเคมีอินทรีย์ขั้นสูง	
SCCH 715	Frontiers in Medicinal Chemistry	3 (3-0-6)
วทคม ๗๑๕	เคมีทางยาแนวหน้า	
SCCH 716	Chemical Biology	3 (3-0-6)
วทคม ๗๑๖	เคมีชีววิทยา	
SCCH 717	Advanced Natural Product Chemistry	3 (3-0-6)
วทคม ๗๑๗	เคมีของสารผลิตภัณฑ์ธรรมชาติขั้นสูง	

SCCH 718	Asymmetric Synthesis	3 (3-0-6)
วทคม ๗๑๘	การสังเคราะห์แบบอสมมาตร	
SCCH 719	Advanced Heterocyclic Chemistry	3 (3-0-6)
วทคม ๗๑๙	เคมีของสารเฮเทอโรไซคลิกขั้นสูง	
SCCH 720	Current Topics in Organic Chemistry	3 (3-0-6)
วทคม ๗๒๐	หัวข้อที่เป็นปัจจุบันทางเคมีอินทรีย์	
SCCH 731	Advanced Techniques in Analytical Chemistry	3 (3-0-6)
วทคม ๗๓๑	เทคนิคทางเคมีวิเคราะห์ขั้นสูง	
SCCH 732	Instrumental Analysis Laboratory	3 (1-6-4)
วทคม ๗๓๒	ปฏิบัติการห้องทดลองการวิเคราะห์โดยอุปกรณ์	
SCCH 733	Separation Techniques	3 (3-0-6)
วทคม ๗๓๓	เทคนิคการแยก	
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)
วทคม ๗๓๔	เทคโนโลยีของไหลสำหรับศาสตร์วิเคราะห์	
SCCH 735	Chemometrics	3 (2-3-5)
วทคม ๗๓๕	เคโมเมตริกส์	
SCCH 738	Special Topics in Analytical Chemistry	3 (3-0-6)
วทคม ๗๓๘	หัวข้อเรื่องพิเศษทางเคมีวิเคราะห์	
SCCH 739	Current Topics in Analytical Chemistry I	3 (3-0-6)
วทคม ๗๓๙	หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๑	
SCCH 740	Current Topics in Analytical Chemistry II	3 (3-0-6)
วทคม ๗๔๐	หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๒	
SCCH 753	Homogeneous Catalysis	3 (3-0-6)
วทคม ๗๕๓	การเร่งปฏิกิริยาเอกพันธ์	
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)
วทคม ๗๕๔	เคมีของโลหะทรานซิชันอินทรีย์	
SCCH 756	Heterogeneous Catalysis	3 (3-0-6)
วทคม ๗๕๖	การเร่งปฏิกิริยาวิวิธพันธุ์	
SCCH 757	Solid State Chemistry	3 (3-0-6)
วทคม ๗๕๗	เคมีของสถานะของแข็ง	
SCCH 758	Small Molecule Activation	3 (3-0-6)
วทคม ๗๕๘	การกระตุ้นโมเลกุลเล็ก	
SCCH 759	Olefin Polymerization Catalysis	3 (3-0-6)
วทคม ๗๕๙	การเร่งปฏิกิริยาพอลิเมอไรเซชันของโอเลฟิน	

SCCH 760	Biorefinery	3 (3-0-6)
วทคม ๗๖๐	การแปรรูปและการแยกผลิตภัณฑ์จากชีวมวล	
SCCH 761	Nanocatalysis	3 (3-0-6)
วทคม ๗๖๑	การเร่งปฏิกิริยานาโน	
SCCH 763	Inorganic Structure and Bonding	3 (3-0-6)
วทคม ๗๖๓	โครงสร้างอนินทรีย์และพันธะเคมี	
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
วทคม ๗๖๔	เทคนิคการพิสูจน์เอกลักษณ์ในเคมีอนินทรีย์	
SCCH 765	Main Group Chemistry	3 (3-0-6)
วทคม ๗๖๕	เคมีของธาตุหมู่หลัก	
SCCH 766	Inorganic Reaction Mechanisms	3 (3-0-6)
วทคม ๗๖๖	กลไกปฏิกิริยาอนินทรีย์	
SCCH 767	NMR Spectroscopy in Inorganic Chemistry	3 (3-0-6)
วทคม ๗๖๗	เอ็นเอ็มอาร์ สเปกโตรสโกปีสำหรับเคมีอนินทรีย์	
SCCH 768	Special Topics in Inorganic Chemistry	3 (3-0-6)
วทคม ๗๖๘	หัวข้อพิเศษทางเคมีอนินทรีย์	
SCCH 771	Quantum Chemistry	3 (3-0-6)
วทคม ๗๗๑	เคมีควอนตัม	
SCCH 772	Thermodynamics and Statistical Mechanics	3 (3-0-6)
วทคม ๗๗๒	อุณหพลศาสตร์และกลศาสตร์เชิงสถิติ	
SCCH 774	Chemical Kinetics and Molecular Dynamics	3 (3-0-6)
วทคม ๗๗๔	จลนพลศาสตร์เคมีและพลศาสตร์โมเลกุล	
SCCH 775	Modern Chemical Physics	3 (3-0-6)
วทคม ๗๗๕	ฟิสิกส์เชิงเคมีสมัยใหม่	
SCCH 776	Mathematical Methods	3 (3-0-6)
วทคม ๗๗๖	วิธีทางคณิตศาสตร์	
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
วทคม ๗๗๘	เทคนิคทางเคมีเชิงฟิสิกส์	
SCCH 779	Surface Chemistry and Advanced Electrochemistry	3 (3-0-6)
วทคม ๗๗๙	เคมีพื้นผิวและเคมีไฟฟ้าขั้นสูง	
SCCH 780	Special Topics in Physical Chemistry	3 (3-0-6)
วทคม ๗๘๐	หัวข้อเรื่องพิเศษทางเคมีเชิงฟิสิกส์	
SCCH 781	Special Topics in Chemical Physics	3 (3-0-6)
วทคม ๗๘๑	หัวข้อเรื่องพิเศษทางฟิสิกส์เชิงเคมี	

SCCH 785	Advanced Physical Chemistry	3 (3-0-6)
วทคม ๗๘๕	เคมีเชิงฟิสิกส์ขั้นสูง	
SCCH 801	Environmental Materials	3 (3-0-6)
วทคม ๘๐๑	วัสดุเชิงสิ่งแวดล้อม	
SCCH 802	Lignocellulosic Chemistry	3 (3-0-6)
วทคม ๘๐๒	เคมีเชิงลิกโนเซลลูโลส	
SCCH803	Chemistry of Waste and Pollution	3 (3-0-6)
วทคม ๘๐๓	เคมีของกากของเสียและมลพิษ	
SCCH804	Concepts in Sustainability	3 (3-0-6)
วทคม ๘๐๔	หลักการความยั่งยืน	
SCCH805	Natural Fibers	3 (3-0-6)
วทคม ๘๐๕	เส้นใยธรรมชาติ	
SCCH806	Industrial Chemistry	3 (3-0-6)
วทคม ๘๐๖	เคมีเชิงอุตสาหกรรม	
SCCH 821#	Chemistry of Small Molecules	3 (3-0-6)
วทคม ๘๒๑	เคมีของสารโมเลกุลเล็ก	
SCCH 822#	Inorganic Materials	3 (3-0-6)
วทคม ๘๒๒	วัสดุอนินทรีย์	
SCCH 823#	Macrocyclic and Supramolecular Chemistry	3 (3-0-6)
วทคม ๘๒๓	เคมีซูปราและสารประกอบแมโครไซคลิก	
SCCH 824#	Functional Dyes, Polymers and Advanced Materials	3 (3-0-6)
วทคม ๘๒๔	สีย้อม พอลิเมอร์ และวัสดุเชิงฟังก์ชันขั้นสูง	
SCCH825#	Bioinorganic Chemistry	3 (3-0-6)
วทคม ๘๒๕	เคมีชีวอนินทรีย์	
SCCH 841#	Cutting-Edge Technologies for Bio-Circular-Green Economy	3 (3-0-6)
วทคม ๘๔๑	เทคโนโลยีก้าวหน้าสำหรับเศรษฐกิจชีวภาพ หมุนเวียน สีเขียว	
SCCH 842#	Computational Design of Catalysts and Materials	3 (3-0-6)
วทคม ๘๔๒	การออกแบบตัวเร่งปฏิกิริยาและวัสดุด้วยการคำนวณ	
SCCH 843#	Business Strategies for Entrepreneurs	3 (3-0-6)
วทคม ๘๔๓	กลยุทธ์ในการทำธุรกิจสำหรับผู้ประกอบการ	
SCCH 844#	Digital Transformation for Entrepreneurs	3 (3-0-6)
วทคม ๘๔๔	การผันแปรดิจิทัลสำหรับผู้ประกอบการ	
SCCH 845#	Learning Design in Chemistry Classrooms	3 (3-0-6)
วทคม ๘๔๕	การออกแบบการเรียนรู้ในห้องเรียนวิชาเคมี	

SCCH 846#	Digitization, Miniaturization, and Advanced Manufacturing for Chemistry Classrooms	3 (3-0-6)
วทคม ๘๔๖	การแปลงเป็นดิจิทัล การย่อขนาด การผลิตขั้นสูง สำหรับห้องเรียนวิชาเคมี	
SCCH 847#	Metaverse for Chemistry Classrooms	3 (3-0-6)
วทคม ๘๔๗	อภิจักรวาลในห้องเรียนวิชาเคมี	
SCCH 848#	NMR Quantum Computation	3 (3-0-6)
วทคม ๘๔๘	การคำนวณควอนตัมเชิงเอ็นเอ็มอาร์	
SCCH 849#	Chemistrobot	3 (3-0-6)
วทคม ๘๔๙	หุ่นยนต์นักเคมี	

In addition to the elective courses shown above, students may choose to enroll in any other courses offered within or outside Mahidol University, pending approval of the advisor and the program director. Students can enroll in any required courses in the program to fulfill the elective credit requirement.

new course

(3.1) Plan 1.1 for Students Holding M.Sc. Degree

Credit (lecture-practice-self study)

SCCH 898	Dissertation	48 (0-144-0)
วทคม ๘๙๘	วิทยานิพนธ์	

(3.2) Plan 2.1 for Students Holding M.Sc. Degree

SCCH 699	Dissertation	36 (0-108-0)
วทคม ๖๙๙	วิทยานิพนธ์	

(3.3) Plan 2.2 for Students Holding B.Sc. Degree

SCCH 799	Dissertation	48 (0-144-0)
วทคม ๗๙๙	วิทยานิพนธ์	

3.1.4 Research Project (Dissertation)

The research projects undertaken by the students may encompass wide-ranging disciplines in chemistry and related interdisciplinary areas, including the following focuses:

- (1) Organic chemistry, natural products, organic synthesis and synthetic methodology, and organic materials and chemical biology;

- (2) Analytical chemistry, development of instrumentation, methods of analysis, and applications;
- (3) Inorganic chemistry, catalysts, and inorganic material properties;
- (4) Physical chemistry and chemical physics and molecular understanding of modern technologies;
- (5) Chemistry for natural resources and waste materials, sustainable development of new materials, and community-level applications.
- (6) Catalysis science and technology, improvement of existing catalysts and development of new catalysts for circular economies and sustainable developments.

3.1.5 Course Code

The definition of four letters for the program course code is based on the rules and regulation set up by the Mahidol University as follow;

The first and second letters as Faculty

SC (สค) means The Faculty of Science

The last two alphabets describe the program responsible for teaching.

CH (ชค) means Chemistry

The three number orders following the two letters, i.e., 6xx, 7xx and 8xx indicate the courses in the Graduate level.

3.1.6 Study Plan

(1) Plan 1.1 for Students Holding M.Sc. Degree in Chemistry or Related Fields

Year	First Semester	Second Semester
1	SCCH 898 Dissertation 8 (0-24-0) <i>Note: Qualifying examination period</i> Total 8 credits	SCCH 898 Dissertation 8 (0-24-0) Total 8 credits
2	SCCH 898 Dissertation 8 (0-24-0) Total 8 credits	SCCH 898 Dissertation 8 (0-24-0) Total 8 credits
3	SCCH 898 Dissertation 8 (0-24-0) Total 8 credits	SCCH 898 Dissertation 8 (0-24-0) Total 8 credits

(2) Plan 2.1 for Students Holding M.Sc. Degree in Chemistry or Related Field

Year	First Semester	Second Semester
1	SCCCH 887 Research Project Development II 2 (2-0-4) SCCCH 889 Seminar in Chemistry II 1 (1-0-2) Elective Courses 6 credits Total 9 credits	SCCCH 888 Innovations in Chemistry 3 (3-0-6) SCCCH 699 Dissertation 8 (0-24-0) <i>Note: Qualifying examination period</i> Total 11 credits
2	SCCCH 699 Dissertation 7 (0-21-0) Total 7 credits	SCCCH 699 Dissertation 7 (0-21-0) Total 7 credits
3	SCCCH 699 Dissertation 7 (0-21-0) Total 7 credits	SCCCH 699 Dissertation 7 (0-21-0) Total 7 credits

(3) Plan 2.2 for Students Holding B.Sc. Degree in Chemistry or Related Fields

Year	First Semester	Second Semester
1	SCCCH 701 Frontiers in Chemistry 3 (3-0-6) SCCCH 702 Chemical Safety and Risk Management 1 (1-0-2) SCCCH 703 Scientific Communications 1 (1-0-2) SCCCH 887 Research Project Development II 2 (2-0-4) SCCCH 709 State-of-the-Art of Instrumentation 3 (3-0-6) Elective Courses 6 credits Total 16 credits	SCCCH 710 Business Models of Chemical Industries 1 (1-0-2) SCCCH 889 Seminar in Chemistry II 1 (1-0-2) SCCCH 799 Dissertation 6 (0-18-0) Elective Courses 2 credits Total 14 credits
2	SCCCH 888 Innovations in Chemistry 3 (3-0-6) SCCCH 799 Dissertation 7 (0-21-0) <i>Note: Qualifying examination period</i> Total 10 credits	SCCCH 799 Dissertation 7 (0-21-0) Total 7 credits
3	SCCCH 799 Dissertation 7 (0-21-0) Total 7 credits	SCCCH 799 Dissertation 7 (0-21-0) Total 7 credits
4	SCCCH 799 Dissertation 7 (0-21-0) Total 7 credits	SCCCH 799 Dissertation 7 (0-21-0) Total 7 credits

3.1.7 Course Descriptions

Please refer to the attached Appendix A.

3.2 Name, I.D. Number, Title, and Degree of Instructors

3.2.1 Full time instructors in charge of the curriculum (Please see Appendix B)

No.	Identification Card Number Academic Position – Name Surname	Degree (Field of Study) University: Year of Graduate	Department
1	x-xxxx-xxxxx-xx-x Associate Professor Dr.Ekasith Somsook	Ph.D. (Chemistry) University of Wisconsin-Madison, USA: 2001 B.Sc. (Chemistry) Mahidol University: 1994	Department of Chemistry Faculty of Science
2	x-xxxx-xxxxx-xx-x Associate Professor Dr.Jonggol Tantirungrotechai	Ph.D. (Chemistry) University of California, Berkeley, USA: 2004 A.B. (Chemistry) Princeton University, USA: 1998	Department of Chemistry Faculty of Science
3	x-xxxx-xxxxx-xx-x Associate Professor Dr. Sirilata Yotphan	Ph.D. (Chemistry) University of California, Berkeley, USA: 2010 B.Sc. (Chemistry) McGill University, Canada: 2006	Department of Chemistry, Faculty of Science

No.	Identification Card Number Academic Position – Name Surname	Degree (Field of Study) University: Year of Graduate	Department
4	x-xxxx-xxxxx-xx-x Associate Professor Dr.Siwaporn Meejoo Smith	Ph.D. (Chemistry) University Birmingham, UK: 2003 B.Sc. (Chemistry) Mahidol University: 1997	Department of Chemistry Faculty of Science
5	x-xxxx-xxxxx-xx-x Associate Professor Dr.Supavadee Kiatisevi	Dr.rer.nat. (Chemie) Universität Stuttgart, Germany: 2004 Diplom-Chemikerin Universität Stuttgart, Germany: 2000 B.Sc. (Chemistry) Mahidol University: 1995	Department of Chemistry Faculty of Science
6	x-xxxx-xxxxx-xx-x Assistant Professor Dr.Soraya Pornsuwan	Ph.D. (Chemistry) University of Pittsburgh, USA: 2007 M.S.(Chemistry) University of Wisconsin-Madison, USA: 2001 B.Sc. (Chemistry) Mahidol University: 1997	Department of Chemistry Faculty of Science

3.2.2 Full time instructors of the curriculum (Please see Appendix B)

No.	Identification Card Number Academic position – Name – Surname	Degree (Field of Study) University: Year of graduate	Department
1	x-xxxx-xxxxx-xx-x Professor Dr. Chutima Kuhakarn	Ph.D. (Chemistry) University of Wisconsin-Madison, USA: 2001 M.Sc. (Organic Chemistry) Mahidol University: 1995 B.Sc. (Chemistry) Mahidol University: 1992	Department of Chemistry, Faculty of Science
2	x-xxxx-xxxxx-xx-x Associate Professor Dr. Atitaya Siripinyanond	Ph.D. (Chemistry) University of Massachusetts, Amherst, USA: 2002 M.Sc. (Applied Analytical and Inorganic Chemistry) Mahidol University: 1996 B.Sc. (Chemistry) Mahidol University: 1994	Department of Chemistry, Faculty of Science
3	x-xxxx-xxxxx-xx-x Associate Professor Dr. Darunee Soorukram	Dr.rer.nat (Organic Chemistry) Ludwig-Maximilians Universität München, Germany: 2006 M.Sc. (Organic Chemistry) Mahidol University: 2003 B.Sc. (Chemistry) Khon Kaen University: 1999	Department of Chemistry, Faculty of Science

4	x-xxxx-xxxxx-xx-x Associate Professor Dr. Duangjai Nacapricha	Ph.D. (Analytical Chemistry) Liverpool John Moores University, UK: 1993 M.Sc. (Analytical Chemistry) Chiang Mai University: 1989 B.Sc. (Chemistry) Prince of Songkla University: 1987	Department of Chemistry, Faculty of Science
5	x-xxxx-xxxxx-xx-x Associate Professor Dr.Ekasith Somsook	Ph.D. (Chemistry) University of Wisconsin-Madison, USA: 2001 B.Sc. (Chemistry) Mahidol University: 1994	Department of Chemistry Faculty of Science
6	x-xxxx-xxxxx-xx-x Associate Professor Dr.Jonggol Tantirungrotechai	Ph.D. (Chemistry) University of California, Berkeley, USA: 2004 A.B. (Chemistry) Princeton University, USA: 1998	Department of Chemistry Faculty of Science
7	x-xxxx-xxxxx-xx-x Associate Professor Dr. Palangpon Kongsaeree	Ph.D. (Chemistry) Cornell University, USA: 1998 M.Sc. (Chemistry) Cornell University, USA: 1995 B.Sc. (Chemistry) Mahidol University: 1992	Department of Chemistry, Faculty of Science
8	x-xxxx-xxxxx-xx-x Associate Professor Dr. Panida Surawatanawong	Ph.D. (Chemistry) Texas A&M University, USA: 2009 B.Sc. (Chemistry) Mahidol University: 2004	Department of Chemistry, Faculty of Science

9	x-xxxx-xxxx-xx-x Associate Professor Dr.Pasit Pakawatpanurut	Ph.D. (Chemistry) Harvard University, USA: 2005 M.A. (Chemistry) Harvard University, USA: 2004 B.S. (Chemistry) The University of Chicago, USA: 1999	Department of Chemistry, Faculty of Science
10	x-xxxx-xxxx-xx-x Associate Professor Dr.Preeyanuch Sangtrirutnugul	Ph.D. (Chemistry) University of California, Berkeley, USA: 2007 B.S. (Chemistry) Massachusetts Institute of Technology, USA: 2000	Department of Chemistry, Faculty of Science
11	x-xxxx-xxxx-xx-x Associate Professor Dr.Rattikan Chantiwas	Ph.D. (Chemistry) Chiang Mai University: 2003 M.Sc. (Applied Analytical and Inorganic Chemistry) Mahidol University: 1999 B.Sc. (Chemistry) Mahidol University: 1996	Department of Chemistry, Faculty of Science
12	x-xxxx-xxxx-xx-x Associate Professor Dr. Sirilata Yotphan	Ph.D. (Chemistry) University of California, Berkeley, USA: 2010 B.Sc. (Chemistry) McGill University, Canada: 2006	Department of Chemistry, Faculty of Science
13	x-xxxx-xxxx-xx-x Associate Professor Dr.Siwaporn Meejoo Smith	Ph.D. (Chemistry) University Birmingham, UK: 2003 B.Sc. (Chemistry) Mahidol University: 1997	Department of Chemistry Faculty of Science

14	x-xxxx-xxxx-xx-x Associate Professor Dr.Supavadee Kiatisevi	Dr.rer.nat. (Chemie) Universität Stuttgart, Germany: 2004 Diplom-Chemikerin Universität Stuttgart, Germany: 2000 B.Sc. (Chemistry) Mahidol University: 1995	Department of Chemistry Faculty of Science
15	x-xxxx-xxxx-xx-x Associate Professor Dr. Taweechai Amornsakchai	Ph.D. (Polymer Physics) University of Leeds, UK: 1994 B.Sc. (Industrial Chemistry) King Mongkut's Institute of Technology Ladkrabang: 1989	Department of Chemistry, Faculty of Science
16	x-xxxx-xxxx-xx-x Associate Professor Dr.Tienthong Thongpanchang	Ph.D. (Chemistry) Columbia University, USA: 1999 B.Sc. (Chemistry) Prince of Songkla University: 1994	Department of Chemistry, Faculty of Science
17	x-xxxx-xxxx-xx-x Associate Professor Dr.Vuthichai Erwithayasuporn	Ph.D. (Materials Science) Japan Advanced Institute of Science and Technology, Japan: 2010 M.Sc. (Chemistry) Worcester Polytechnic Institute, USA: 2006 B.Sc. (Chemistry) Chulalongkorn University: 2004	Department of Chemistry, Faculty of Science

18	x-xxxx-xxxxx-xx-x Assistant Professor Dr. Chutima Jiarpinithun	Ph.D. (Chemistry) University of Wisconsin-Madison, USA: 2008 B.S. (Chemistry) The University of Chicago, USA: 2001	Department of Chemistry, Faculty of Science
19	x-xxxx-xxxxx-xx-x Assistant Professor Dr. Kanchana Uraisin	Ph.D. (Molecular and Material Science) Okayama University, Japan: 2006 M.Sc. (Applied Analytical and Inorganic Chemistry) Mahidol University: 2003 B.Sc. (Chemistry) Mahidol University: 2000	Department of Chemistry, Faculty of Science
20	x-xxxx-xxxxx-xx-x Assistant Professor Dr. Pawaret Leowanawat	Ph.D. (Chemistry) University of Pennsylvania, USA: 2013 B.Sc. (Chemistry) Mahidol University: 2004	Department of Chemistry, Faculty of Science
21	x-xxxx-xxxxx-xx-x Assistant Professor Dr. Phoonthawee Saetear	Ph.D. (Analytical Chemistry) Mahidol University: 2014 M.Sc. (Applied Analytical and Inorganic Chemistry) Mahidol University: 2010 B.Sc. (Chemistry) Mahidol University: 2007	Department of Chemistry, Faculty of Science

22	x-xxxx-xxxxx-xx-x Assistant Professor Dr.Soraya Pornsuwan	Ph.D. (Chemistry) University of Pittsburgh, USA: 2007 M.S.(Chemistry) University of Wisconsin-Madison, USA: 2001 B.Sc. (Chemistry) Mahidol University: 1997	Department of Chemistry Faculty of Science
23	x-xxxx-xxxxx-xx-x Assistant Professor Dr. Teera Chantarojsiri	Ph.D. (Chemistry) University of California, Berkeley, USA: 2015 B.S. (Chemistry) Stanford University, USA: 2010	Department of Chemistry, Faculty of Science
24	x-xxxx-xxxxx-xx-x Assistant Professor Dr. Torsak Luanphaisarnnont	Ph.D. (Chemistry) Harvard University, USA: 2012 M.A. (Chemistry) Harvard University, USA: 2008 B.S. (Chemistry) Massachusetts Institute of Technology, USA: 2005	Department of Chemistry, Faculty of Science
25	x-xxxx-xxxxx-xx-x Lecturer Dr. Nopporn Ruangsapapichat	Ph.D. (Organic Chemistry) University of Groningen, the Netherlands: 2011 M.Sc. (Organic Chemistry) Mahidol University: 2006 B.Sc. (Chemistry) Mahidol University: 2002	Department of Chemistry, Faculty of Science

26	x-xxxx-xxxxx-xx-x Lecturer Dr. Suarwee Akavipat	Ph.D. (Environmental Science) New Jersey Institute of Technology, USA: 2013 M.S. (Environmental Science) New Jersey Institute of Technology, USA: 2008 B.Sc. (Chemistry) Chulalongkorn University: 2003	Department of Chemistry, Faculty of Science
27	x-xxxx-xxxxx-xx-x Lecturer Dr. Thanthapatra Bunchuay	D.Phil (Inorganic Chemistry) University of Oxford, UK: 2018 M.Sc. (Applied Analytical and Inorganic Chemistry) Mahidol University: 2014 B.Sc. (Chemistry) Mahidol University: 2011	Department of Chemistry, Faculty of Science

4. Details of Practicum

-None-

5. Dissertation Requirement

5.1 Short Description

Basic or applied research that presents original, in-depth knowledge and new contribution to the chosen field, as well as demonstrating good scientific ethics.

5.2 Standard Learning Outcomes (or Program Learning Outcomes or PLOs)

Upon completion of the dissertation,

- 5.2.1 Graduates must be concerned about the ethical and social aspects when applying chemical knowledge.
- 5.2.2 Graduates are capable of describing chemical knowledge, designing chemical research and conducting experiments safely for the benefit of mankind.
- 5.2.3 Graduates are capable of working with others in the global enterprises.
- 5.2.4 Graduates are capable of adapting themselves to the latest chemical skills and knowledge to become life-long learners.

- 5.2.5 Graduates are capable of strengthening the competitiveness of their work by means of digital technologies and/or automation.
- 5.2.6 Graduates are capable of working as independent researchers.

5.3 Timeframe

Students may start performing dissertation work in the first semester (Plan 1.1) or the second semester (Plans 2.1 and 2.2) of the first academic year.

5.4 Number of Credits

- 5.4.1 Plan 1.1 for students holding M.Sc. degree: 48 credits
- 5.4.2 Plan 2.1 for students holding M.Sc. degree: 36 credits
- 5.4.3 Plan 2.2 for students holding B.Sc. degree: 72 credits

5.5 Preparation

- 5.5.1 The faculty members in the program inform the students about available research areas and/or topics.
- 5.5.2 The students choose their research advisors and together develop research topics.
- 5.5.3 The students plan out their research projects under the supervision of their research advisors.
- 5.5.4 The students prepare their research proposals, undertake proposal examinations, and acquire dissertation advisory committees.

5.6 Evaluation Process

A qualifying examination is held in order to evaluate a student's academic competency, which can take place in the first semester (Plan 1.1) or the second semester (Plans 2.1 and 2.2) of the first academic year. The dissertation proposal examination must be held within 2 semesters of first registering for the dissertation. After passing the proposal examination, the progress of the dissertation is evaluated by an advisor twice a year and by presenting the work to the faculty at the end of each academic year. Once the dissertation is completed, a dissertation examination committee that consists of at least 5 members, one of which is an external expert, evaluates the work. One (for Plans 2.1 and 2.2) or two (for Plan 1.1) of research articles

derived from the dissertation must be published in international journals in accordance with the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation announcement.

Section 4 Learning Outcome, Teaching Strategies, and Evaluation

1. Development of Students' Specific Qualifications

Special Characteristics	Teaching Strategies or Student Activities
1. Graduates have good moral understanding and conform to scientific ethics and social responsibility.	1. Organize workshops on scientific ethics. 2. Organize workshops on social responsibility
2. Graduates possess comprehensive knowledge and experience in chemistry.	1. Organize conferences and workshops on chemistry fields. 2. Offer opportunities for short-term research visit (3-6 months) at networking international institutions.
3. Graduates show analysis and synthesis thinking, problem solving, and original work creation.	1. Organize conferences and workshops on chemistry fields. 2. Offer opportunities for short-term research visit (3-6 months) at networking international institutions.
4. Graduates show good human relations, leadership, and responsibility.	1. Organize special events for student gathering. 2. Organize seminars hosted by students.
5. Graduates attain analytical, communication, and information technology skills.	1. Organize seminars or workshops in English and information technology and database, at least once every semester. 2. Offer opportunities for short-term research visit (3-6 months) at networking international institutions.

Special Characteristics	Teaching Strategies or Student Activities
	3. Organize conferences and workshops on chemistry fields.

2. Development of Learning Outcome in Each Objective

The program strictly conforms to the quality assurance guided by the Thai Qualifications Framework for Higher Education (TQF) 2015. Thus, to successfully produce graduates according to the program objectives (in Section 2) or the Specific Qualifications of Students stated above, the TQF learning outcomes for the program are formulated as shown below.

Expected Outcome	Teaching Strategies	Evaluation Strategies
1. Morality and Ethics 1.1 Have professional integrity and compassion 1.2 Have self-discipline and self-responsibility 1.3 Respect rules and regulations of the program and institution 1.4 Possess professional ethics	1.1 Give advice, directly or indirectly, during the teaching of the courses and the dissertation period 1.2 Give a clear timeline emphasis on assignments and class attendance 1.3 Organize an orientation to new students to inform them of rules and regulations in the program and the university 1.4 Arrange group activities and encourage group assignments in relevant courses	1.1 Observe and make record of punctuality for class attendance and assignments 1.2 Monitor students' behavior 1.3 Allow students to self-evaluate 1.4 Evaluate the performance of group activities or assignments
2. Knowledge 2.1 Possess comprehensive knowledge, theories and concepts, and in-depth understanding of relevant to chemistry 2.2 Remain updated on new knowledge	2.1 Courses 2.2 Seminars and class discussion	2.1 Course evaluation, as well as dissertation proposal examinations and defense

Expected Outcome	Teaching Strategies	Evaluation Strategies
3. Intellectual Development 3.1 Systematically perform analysis 3.2 Solve problems analytically and logically 3.3 Propose new ideas in chemistry	3.1 Courses 3.2 Seminars and group discussion 3.3 Scientific report	3.1 Course evaluation, as well as dissertation proposal examination and defense
4. Interpersonal Skills and Responsibility 4.1 Be open-minded toward different opinions and possess good human relations 4.2 Be responsible for assigned task and duty	4.1 group assignments	4.1 Monitor students' behavior 4.2 Evaluation of group performance
5. Skills in Numerical Analysis, Communication, and Information Technology 5.1 Utilize data using appropriate technology 5.2 Choose appropriate information technology platforms 5.3 Use English speaking, listening, reading, and writing skills to communicate with others 5.4 Analyze numerical data and use basic statistics correctly 5.5 Communicate chemical information to other people	5.1 Group research and assignment using information technology 5.2 Dissertation period that includes proposal, progress report, and defense 5.3 Participation in the national or international conferences 5.4 Workshops on English skills	5.1 Group reports 5.2 Dissertation progress reports, proposal examination, and defense 5.3 Record of conference participations 5.4 Examinations and self-evaluation

Expected Outcome	Teaching Strategies	Evaluation Strategies
effectively by using appropriate media		

The curriculum detailed in this document was developed with a concept of outcome-based education provided by the ASEAN University Network–Quality Assurance (AUN-QA) guidelines. Consistent with the AUN-QA, the program conducted a survey for different opinions from students, faculty, and employers in order to formulate a set of program learning outcomes (PLOs). Key information gained from the survey and the implementation of obtained PLOs are shown in Appendix C. The PLOs serve as a critical measure that can guide the operation of the program to achieve its objectives. The PLOs are closely aligned with the TQF learning outcomes stated above, the alignment of which can be found in Appendix D. The PLOs of this program are shown below.

2.1 Program Learning Outcomes

- i. Graduates must be concerned about the ethical and social aspects when applying chemical knowledge.
- ii. Graduates are capable of describing chemical knowledge, designing chemical research and conducting experiments safely for the benefit of mankind.
- iii. Graduates are capable of working with others in the global enterprises.
- iv. Graduates are capable of adapting themselves to the latest chemical skills and knowledge to become life-long learners.
- v. Graduates are capable of strengthening the competitiveness of their work by means of digital technologies and/or automation.
- vi. Graduates are capable of working as independent researchers.

3. Curriculum Mapping

The curriculum mapping according to the TQF is shown in Appendix E.

Section 5 Criteria for Student Evaluation

1. Grading System

Students receive grades according to the criteria stated in Mahidol University's regulations on graduate studies.

2. Evaluation Process for the Learning Outcomes of Students

2.1 Evaluation Process during Students' Undertaking of the Program

- 2.1.1 The evaluation process for the learning outcomes is formally stated as part of the quality assurance system of Mahidol University.
- 2.1.2 The evaluation process for each active course is conducted by a committee that consists of full-time instructors and/or selected experts.
- 2.1.3 The evaluation process for the entire program is conducted by full-time faculty members and the program committee.

2.2 Evaluation Process after Students' Graduation

Students' career after graduation is emphasized. The specific aspects of the students' career used in the evaluation are:

- 2.2.1 the employment status;
- 2.2.2 work performance;
- 2.2.3 level of satisfaction of the employers; and
- 2.2.4 award or certificate of compliment received in, for example, ethics, knowledge, performance, human relations, responsibility, communications, decision making, and technological capability.

3. Requirements for Graduation

Requirement	Plan 1	Plan 2	
		Plan 2.1 M.Sc. Student	Plan 2.2 B.Sc. Student
Time of study	The duration of study shall not exceed the study plan	The duration of study shall not exceed the study plan	The duration of study shall not exceed the study plan
Credit requirement	48 credits of dissertation	At least 12 credits of courses and 36 credits of dissertation	At least 24 credits of courses and 48 credits of dissertation

Requirement	Plan 1	Plan 2	
		Plan 2.1 M.Sc. Student	Plan 2.2 B.Sc. Student
GPA requirement	-	At least 3.00 upon completion of all courses	At least 3.00 upon completion of all courses
English proficiency	As required by the Faculty of Graduate Studies	As required by the Faculty of Graduate Studies	As required by the Faculty of Graduate Studies
Soft skills	Fulfill soft skill training in each of the following areas: language and communication, leadership, research, and information technology	Fulfill soft skill training in each of the following areas: language and communication, leadership, research, and information technology	Fulfill soft skill training in each of the following areas: language and communication, leadership, research, and information technology
Qualifying Examination	Pass	Pass	Pass
Dissertation	Pass proposal and open defense examinations	Pass proposal and open defense examinations	Pass proposal and open defense examinations
Publication from dissertation	At least 2 publications in international journals in accordance with the announcement of the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation	At least 1 publication in an international journal in accordance with the announcement of the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation	At least 1 publication in an international journal in accordance with the announcement of the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research and Innovation

Section 6 Faculty Development

1. The Orientation for New Faculty Members

A more senior faculty member helps mentor a new member on teaching, research, and grant applications.

2. Skill and Knowledge Development for New Faculty Members

2.1 Skill Development in Teaching and Evaluation

- 2.1.1 Encourage the faculty to develop skills on teaching and learning methods.
- 2.1.2 Encourage the faculty, and provide support when necessary, to participate in workshops on teaching and curriculum development that are organized by Mahidol University and other institutions.

2.2 Other Academic and Professional Skills

- 2.2.1 Encourage the faculty to participate in national or international conferences and workshops on a regular basis.
- 2.2.2 Encourage the faculty to engage in academic services, such as invited speakers or lecturers, research grant reviewers, committee members of professional societies, and academic article contributors.

Section 7 Quality Assurance

1. Quality Assurance of the Curriculum

The management of the program is carried out by the program committee, which consists of a director and full-time faculty members oversighted by the dean of the Faculty of Graduate Studies and also works closely with the dean of the Faculty of Science. Administration of the teaching is done in collaboration with the administrators of the Faculty of Science. The curriculum is continuously monitored by the program committee, the information collected from which will be used in the revision process of the curriculum scheduled once every 5 years.

Objective	Action	Evaluation
1. To become a progressive program, where students and faculty have strong proficiency in chemistry.	1.1 Develop the curriculum in accordance with the Thai Qualifications Framework for Higher Education 2015. 1.2 Require all instructors to hold a doctoral degree. 1.3 Encourage all instructors to master academically.	1.1 The curriculum is reviewed by the committee on curriculum restructuring, the Faculty of Graduate Studies, and the university council. 1.2 Keep database of the faculty in the program. 1.3 Review academic performance of the instructors.
2. To make sure that the curriculum is high quality.	2.1 Continuously monitor and conduct the revision of the curriculum once every 5 years.	2.1 The quality of students is regularly assessed by all advisors and, after graduation, the information from both students and employers will be collected on a regular basis.
3. To motivate students to have a desire for learning.	3.1 Require students to perform teaching assistant	3.1 Feedback from undergraduate students

Objective	Action	Evaluation
4.To evaluate the program on a regular basis.	(TA) duty for at least 1 semester prior to graduation. 4.1 Appoint a committee that includes external experts to assess the curriculum. 4.2 Maintain a database of students, faculty, research, budget, and international collaboration for quality assessment whenever needed. 4.3 Survey for opinions from graduates and employers.	taking the class is used to assess a TA's attitude toward teaching others. 4.1 Keep record of the meeting for the curriculum assessment. 4.2 Regularly check the completeness of the database. 4.3 Check for the evidence and information of the survey.

2. Graduates

2.1 Quality of Graduates in Accordance with the Thai Qualifications Framework for Higher Education 2015

The program plans to conduct regular surveys on the needs of employers and their satisfaction with graduates. The results from all of these surveys will be used in the next revision of the curriculum.

2.2 Employment and Research Output of the Graduates

Upon completion of the curriculum, graduates will acquire academic competency and professional skills that will empower them for future workforce in various capacity, such as an academic or research personnel at government or private sector, a researcher or faculty at university or research institution, and even an entrepreneur of their own choices. The program plans to conduct regular surveys on the status of our graduates after completing the degree. The number of scientific conference proceedings, national and international journals resulting from the thesis or parts of the thesis will be collected regularly.

3. Students

3.1 Admission of Students

Qualification of prospective students is described in Topic 2.2 of Section 3. Under supervision of an advisor, a student may be recommended to take college chemistry courses whenever necessary. Seminar or workshops in information technology and database are organized. Student-organized events, such as off-campus orientation camp are arranged to help students adapt to graduate study and the new atmosphere. Peer-to-peer mentoring system is promoted among students to provide needed support.

3.2 Student Support and Development

The program provides courses of fundamental and advanced principles, as well as courses that offer broad perspective and experience. Required courses on English and communication skills, as well as regular English workshops are provided for continuous language skill development of the students. The teaching on ethics and morality is integrated into courses and the thesis period. Several platforms for oral presentations for students are provided to develop good communication skills and human relations. Students will be encouraged to work as teaching assistants. The program also supports students to present their works at academic conferences and to conduct short-term research visits at respectable institutions. Students will be encouraged to publish their findings in quality journals.

3.3 Student Performance

The number of students enrolled and graduated will be collected each year. The surveys on student satisfaction will be conducted. If students question grading in any of the courses, they have a right to review their exam papers and grades. In addition, students also have a right to file complaints directly to dean of the Faculty of Graduate Studies.

4. Faculty Members

4.1 Management and Development of the Faculty Members

General requirements for the recruitment of new faculty members are set according to the regulations of Mahidol University. Any new faculty member needs to have a doctoral degree in chemistry or related field, extensive research experience, good teaching skill, and adequate English proficiency. After an initial contact with the department, a candidate for a faculty position is invited to give a seminar and hold a trial teaching session. After an interview with the candidate, the department summons a

meeting to make final decision on the candidate. A more senior faculty member helps mentor a new member on teaching, research, and grant applications.

The faculty members are encouraged to develop skills on teaching and learning methods. The program encourages and provides support, when necessary, for the faculty to participate in workshops on teaching and curriculum development that are organized by Mahidol University and other institutions. The faculty is encouraged to participate in national or international conferences and workshops on a regular basis. The faculty is also encouraged to engage in academic services, such as invited speakers or lecturers, research grant reviewers, committee members of professional societies, and academic article contributors.

4.2 Quality of the Faculty Members

All faculty members and instructors of the curriculum hold a doctoral degree (Topic 3.2 of Section 3). The number of scientific conference proceedings and national and international journals published by the faculty of the curriculum will be recorded regularly.

4.3 Faculty Performance

The number of the faculty members and instructors of the curriculum will be recorded each year. The surveys on faculty satisfaction will be conducted.

5. Curriculum, Teaching Methods, and Student Evaluation

5.1 Details of the Curriculum

The program provides in-depth knowledge that instills expertise of relevant fields for the students. At the same time, the training in the program should also cover a broader aspect of personal development, such as communication and interpersonal skills. A good understanding of cultural differences would prepare the students well for working in a diverse society. The full-time instructors of the program and contributing faculty have joint meetings in order to plan and improve teaching and learning methods by using the results of students' evaluations of instructors in order to review and assess the curriculum.

Regarding to the thesis requirement, the faculty members in the program inform the students about available research areas and/or topics. The students choose their research advisors and together develop research topics. The students plan out their research projects under the supervision of their research advisors. The students need to pass a qualifying examination, prepare their research proposal, undertake proposal

examination, and acquire dissertation advisory committee. After passing the proposal examination, the progress of the dissertation work is evaluated twice a year. Once the dissertation is completed, a dissertation examination committee that consists of at least 5 faculty members—one of which needs to be an external expert and also chairs the examination—evaluates the work. The dissertation work or part of it must be published in international journals.

5.2 Instructor Specifications and Teaching Methods

All faculty members have a doctoral degree in chemistry or related field, extensive research experience, good teaching skill, and adequate English proficiency. Course coordinators may invite guest lecturers when necessary, pending approval of the program director. Guest lecturers must either have doctoral degrees or extensive experience in fields relevant to the teaching.

General advisors are appointed according to the program director's suggestion to provide counseling to the first-year students on study plan and course registration. Once the dissertation proposals are approved, research advisors are appointed to provide guidance on dissertation works. The evaluation process for the entire program is conducted by full-time faculty members and the program committee.

5.3 Student Evaluation

Students receive grades according to the criteria stated in Mahidol University's regulations on graduate studies. The evaluation process for the learning outcomes is formally stated as part of the quality assurance system of Mahidol University. The evaluation process for each active course is conducted by a committee that consists of full-time instructors and/or selected experts.

Total time of study should not exceed 6 or 8 academic years for students holding M.Sc. or B.Sc., respectively. Students must fulfill the course credit requirement. Students must have a minimum of 3.00 GPA upon the completion of all courses. The English requirement set by the Faculty of Graduate Studies is fulfilled. Students must pass dissertation examination. The dissertation work (or part of it) must be published (or accepted for publication) in international scientific journals.

6. Teaching Materials and Resources

6.1 Budget

The Faculty of Science and the Faculty of Graduate Studies provide both annual and quarter budgets for purchasing an adequate number of books, teaching and learning media, visual aids, and teaching aids. The Department of Chemistry also helps provide books, teaching and learning media, as well as sufficient internet access for a suitable environment for learning.

6.2 Utilization of Available Resources

The Central Library and the Faculty of Science Library together provide abundant books, both electronic and hardcopy, as well as subscription to various journals and databases. The faculty and the department also provide learning resources, such as computers, visual projectors, high-speed internet via local area network, and sufficient wireless internet access. In addition, the faculty and the department regularly maintain lecture rooms and laboratory spaces of various capacity to accommodate teaching activities.

6.3 Search for More Resources

The program regularly collaborates with the Faculty of Science Library on the expansion of book and journal collections. The Faculty of Science can also allocate budget for learning space construction when demanded; just recently, the Faculty of Science Library started offering new learning spaces equipped with high-speed internet access and multimedia resources, to which all students and staff members in the program have access.

6.4 Evaluation on the Adequacy of the Resources

The Faculty of Science Library annually conducts survey for the need of additional resources, such as books and journal subscriptions. The faculty's staff members are always on standby to assist the instructors and the students on audio and visual equipment. An online course evaluation system is available to collect feedback from students twice a year.

7. Key Performance Indicators

The key performance indicators (KPIs) numbered 1 to 5 in the following table are the required KPIs of the program that need to be fulfilled for at least two consecutive years. The program also expects that at least 80% of all KPIs in the following table will be fulfilled in each year.

Key Performance Indicator	Academic Year				
	2023	2024	2025	2026	2027
1. At least 80% of all full-time instructors in each program have to participate in meetings that set up plans to evaluate and revise the curriculum.	✓	✓	✓	✓	✓
2. The program must have the details of the curriculum according to TQF2 which is associated with the Thai Qualifications Framework or the standards of the program (if any)	✓	✓	✓	✓	✓
3. The program must have course specifications and field experience specifications (if any) according to TQF3 and TQF4 before the beginning of each trimester	✓	✓	✓	✓	✓
4. Instructors must produce course reports and file experience reports (if any) according to TQF5 and TQF6 within 30 days after the end of the trimester.	✓	✓	✓	✓	✓
5. Instructors must produce program reports according to TQF7 within 60 days after the end of the academic year	✓	✓	✓	✓	✓
6. Instructors must revise the grading of students according to learning standards indicated in TQF3 and TQF4 (if any) for at least 25 percent of courses that are offered each academic year.	✓	✓	✓	✓	✓

Key Performance Indicator	Academic Year				
	2023	2024	2025	2026	2027
7. Instructors must assess the development and/or improvement of teaching methods, teaching techniques or the grading system from the evaluation results in TQF 7 of the previous year.	-	✓	✓	✓	✓
8. Every new instructor (if any) has to participate in the orientation and receive adequate information on the college's teaching requirements.	✓	✓	✓	✓	✓
9. Full-time instructors must demonstrate academic and/or profession improvement at least once a year.	✓	✓	✓	✓	✓
10. The number of supporting staff (if any) who demonstrate academic and/or professional improvement by at least 50 percent each year.	✓	✓	✓	✓	✓
11. The level of satisfaction from the previous year's students and new graduates toward curriculum quality, with an average score of at least 3.5 out of 5	-	-	✓	✓	✓
12. The level of satisfaction from employers of new graduates with an average score of at least 3.5 out of 5	-	-	-	✓	✓
13. Instructors have been evaluated by students after teaching at 100 percent.	✓	✓	✓	✓	✓
14. The number of accepted students in accordance with the program's plan.	✓	✓	✓	✓	✓
15. Graduates who get a job with a starting rate salary not lower than the rate stated by	-	✓	✓	✓	✓

Key Performance Indicator	Academic Year				
	2023	2024	2025	2026	2027
the Office of the Civil Service Commission (OCSC).					
16.Total key performance indicators (items) for each year	11	13	14	15	15
17.Required performance indicators (items)	11	13	14	15	15
18.Performance indicators that need to pass expectations	11	13	14	15	15

Section 8

Evaluation and Improvement of the Curriculum Implementation

1. Evaluation on the Teaching Efficiency

1.1 Evaluation of Teaching Strategies

- 1.1.1 Provide online system for students' evaluation toward courses and instructors.
- 1.1.2 Organize meetings for full-time faculty members of the program and instructors to discuss about the evaluation results and teaching strategies.

1.2 Evaluation of Instructors' Skills in Using Teaching Strategies

- 1.2.1 Provide online system for students' evaluation toward courses and instructors.
- 1.2.2 Collect feedback from course coordinators, program director, and/or other instructors within or outside the program.

2. Evaluation of the Curriculum in General

To obtain the overall picture of the curriculum, the program provides an evaluation platform for the following stakeholders:

- 2.1 Current students and graduates
- 2.2 Instructors
- 2.3 External experts
- 2.4 Employers or relevant users of the graduates

3. Evaluation of the Curriculum Implementation Specified in the Curriculum

The evaluation is made annually by the program faculty members and the instructors according to the KPIs in Item 7 of Section 7.

4. Review of the Evaluation and Plans for Improvement

- 4.1 Collect the evaluation results and suggestions made by students, graduates, instructors, employers, and external experts.
- 4.2 The program committee analyzes the above evaluation results.
- 4.3 A set of recommendations are proposed and discussed among the program faculty and instructors.

Attachment

Appendix A Course Descriptions

(1) Required Courses

Credit (lecture-practice-self-study)

SCCH 701 Frontiers in Chemistry

3 (3-0-6)

วทคม ๗๐๑ เคมีแนวหน้า

Fundamental link in subtopics and specialties of chemistry; forefront of chemical knowledge and impactful discoveries; latest development in chemical science and technology; emerging fields and international trends in chemical research; relevancy and significance of interdisciplinary knowledge for problem-solving in chemistry

การเชื่อมโยงพื้นฐานในหัวข้อย่อยและลักษณะเฉพาะของเคมี การค้นพบความรู้ทางเคมีใหม่ๆที่มีผลกระทบในวงกว้าง การพัฒนาวิทยาศาสตร์และเทคโนโลยีทางเคมีล่าสุด สาขาวิชาทางเคมีที่เกิดขึ้นใหม่และแนวโน้มในระดับนานาชาติ ความรู้ในเชิงบูรณาการจากหลากหลายสาขาของเคมีขั้นสูงในปัจจุบัน ความสัมพันธ์และความสำคัญของการใช้ความรู้เพื่อนำมาแก้ปัญหาทางเคมี

SCCH 702 Chemical Safety and Risk Management

1 (1-0-2)

วทคม ๗๐๒ ความปลอดภัยทางเคมีและการจัดการความเสี่ยง

Chemical hygiene plan; hazard communication; safety data sheet; chemical labeling; personal protective equipment; preparation for emergencies; chemical storage and chemical usage; laboratory design; handling of hazardous materials; fire safety; waste management; risk management; related regulations

แผนสุขอนามัยเคมี การสื่อสารเกี่ยวกับสารอันตราย เอกสารความปลอดภัยของสารเคมี การเขียนฉลากสารเคมี อุปกรณ์ป้องกันภัยส่วนบุคคล การเตรียมตัวในสถานะฉุกเฉิน การเก็บและการใช้สารเคมี การออกแบบห้องปฏิบัติการ การปฏิบัติกับสารอันตราย ความปลอดภัยทางอัคคีภัย การจัดการของเสีย การจัดการความเสี่ยง กฎหมายที่เกี่ยวข้อง

SCCH 703 Scientific Communications

1 (1-0-2)

วทคม ๗๐๓ การสื่อสารทางวิทยาศาสตร์

Scientific communication skills; techniques in presenting research findings and writing scientific articles;

ทักษะการสื่อสารทางวิทยาศาสตร์ เทคนิคการนำเสนอผลงานวิจัยและการเขียนบทความวิจัยทางวิทยาศาสตร์

SCCH 709 State-of-the-Art of Instrumentation 3 (3-0-6)

วทคม ๗๐๙ การใช้เครื่องมือที่ทันสมัย

Megatrends in the state-of-the-art of instrumentation in chemistry; strengthen the competitiveness by digital technologies and automation for synthesis and analysis in chemistry

แนวโน้มการเปลี่ยนแปลงระดับโลกในการใช้เครื่องมือที่ทันสมัยทางเคมี การเพิ่มขีดความสามารถในการแข่งขันด้วยดิจิทัลเทคโนโลยีและระบบอัตโนมัติสำหรับการสังเคราะห์และการวิเคราะห์ทางเคมี

SCCH 710 Business Models of Chemical Industries 1 (1-0-2)

วทคม ๗๑๐ แบบจำลองธุรกิจของอุตสาหกรรมเคมี

Chemical industry; design thinking process; business model canvas; value proposition design; survey of business model of chemical industries; business model generation; patent analysis; product analysis; quality management system; law and regulations

อุตสาหกรรมทางเคมี กระบวนการออกแบบกระบวนการคิด ผืนผ้าใบแบบจำลองธุรกิจ การออกแบบคุณค่าที่ส่งมอบให้ลูกค้า การสำรวจแบบจำลองธุรกิจของอุตสาหกรรมเคมี การสร้างแบบจำลองธุรกิจ การวิเคราะห์สิทธิบัตร การวิเคราะห์ผลิตภัณฑ์ ระบบจัดการคุณภาพ กฎหมายและระเบียบที่เกี่ยวข้องกับการทำธุรกิจ

SCCH 887 Research Project Development II 2 (2-0-4)

วทคม ๘๘๗ การพัฒนาทักษะการวิจัย ๒

Advanced research methodology for chemical research; guidelines for formulating research proposal; research design and method; project planning; research ethics; data collection; data analysis and assessments; chemical research presentation

ระเบียบวิธีวิจัยของการวิจัยทางเคมีขั้นสูง การแนะนำการเขียนข้อเสนอโครงการวิจัย การออกแบบการวิจัยและวิธีการ การวางแผนโครงการ จรรยาบรรณการวิจัย การเก็บข้อมูลและการประเมิน การนำเสนอผลงานวิจัยทางเคมี

SCCH 888 Innovations in Chemistry 3 (3-0-6)

วทคม ๘๘๘ นวัตกรรมทางเคมี

Comprehension of new findings and modern research topics in chemistry; writing a research proposal for chemical innovations

หัวข้อที่ค้นพบใหม่และหัวข้อวิจัยที่ทันสมัยทางเคมี การเขียนข้อเสนอการวิจัยสำหรับนวัตกรรมทางเคมี

SCCH 889 Seminar in Chemistry II**1 (1-0-2)****วทศ ๘๘๙ สัมมนาทางเคมี ๒**

Seminar on new findings and research topics in modern chemistry; state-of-the-art instrumentation; subjects from published peer review publications or document; presentation and scientific explanation skills

สัมมนาในหัวข้อที่ค้นพบใหม่และหัวข้อวิจัยที่ทันสมัยทางเคมี การใช้เครื่องมือที่ทันสมัย เนื้อหาจากวารสารหรือเอกสารวิชาการ ทักษะการนำเสนอและตอบข้อซักถาม

(2) Elective Courses**SCCH 711 Organic Structure Determination****3 (3-0-6)****วทศ ๗๑๑ การหาโครงสร้างของสารอินทรีย์**

Fundamental and advanced aspects of characterization methods in organic spectroscopy; application in compound characterization and structure elucidation

พื้นฐานหลักการและวิธีการขั้นสูงในการศึกษาโมเลกุลด้วยเทคนิคทางสเปกโตรสโกปีสำหรับสารอินทรีย์ การประยุกต์ใช้ในการศึกษาลักษณะและการหาโครงสร้างของโมเลกุล

SCCH 712 Molecular Structures and Functions**3 (3-0-6)****วทศ ๗๑๒ โครงสร้างและหน้าที่ระดับโมเลกุล**

Factors that influence molecular structures and functions; conformational analysis; reaction mechanisms and reactive intermediates; stereoelectronic effects; molecular orbitals and reactions; pericyclic reactions by thermal or photo processes

ปัจจัยที่มีผลต่อโครงสร้างและหน้าที่ของโมเลกุล การวิเคราะห์เชิงคอนฟอร์เมชัน กลไกและสารมัธยันตร์ของปฏิกิริยา ผลทางสเตอริโออิเล็กทรอนิกส์ โมเลกุลาร์ออร์บิทัลและการเกิดปฏิกิริยา ปฏิกิริยาเพอริไซคลิกโดยกระบวนการผ่านความร้อนหรือแสง

SCCH 713 Advanced Organic Synthesis**3 (3-0-6)****วทศ ๗๑๓ เคมีอินทรีย์สังเคราะห์ขั้นสูง**

Contemporary and modern organic reactions; reactivity; reaction selectivity; utility in the synthesis of organic compounds; structurally complex natural products; bioactive compounds; synthetic design

ปฏิกิริยาเคมีอินทรีย์ร่วมสมัยและทันสมัย ความไวปฏิกิริยา สมรรถนะการเลือกเกิดปฏิกิริยา การนำไปใช้ในการสังเคราะห์สารอินทรีย์ สารจากธรรมชาติที่มีโครงสร้างซับซ้อน สารออกฤทธิ์ทางชีวภาพ การออกแบบการสังเคราะห์

SCCH 714 Advanced Organic Reaction Mechanism**3 (3-0-6)****วทคม ๗๑๔ กลไกปฏิกิริยาเคมีอินทรีย์ขั้นสูง**

Analysis of advanced organic reaction mechanisms via electron-pushing principles; class discussion of the proposed reaction mechanisms presenting in current chemistry literatures

การวิเคราะห์กลไกปฏิกิริยาเคมีอินทรีย์ขั้นสูง โดยใช้หลักการการเคลื่อนที่ของอิเล็กตรอน การอภิปรายกลไกปฏิกิริยาที่เสนอในวารสารทางเคมีในปัจจุบัน

SCCH 715 Frontiers in Medicinal Chemistry**3 (3-0-6)****วทคม ๗๑๕ เคมีทางยาแนวหน้า**

Perspectives on the discovery of therapeutics and their developments; search of new lead molecules; kinetics of interactions between the lead molecules and their biological targets; rational design of new therapeutics; advances in combinatorial chemistry; examples of successful developments of drug discovery in pharmaceutical industries

ภาพรวมของการค้นพบและการพัฒนาเภสัชภัณฑ์ การค้นหาสารต้นแบบตัวใหม่ จลนพลศาสตร์ของอันตรกิริยาของสารต้นแบบกับชีวโมเลกุล หลักการออกแบบสารสังเคราะห์ที่มีฤทธิ์ทางชีวภาพ การสังเคราะห์ที่มีประสิทธิภาพขั้นสูง ตัวอย่างการค้นพบและพัฒนาที่ประสบความสำเร็จต่างๆ ในอุตสาหกรรมยา

SCCH 716 Chemical Biology**3 (3-0-6)****วทคม ๗๑๖ เคมีชีววิทยา**

Frontier knowledge of chemistry and biology; relationship between small molecules and biomolecules and subsequent effects on biological functions; biosynthesis of bioactive natural products; metabolic engineering; chemical genetics; chemical proteomics; protein design and engineering; emerging topics in related areas

ศาสตร์ทางเคมีและชีววิทยาแนวหน้า ความสัมพันธ์ระหว่างโมเลกุลขนาดเล็กและชีวโมเลกุลผลต่อหน้าที่ทางชีวภาพ ชีวสังเคราะห์ของสารผลิตภัณฑ์ธรรมชาติที่มีฤทธิ์ทางชีวภาพ วิศวกรรมการเผาผลาญ เคมีพันธุกรรม เคมีคัลโปรตีโอมิกส์ วิศวกรรมการออกแบบโปรตีน หัวข้อใหม่ ๆ ที่เกี่ยวข้อง

SCCH 717 Advanced Natural Product Chemistry**3 (3-0-6)****วทคม ๗๑๗ เคมีของสารผลิตภัณฑ์ธรรมชาติขั้นสูง**

Chemistry of bioactive natural products; the occurrences and biosynthetic pathways; structure elucidation; biological activities

เคมีของสารผลิตภัณฑ์ธรรมชาติที่มีฤทธิ์ทางชีวภาพ การเกิดและชีวสังเคราะห์ การพิสูจน์โครงสร้างฤทธิ์ทางชีวภาพ

SCCH 718 Asymmetric Synthesis 3 (3-0-6)

วทคม ๗๑๘ การสังเคราะห์แบบอสมมาตร

Asymmetric reactions; selectivity and transition state theory; chiral ligands and chiral catalysts; reaction mechanisms; examples of asymmetric reactions for modern synthesis

ปฏิกิริยาอสมมาตร สมรรถนะการเลือกและทฤษฎีสถานะแทรนซิชัน ไครัลลิแกนด์และตัวเร่งปฏิกิริยาชนิดไครัล กลไกปฏิกิริยา ตัวอย่างของการประยุกต์ปฏิกิริยาแบบอสมมาตรในการสังเคราะห์สมัยใหม่

SCCH 719 Advanced Heterocyclic Chemistry 3 (3-0-6)

วทคม ๗๑๙ เคมีของสารเฮเทอโรไซคลิกขั้นสูง

Chemical properties and chemical reactions of heterocyclic compounds; advanced study and applications in research

สมบัติทางเคมีและปฏิกิริยาเคมีของสารประกอบเฮเทอโรไซคลิก การศึกษาและการประยุกต์ขั้นสูงในงานวิจัย

SCCH 720 Current Topics in Organic Chemistry 3 (3-0-6)

วทคม ๗๒๐ หัวข้อที่เป็นปัจจุบันทางเคมีอินทรีย์

Current topics with modern and advanced contents related to the field of organic chemistry

หัวข้อที่เป็นปัจจุบันที่ครอบคลุมเนื้อหาทันสมัยที่มีเนื้อหาขั้นสูงเฉพาะทางศาสตร์เคมีอินทรีย์

SCCH 731 Advanced Techniques in Analytical Chemistry 3 (3-0-6)

วทคม ๗๓๑ เทคนิคทางเคมีวิเคราะห์ขั้นสูง

Recent developments in atomic and molecular spectrometry; mass spectrometry; electrochemical techniques

พัฒนาการใหม่ๆ ทางสเปกโทรสโกปีของอะตอมและโมเลกุล แมสสเปกโตรเมตรี เทคนิคทางเคมีไฟฟ้า

SCCH 732 Instrumental Analysis Laboratory 3 (1-6-4)

วทคม ๗๓๒ ปฏิบัติการห้องทดลองการวิเคราะห์โดยอุปกรณ์

Laboratory of modern analytical instruments; atomic absorption spectrophotometers; inductively coupled plasma mass spectrometer; inductively coupled plasma optical emission spectrometer; electroanalytical instruments; high performance liquid chromatography; gas

chromatograph; capillary electrophoresis, microfluidic analysis, construction of flow injection analysis systems

ปฏิบัติการห้องทดลองการใช้เครื่องมือวิเคราะห์สมัยใหม่ อะตอมมิคแอบซอร์พชันสเปกโตรโฟโตมิเตอร์ อินดักทีฟพลาสมาแมสสเปกโตรมิเตอร์ อินดักทีฟพลาสมาออปติคัลอิมิสชันสเปกโตรมิเตอร์ เครื่องมือวิเคราะห์ทางไฟฟ้า เครื่องโครมาโทกราฟีของเหลวสมรรถนะสูง เครื่องแก๊สโครมาโทกราฟี การติดตั้งระบบวิเคราะห์แบบอัตโนมัติ

SCCH 733 Separation Techniques

3 (3-0-6)

วทคม ๗๓๓ เทคนิคการแยก

Separation techniques; instrumentations and applications; high performance liquid chromatography techniques; ion chromatography, capillary electrophoresis; gas chromatography; qualitative and quantitative analysis in chromatographic techniques; sample preparation and extraction techniques

เทคนิคการแยก เครื่องมือและการประยุกต์ เทคนิคโครมาโทกราฟีของเหลวสมรรถนะสูง ไอออนโครมาโทกราฟี โครมาโทกราฟีแบบแยกขนาด คาปิลลารีอิเล็กโตรโฟรีซิส แก๊สโครมาโทกราฟี โครมาโทกราฟีแบบของไหลวิกฤตยิ่งยวด การวิเคราะห์เชิงคุณภาพและเชิงปริมาณด้วยเทคนิคทางโครมาโทกราฟี เทคนิคการเตรียมตัวอย่างและการสกัด

SCCH 734 Fluidic Technology for Analytical Science

3 (3-0-6)

วทคม ๗๓๔ เทคโนโลยีของไหลสำหรับศาสตร์วิเคราะห์

Definitions and theories in fluidics; related technologies; flow pattern in macroscale and microscale; fabrication techniques of microfluidic devices; microfluidics analysis and its applications

นิยามและทฤษฎีของไหล เทคโนโลยีที่เกี่ยวข้อง รูปแบบการไหลในระดับมหภาคและระดับจุลภาค การสร้างอุปกรณ์ต่าง ๆ การวิเคราะห์โดยของไหลจุลภาคและการประยุกต์

SCCH 735 Chemometrics

3 (2-3-5)

วทคม ๗๓๕ เคมีเมตริกส์

Chemometrics; utilization of statistics; data processing for complex chemical analysis; processing of time-based electronic signals; simplex optimization for analytical system; univariate and multivariate calibrations; principle component analysis; partial least squares regression analysis; pattern recognition and classification; modeling; applications of chemometrics

เคโมเมตริกส์ การใช้สถิติ การจัดการข้อมูลเพื่อประยุกต์ในงานเคมีวิเคราะห์ที่ซับซ้อน การจัดการข้อมูลชุดสัญญาณอิเล็กทรอนิกส์ที่ขึ้นกับเวลา การหาสภาวะที่เหมาะสมของระบบวิเคราะห์แบบซีเมตริกซ์ การสอบเทียบแบบตัวแปรเดียวและแบบหลายตัวแปร การวิเคราะห์องค์ประกอบหลัก การวิเคราะห์ด้วยกำลังสองน้อยที่สุดบางส่วน การจดจำและการจำแนกรูปแบบ การสร้างแบบจำลอง การประยุกต์ใช้เคโมเมตริก

SCCH 738 Special Topics in Analytical Chemistry

3 (3-0-6)

วทคม ๗๓๘ หัวข้อเรื่องพิเศษทางเคมีวิเคราะห์

Special topics with modern and advanced contents related to the field of analytical chemistry

หัวข้อเรื่องพิเศษครอบคลุมเนื้อหาทันสมัยและขั้นสูงเฉพาะทางเคมีวิเคราะห์

SCCH 739 Current Topics in Analytical Chemistry I

3 (3-0-6)

วทคม ๗๓๙ หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๑

Discussion among students and instructors on the topics of current interest in the field of analytical chemistry

อภิปรายร่วมกันระหว่างนักศึกษาและอาจารย์ในหัวข้อที่อยู่ในความสนใจปัจจุบันทางเคมีวิเคราะห์

SCCH 740 Current Topics in Analytical Chemistry II

3 (3-0-6)

วทคม ๗๔๐ หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๒

Discussion among students and instructors on the topics of current interest in the field of analytical chemistry; original research proposal

อภิปรายร่วมกันระหว่างนักศึกษาและอาจารย์ในหัวข้อที่อยู่ในความสนใจทางเคมีวิเคราะห์ การเสนอโครงการวิจัย

SCCH 753 Homogeneous Catalysis

3(3-0-6)

วทคม ๗๕๓ การเร่งปฏิกิริยาเอกพันธ์

Introductory course to homogeneous catalysis; knowledge of the principles of homogeneous catalysis, including classification of homogeneous catalysts; understanding of the structure- property relation; an overview of selected industrial applications of homogeneous catalysis

ความรู้เบื้องต้นเกี่ยวกับการเร่งปฏิกิริยาเอกพันธ์ความรู้เกี่ยวกับหลักการในการเร่งปฏิกิริยาเอกพันธ์ รวมถึงการจำแนกชนิดของสารเร่งปฏิกิริยาเอกพันธ์ ความเข้าใจถึงความสัมพันธ์ระหว่างโครงสร้างและสมบัติ และ ภาพรวมของการประยุกต์ใช้สารเร่งปฏิกิริยาเอกพันธ์บางชนิดในอุตสาหกรรม

SCCH 754 Organotransition Metal Chemistry**3(3-0-6)****วทคม ๗๕๔ เคมีของโลหะแทรนซิชันอินทรีย์**

General scopes; types of ligand and bonding; reaction mechanisms and chemical reactivity; industrial applications of organotransition metal complexes

เคมีในภาพรวม ชนิดของลิแกนด์และพันธะ กลไกปฏิกิริยา และปฏิกิริยาทางเคมีที่เกี่ยวข้อง ตัวอย่างของการนำสาร ประกอบเชิงซ้อนโลหะแทรนซิชันมาประยุกต์ใช้ในอุตสาหกรรม

SCCH 756 Heterogeneous Catalysis**3(3-0-6)****วทคม ๗๕๖ การเร่งปฏิกิริยาวิวิธพันธุ์**

Introductory course to heterogeneous catalysis; knowledge of the principles of heterogeneous catalysis, including classification of heterogeneous catalysts; fundamentals of adsorption, and surface chemistry of catalysts; understanding of the structure- property relation; an overview of selected industrial applications of heterogeneous catalysis

ความรู้เบื้องต้นเกี่ยวกับการเร่งปฏิกิริยาวิวิธพันธุ์ ความรู้เกี่ยวกับหลักการในการเร่งปฏิกิริยาวิวิธพันธุ์ รวมถึงการจำแนกชนิดของสารเร่งปฏิกิริยาวิวิธพันธุ์ หลักการพื้นฐานของการดูดซับ เคมีพื้นผิวของสารเร่งปฏิกิริยาวิวิธพันธุ์ ความเข้าใจถึงความสัมพันธ์ระหว่างโครงสร้างและสมบัติ และ ภาพรวมของการประยุกต์ใช้สารเร่งปฏิกิริยาวิวิธพันธุ์บางชนิดในอุตสาหกรรม

SCCH 757 Solid State Chemistry**3(3-0-6)****วทคม ๗๕๗ เคมีของสถานะของแข็ง**

Structure; chemical bonding; chemical properties of aggregates of molecules; crystals; metals; glasses; semiconductors; polymers and biomaterials

โครงสร้าง พันธะเคมี สมบัติทางเคมีของการเกาะรวมกลุ่มกันของโมเลกุล ผลึก โลหะ แก้ว สารกึ่งตัวนำ พอลิเมอร์และวัสดุชีวภาพ

SCCH 758 Small Molecule Activation**3(3-0-6)****วทคม ๗๕๘ การกระตุ้นโมเลกุลเล็ก**

โครงสร้างและพันธะของโมเลกุลขนาดเล็ก การพิสูจน์อัตลักษณ์ การศึกษากลไก การกระตุ้นแก๊สไฮโดรเจน การเปลี่ยนหมู่ฟังก์ชันของมีเทน การแปรสภาพแก๊สคาร์บอนมอนอกไซด์ การรีดิวซ์แก๊สคาร์บอนไดออกไซด์ การแปรสภาพแก๊สไนโตรเจน การรีดิวซ์แก๊สไนโตรเจนออกไซด์ การกระตุ้นแก๊สออกซิเจน การออกซิไดซ์ของน้ำ

Structures and bonding of small-sized molecules; characterizations; mechanistic studies; dihydrogen activation; methane functionalization; carbon monoxide transformation;

carbon dioxide reduction; dinitrogen transformation; nitrogen oxide reduction; dioxygen activation; water oxidation

SCCH 759 Olefin Polymerization Catalysis 3(3-0-6)

วทคม ๗๕๙ การเร่งปฏิกิริยาพอลิเมอไรเซชันของโอเลฟิน

โครงสร้างและพันธะของสารเชิงซ้อนอินทรีย์ การพิสูจน์เอกลักษณ์ การศึกษาจลนพลศาสตร์ และกลไกการเกิดปฏิกิริยา พอลิเมอไรเซชันแบบซีเกลอร์-นัตตา พอลิเมอไรเซชันแบบเมทาโลซีน พอลิเมอไรเซชันแบบนินเมทาโลซีน พอลิเมอไรเซชันแบบการเปิดวงเมทาทีซิส พอลิเมอไรเซชันแบบการถ่ายโอนอะตอมอนุมูลอิสระ

Structures and bonding of inorganic complexes; characterization; kinetics and mechanistic studies; Ziegler- Natta polymerization; metallocene- based polymerization; nonmetallocene-based polymerization; ring-opening metathesis polymerization; atom transfer radical polymerization

SCCH 760 Biorefinery 3(3-0-6)

วทคม ๗๖๐ การแปรสภาพและการแยกผลิตภัณฑ์จากชีวมวล

ปฏิกิริยาการแปรสภาพชีวมวล คาร์โบไฮเดรตจากชีวมวล ไขมันจากชีวมวล การแยกผลิตภัณฑ์จากชีวมวล

Reactions of biomass transformation; biomass-derived carbohydrates; biomass-derived lipids; separation of biomass-derived products

SCCH 761 Nanocatalysis 3(3-0-6)

วทคม ๗๖๑ การเร่งปฏิกิริยานาโน

นาโนเทคโนโลยี การสังเคราะห์โครงสร้างนาโน การพิสูจน์เอกลักษณ์ การเร่งปฏิกิริยานาโน

Nanotechnology; synthesis of nanostructures; characterization; nanocatalysis

SCCH 763 Inorganic Structure and Bonding 3 (3-0-6)

วทคม ๗๖๓ โครงสร้างอินทรีย์และพันธะเคมี

Atomic structure; electronic properties of atoms and molecules; diatomic molecules; polyatomic molecules; transition metal complexes; bonding in solids

โครงสร้างอะตอม คุณสมบัติทางอิเล็กทรอนิกส์ของอะตอมและโมเลกุล โมเลกุลอะตอมคู่ โมเลกุลพหุอะตอม สารเชิงซ้อนแทรนซิชัน พันธะในของแข็ง

SCCH 764 Characterization Techniques in Inorganic Chemistry 3(3-0-6)

วทคม ๗๖๔ เทคนิคการพิสูจน์เอกลักษณ์ในเคมีอนินทรีย์

Fundamental aspects of characterization methods in inorganic chemistry: spectroscopy, microscopy and crystallography

หลักการและการประยุกต์ใช้วิธีพิสูจน์เอกลักษณ์ในเคมีอนินทรีย์ สเปกโทรสโกปี จุลทรรศน์ และ ผลึกศาสตร์

SCCH 765 Main Group Chemistry 3(3-0-6)

วทคม ๗๖๕ เคมีของธาตุหมู่หลัก

General properties of inorganic and organometallic compounds of main group elements; hydrogen; carbon; silicon, germanium, tin, and lead; nitrogen, phosphorus, arsenic, antimony, and bismuth; the chalcogen; halogens and noble gases; boron, aluminum, gallium, indium, and thallium; the alkali and alkaline earth metals

คุณสมบัติทั่วไปของสารประกอบอนินทรีย์และสารเชิงซ้อนของธาตุหมู่หลัก ไฮโดรเจน คาร์บอน ซิลิกอน เจอร์มาเนียม ดีบุก และตะกั่ว ไนโตรเจน ฟอสฟอรัส อาร์เซนิก แอนติโมนี และบิสมัท ฮาลโคเจน และแก๊สมีตระกูล โบรอน อะลูมิเนียม แกลเลียม อินเดียม และทาลเลียม โลหะอัลคาไลน์ และ อัลคาไลน์เอิร์ธ

SCCH 766 Inorganic Reaction Mechanisms 3(3-0-6)

วทคม ๗๖๖ กลไกปฏิกิริยาอนินทรีย์

Principles of chemical kinetics; techniques in the monitoring of reactions; applications of chemical kinetics in the elucidation of reaction mechanisms; DFT calculations to support the proposed mechanisms

หลักการของจลนศาสตร์เคมี เทคนิคการเฝ้าปฏิกิริยา การนำจลนศาสตร์เคมีไปใช้ในการค้นพบกลไกปฏิกิริยา การคำนวณดีเอฟทีเพื่อยืนยันกลไกปฏิกิริยาที่เสนอ

SCCH 767 NMR Spectroscopy in Inorganic Chemistry 3(3-0-6)

วทคม ๗๖๗ เอ็นเอ็มอาร์ สเปกโตรสโกปีสำหรับเคมีอนินทรีย์

Principles of NMR spectroscopy; some NMR spectroscopic techniques used in inorganic chemistry; Solid-state NMR; applications of NMR spectroscopy in inorganic chemistry

หลักการของเอ็นเอ็มอาร์สเปกโตรสโกปี เทคนิคทางเอ็นเอ็มอาร์ที่ใช้ในเคมีอนินทรีย์ เอ็นเอ็มอาร์สถานะของแข็ง การนำเอ็นเอ็มอาร์สเปกโตรสโกปีไปใช้ในเคมีอนินทรีย์

SCCH 768 Special Topics in Inorganic Chemistry**3(3-0-6)****วทคม ๗๖๘ หัวข้อพิเศษทางเคมีอนินทรีย์**

Special topics with modern and advanced contents related to the field of inorganic chemistry

หัวข้อพิเศษที่มีเนื้อหาทันสมัยและขั้นสูงในสาขาเคมีอนินทรีย์

SCCH 771 Quantum Chemistry**3 (3-0-6)****วทคม ๗๗๑ เคมีควอนตัม**

Quantum postulates; particle in a box; harmonic oscillation; angular momentum; wave function of hydrogen atom; electron spin; variation method; approximation methods: Hartree-Fock theory, perturbation theory, configuration interaction and density functional theory

สัจพจน์ทางควอนตัม อนุภาคในกล่อง การสั่นแบบฮาร์มอนิก โมเมนตัมเชิงมุม ฟังก์ชันคลื่นของอะตอมไฮโดรเจน สปินของอิเล็กตรอน ระเบียบวิธีการแปรค่า วิธีการประมาณต่างๆ ทฤษฎีฮาร์รี-ฟอกก์ ทฤษฎีการรบกวน อันตรกิริยาของโครงสร้างและทฤษฎีฟังก์ชันความหนาแน่น

SCCH 772 Thermodynamics and Statistical Mechanics**3 (3-0-6)****วทคม ๗๗๒ อุณหพลศาสตร์และกลศาสตร์เชิงสถิติ**

Thermodynamics of pure substance and solutions; single- and multi-phase; physical transformation and chemical reaction; statistical mechanics of ideal and real gases and liquid

อุณหพลศาสตร์ของสารบริสุทธิ์และสารละลาย วัฏภาคเดียวและหลายวัฏภาค การเปลี่ยนแปลงกายภาพและปฏิกิริยาเคมี กลศาสตร์เชิงสถิติของแก๊สอุดมคติ แก๊สจริงและของเหลว

SCCH 774 Chemical Kinetics and Molecular Dynamics**3 (3-0-6)****วทคม ๗๗๔ จลนพลศาสตร์เคมีและพลศาสตร์โมเลกุล**

Kinetic theory of gases; rates of chemical reactions; theories of chemical reaction rates; reactions in liquid solutions; molecular dynamics of chemical reactions

ทฤษฎีจลนพลศาสตร์ของแก๊ส อัตราการเกิดปฏิกิริยาเคมี ทฤษฎีอัตราการเกิดปฏิกิริยาเคมี ปฏิกิริยาในสารละลายของเหลว พลศาสตร์โมเลกุลของปฏิกิริยาเคมี

SCCH 775 Modern Chemical Physics**3 (3-0-6)****วทคม ๗๗๕ ฟิสิกส์เชิงเคมีแผนใหม่**

Interesting properties and phenomena in physics and chemistry; mathematics and its applications in the nonlinear world; self-organization and pattern formation

สมบัติและปรากฏการณ์ทางฟิสิกส์และเคมีที่น่าสนใจ การใช้คณิตศาสตร์ในการทำความเข้าใจโลกไม่เชิงเส้น การจัดระเบียบตนเองและการเกิดลวดลาย

SCCH 776 Mathematical Methods**3 (3-0-6)****วทคม ๗๗๖ วิธีทางคณิตศาสตร์**

Partial differential equations in physics and chemistry; equation solving: separation of variables, application of special functions; numerical method: finite differences; use of computer programming to solve problems in physics and chemistry

สมการเชิงอนุพันธ์ย่อยในฟิสิกส์และเคมี การแก้สมการโดยการแยกตัวแปรและการประยุกต์ฟังก์ชันพิเศษ การคำนวณเชิงตัวเลขสำหรับแก้สมการอนุพันธ์โดยวิธีไฟไนต์ดิฟเฟอเรนซ์ ใช้งานโปรแกรมคอมพิวเตอร์ในการแก้ปัญหามทางฟิสิกส์และเคมี

SCCH 778 Physico-chemical Techniques**3 (2-3-5)****วทคม ๗๗๘ เทคนิคทางเคมีเชิงฟิสิกส์**

Instrumental principles for analysis; methods of physico-chemical measurement employed in contemporary research

หลักการของเครื่องมือที่ใช้ในการวิเคราะห์ แบบแผนของการวัดทางเคมีเชิงฟิสิกส์ที่ใช้ในการทำวิจัยในปัจจุบัน

SCCH 779 Surface Chemistry and Advanced Electrochemistry**3 (3-0-6)****วทคม ๗๗๙ เคมีพื้นผิวและเคมีไฟฟ้าขั้นสูง**

Theories based on surface chemistry and electrochemistry; sorption on colloids; properties of electrolyte solutions and fused salts; electrode processes and electrokinetic phenomena

ทฤษฎีเกี่ยวข้องกับเคมีพื้นผิวและเคมีไฟฟ้า การดูดซับสารบนคอลลอยด์ สมบัติของสารละลายอิเล็กโทรไลต์และเกลือที่หลอมเหลว การเปลี่ยนแปลงที่ขั้วไฟฟ้า และปรากฏการณ์จลนพลศาสตร์ไฟฟ้า

SCCH 780 Special Topics in Physical Chemistry**3 (3-0-6)****วทคม ๗๘๐ หัวข้อเรื่องพิเศษทางเคมีเชิงฟิสิกส์**

Special topics with modern and advanced contents related to the field of physical chemistry

หัวข้อเรื่องพิเศษครอบคลุมเนื้อหาทันสมัยที่มีเนื้อหาขั้นสูงเฉพาะทางศาสตร์เคมีเชิงฟิสิกส์

SCCH 781 Special Topics in Chemical Physics**3 (3-0-6)****วทคม ๗๘๑ หัวข้อเรื่องพิเศษทางฟิสิกส์เชิงเคมี**

Special topics with modern and advanced contents related to the field of chemical physics

หัวข้อเรื่องพิเศษครอบคลุมเนื้อหาทันสมัยที่มีเนื้อหาขั้นสูงเฉพาะทางศาสตร์ฟิสิกส์เชิงเคมี

SCCH 785 Advanced Physical Chemistry**3 (3-0-6)****วทศ ๗๘๕ เคมีเชิงฟิสิกส์ขั้นสูง**

Nonlinear analysis; energy materials; magnetic resonance in biological systems; computational chemistry; atmospheric chemistry

การวิเคราะห์ที่ไม่เชิงเส้น วัสดุพลังงาน เรโซแนนซ์แม่เหล็กในระบบทางชีววิทยา เคมีคำนวณ เคมีบรรยากาศโลก

SCCH 801 Environmental Materials**3 (3-0-6)****วทศ ๘๐๑ วัสดุเชิงสิ่งแวดล้อม**

Materials structure, chemical and physical properties, processing and design; material extraction and resource implications, environmental impacts of materials processing, end-of-life issues; environmental legislation and economic factors; real world examples and case studies of materials design for sustainability

โครงสร้างวัสดุ รวมทั้งสมบัติเชิงเคมี สมบัติเชิงฟิสิกส์ การออกแบบและกรรมวิธีการผลิตวัสดุ การตัดแยกและการเลือกใช้ทรัพยากรเชิงวัสดุ ผลกระทบด้านสิ่งแวดล้อมซึ่งเนื่องจากการผลิตวัสดุ หรือวัสดุซึ่งหมดอายุการใช้งาน ปัจจัยด้านเศรษฐกิจและกฎหมายด้านสิ่งแวดล้อม ตัวอย่างและกรณีศึกษาการใช้งานจริงของวัสดุที่ได้รับการออกแบบเพื่อความยั่งยืน

SCCH 802 Lignocellulosic Chemistry**3 (3-0-6)****วทศ ๘๐๒ เคมีเชิงลิกโนเซลลูโลส**

Lignocellulose as a resource of fuels and chemicals; cellulose, hemicellulose, lignin and extractives; pretreatments of lignocellulose; chemical conversion of lignocellulosic feedstocks; analytical methods

การใช้ลิกโนเซลลูโลสเพื่อผลิตเชื้อเพลิงและสารเคมี เซลลูโลส เฮมิเซลลูโลส ลิกนินและสารสกัดจากลิกนิน การปรับปรุงสภาพของลิกโนเซลลูโลสก่อนใช้งาน การเปลี่ยนวัตถุดิบของลิกโนเซลลูโลสเป็นผลิตภัณฑ์ตลอดจนกรรมวิธีวิเคราะห์

SCCH 803 Chemistry of Waste and Pollution**3 (3-0-6)****วทศ ๘๐๓ เคมีของกากของเสียและมลพิษ**

Chemical principles related to waste and pollution; water, air, chemical and radioactive pollution, introduction of pollution laws and policy; real world examples and case studies of environmental remediation and waste management

หลักการเคมีเกี่ยวข้องกับของเสียและมลพิษ: มลพิษทางน้ำและอากาศ มลพิษจากวัตถุเคมีและวัตถุกำมันตรังสี บทนำของกฎหมายและนโยบายด้านมลพิษ ตัวอย่างการใช้งานจริงและกรณีศึกษาด้านการบำบัดและการจัดการกากของเสีย

SCCH 804 Concepts in Sustainability**3 (3-0-6)****วทศ ๘๐๔ หลักการความยั่งยืน**

Relevance of sciences, particularly chemistry, and global issues such as food, agriculture, energy, climate change, environment, health and well-being; innovative uses of natural resources; research and development in bioeconomy; sustainability measuring tools such as life cycle analysis; sustainability indicators such as social-and-human, natural and economic capital

ภัยที่ต้องระวังระดับโลก เช่น ภัยด้านอาหาร เกษตรกรรม พลังงาน การเปลี่ยนแปลงสภาพอากาศ สิ่งแวดล้อม สุขภาพและการอยู่ดีกินดี ซึ่งเชื่อมโยงกับวิทยาศาสตร์โดยเฉพาะเคมี นวัตกรรมการใช้ทรัพยากรธรรมชาติ การวิจัยและการพัฒนาเพื่อการพัฒนาเศรษฐกิจชีวภาพ เครื่องมือตรวจวัดความยั่งยืน เช่น หลักการประเมินวัฏจักรชีวิตของผลิตภัณฑ์ ตัวชี้วัดความยั่งยืนด้านผลกระทบต่อสังคมและชุมชน รวมทั้งผลกระทบต่อธรรมชาติและทุนทางเศรษฐกิจ

SCCH 805 Natural Fibers**3 (3-0-6)****วทศ ๘๐๕ เส้นใยธรรมชาติ**

Classification of natural fibers; plant fibers, animal fibers and mineral fiber; structure of plant fibers; properties and characteristics of natural fibers; extraction, processing and chemical modification of plant fibers; industrial production of natural fibers; industrial uses of natural fibers and case studies, recent trend and future in natural fiber utilization

ประเภทของเส้นใยธรรมชาติ เส้นใยจากพืช สัตว์และหินแร่ โครงสร้างของเส้นใยจากพืช สมบัติและเอกลักษณ์ของเส้นใยจากพืช การสกัด กรรมวิธีเตรียมและการปรับสภาพเชิงเคมีของเส้นใยจากพืช การผลิตเส้นใยจากพืชระดับอุตสาหกรรม ตัวอย่างและกรณีศึกษาด้านการใช้เส้นใยจากพืชในระดับอุตสาหกรรม

SCCH 806 Industrial Chemistry**3 (3-0-6)****วทศ ๘๐๖ เคมีเชิงอุตสาหกรรม**

Real world examples and case studies of utilizing in-depth knowledge and application of chemistry and creativity with chemicals; research and development in petrochemicals, polymers, plastics food, cosmetics, pharmaceuticals, minerals and new materials; successful examples of modern business model

ตัวอย่างและกรณีศึกษาการใช้องค์ความรู้เชิงลึกร่วมกับการประยุกต์ใช้เคมีศาสตร์และความคิดสร้างสรรค์ด้านสารเคมีเพื่อการใช้งานจริง การวิจัยและพัฒนาด้านปิโตรเคมี พอลิเมอร์ พลาสติก อาหาร เครื่องสำอาง ยา แร่และวัสดุใหม่ ตัวอย่างโมเดลธุรกิจที่ประสบความสำเร็จ

SCCH 821 Chemistry of Small Molecules 3(3-0-6)

วทคม ๘๒๑ เคมีของสารโมเลกุลเล็ก

Small molecule in nature and utilization; chemical catalysts for small molecule activation; electron transfer process and redox catalysts; electrocatalysis; photocatalysis; carbon, oxygen, and nitrogen cycles

สารโมเลกุลเล็กในธรรมชาติ และการนำไปใช้ประโยชน์ ตัวเร่งปฏิกิริยาทางเคมีสำหรับสารโมเลกุลเล็ก การถ่ายเทอิเล็กตรอนและตัวเร่งปฏิกิริยารีดอกซ์ การเร่งปฏิกิริยาโดยใช้ไฟฟ้า การเร่งปฏิกิริยาโดยใช้แสง วัฏจักรคาร์บอน ออกซิเจนและไนโตรเจน

SCCH 822 Inorganic Materials 3(3-0-6)

วทคม ๘๒๒ วัสดุอนินทรีย์

Inorganic materials structure; properties and applications; synthetic methods; relation between structure and properties of materials; examples of modern inorganic materials

โครงสร้างวัสดุอนินทรีย์ สมบัติและการประยุกต์ใช้ วิธีการสังเคราะห์ ความสัมพันธ์ระหว่างโครงสร้างและสมบัติของวัสดุ ตัวอย่างวัสดุอนินทรีย์สมัยใหม่

SCCH 823 Macrocyclic and Supramolecular Chemistry 3(3-0-6)

วทคม ๘๒๓ เคมีซูปราและสารประกอบแมคโครไซคลิก

Supramolecular chemistry, non-covalent interactions, coordination chemistry of macrocyclic ligands, thermodynamics and kinetics of complex formation, surveys of macrocyclic ligands and syntheses, synthetic receptors for cation, anion, and neutral guest recognition, anion coordination chemistry, sensors, mechanically interlocked structures, molecular devices and machines, self-assembly, molecular encapsulations, supramolecular materials, practical applications of supramolecular chemistry

เคมีซูปรา แรงกระทำระหว่างโมเลกุล เคมีโคออร์ดิเนชันของสารประกอบชนิดแมคโครไซคลิก อุณหพลศาสตร์และจลนศาสตร์ของการเกิดสารเชิงซ้อน ประเภทของแมคโครไซคลิกลิแกนด์และการสังเคราะห์ ตัวรับรู้ชนิดสังเคราะห์สำหรับไอออนบวก ไอออนลบ และโมเลกุล เคมีโคออร์ดิเนชันของไอออนลบ ตัวตรวจวัด Mechanically interlocked structures อุปกรณ์และเครื่องจักรกลระดับโมเลกุล, การจัดวางโครงสร้างระดับโมเลกุล การห่อหุ้มระดับโมเลกุล วัสดุซูปรา การประยุกต์ใช้งานของเคมีซูปราในชีวิตประจำวัน

SCCH 824 Functional Dyes, Polymers and Advanced Materials 3(3-0-6)

วทคม ๘๒๔ สีย้อม พอลิเมอร์ และวัสดุเชิงฟังก์ชันขั้นสูง

Dyes-mauveine, chromophores, commercial dyes, synthesis of azo dyes and cyanines, photochemistry of dyes and pigments, functional polymers, surface functionalisations, organic semiconductors and conjugated polymers, liquid crystals, organic electronic materials, nanoparticles, quantum dots, dye-sensitised solar cells, perovskite solar cells

สีย้อม รงควัตถุ สีย้อมเชิงพาณิชย์ การสังเคราะห์สีย้อมเอโซและไซยานีน เคมีแสงของสีย้อมและรงควัตถุ พอลิเมอร์เชิงฟังก์ชัน การดัดแปรพื้นผิว สารอินทรีย์กึ่งตัวนำและพอลิเมอร์ชนิดคอนจูเกต ผลึกเหลว วัสดุอินทรีย์อิเล็กทรอนิกส์ อนุภาคนาโน ควอนตัมดอท เซลล์แสงอาทิตย์ชนิดสีย้อมไวแสง เซลล์แสงอาทิตย์ชนิดเพอรอฟสไกต์

SCCH 825 Bioinorganic Chemistry 3(3-0-6)

วทคม ๘๒๕ เคมีชีวอนินทรีย์

Roles of metal in biology; different types of metalloenzymes; applications in biomedical sciences; applications in material sciences and alternative energy

ความสำคัญของไอออนโลหะในชีววิทยา เมทัลโลเอนไซม์ประเภทต่างๆ การประยุกต์ใช้ทางการแพทย์ การประยุกต์ใช้ในวัสดุศาสตร์และพลังงานทางเลือก

SCCH 841 Cutting-Edge Technologies for Bio-Circular-Green Economy 3(3-0-6)

วทคม ๘๔๑ เทคโนโลยีก้าวหน้าสำหรับเศรษฐกิจชีวภาพ หมุนเวียน สีเขียว

Value-based and innovation-driven economy; roles of BCG models in the strengthen of economies; sustainable development goals (SDGs); cutting-edge technologies for BCG economy; decarbonization technology; artificial intelligence and high-performance computing; cutting-edge digital and automation technology platforms

เศรษฐกิจที่มีการเพิ่มมูลค่า เศรษฐกิจที่ขับเคลื่อนด้วยนวัตกรรม บทบาทของ BCG ในการเพิ่มความแข็งแกร่งให้กับเศรษฐกิจ เป้าหมายการพัฒนาที่ยั่งยืน เทคโนโลยีก้าวหน้าสำหรับเศรษฐกิจชีวภาพ หมุนเวียน สีเขียว เทคโนโลยีการลดการใช้คาร์บอน ปัญญาประดิษฐ์และการคำนวณประสิทธิภาพสูง เทคโนโลยีก้าวหน้าทางด้านดิจิทัลและอัตโนมัติ

SCCH 842 Computational Design of Catalysts and Materials 3 (3-0-6)

วทคม ๘๔๒ การออกแบบตัวเร่งปฏิกิริยาและวัสดุด้วยการคำนวณ

Computational tools for structures of catalysts and materials; modeling spectroscopy and thermochemistry; calculations of potential energy surface; reaction mechanisms

เครื่องมือในการคำนวณโครงสร้างของตัวเร่งปฏิกิริยาและวัสดุ การจำลองข้อมูลทางสเปกโตรสโกปี และเทอร์โมเคมี การคำนวณพลังงานศักย์พื้นผิว กลไกการเกิดปฏิกิริยา

SCCH 843 Business Strategies for Entrepreneurs 3(3-0-6)

วทคม ๘๔๓ กลยุทธ์ในการทำธุรกิจสำหรับผู้ประกอบการ

How to start a business; basic marketing for non-marketers; accounting and finances; people management; technologies for business managements; start-up pitching

วิธีการเริ่มทำธุรกิจ การตลาดเบื้องต้นสำหรับผู้ไม่ใช่นักการตลาด การบัญชีและการเงิน การบริหารบุคคล เทคโนโลยีสำหรับการจัดการธุรกิจ การนำเสนอแผนธุรกิจให้กับนักลงทุน

SCCH 844 Digital Transformation for Entrepreneurs 3(3-0-6)

วทคม ๘๔๔ การผันแปรดิจิทัลสำหรับผู้ประกอบการ

Disruptive technologies; platform business; business transformations; big data; digital strategy framework; digital transformation canvas; business repositioning

เทคโนโลยีในยุคการพลิกผัน ฐานธุรกิจ การผันแปรธุรกิจ ข้อมูลมหัต เศรษฐกิจดิจิทัล ผืนผ้า การผันแปรดิจิทัล การวางตำแหน่งใหม่ในทางธุรกิจ

SCCH 845 Learning Design in Chemistry Classrooms 3(3-0-6)

วทคม ๘๔๕ การออกแบบการเรียนรู้ในห้องเรียนวิชาเคมี

Design thinking; human-centered design; learning sciences; pedagogical practices; best practices in curriculum development; backward design; data driven design; collaborative problem solving

การออกแบบกระบวนการคิด การออกแบบโดยยึดคนเป็นศูนย์กลาง วิทยาศาสตร์การเรียนรู้ แนวปฏิบัติในการสอน แนวปฏิบัติที่ดีที่สุดในการพัฒนาหลักสูตร การออกแบบย้อนกลับ การออกแบบโดยใช้ข้อมูลเป็นตัวขับเคลื่อน การแก้ปัญหาแบบร่วมมือ

SCCH 846 Digitization, Miniaturization, and Advanced Manufacturing for Chemistry Classrooms 3(3-0-6)

วทคม ๘๔๖ การแปลงเป็นดิจิทัล การย่อขนาด การผลิตขั้นสูง สำหรับห้องเรียนวิชาเคมี

Equipments for chemistry classrooms; digitization; miniaturization; advanced manufacturing; development of equipments for chemistry classrooms

เครื่องมือในห้องเรียนวิชาเคมี การแปลงดิจิทัล การย่อขนาด การผลิตขั้นสูง การพัฒนาเครื่องมือในห้องเรียนวิชาเคมี

SCCH 847 Metaverse for Chemistry Classrooms 3(3-0-6)

วทคม ๘๔๗ อภิจักรวาลในห้องเรียนวิชาเคมี

Virtual reality technology; augmented reality technology; building the metaverse for chemistry classrooms

เทคโนโลยีโลกเสมือนจริง เทคโนโลยีความเป็นจริงเสริม การสร้างอภิจักรวาลสำหรับห้องเรียนวิชาเคมี

SCCH 848 NMR Quantum Computation 3(3-0-6)

วทคม ๘๔๘ การคำนวณควอนตัมเชิงเอ็นเอ็มอาร์

Quantum computation; building NMR quantum computers; qubits and NMR spin states; quantum information

การคำนวณควอนตัม การสร้างเอ็นเอ็มอาร์ควอนตัมคอมพิวเตอร์ คิวบิตและสถานะของสปินเอ็นเอ็มอาร์ ข้อมูลเชิงควอนตัม

SCCH 849 Chemistrobot 3(3-0-6)

วทคม ๘๔๙ หุ่นยนต์นักเคมี

Automatic system in chemistry; programming in chemistry; transformation of chemical processes into robotic languages

ระบบอัตโนมัติในเคมี การเขียนโปรแกรมในวิชาเคมี การแปลงกระบวนการทางเคมีเป็นภาษาที่หุ่นยนต์ทำงานได้

(3) Dissertation

Credit (lecture-practice-self-study)

SCCH 898 Dissertation 48 (0-144-0)

วทคม ๘๙๘ วิทยานิพนธ์

Identifying research topic of interest and develop research proposal; conducting research study abiding research ethics; collecting data; data analysis, interpretation of the results, and report of the results in terms of the dissertation; presenting the dissertation; preparing manuscript and publishing research in an international peer-reviewed journal; ethics in dissemination the research results

การออกแบบและกำหนดโครงการวิจัย การเสนอเค้าโครงวิจัย การศึกษาวิจัยอย่างมีจริยธรรม การคัดกรองข้อมูล การวิเคราะห์ข้อมูล การสังเคราะห์และวิพากษ์ผลการวิจัย การนำผลการวิจัยมาเรียบเรียงเป็นวิทยานิพนธ์ การนำเสนอวิทยานิพนธ์ การเรียบเรียงผลงานวิจัยเพื่อเผยแพร่ การเผยแพร่ผลงานวิจัยในวารสารวิชาการระดับนานาชาติ จริยธรรมในการเผยแพร่ผลงานวิจัย

SCCH 699 Dissertation**36 (0-108-0)****วทศ ๖๙๙ วิทยานิพนธ์**

Identifying research topic of interest and develop research proposal; conducting research study abiding research ethics; collecting data; data analysis, interpretation of the results, and report of the results in terms of the dissertation; presenting the dissertation; preparing manuscript and publishing research in an international peer-reviewed journal; ethics in dissemination the research results

การออกแบบและกำหนดโครงการวิจัย การเสนอเค้าโครงวิจัย การศึกษาวิจัยอย่างมีจริยธรรม การคัดกรองข้อมูล การวิเคราะห์ข้อมูล การสังเคราะห์และวิพากษ์ผลการวิจัย การนำผลการวิจัยมาเรียบเรียงเป็นวิทยานิพนธ์ การนำเสนอวิทยานิพนธ์ การเรียบเรียงผลงานวิจัยเพื่อเผยแพร่ การเผยแพร่ผลงานวิจัยในวารสารวิชาการระดับนานาชาติ จริยธรรมในการเผยแพร่ผลงานวิจัย

SCCH 799 Dissertation**48 (0-144-0)****วทศ ๗๙๙ วิทยานิพนธ์**

Identifying research topic of interest and develop research proposal; conducting research study abiding research ethics; collecting data; data analysis, interpretation of the results, and report of the results in terms of the dissertation; presenting the dissertation; preparing manuscript and publishing research in an international peer-reviewed journal; ethics in dissemination the research results

การออกแบบและกำหนดโครงการวิจัย การเสนอเค้าโครงวิจัย การศึกษาวิจัยอย่างมีจริยธรรม การคัดกรองข้อมูล การวิเคราะห์ข้อมูล การสังเคราะห์และวิพากษ์ผลการวิจัย การนำผลการวิจัยมาเรียบเรียงเป็นวิทยานิพนธ์ การนำเสนอวิทยานิพนธ์ การเรียบเรียงผลงานวิจัยเพื่อเผยแพร่ การเผยแพร่ผลงานวิจัยในวารสารวิชาการระดับนานาชาติ จริยธรรมในการเผยแพร่ผลงานวิจัย

Appendix B

Curriculum Vitae of the Faculty in Charge of the Program

1. Name Associate Professor Dr.Ekasith Somsook

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Wisconsin-Madison, USA	2001
B.Sc.	Chemistry	Mahidol University	1994

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Catalysis science and technology for circular and sustainable chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Taube C, Schwedtmann K, Noikham M, Somsook E , Hennersdorf F, Wolf R, Weigand JJ. P–P Condensation and P/N–P/P bond metathesis: Facile synthesis of cationic tri- and tetraphosphanes. <i>Angew Chem Int Ed.</i> 2020; 59: 3585-3591.	12, 1	2020
	Poonsawat T, Techalertmanee T, Chumkaeo P, Yunita I, Meechai T, Namkajorn M, Pornsuwan S, Somsook E . Facile	12, 1	2019

	<p>synthesis of high performance iron oxide/carbon nanocatalysts derived from the calcination of ferrocenium for the decomposition of methylene blue. Catalysts. 2019; 9: 948.</p> <p>Yunita I, Putisompon S, Chumkaeo P, Poonsawat T, Somsook E. Effective catalysts derived from waste ostrich eggshells for glycolysis of post-consumer PET bottles. Chem Pap. 2019; 73(6); 1547-1560.</p> <p>Chumkaeo P, Poonsawat T, Meechai T, Somsook E. Synergistic activities in the Ullmann coupling of chloroarenes at ambient temperature by Pd-supported calcined ferrocenated La₂O₃. Appl Organomet Chem. 2019; 33: e4675.</p>	12, 1	2019
		12, 1	2019

Standard Criteria and Weights of Academic Work

Items	Standard Criteria	Weights
1	Innovative work published at international cooperation level	0.8
2	Innovative work published at national level	0.6
3	Innovative work published at international level	1
4	Innovative work published at the ASEAN regional level	1
5	Innovative work published at institutional level	0.4
6	Innovative work published in public or through electronic and online media	0.2
7	Books or textbooks successfully meeting the evaluation criteria regarding academic rank appointment request	1

Items	Standard Criteria	Weights
8	Books or textbooks successfully meeting the evaluation criteria regarding academic rank appointment request, but not being submitted into the request process.	1
9	Research or academic articles published in the academic journals appearing in the database (group 2)	0.6
10	Research or academic articles in complete version published in national academic conference proceeding reports	0.2
11	Research or academic articles in complete version published in international academic conference proceeding reports or the national academic journals available in the database and listed in the Civil Government Officials announcement or the regulations of the Higher Education Commission on Criteria for Academic Journals for Academic Work Dissemination, B.E. 2556	0.4
12	Research or academic articles published in international academic journals listed in the database in accordance with the Civil Government Officials announcement or the regulations of the Higher Education Commission on Criteria for Academic Journals for Academic Work Dissemination, B.E. 2556	1
13	Research or academic articles published in international academic journals not listed in the database in accordance with the Civil Government Officials announcement or the regulations of the Higher Education Commission on Criteria for Academic Journals for Academic Work Dissemination, B.E. 2556, and presented by the institution to the institution council for official sanction; the institution makes announcement and informs the Civil Service Commission in the Higher Education Institutes/ The Higher Education Commission within 30 days starting from the day of announcement (not included in Beall's list) or published in the academic journals appearing in the database TCI (group 1)	0.8
14	Business establishment experience	1

Items	Standard Criteria	Weights
15	Research work on the discovery of new species of plants and animals that have been patented	1
16	Research work patented	1
17	Research work petty patented	0.4
18	Research work employed to conduct by national organizations or institutes	1
19	Academic service to society work successfully meeting the evaluation criteria regarding academic rank appointment request	1

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 702	Chemical Safety and Risk Management	1 (1-0-2)
SCCH 703	Scientific Communications	1 (1-0-2)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 753	Homogeneous Catalysis	3 (3-0-6)
SCCH 756	Heterogeneous Catalysis	3 (3-0-6)
SCCH 758	Small Molecule Activation	3 (3-0-6)
SCCH 759	Olefin Polymerization Catalysis	3 (3-0-6)
SCCH 760	Biorefinery	3 (3-0-6)
SCCH 761	Nanocatalysis	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 710	Business Models in Chemical Industries	1 (1-0-2)

SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 753	Homogeneous Catalysis	3 (3-0-6)
SCCH 756	Heterogeneous Catalysis	3 (3-0-6)
SCCH 758	Small Molecule Activation	3 (3-0-6)
SCCH 759	Olefin Polymerization Catalysis	3 (3-0-6)
SCCH 760	Biorefinery	3 (3-0-6)
SCCH 761	Nanocatalysis	3 (3-0-6)
SCCH 841	Cutting-Edge Technologies for Bio-Circular-Green Economy	3 (3-0-6)
SCCH 842	Computational Design of Catalysts and Materials	3 (3-0-6)
SCCH 843	Business Strategies for Entrepreneurs	3 (3-0-6)
SCCH 844	Digital Transformation for Entrepreneurs	3 (3-0-6)
SCCH 845	Learning Design in Chemistry Classrooms	3 (3-0-6)
SCCH 846	Digitization, Miniaturization, Advanced Manufacturing for Chemistry Classrooms	3 (3-0-6)
SCCH 847	Metaverse in Chemistry Classrooms	3 (3-0-6)
SCCH 848	NMR Quantum Computation	3 (3-0-6)
SCCH 849	Chemistrobot	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

2. Name Associate Professor Dr. Jonggol Tantirungrotechai

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of California, Berkeley, USA	2004
A.B.	Chemistry	Princeton University, USA	1998

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Catalysis
2. Inorganic materials

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Pham V, Mai D, Bui D, Man T, Zhu B, Zhang L, Sangkaworn J, Tantirungrotechai J , et al. Emerging 2D/0D g-C ₃ N ₄ /SnO ₂ S-scheme photocatalyst: new generation architectural structure of heterojunctions toward visible-light-driven NO degradation. Environ Pollut. 2021;286:117510.	12, 1	2021
	Chutimasakul T, Na Nakhonpanom P, Tirdtrakool W, Intanin A, Bunchuay T, Chantiwas R, Tantirungrotechai J . Uniform Cu/chitosan beads as a green and reusable catalyst for facile synthesis of imines via oxidative	12, 1	2020

	coupling reaction. RSC Advances. 2020;10(35):21009-18.	12, 1	2020
	Chutimasakul T, Uetake Y, Tantirungrotechai J , Asoh T, Uyama H, Sakurai H. Size-controlled preparation of gold nanoparticles deposited on surface-fibrillated cellulose obtained by citric acid modification. ACS Omega. 2020;5(51):33206-13.	12, 1	2020
	Intanin A, Inpota P, Chutimasakul T, Tantirungrotechai J , Wilairat P, Chantiwas R. Development of a simple reversible-flow method for preparation of micron-size chitosan-Cu(II) catalyst particles and their testing of activity. Molecules. 2020;25(8).	12, 1	2020
	Ruengsuk A, Khamphaijun K, Pananusorn P, Docker AN, Tantirungrotechai J , Sukwattanasinitt M, et al. Pertosylated pillar[5]arene: self-template assisted synthesis and supramolecular polymer formation. Chem Commun. 2020;56(62):8739-42.	12, 1	2019
	Praban S, Piromjitpong P, Balasanthiran V, Jayaraj S, Chisholm MH, Tantirungrotechai J , et al. Highly efficient metal(iii) porphyrin and salen complexes for the polymerization of rac-lactide under ambient conditions. Dalton Trans. 2019;48(10):3223-30.		
	Praban S, Yimthachote S, Kiriratnikom J, Chotchatchawankul S, Tantirungrotechai J , Phomphrai K. Synthesis and characterizations of bis(phenoxy)-amine tin(II) complexes for ring-opening polymerization of	12, 1	2019

	lactide. Journal of Polymer Science Part A: Polym Chem. 2019;57(20):2104-12.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 703	Scientific Communications	1 (1-0-2)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 710	Business Models in Chemical Industries	1 (1-0-2)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 768	Special Topics in Inorganic Chemistry	3 (3-0-6)
SCCH 822	Inorganic Materials	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

3. Name Associate Professor Dr. Sirilata Yotphan

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of California, Berkeley, USA	2010
B.Sc.	Chemistry	McGill University, Canada	2006

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Kittikool T, Yotphan S. Metal-free direct C–H thiolation and thiocyanation of pyrazolones. Eur J Org Chem. 2020;2020(8):961-70.	12, 1	2020
	Beukeaw D, Noikham M, Yotphan S. Iodine/persulfate-promoted site-selective direct thiolation of quinolones and uracils. Tetrahedron. 2019;75(39):130537.	12, 1	2019
	Noikham M, Yotphan S. Copper-Catalyzed Regioselective Direct C–H Thiolation and Thiocyanation of Uracils. European J Org Chem. 2019;2019(16):2759-66.	12, 1	2019

	Phakdeeyothin K, Yotphan S. Metal-free regioselective direct thiolation of 2-pyridones. Org Biomol Chem. 2019;17(26):6432-40.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 718	Asymmetric Synthesis	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 718	Asymmetric Synthesis	3 (3-0-6)
SCCH 719	Advanced Heterocyclic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

4. Name Associate Professor Dr. Siwaporn Meejoo Smith

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Birmingham, UK	2003
B.Sc.	Chemistry	Mahidol University	1997

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Catalysts and sorbents for environmental remediation
2. Natural resources and waste material utilization
3. Material synthesis/processing and characterization

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Deebansok S, Amornsakchai T, Sae-ear P, Siriphannon P, Smith SM . Sphere-like and flake-like ZnO immobilized on pineapple leaf fibers as easy-to-recover photocatalyst for the degradation of Congo Red. J Environ Chem Eng. 2021; 9(2): 104746.	12, 1	2021
	Esan AO, Olabemiwo OM, Smith SM , Ganesan S. A concise review on alternative route of biodiesel production via interesterification of different feedstocks. Intl J Energy Res. 2021; 45(9): 12614-37.	12, 1	2021

	Dante RC, Trakulmututa J, Smith SM , Sirisit N, Martín-Ramos P, Chamorro-Posada P, Rutto D, Dante DG. A solid-state glucose sensor based on Cu and Fe-doped carbon nitride. Mater Chem Phys. 2021; 258(15): 124023.	12, 1	2021
	Srikhaow S, Butburee T, Pon-On W, Srihirin T, Uraisin K, Suttiponpanit K, Chaveanghong S, Smith SM . Efficient mercury removal at ultralow metal concentrations by cysteine functionalized carbon coated magnetite. Appl Sci. 2020; 10(22): 1-18, 8262.	12, 1	2020
	Nguyen V-H, Smith SM , Wantala K, Kajitvichyanukul P. Photocatalytic remediation of persistent organic pollutants (POPs): A review, Arab. J Chem. 2020; 13 (11): 8309-8337.	12, 1	2020
	Wichannananon P, Kobkeatthawin T, Smith SM . Visible light responsive strontium carbonate catalyst derived from solvothermal synthesis, Catalysts. 2020;10(9): 1069.	12, 1	2020
	Dechakhumwat S, Hongmanorom P, Thunyaratchatanon C, Smith SM , Boonyuen S, Luengnaruemitchai A. Catalytic activity of heterogeneous acid catalysts derived from corncob in the esterification of oleic acid with methanol. Renew Energy. 2020; 148: 897-906.	12, 1	2020
	Eaimsumang S, Wongkasemjit S, Pongstabodee S, Smith SM , Ratanawilai S, Chollacoop N, Luengnaruemitchai A.	12, 1	2019

	Effect of synthesis time on morphology of CeO ₂ nanoparticles and Au/CeO ₂ and their activity in oxidative steam reforming of methanol. J Rare Earth. 2019; 37(8): 819-28		
	Weeramonkhonlert V, Srikhaow A, Smith SM . Formation of copper hydroxy double salts derived from metal oxides and their catalytic activity in degradation of methyl orange. Ceram Intl. 2019; 45(1): 993-1000.	12, 1	2019
	Dante RC, Trakulmututa J, Smith SM , Martín-Ramos P, Chamorro-Posada P, Rutto D, Sanchez-Arevlo FM. Methylene blue-carbon nitride system as a reusable air-sensor. Mater Chem Phys. 2019; 231(1): 351-6.	12, 1	2019

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 801	Environmental Materials	3 (3-0-6)
SCCH 803	Chemistry of Waste and Pollution	3 (3-0-6)
SCCH 802	Lignocellulosic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 801	Environmental Materials	3 (3-0-6)
SCCH 802	Lignocellulosic Chemistry	3 (3-0-6)
SCCH 803	Chemistry of Waste and Pollution	3 (3-0-6)
SCCH 804	Concepts in Sustainability	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

5. Name Associate Professor Dr. Supavadee Kiatisevi

Education

Degree	Field	Institution	Year
Dr.rer.nat.	Chemie	Universität Stuttgart, Germany	2004
Diplom-Chemikerin	Chemistry	Universität Stuttgart, Germany	2000
B.Sc.	Chemistry	Mahidol University	1995

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Functional materials and in particular sensing materials, photosensitizers, and analyte-responsive imaging agents
2. Development of catalysts and catalyst technologies for sustainable chemical processes

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Saiyasombat, W, Eiamprasert, U, Chantarojsiri, T, Chainok, K, Kiatisevi, S. <u>Bis-BODIPY-based fluoride and cyanide sensor mediated by unconventional deprotonation of C-H proton</u> . Dye Pigm. 2022; 206: 110643.	12, 1	2022
	Saiyasombat W, Kiatisevi S. Bis-BODIPY linked-triazole based on catechol core for selective dual detection of Ag ⁺ and	12, 1	2021

	Hg ₂ ⁺ . RSC Advances. 2021;11(6):3703-12. Boontiem P, Kiatisevi S . Facile and economical Miyaura borylation and one-pot Suzuki-Miyaura cross-coupling reaction. Inorganica Chimica Acta. 2020;506:119538.	12, 1	2020
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 765	Main Group Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 765	Main Group Chemistry	3 (3-0-6)
SCCH 824	Functional Dyes, Polymers, and Advanced Materials	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)

SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

6. Name Assistant Professor Dr. Soraya Pornsuwan

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Pittsburgh	2007
M.S.	Chemistry	University of Wisconsin-Madison, USA	2001
B.Sc.	Chemistry	Mahidol University	1997

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Biological enzymatic activity of metalloproteins.
2. Applying spectroscopic techniques for protein dynamics.

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Boochakiatab S, Tantraviwat D, Thongsook O, Pornsuwan S , Nattestad A, Chen J, Channei D, Inceesungvorn B. Effect of exposed facets of bismuth vanadate, controlled by ethanolamine, on oxidative coupling of primary amines, J Coll Int Sci 2021; 602, 168-176.	12, 1	2021
	Juntrapirom S, Tantraviwat D, Thongsook O, Anuchai S, Pornsuwan S , Channei D, Inceesungvorn B. Natural sunlight driven photocatalytic coupling of primary amines over	12, 1	2021

	<p>TiO₂/BiOBr heterojunction, Appl Surf Sci. 2021; 545, 149015.</p> <p>Phasayavan W, Japa M, Pornsuwan S, Tantraviwat D, Kielar F, Golovko VB, Jungsuttiwong S, Inceesungvorn B. Oxygen-deficient bismuth molybdate nanocatalysts: Synergistic effects in boosting photocatalytic oxidative coupling of benzylamine and mechanistic insight, J Coll Int Sci. 2021; 581, 719-728.</p> <p>Kingchok S, Pornsuwan S. Comparison of spherical and rod-like morphologies of SBA-15 for enzyme immobilization, J Por Mat. 2020; 27(5), 1547-1557.</p> <p>Juntrapirom S, Anuchai S, Thongsook O, Pornsuwan S, Meepowpan P, Thavornyutikarn P, Phanichphant S, Tantraviwat D, Inceesungvorn B. Photocatalytic activity enhancement of g-C₃N₄/BiOBr in selective transformation of primary amines to imines and its reaction mechanism, Chem Eng J. 2020; 394, 124934.</p> <p>Khampuanbut A, Santalelat S, Pankiew A, Channei D, Pornsuwan S, Faungnawakij K, Phanichphant S, Inceesungvorn B. Visible-light-driven WO₃/BiOBr heterojunction photocatalysts for oxidative coupling of amines to imines: Energy band alignment and mechanistic insight, J Coll Int Sci. 2020; 560, 213-224.</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2021</p> <p>2020</p> <p>2020</p> <p>2019</p> <p>2019</p>
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	<p>Chongkae S, Nosanchuk JD, Pruksaphon K, Laliam A, Pornsuwan S, Youngchim S. Production of melanin pigments in saprophytic fungi in vitro and during infection, J Basic Microb. 2019; 59 (11), 1092-1104.</p> <p>Poonsawat T, Techalertmanee T, Chumkaeo P, Yunita I, Meechai T, Namkajorn M, Pornsuwan S, Somsook, E. Facile synthesis of high performance iron oxide/carbon nanocatalysts derived from the calcination of ferrocenium for the decomposition of methylene blue, Catalysts. 2019; 9 (11), 948.</p> <p>Khunoad N, Krittametaporn N, Pornsuwan S, Kongsaree P, Demeshko S, Sangtrirutnugul P. Self-assembled Cu(II) cluster from aerobic oxidation of Cu(I)Br with tris(triazolyl)methanol, Inorg Chim Acta. 2019; 488, 141-144.</p>	<p>12, 1</p> <p>12, 1</p>	<p>2019</p> <p>2019</p>
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 785	Advanced physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 702	Chemical Safety and Risk Management	1 (1-0-2)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 772	Thermodynamics and Statistical Mechanics	3 (3-0-6)
SCCH 775	Modern Chemical Physics	3 (3-0-6)
SCCH 776	Mathematical Methods	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 780	Special Topics in Physical Chemistry	3 (3-0-6)
SCCH 785	Advanced physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Full time instructors in charge of the curriculum

1. Name Professor Dr. Chutima Kuhakarn

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Wisconsin-Madison, USA	2001
M.Sc.	Organic Chemistry	Mahidol University	1995
B.Sc.	Chemistry	Mahidol University	1992

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Aiebchun T, Mahalapbutr P, Auepattanapong A, Khaikate O, Seetaha S, Tabtimmai L, Kuhakarn C , et al. Identification of Vinyl Sulfone Derivatives as EGFR Tyrosine Kinase Inhibitor: In Vitro and In Silico Studies. <i>Molecules</i> . 2021;26(8).	12, 1	2021
	Chumsri N, Kuhakarn C , Leowanawat P, Reutrakul V, Soorukram D. Concise synthesis and confirmation of the absolute configurations of naturally occurring bioactive 2,7'-	12, 1	2021

cyclolignans. Tetrahedron Lett. 2021;66:152827.		
Kantarod K, Worakul T, Soorukram D, Kuhakarn C , Reutrakul V, Surawatanawong P, et al. Dibenzopleiadiene-embedded polyaromatics via [4 + 3] annulative decarbonylation/decarboxylation. Org Chem Front. 2021;8(3):522-30.	12, 1	2021
Limjiasahapong S, Kaewnarin K, Jariyasopit N, Hongthong S, Nuntasen N, Robinson JL, Nookaew I, Sirivatanauksorn Y, Kuhakarn C , et al. UPLC-ESI-MRM/MS for Absolute Quantification and MS/MS Structural Elucidation of Six Specialized Pyranonaphthoquinone Metabolites From Ventilago harmandiana. Front Plant Sci. 2021;11(2038).	12, 1	2021
Moe T, Chaturonrutsamee S, Bunteang S, Kuhakarn C , Prabpai S, Surawatanawong P, et al. Boesenmaxane Diterpenoids from Boesenbergia maxwellii. J Nat Prod. 2021;84(2):518-26.	12, 1	2021
Sukbangnop W, Hosen AN, Hongthong S, Kuhakarn C , Tuchinda P, Chaturonrutsamee S, et al. Bioactive tetrahydrofuran lignans from roots, stems, leaves and twigs of Anogeissus rivularis. Fitoterapia. 2021;151:104885.	12, 1	2020
Bach QN, Hongthong S, Quach LT, Pham LV, Pham TV, Kuhakarn C , et al. Antimicrobial activity of rhodomertone isolated from Rhodomyrtus tomentosa (Aiton) Hassk. Nat Prod Res. 2020;34(17):2518-23.	12, 1	2020

	<p>Chatpreecha R, Kuhakarn C, Leowanawat P, Reutrakul V, Soorukram D. Bioinspired stereoselective synthesis of chiral 2,5-diaryl-3,4-dimethyltetrahydrofurans from unprotected 1,4-diarylbutane-1,4-diols (20-11276YP). The Free Internet Journal for Organic Chemistry, Arkivoc 2020. 2020:299-311.</p> <p>Jaitheerapapkul S, Kuhakarn C, Hongthong S, Anantachoke N, Thanasansurapong S, Chairoungdua A, et al. Lanostane derivatives from the leaves and twigs of <i>Garcinia wallichii</i>. Phytochem Lett. 2020;38:101-6</p> <p>La-ongthong K, Naweephattana P, Khaikate O, Surawatanawong P, Soorukram D, Pohmakotr M, et al. Alkanethiol-Mediated Cyclization of o-Alkynylisocyanobenzenes: Synthesis of Bis-Thiolated Indole Derivatives. J Org Chem. 2020;85(10):6338-51.</p> <p>Panthong K, Hongthong S, Kuhakarn C, Piyachaturawat P, Suksen K, Panthong A, et al. Pyranonaphthoquinone and anthraquinone derivatives from <i>Ventilago harmandiana</i> and their potent anti-inflammatory activity. Phytochem. 2020;169:112182.</p> <p>Jaipetch T, Hongthong S, Bunteang S, Akkarawongsapat R, Limthongkul J, Napaswad C, et al. A New ellagic acid from the leaves and twigs of <i>Irvingia malayana</i>. Nat Prod Commun. 2019;14:1934578X84816.</p> <p>Jaipetch T, Hongthong S, Kuhakarn C, Pailee P, Piyachaturawat P, Suksen K, et al. Cytotoxic polyoxygenated cyclohexene derivatives from</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2020</p> <p>2020</p> <p>2019</p> <p>2019</p>
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	the aerial parts of <i>Uvaria cherrevensis</i> . Fitoterapia. 2019;137:104182.	12, 1	2019
	Kantarod K, Naweephattana P, Reutrakul V, Pohmakotr M, Soorukram D, Kuhakarn C , Surawatanawong P, et al. Synthesis of peri-diarylated naphthalimides via double decarboxylative cross-coupling reaction. Synthesis. 2019;51(15):2915-22.	12, 1	2019
	Katrun P, Kuhakarn C . $K_2S_2O_8$ -Mediated halogenation of 2-arylimidazo[1,2-a]pyridines using sodium halides as the halogen sources. Tetrahedron Lett. 2019;60(14):989-93.	12, 1	2019
	Khaikate O, Inthalaeng N, Meesin J, Kantarod K, Pohmakotr M, Reutrakul V, Soorukram D, Leowanawat P, Kuhakarn C . Synthesis of Indolo- and Benzothieno[2,3-b]quinolines by a Cascade Cyclization of o-Alkynylisocyanobenzene Derivatives. J Org Chem. 2019;84(23):15131-44.	12, 1	2019
	Khaikate O, Soorukram D, Leowanawat P, Pohmakotr M, Reutrakul V, Kuhakarn C . Azide-triggered bicyclization of o-alkynylisocyanobenzenes: synthesis of tetrazolo[1,5-a]quinolines. Eur J Org Chem. 2019;2019(42):7050-7.	12, 1	2019
	Phae-nok S, Pohmakotr M, Kuhakarn C , Reutrakul V, Soorukram D. Site-Specific Synthesis of β -Fluorinated γ -Butyrolactams via Decarboxylative Fluorination of β -Carboxyl- γ -Butyrolactams. Eur J Org Chem. 2019; 2019(29):4710-20.	12, 1	2019

	Racochote S, Pohmakotr M, Kuhakarn C , Leowanawat P, Reutrakul V, Soorukram D. Asymmetric Synthesis of Trifluoromethylated ent-Fragransin C1. Eur J Org Chem. 2019; 2019(12):2212-23.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 714	Advanced Organic Reaction Mechanism	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 714	Advanced Organic Reaction Mechanism	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

2. Name Associate Professor Dr. Atitaya Siripinyanond

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Massachusetts, Amherst, USA	2002
M.Sc.	Applied Analytical and Inorganic Chemistry	Mahidol University	1996
B.Sc.	Chemistry	Mahidol University	1994

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Analytical Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Dumrongwongsiri O, Chongviriyaphan N, Chatvutinun S, Phoonlabdacha P, Sangcakul A, Siripinyanond A , et al. Dietary Intake and Milk Micronutrient Levels in Lactating Women with Full and Partial Breastfeeding. <i>Matern Child Health J.</i> 2021;25(6):991-7.	12, 1	2021
	Mettakoonpitak J, Khongsoun K, Wongwan N, Kaewbutdee S, Siripinyanond A , Kuharuk A, et al. Simple biodegradable plastic screen-printing for microfluidic	12, 1	2021

	paper-based analytical devices. Sens Actuators B Chem. 2021;331:129463.	12, 1	2021
	Techarang T, Siripinyanond A . Use of electrical field-flow fractionation for gold nanoparticles after improving separation efficiency by carrier liquid optimization. Anal Chim Acta. 2021;1144:102-10.	12, 1	2020
	Teprek A, Poetri Artono V, Waiyawat W, Limsakul A, Shiowatana J, Siripinyanond A . Semi-quantitative analysis by spot counting on origami paper-based device for endpoint detection in titrimetric analysis. Microchem J. 2020;158:105284.		
	Maknun L, Sumranjit J, Siripinyanond A . Use of flow field-flow fractionation and single particle inductively coupled plasma mass spectrometry for size determination of selenium nanoparticles in a mixture. RSC Adv. 2020;10(11):6423-35.	12, 1	2020
	Malahom N, Jarujamrus P, Anutrasakda W, Chawengkirttikul R, Siripinyanond A , Meelapsom R, et al. Novel paper-based colorimetric immunoassay (PCI) for sensitive and specific detection of salbutamol residues in flesh of swine and urine using Ag ₃ PO ₄ /Ag nanocomposite as label. J Food Sci. 2020;85(1):209-19.	12, 1	2020
	Zangmo T, Siripinyanond A . Exploring the applicability of nano-selenium for	12, 1	2019

	capture of mercury vapor: Paper based sorbent and a chemical modifier in graphite furnace atomic absorption spectrometry. Anal Chim Acta. 2019;1085:29-38.		
	Jarujamrus P, Meelapsom R, Naksen P, Ditcharoen N, Anutrasakda W, Siripinyanond A , et al. Screen-printed microfluidic paper-based analytical device (μ PAD) as a barcode sensor for magnesium detection using rubber latex waste as a novel hydrophobic reagent. Anal Chim Acta. 2019;1082:66-77.	12, 1	2019
	Mekprayoon S, Siripinyanond A . Performance evaluation of flow field-flow fractionation and electrothermal atomic absorption spectrometry for size characterization of gold nanoparticles. J Chromatogr A. 2019;1604:460493.	12, 1	2019
	Saenmuangchin R, Siripinyanond A . Identification of white scale formation in pineapple juice concentrate. Microchem J. 2019;147:1180-5.	12, 1	2019

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)

SCCH 731	Advanced Techniques in Analytical Chemistry	3 (3-0-6)
SCCH 732	Instrumental Analysis Laboratory	3 (1-6-4)
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 731	Advanced Techniques in Analytical Chemistry	3 (3-0-6)
SCCH 732	Instrumental Analysis Laboratory	3 (1-6-4)
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

3. Name Associate Professor Dr. Darunee Soorukram

Education

Degree	Field	Institution	Year
Dr.rer.nat.	Organic Chemistry	Ludwig-Maximilians Universität München, Germany	2006
M.Sc.	Organic Chemistry	Mahidol University	2003
B.Sc.	Chemistry	Khon Kaen University	1999

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Total synthesis of bioactive lignan natural products
2. Synthesis of bioactive molecules
3. Synthesis of organofluorenes

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Chumsri N, Kuhakarn C, Leowanawat P, Reutrakul V, Soorukram D . Concise synthesis and confirmation of the absolute configurations of naturally occurring bioactive 2,7'-cycloignans. Tetrahedron Lett. 2021;66:152827.	12, 1	2021
	Kantarod K, Worakul T, Soorukram D , Kuhakarn C, Reutrakul V, Surawatanawong P, et al. Dibenzopleiadiene-embedded polyaromatics via [4 + 3] annulative	12, 1	2021

	<p>decarbonylation/decarboxylation. <i>Org Chem Front.</i> 2021;8(3):522-30.</p> <p>Chatpreecha R, Kuhakarn C, Leowanawat P, Reutrakul V, Soorukram D. Bioinspired stereoselective synthesis of chiral 2,5-diaryl-3,4-dimethyltetrahydrofurans from unprotected 1,4-diarylbutane-1,4-diols (20-11276YP). <i>The Free Internet Journal for Organic Chemistry, Arkivoc</i> 2020. 2020:299-311.</p> <p>Kantarod K, Naweephattana P, Reutrakul V, Pohmakotr M, Soorukram D, Kuhakarn C, Surawatanawong P, et al. Synthesis of peri-diarylated naphthalimides via double decarboxylative cross-coupling reaction. <i>Synthesis.</i> 2019;51(15):2915-22.</p> <p>Khaikate O, Inthalaeng N, Meesin J, Kantarod K, Pohmakotr M, Reutrakul V, Soorukram D, Leowanawat P, Kuhakarn C. Synthesis of indolo- and benzothieno[2,3-b]quinolines by a cascade cyclization of o-alkynylisocyanobenzene derivatives. <i>J Org Chem.</i> 2019;84(23):15131-44.</p> <p>Khaikate O, Soorukram D, Leowanawat P, Pohmakotr M, Reutrakul V, Kuhakarn C. Azide-Triggered Bicyclization of o-alkynylisocyanobenzenes: synthesis of tetrazolo[1,5-a]quinolines. <i>Eur J Org Chem.</i> 2019;2019(42):7050-7.</p> <p>Phae-nok S, Pohmakotr M, Kuhakarn C, Reutrakul V, Soorukram D. Site-Specific Synthesis of β-Fluorinated γ-Butyrolactams via Decarboxylative Fluorination of β-Carboxyl-γ-</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2019</p> <p>2019</p> <p>2019</p> <p>2019</p> <p>2019</p>
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	Butyrolactams. Eur J Org Chem. 2019;2019(29):4710-20. Racochote S, Pohmakotr M, Kuhakarn C, Leowanawat P, Reutrakul V, Soorukram D. Asymmetric Synthesis of Trifluoromethylated ent-Fragransin C ₁ . European Journal of Organic Chemistry. 2019;2019(12):2212-23.	12, 1	2019
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 713	Advanced Organic Synthesis	3 (3-0-6)
SCCH 714	Advanced Organic Reaction Mechanism	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 713	Advanced Organic Synthesis	3 (3-0-6)
SCCH 714	Advanced Organic Reaction Mechanism	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

4. Name Associate Professor Dr. Duangjai Nacapricha

Education

Degree	Field	Institution	Year
Ph.D.	Analytical Chemistry	Liverpool John Moores University, UK	1993
M.Sc.	Analytical Chemistry	Chiang Mai University	1989
B.Sc.	Chemistry	Prince of Songkla University	1987

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Analytical Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Ar-sanork K, Karuwan C, Surapanich N, Wilairat P, Nacapricha D , Chaisuwan P. Mixed mode monolithic sorbent in pipette tip for extraction of ractopamine and clenbuterol prior to analysis by HPLC-UV and UHPLC-Q Exactive TM Plus Orbitrap MS. J Anal Sci Technol . 2021;12(1):23.	12, 1	2021
	Fukana N, Sonsa-ard T, Chantipmanee N, Hauser PC, Wilairat P, Nacapricha D . Contactless conductivity sensor as detector for microfluidic paper-based analytical device with application to unique rapid method for	12, 1	2021

quantifying sulfite preservative. Sens Actuators B Chem. 2021;339:129838.	12, 1	2021
Karamahito P, Sitanurak J, Nacapricha D , Wilairat P, Chaisiwamongkhol K, Phonchai A. Paper device for distance-based visual quantification of sibutramine adulteration in slimming products. Microchem J. 2021;162:105784.	12, 1	2021
Nashukha HL, Sitanurak J, Sulistyarti H, Nacapricha D , Uraisin K. Simple and Equipment-Free Paper-Based Device for Determination of Mercury in Contaminated Soil. Molecules. 2021;26(7).	12, 1	2021
Nontawong N, Amatatongchai M, Jarujamrus P, Nacapricha D , Lieberzeit PA. Novel dual-sensor for creatinine and 8-hydroxy-2'-deoxyguanosine using carbon-paste electrode modified with molecularly imprinted polymers and multiple-pulse amperometry. Sens Actuators B Chem. 2021;334:129636.	12, 1	2021
Prasertying P, Jantawong N, Sonsa-Ard T, Wongpakdee T, Khoonrueng N, Buring S, et al. Gold leaf electrochemical sensors: applications and nanostructure modification. Analyst. 2021;146(5):1579-89.		
Sridapan T, Tangkawsakul W, Janvilisri T, Kiatpathomchai W, Dangtip S, Ngamwongsatit N, et al. Rapid detection of Clostridium perfringens in food by loop-mediated isothermal amplification combined with a lateral flow biosensor. PLOS ONE. 2021;16(1):e0245144.	12, 1	2021
Amatatongchai M, Thimoonnee S, Jarujamrus P, Nacapricha D , Lieberzeit PA. Novel amino-	12, 1	2020

	containing molecularly-imprinted polymer coating on magnetite-gold core for sensitive and selective carbofuran detection in food. Microchem J. 2020;158:105298.		
	Chantipmanee N, Sonsa-ard T, Fukana N, Kotakanok K, Mantim T, Wilairat P, et al. Contactless conductivity detector from printed circuit board for paper-based analytical systems. Talanta. 2020;206:120227.	12, 1	2020
	Duangdeewong C, Sitanurak J, Wilairat P, Nacapricha D , Teerasong S. Microfluidic paper-based analytical device for convenient use in measurement of iodate in table salt and irrigation water. Microchem J. 2020;152:104447.	12, 1	2020
	Jeerapan I, Sonsa-ard T, Nacapricha D . Applying Nanomaterials to Modern Biomedical Electrochemical Detection of Metabolites, Electrolytes, and Pathogens. Chemosensors. 2020;8(3).	12, 1	2020
	Mantim T, Chaisiwamongkhol K, Uraisin K, Hauser PC, Wilairat P, Nacapricha D . Dual-Purpose Photometric-Conductivity Detector for Simultaneous and Sequential Measurements in Flow Analysis. Molecules. 2020;25(10).	12, 1	2020
	Ratanawimarnwong N, Sinpun M, Chankaw P, Choengchan N, Nacapricha D . Simple flow system with in-line gas-diffusion unit for determination of ethanol employing hypsochromic shift of visible absorbance band of methyl orange. Talanta. 2020;206:120234.	12, 1	2020
	Sonsa-ard T, Chantipmanee N, Fukana N, Hauser PC, Wilairat P, Nacapricha D . Contactless conductivity sensor employing	12, 1	2020

moist paper as absorbent for in-situ detection of generated carbon dioxide gas. Anal Chim Acta. 2020;1118:44-51.		
Thepchuay Y, Costa CFA, Mesquita RBR, Sampaio-Maia BE, Nacapricha D , Rangel AOSS. Flow-based method for the determination of biomarkers urea and ammoniacal nitrogen in saliva. Bioanalysis. 2020;12(7):455-65.	12, 1	2020
Thepchuay Y, Mesquita RBR, Nacapricha D , Rangel AOSS. Micro-PAD card for measuring total ammonia nitrogen in saliva. Anal BioanalChem. 2020;412(13):3167-76.	12, 1	2020
Thepchuay Y, Sonsa-ard T, Ratanawimarnwong N, Auparakkitanon S, Sitanurak J, Nacapricha D . Paper-based colorimetric biosensor of blood alcohol with in-situ headspace separation of ethanol from whole blood. Anal Chim Acta. 2020;1103:115-21.	12, 1	2020
Ayuning Tyas A, Sonsa-ard T, Uraisin K, Nacapricha D , Saetear P. Simple flow-based system with an in-line membrane gas-liquid separation unit and a contactless conductivity detector for the direct determination of sulfite in clear and turbid food samples. Membranes. 2020;10(5).	12, 1	2020
Amatatongchai M, Sitanurak J, Sroysee W, Sodanat S, Chairam S, Jarujamrus P, Nacapricha D. Et al. Highly sensitive and selective electrochemical paper-based device using a graphite screen-printed electrode modified with molecularly imprinted polymers coated Fe ₃ O ₄ @Au@SiO ₂ for serotonin determination. Anal Chim Acta. 2019;1077:255-65.	12, 1	2019

Buking S, Suedomi Y, Nacapricha D , Kaneta T. Characterization of Pieces of Paper That Form Reagent Containers for Use as Portable Analytical Devices. ACS Omega. 2019;4(12):15249-54.	12, 1	2019
Chaneam S, Kaewyai K, Mantim T, Chaisuksant R, Wilairat P, Nacapricha D . Simultaneous and direct determination of urea and creatinine in human urine using a cost-effective flow injection system equipped with in-house contactless conductivity detector and LED colorimeter. Anal Chim Acta. 2019;1073:54-61.	12, 1	2019
Hoisang W, Nacapricha D , Wilairat P, Tiyaopongpattana W. Solidification of floating organic droplet microextraction for determination of seven insecticides in fruit juice, vegetables and agricultural runoff using gas chromatography with flame ionization and mass spectrometry detection. J Sep Sci. 2019;42(11):2032-43.	12, 1	2019
Kraikaew P, Pluangklang T, Ratanawimarnwong N, Uraisin K, Wilairat P, Mantim T, Nacapricha D . Simultaneous determination of ethanol and total sulfite in white wine using on-line cone reservoirs membraneless gas-liquid separation flow system. Microchem J . 2019;149:104007.	12, 1	2019
Manthong N, Wilairat P, Nacapricha D , Chaneam S. Simultaneous Colorimetric Measurements of Antioxidant Capacity by Flow Injection Analysis with Paired Emitter Detector Diode. Anal Sci . 2019;35(5):535-41.	12, 1	2019
Puangbanlang C, Sirivibulkovit K, Nacapricha D , Sameenoi Y. A paper-based device for	12, 1	2019

	simultaneous determination of antioxidant activity and total phenolic content in food samples. Talanta. 2019;198:542-9. Sitanurak J, Fukana N, Wongpakdee T, Thepchuay Y, Ratanawimarnwong N, Amornsakchai T, Nacapricha D . T-shirt ink for one-step screen-printing of hydrophobic barriers for 2D- and 3D-microfluidic paper-based analytical devices. Talanta. 2019;205:120113.	12, 1	2019
	Sonsa-ard T, Nacapricha D , Kaneta T. Miniaturized Potentiometric Titration for Improving Portability and Accuracy in the Determination of Total Acid in Squeezed Fruit Juice. J Food Sci. 2019;84(8):2165-70.	12, 1	2019

Current Teaching Duty

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 704 Seminar in Chemistry	1 (1-0-2)
SCCH 705 Progress in Chemistry	3 (3-0-6)
SCCH 706 Research Skill Development I	3 (3-0-6)
SCCH 707 Research Skill Development II	3 (3-0-6)
SCCH 708 Special Problems in Chemistry	3 (3-0-6)
SCCH 734 Fluidic Technology for Analytical Science	3 (3-0-6)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 709 State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887 Research Project Development II	2 (2-0-4)

SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)
SCCH 735	Chemometrics	3 (2-3-5)
SCCH 738	Special Topics in Analytical Chemistry	3 (3-0-6)
SCCH 739	Current Topics in Analytical Chemistry I	3 (3-0-6)
SCCH 740	Current Topics in Analytical Chemistry II	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

5. Name Associate Professor Dr.Ekasith Somsook

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Wisconsin-Madison, USA	2001
B.Sc.	Chemistry	Mahidol University	1994

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Catalysis science and technology for circular and sustainable chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Taube C, Schwedtmann K, Noikham M, Somsook E , Hennersdorf F, Wolf R, Weigand JJ. P–P Condensation and P/N–P/P bond metathesis: Facile synthesis of cationic tri- and tetraphosphanes. <i>Angew Chem Int Ed.</i> 2020; 59: 3585-3591.	12, 1	2020
	Poonsawat T, Techalertmanee T, Chumkaeo P, Yunita I, Meechai T, Namkajorn M, Pornsuwan S, Somsook E . Facile synthesis of high performance iron oxide/carbon nanocatalysts derived from the calcination of ferrocenium for	12, 1	2019

	the decomposition of methylene blue. Catalysts. 2019; 9: 948. Yunita I, Putisompon S, Chumkaeo P, Poonsawat T, Somsook E . Effective catalysts derived from waste ostrich eggshells for glycolysis of post-consumer PET bottles. Chem Pap. 2019; 73(6); 1547-1560.	12, 1	2019
	Chumkaeo P, Poonsawat T, Meechai T, Somsook E . Synergistic activities in the Ullmann coupling of chloroarenes at ambient temperature by Pd-supported calcined ferrocenated La ₂ O ₃ . Appl Organomet Chem. 2019; 33: e4675.	12, 1	2019

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 702	Chemical Safety and Risk Management	1 (1-0-2)
SCCH 703	Scientific Communications	1 (1-0-2)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 753	Homogeneous Catalysis	3 (3-0-6)
SCCH 756	Heterogeneous Catalysis	3 (3-0-6)
SCCH 758	Small Molecule Activation	3 (3-0-6)
SCCH 759	Olefin Polymerization Catalysis	3 (3-0-6)
SCCH 760	Biorefinery	3 (3-0-6)
SCCH 761	Nanocatalysis	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)

SCCH 898	Dissertation	48 (0-144-0)
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Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 710	Business Models in Chemical Industries	1 (1-0-2)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 753	Homogeneous Catalysis	3 (3-0-6)
SCCH 756	Heterogeneous Catalysis	3 (3-0-6)
SCCH 758	Small Molecule Activation	3 (3-0-6)
SCCH 759	Olefin Polymerization Catalysis	3 (3-0-6)
SCCH 760	Biorefinery	3 (3-0-6)
SCCH 761	Nanocatalysis	3 (3-0-6)
SCCH 841	Cutting-Edge Technologies for Bio-Circular-Green Economy	3 (3-0-6)
SCCH 842	Computational Design of Catalysts and Materials	3 (3-0-6)
SCCH 843	Business Strategies for Entrepreneurs	3 (3-0-6)
SCCH 844	Digital Transformation for Entrepreneurs	3 (3-0-6)
SCCH 845	Learning Design in Chemistry Classrooms	3 (3-0-6)
SCCH 846	Digitization, Miniaturization, Advanced Manufacturing for Chemistry Classrooms	3 (3-0-6)
SCCH 847	Metaverse in Chemistry Classrooms	3 (3-0-6)
SCCH 848	NMR Quantum Computation	3 (3-0-6)
SCCH 849	Chemistrobot	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

6. Name Associate Professor Dr. Jonggol Tantirungrotechai

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of California, Berkeley, USA	2004
A.B.	Chemistry	Princeton University, USA	1998

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Catalysis
2. Inorganic materials

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Pham V, Mai D, Bui D, Man T, Zhu B, Zhang L, Sangkaworn J, Tantirungrotechai J , et al. Emerging 2D/0D g-C ₃ N ₄ /SnO ₂ S-scheme photocatalyst: new generation architectural structure of heterojunctions toward visible-light-driven NO degradation. Environ Pollut. 2021;286:117510.	12, 1	2021
	Chutimasakul T, Na Nakhonpanom P, Tirdtrakool W, Intanin A, Bunchuay T, Chantiwas R, Tantirungrotechai J . Uniform Cu/chitosan beads as a green and reusable catalyst for facile synthesis of imines via oxidative	12, 1	2020

	coupling reaction. RSC Advances. 2020;10(35):21009-18.	12, 1	2020
	Chutimasakul T, Uetake Y, Tantirungrotechai J , Asoh T, Uyama H, Sakurai H. Size-controlled preparation of gold nanoparticles deposited on surface-fibrillated cellulose obtained by citric acid modification. ACS Omega. 2020;5(51):33206-13.	12, 1	2020
	Intanin A, Inpota P, Chutimasakul T, Tantirungrotechai J , Wilairat P, Chantiwas R. Development of a simple reversible-flow method for preparation of micron-size chitosan-Cu(II) catalyst particles and their testing of activity. Molecules. 2020;25(8).	12, 1	2020
	Ruengsuk A, Khamphaijun K, Pananusorn P, Docker AN, Tantirungrotechai J , Sukwattanasinitt M, et al. Pertosylated pillar[5]arene: self-template assisted synthesis and supramolecular polymer formation. Chem Commun. 2020;56(62):8739-42.	12, 1	2019
	Praban S, Piromjitpong P, Balasanthiran V, Jayaraj S, Chisholm MH, Tantirungrotechai J , et al. Highly efficient metal(iii) porphyrin and salen complexes for the polymerization of rac-lactide under ambient conditions. Dalton Trans. 2019;48(10):3223-30.		
	Praban S, Yimthachote S, Kiriratnikom J, Chotchatchawankul S, Tantirungrotechai J , Phomphrai K. Synthesis and characterizations of bis(phenoxy)-amine tin(II) complexes for ring-opening polymerization of	12, 1	2019

	lactide. Journal of Polymer Science Part A: Polym Chem. 2019;57(20):2104-12.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 703	Scientific Communications	1 (1-0-2)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 710	Business Models in Chemical Industries	1 (1-0-2)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 768	Special Topics in Inorganic Chemistry	3 (3-0-6)
SCCH 822	Inorganic Materials	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

7. Name Associate Professor Dr. Palangpon Kongsaree

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	Cornell University, USA	1998
M.Sc.	Chemistry	Cornell University, USA	1995
B.Sc.	Chemistry	Mahidol University	1992

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Wechakorn K, Chomngam S, Eiamprasert U, Kongsaree P . A rhodamine–bistriazole based fluorescent and colorimetric sensor containing a phenyl linker for Fe(III) detection. Chem Pap. 2021;75(3):883-92.	12, 1	2021
	Panthong K, Hongthong S, Kuhakarn C, Piyachaturawat P, Suksen K, Panthong A, Chiranthanut N, Kongsaree P , et al. Pyranonaphthoquinone and anthraquinone derivatives from Ventilago harmandiana and their potent anti-inflammatory activity. Phytochem. 2020;169:112182.	12, 1	2020
		12, 1	2019

	<p>Jaipetch T, Hongthong S, Kuhakarn C, Pailee P, Piyachaturawat P, Suksen K, Kongsaeree P, et al. Cytotoxic polyoxygenated cyclohexene derivatives from the aerial parts of <i>Uvaria cherrevensis</i>. <i>Fitoterapia</i>. 2019;137:104182.</p> <p>Khunoad N, Krittametaporn N, Pornsuwan S, Kongsaeree P, Demeshko SE, Sangtrirutnugul P. Self-assembled Cu(II) cluster from aerobic oxidation of Cu(I)Br with tris(triazolyl)methanol. <i>Inorganica Chimica Acta</i>. 2019;488:141-4.</p>	12, 1	2019
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

8. Name Associate Professor Dr. Panida Surawatanawong

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	Texas A&M University, USA	2009
B.Sc.	Chemistry	Mahidol University	2004

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Computational chemistry for catalysis and alternative energy
2. Electronic structures and mechanisms of organometallic reactions
3. Non-precious metal catalysts for efficient use of biomass
4. Hydrogen activation and hydrogen production catalysts

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Kantarod K, Worakul T, Soorukram D, Kuhakarn C, Reutrakul V, Surawatanawong P , et al. Dibenzopleiadiene-embedded polyaromatics via [4 + 3] annulative decarbonylation/decarboxylation. Org Chem Front. 2021;8(3):522-30.	12, 1	2021
	Kornsakulkarn J, Pruksatrakul T, Surawatanawong P , Thangsrikeattigun C, Komwijit S, Boonyuen N, et al. Antimicrobial, antimalarial, and cytotoxic substances from the	12, 1	2021

	<p>insect pathogenic fungus <i>Beauveria asiatica</i> BCC 16812. <i>Phytochem Lett.</i> 2021;43:8-15.</p> <p>Moe T, Chaturonrutsamee S, Bunteang S, Kuhakarn C, Prabpai S, Surawatanawong P, et al. Boesenmaxane diterpenoids from <i>Boesenbergia maxwellii</i>. <i>J Nat Prod.</i> 2021;84(2):518-26.</p> <p>Bunchuay T, Docker A, Eiamprasert U, Surawatanawong P, Brown A, Beer PD. Chalcogen bond mediated enhancement of cooperative ion-pair recognition. <i>Angew Chem Int Ed.</i> 2020;59(29):12007-12.</p> <p>La-ongthong K, Naweephattana P, Khaikate O, Surawatanawong P, Soorukram D, Pohmakotr M, et al. Alkanethiol-mediated cyclization of o-alkynylisocyanobenzenes: synthesis of bis-thiolated indole derivatives. <i>J Org Chem.</i> 2020;85(10):6338-51.</p> <p>Liu C-Y, Wititsuwannakul T, Hsieh C-H, Tsai C-Y, Wang T-H, Ambre RA, Chen W-C, Surawatanawong P, et al. Nickel-mediated cross-coupling via C–O activation assisted by organoaluminum. <i>J Chin Chem Soc.</i> 2020;67(3):376-82.</p> <p>Lythell EM, Suardiaz RE, Hinchliffe PH, Hanpaibool C, Visitsatthawong S, Oliveira ASF, Lang Eric JM, Surawatanawong P, et al. Resistance to the “last resort” antibiotic colistin: a single-zinc mechanism for phosphointermediate formation in MCR enzymes. <i>Chem Comm.</i> 2020;56(50):6874-7.</p> <p>Naweephattana P, Sawatlon B, Surawatanawong P. Insights into the</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2021</p> <p>2020</p> <p>2020</p> <p>2020</p> <p>2020</p> <p>2020</p> <p>2020</p>
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	regioselectivity of hydroheteroarylation of allylbenzene with pyridine catalyzed by Ni/AlMe ₃ with N-heterocyclic carbene: the concerted hydrogen transfer mechanism. J Org Chem. 2020;85(17):11340-9.		
	Kantarod K, Naweephattana P, Reutrakul V, Pohmakotr M, Soorukram D, Kuhakarn C, Surawatanawong P , et al. Synthesis of peri-diarylated naphthalimides via double decarboxylative cross-coupling reaction. Synthesis. 2019;51(15):2915-22.	12, 1	2019
	Uthayopas C, Surawatanawong P . Aryl C–O oxidative addition of phenol derivatives to nickel supported by an N-heterocyclic carbene via a Ni(0) five-centered complex. Dalton Trans. 2019;48(22):7817-27.	12, 1	2019
	Wongnate T, Surawatanawong P , Chuaboon L, Lawan N, Chaiyen P. The Mechanism of Sugar C–H Bond Oxidation by a Flavoprotein Oxidase Occurs by a Hydride Transfer Before Proton Abstraction. Chem Eur J . 2019;25(17):4460-71.	12, 1	2019

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 771	Quantum Chemistry	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 785	Advanced Physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)

SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 771	Quantum Chemistry	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 781	Special Topics in Chemical Physics	3 (3-0-6)
SCCH 785	Advanced Physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

9. Name Associate Professor Dr. Pasit Pakawatpanurut

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	Harvard University, USA	2005
M.A.	Chemistry	Harvard University, USA	2004
B.S.	Chemistry	The University of Chicago, USA	1999

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Photovoltaics
2. Energy storage materials

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Siripraparat A, Ponchai J, Kanjanaboos P, Pakawatpanurut P . Efficiency enhancement of perovskite solar cells by using Ag- or Ag-Cu composite-doped surface passivation of the electron transport layer. Appl Surf Sci. 2021;562:150147.	12, 1	2021
	Hantanasirisakul K, Alhabeb MO, Lipatov AL, Maleski KA, Anasori BA, Salles PO, Leosakulrat C, Pakawatpanurut P , et al. Effects of Synthesis and Processing on Optoelectronic Properties of Titanium Carbonitride Mxene. Chem Mater. 2019;31(8):2941-51.	12, 1	2019

	Saning AM, Herou SE, Dechtrirat D, Leosakulrat C, Pakawatpanurut P , Kaowphong S, et al. Green and sustainable zero-waste conversion of water hyacinth (<i>Eichhornia crassipes</i>) into superior magnetic carbon composite adsorbents and supercapacitor electrodes. RSC Adv. 2019;9(42):24248-58.	12, 1	2019
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 785	Advanced Physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 774	Chemical Kinetics and Molecular Dynamics	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 779	Surface Chemistry and Advanced Electrochemistry	3 (3-0-6)
SCCH 785	Advanced Physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

10. Name Associate Professor Dr. Preeyanuch Sangtrirutnugul

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of California, Berkeley, USA	2007
B.S.	Chemistry	Massachusetts Institute of Technology, USA	2000

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Inorganic Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Gopalakrishnan M, Krittametaporn N, Yoshinari N, Konno T, Sangtrirutnugul P. Anion-templated assembly of multinuclear copper(ii)-triazole complexes. New J Chem. 2020;44(32):13764-70.	12, 1	2020
	Inthong J, Nakarajouyphon V, Udomsasporn K, Phomphrai K, Yoshinari N, Konno T, Sangtrirutnugul P. Dinickel(II) complexes with pyridine-substituted bis(triazolylmethyl)amine ligands: Structures and magnetic properties. Polyhedron. 2020;191:114813.	12, 1	2020
	Krittametaporn N, Chantarojsiri T, Virachotikul A, Phomphrai K, Kuwamura N, Kojima T, Konno T, Sangtrirutnugul P. Influence of catalyst	12, 1	2020

	nuclearity on copper-catalyzed aerobic alcohol oxidation. Dalton Trans . 2020;49(3):682-9. Ampawa S, Krittametaporn N, Ungpittagul H, Phomphrai K, Sangtrirutnugul P. Triazole-based ligands functionalized silica: effects of ligand denticity and donors on catalytic oxidation activity of Pd nanoparticles. Appl Organomet Chem. 2019;33(12):e5238.	12, 1	2019
	Khunoad N, Krittametaporn N, Pornsuwan S, Kongsaree P, Demeshko S, Sangtrirutnugul P. Self-assembled Cu(II) cluster from aerobic oxidation of Cu(I)Br with tris(triazolyl)methanol. Inorg Chim Acta. 2019;488:141-4.	12, 1	2019

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)

SCCH 766 Inorganic Reaction Mechanisms	3 (3-0-6)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

11. Name Associate Professor Dr. Rattikan Chantiwas

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	Chiang Mai University	2003
M.Sc.	Applied Analytical and Inorganic Chemistry	Mahidol University	1999
B.Sc.	Chemistry	Mahidol University	1996

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Analytical Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Chutimasakul T, Na Nakhonpanom P, Tirdtrakool W, Intanin A, Bunchuay T, Chantiwas R , et al. Uniform Cu/chitosan beads as a green and reusable catalyst for facile synthesis of imines via oxidative coupling reaction. RSC Adv. 2020;10(35):21009-18.	12, 1	2020
	Intanin A, Inpota P, Chutimasakul T, Tantirungrotechai J, Wilairat P, Chantiwas R . Development of a Simple Reversible-Flow Method for Preparation of Micron-Size Chitosan-Cu(II) Catalyst Particles and Their Testing of Activity. Molecules. 2020;25(8).	12, 1	2020

	Sangawitayakorn C, Wilairat P, Chantiwas R . Experimental determination of phase ratio of C ₈ columns employing retention factors and octane-mobile phase partition coefficients of homologous series of linear alkylbenzenes. J Chromatogr A. 2020;1634:461668.	12, 1	2020
	Suparman, Inpota P, Phonchai A, Wilairat P, Chantiwas R . Rapid measurement of indole levels in Brassica vegetables using one millilitre binary organic extraction solvent and capillary electrophoresis-UV analysis. Phytochem Anal. 2020;31(4):522-30.	12, 1	2020
	Tongdee M, Yamanishi C, Maeda M, Kojima T, Dishinger J, Chantiwas R , et al. One-incubation one-hour multiplex ELISA enabled by aqueous two-phase systems. Analyst. 2020;145(10):3517-27.	12, 1	2020
	Woraruthai T, Kunno J, Pongsopon M, Yansakon K, Phoopraintra P, Chantiwas R , et al. Identification and cultivation of hydrogenotrophic methanogens from palm oil mill effluent for high methane production. International Journal of Energy Research. 2020;44(13):10058-70.	12, 1	2020

Current Teaching Duty

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 704 Seminar in Chemistry	1 (1-0-2)
SCCH 705 Progress in Chemistry	3 (3-0-6)
SCCH 706 Research Skill Development I	3 (3-0-6)
SCCH 707 Research Skill Development II	3 (3-0-6)
SCCH 708 Special Problems in Chemistry	3 (3-0-6)
SCCH 732 Instrumental Analysis Laboratory	3 (1-6-4)

SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 709 State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887 Research Project Development II	2 (2-0-4)
SCCH 888 Innovations in Chemistry	3 (3-0-6)
SCCH 889 Seminar in Chemistry II	1 (1-0-2)
SCCH 732 Instrumental Analysis Laboratory	3 (1-6-4)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

12. Name Associate Professor Dr. Sirilata Yotphan

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of California, Berkeley, USA	2010
B.Sc.	Chemistry	McGill University, Canada	2006

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Kittikool T, Yotphan S. Metal-free direct C–H thiolation and thiocyanation of pyrazolones. Eur J Org Chem. 2020;2020(8):961-70.	12, 1	2020
	Beukeaw D, Noikham M, Yotphan S. Iodine/persulfate-promoted site-selective direct thiolation of quinolones and uracils. Tetrahedron. 2019;75(39):130537.	12, 1	2019
	Noikham M, Yotphan S. Copper-Catalyzed Regioselective Direct C–H Thiolation and Thiocyanation of Uracils. European J Org Chem. 2019;2019(16):2759-66.	12, 1	2019

	Phakdeeyothin K, Yotphan S. Metal-free regioselective direct thiolation of 2-pyridones. Org Biomol Chem. 2019;17(26):6432-40.		
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Current Teaching Duty

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 704 Seminar in Chemistry	1 (1-0-2)
SCCH 705 Progress in Chemistry	3 (3-0-6)
SCCH 706 Research Skill Development I	3 (3-0-6)
SCCH 707 Research Skill Development II	3 (3-0-6)
SCCH 708 Special Problems in Chemistry	3 (3-0-6)
SCCH 718 Asymmetric Synthesis	3 (3-0-6)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 709 State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887 Research Project Development II	2 (2-0-4)
SCCH 888 Innovations in Chemistry	3 (3-0-6)
SCCH 889 Seminar in Chemistry II	1 (1-0-2)
SCCH 718 Asymmetric Synthesis	3 (3-0-6)
SCCH 719 Advanced Heterocyclic Chemistry	3 (3-0-6)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

13. Name Associate Professor Dr. Siwaporn Meejoo Smith

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Birmingham, UK	2003
B.Sc.	Chemistry	Mahidol University	1997

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Catalysts and sorbents for environmental remediation
2. Natural resources and waste material utilization
3. Material synthesis/processing and characterization

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Deebansok S, Amornsakchai T, Sae-ear P, Siriphannon P, Smith SM . Sphere-like and flake-like ZnO immobilized on pineapple leaf fibers as easy-to-recover photocatalyst for the degradation of Congo Red. J Environ Chem Eng. 2021; 9(2): 104746.	12, 1	2021
	Esan AO, Olabemiwo OM, Smith SM , Ganesan S. A concise review on alternative route of biodiesel production via interesterification of different feedstocks. Intl J Energy Res. 2021; 45(9): 12614-37.	12, 1	2021

	Dante RC, Trakulmututa J, Smith SM , Sirisit N, Martín-Ramos P, Chamorro-Posada P, Rutto D, Dante DG. A solid-state glucose sensor based on Cu and Fe-doped carbon nitride. Mater Chem Phys. 2021; 258(15): 124023.	12, 1	2021
	Srikhaow S, Butburee T, Pon-On W, Srihirin T, Uraisin K, Suttiponpanit K, Chaveanghong S, Smith SM . Efficient mercury removal at ultralow metal concentrations by cysteine functionalized carbon coated magnetite. Appl Sci. 2020; 10(22): 1-18, 8262.	12, 1	2020
	Nguyen V-H, Smith SM , Wantala K, Kajitvichyanukul P. Photocatalytic remediation of persistent organic pollutants (POPs): A review, Arab. J Chem. 2020; 13 (11): 8309-8337.	12, 1	2020
	Wichannananon P, Kobkeatthawin T, Smith SM . Visible light responsive strontium carbonate catalyst derived from solvothermal synthesis, Catalysts. 2020;10(9): 1069.	12, 1	2020
	Dechakhumwat S, Hongmanorom P, Thunyaratchatanon C, Smith SM , Boonyuen S, Luengnaruemitchai A. Catalytic activity of heterogeneous acid catalysts derived from corncob in the esterification of oleic acid with methanol. Renew Energy. 2020; 148: 897-906.	12, 1	2020
	Eaimsumang S, Wongkasemjit S, Pongstabodee S, Smith SM , Ratanawilai S, Chollacoop N, Luengnaruemitchai A.	12, 1	2019

	Effect of synthesis time on morphology of CeO ₂ nanoparticles and Au/CeO ₂ and their activity in oxidative steam reforming of methanol. J Rare Earth. 2019; 37(8): 819-28		
	Weeramonkhonlert V, Srikhaow A, Smith SM . Formation of copper hydroxy double salts derived from metal oxides and their catalytic activity in degradation of methyl orange. Ceram Intl. 2019; 45(1): 993-1000.	12, 1	2019
	Dante RC, Trakulmututa J, Smith SM , Martín-Ramos P, Chamorro-Posada P, Rutto D, Sanchez-Arevlo FM. Methylene blue-carbon nitride system as a reusable air-sensor. Mater Chem Phys. 2019; 231(1): 351-6.	12, 1	2019

Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 801	Environmental Materials	3 (3-0-6)
SCCH 803	Chemistry of Waste and Pollution	3 (3-0-6)
SCCH 802	Lignocellulosic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 801	Environmental Materials	3 (3-0-6)
SCCH 802	Lignocellulosic Chemistry	3 (3-0-6)
SCCH 803	Chemistry of Waste and Pollution	3 (3-0-6)
SCCH 804	Concepts in Sustainability	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

14. Name Associate Professor Dr. Supavadee Kiatisevi

Education

Degree	Field	Institution	Year
Dr.rer.nat.	Chemie	Universität Stuttgart, Germany	2004
Diplom-Chemikerin	Chemistry	Universität Stuttgart, Germany	2000
B.Sc.	Chemistry	Mahidol University	1995

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Functional materials and in particular sensing materials, photosensitizers, and analyte-responsive imaging agents
2. Development of catalysts and catalyst technologies for sustainable chemical processes

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Saiyasombat, W, Eiamprasert, U, Chantarojsiri, T, Chainok, K, Kiatisevi, S. <u>Bis-BODIPY-based fluoride and cyanide sensor mediated by unconventional deprotonation of C-H proton</u> . Dye Pigm. 2022; 206: 110643.	12, 1	2022
	Saiyasombat W, Kiatisevi S. Bis-BODIPY linked-triazole based on catechol core for selective dual detection of Ag ⁺ and Hg ²⁺ . RSC Advances. 2021;11(6):3703-12.	12, 1	2021

	Boontiem P, Kiatisevi S. Facile and economical Miyaura borylation and one-pot Suzuki–Miyaura cross-coupling reaction. <i>Inorganica Chimica Acta</i> . 2020;506:119538.	12, 1	2020
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 765	Main Group Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)
SCCH 765	Main Group Chemistry	3 (3-0-6)
SCCH 824	Functional Dyes, Polymers, and Advanced Materials	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

15. Name Associate Professor Dr. Taweechai Amornsakchai

Education

Degree	Field	Institution	Year
Ph.D.	Polymer Physics	University of Leeds, UK	1994
B.Sc.	Industrial Chemistry	King Mongkut's Institute of Technology Ladkrabang	1989

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Natural resources

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Deebansok S, Amornsakchai T , Sae-ear P, Siriphannon P, Smith SM. Sphere-like and flake-like ZnO immobilized on pineapple leaf fibers as easy-to-recover photocatalyst for the degradation of congo red. Journal of Environ Chem Eng. 2021;9(2):104746.	12, 1	2021
	Noipitak P, Inphonlek S, Nillawong M, Sunintaboon P, Amornsakchai T . Chitosan/alginate composite porous hydrogels reinforced with PHEMA/PEI core-shell particles and pineapple-leaf cellulose fibers: their physico-mechanical properties and ability to incorporate AgNP. J Polym Res. 2021;28(5):182.	12, 1	2021

	<p>Kengkhetkit N, Amornsakchai T. Effect of matrix orientation and fiber content on the properties of uniaxial pineapple leaf fiber – polypropylene composites. KGK-Kautsch Gummi Kunstst. 2020;73(5):44.</p> <p>Surajarusarn B, Hajjar-Garreau SA, Schrodj GA, Mougine KA, Amornsakchai T. Comparative study of pineapple leaf microfiber and aramid fiber reinforced natural rubbers using dynamic mechanical analysis. Polym Test. 2020;82:106289.</p> <p>Berzin FR, Amornsakchai T, Lemaitre AL, Castellani RO, Vergnes BR. Influence of fiber content on rheological and mechanical properties of pineapple leaf fibers-polypropylene composites prepared by twin-screw extrusion. Polym Compos. 2019;40(12):4519-29.</p> <p>Sitanurak J, Fukana N, Wongpakdee T, Thepchuay Y, Ratanawimarnwong N, Amornsakchai T, et al. T-shirt ink for one-step screen-printing of hydrophobic barriers for 2D- and 3D-microfluidic paper-based analytical devices. Talanta. 2019;205:120113.</p> <p>Surajarusarn B, Traiperm P, Amornsakchai T. Revisiting the Morphology, Microstructure, and Properties of Cellulose Fibre from Pineapple Leaf so as to Expand Its Utilization. Sains Malays 2019;48(1):145–54.</p> <p>Yantaboot K, Amornsakchai T. Improvement of Stress Transfer in short Pineapple Leaf Fiber reinforced Nitrile Rubber. KGK-Kautsch Gummi Kunstst. 2019;72(7-8):47-51.</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2020</p> <p>2019</p> <p>2019</p> <p>2019</p> <p>2019</p>
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 805	Natural Fibers	3 (3-0-6)
SCCH 806	Industrial Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 805	Natural Fibers	3 (3-0-6)
SCCH 806	Industrial Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

16. Name Associate Professor Dr. Tienthong Thongpanchang

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	Columbia University, USA	1999
B.Sc.	Chemistry	Prince of Songkla University	1994

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Tanawattanasuntorn T, Thongpanchang T , Rungrotmongkol T, Hanpaibool C, Graidist P, Tipmanee V. (-)-Kusunokinin as a Potential Aldose Reductase Inhibitor: Equivalency observed via AKR1B1 dynamics simulation. ACS Omega. 2021;6(1):606-14.	12, 1	2021
	Kornsakulkarn J, Palasarn S, Choowong W, Thongpanchang T , Boonyuen N, Choeyklin R, et al. Antimalarial 9-Methoxystrobilurins, oudemansins, and related polyketides from cultures of basidiomycete Favolaschia Species. J Nat Prod. 2020;83(4):905-17.	12, 1	2020
	Rattanaburee T, Tipmanee V, Tedasen A, Thongpanchang T , Graidist P. Inhibition of	12, 1	2020

	<p>CSF1R and AKT by (±)-kusunokinin hinders breast cancer cell proliferation. Biomed Pharmacoth. 2020;129.</p> <p>Sermmai P, Ruangsupapichat N, Thongpanchang T. Oxiranyl remote anions from epoxy cinnamates and their application towards the synthesis of α,β-epoxy-γ-butyrolactones. Tetrahedron Lett. 2020;61(50):152609.</p> <p>Rattanaburee T, Thongpanchang T, Wongma K, Tedasen A, Sukpondma Y, Graidist P. Anticancer activity of synthetic (±)-kusunokinin and its derivative (±)-bursehernin on human cancer cell lines Biomed Pharmacoth. 2019;117.</p> <p>Soponpong J, Dolsophon K, Thongpanchang C, Linden AN, Thongpanchang T. Application of deuterated THENA for assigning the absolute configuration of chiral secondary alcohols. Tetrahedron Lett. 2019;60(6):497-500</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2019</p> <p>2019</p>
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 717	Advanced Natural Product Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

17. Name Associate Professor Dr. Vuthichai Ervithayasuporn

Education

Degree	Field	Institution	Year
Ph.D.	Materials Science	Japan Advanced Institute of Science and Technology, Japan	2010
M.Sc.	Chemistry	Worcester Polytechnic Institute, USA	2006
B.Sc.	Chemistry	Chulalongkorn University	2004

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Inorganic Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Majumdar R, Wannasiri C, Sukwattanasinitt M, Ervithayasuporn V . Porous silsesquioxane cage and porphyrin nanocomposites: sensing and adsorption for heavy metals and anions. Polym Chem. 2021;12(23):3391-412.	12, 1	2021
	Pherkkhantod C, Ervithayasuporn V , Chanmungkalakul S, Wang C, Liu X, Harding DJ, et al. Water-soluble polyaromatic-based imidazolium for detecting picric acid: Pyrene vs. Anthracene. Sens Actuators B Chem. 2021;330:129287.	12, 1	2021
		12, 1	2020

	<p>Prigyai N, Chanmungkalakul S, Thanyalax S, Sukwattanasinitt M, Ervithayasuporn V. Cyclic siloxanes conjugated with fluorescent aromatic compounds as fluoride sensors. Mater Adv. 2020;1(9):3358-68.</p> <p>Wannasiri C, Chanmungkalakul S, Bunchuay T, Chuenchom L, Uraisin K, Ervithayasuporn V, et al. Cross-Linking Silsesquioxane Cages with Polyaromatics as Fluorescent Porous Polymers for Fluoride Sensing and Removal. ACS Appl Polym Mater. 2020;2(3):1244-55.</p> <p>Wiwasuku T, Othong J, Boonmak J, Ervithayasuporn V, Youngme S. Sonochemical synthesis of microscale Zn(ii)-MOF with dual Lewis basic sites for fluorescent turn-on detection of Al³⁺ and methanol with low detection limits. Dalton Trans. 2020;49(29):10240-9.</p> <p>Ervithayasuporn V, Chanmungkalakul S, Churinthorn N, Jaroentomeechai T, Hanprasit S, Sodkhomkhum R, et al. Modifying interlayer space of montmorillonite with octakis(3-(1-methylimidazolium)propyl) octasilsesquioxane chloride. Appl Clay Sci. 2019;171:6-13.</p> <p>Prigyai N, Chanmungkalakul S, Ervithayasuporn V, Yodsini N, Jungsuttiwong S, Takeda N, et al. Lithium-Templated Formation of Polyhedral Oligomeric Silsesquioxanes (POSS). Inorg Chem. 2019;58(22):15110-7.</p> <p>Saini N, Wannasiri C, Chanmungkalakul S, Prigyai N, Ervithayasuporn V, Kiatkamjornwong S. Furan/thiophene-based fluorescent hydrazones as fluoride and cyanide sensors. J</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2020</p> <p>2019</p> <p>2019</p> <p>2019</p>
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	Photochem Photobiol A Chem. 2019;385:112038. Wiwasuku T, Boonmak J, Siri Wong K, Ervithayasuporn V , Youngme S. Highly sensitive and selective fluorescent sensor based on a multi-responsive ultrastable amino- functionalized Zn(II)-MOF for hazardous chemicals. Sens Actuators B Chem. 2019;284:403-13.	12, 1	2019
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 757	Solid State Chemistry	3 (3-0-6)
SCCH 763	Inorganic Structure and Bonding	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 757	Solid State Chemistry	3 (3-0-6)
SCCH 824	Functional Dyes, Polymers, and Advanced Materials	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

18. Name Assistant Professor Dr. Chutima Jiarpinitnun

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Wisconsin-Madison, USA	2008
B.S.	Chemistry	The University of Chicago, USA	2001

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Vorasin O, Momphanao K, Katrun P, Kuhakarn C, Jiarpinitnun C . Antibacterial activity evaluation of vinyl sulfones against global predominant methicillin-resistant Staphylococcus aureus USA300 Bioorg Med Chem Lett. 2022; 63: 128652	12, 1	2022
	Tonum K, Chabang N, Fongsupa S, Chantawarin S, Jiarpinitnun C , Tuchinda P, Soodvilai S. Pinostrobin inhibits renal CFTR-mediated Cl ⁻ secretion and retards cyst growth in cell-derived cyst and polycystic kidney disease rats J Pharmacol Sci. 2022; 148(4): 369–376	12, 1	2022
		12, 1	2019

	Supa-amornkul S, Mongkolsuk P, Summpunn P, Chaiyakunvat P, Navaratdusit W, Jiarpinithun C, et al. Alternative Sigma Factor B in Bovine Mastitis-Causing Staphylococcus aureus: Characterization of Its Role in Biofilm Formation, Resistance to Hydrogen Peroxide Stress, Regulon Members. Front Microbiol. 2019;10(2493).		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 715	Frontiers in Medicinal Chemistry	3 (3-0-6)
SCCH 716	Chemical Biology	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 715	Frontiers in Medicinal Chemistry	3 (3-0-6)
SCCH 716	Chemical Biology	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

19. Name Assistant Professor Dr. Kanchana Uraisin

Education

Degree	Field	Institution	Year
Ph.D.	Molecular and Material Science	Okayama University, Japan	2006
M.Sc.	Applied Analytical and Inorganic Chemistry	Mahidol University	2003
B.Sc.	Chemistry	Mahidol University	2000

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Analytical Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Danchana K, Jitthiang P, Uraisin K , Cerdà VI. WinMLR program for the determination of sorbic and benzoic acids in food samples. Food Chem. 2021;361:130086.	12, 1	2021
	Nashukha HL, Sitanurak J, Sulistyarti HE, Nacapricha D, Uraisin K . Simple and Equipment-Free Paper-Based Device for Determination of Mercury in Contaminated Soil. Molecules. 2021;26(7).	12, 1	2020
	Ratanawimarnwong N, Ruckchang P, Yooram S, Songsrirote K, Uraisin K , Cerdà VI.	12, 1	2020

	<p>Development of a microfluidic membraneless vaporization flow system for trace analysis of arsenic. Anal Methods. 2021;13(2):202-11.</p> <p>Mantim T, Chaisiwamongkhon K, Uraisin K, Hauser PC, Wilairat P, Nacapricha D. Dual-Purpose Photometric-Conductivity Detector for Simultaneous and Sequential Measurements in Flow Analysis. Molecules. 2020;25(10).</p> <p>Srikhaow A, Butburee T, Pon-On W, Srihirin T, Uraisin K, Suttiponpanit K, et al. Efficient Mercury Removal at Ultralow Metal Concentrations by Cysteine Functionalized Carbon-Coated Magnetite. Appl Sci. 2020;10(22).</p> <p>Ayuning Tyas A, Sonsa-ard T, Uraisin K, Nacapricha D, Saetear PH. Simple Flow-Based System with an In-Line Membrane Gas-Liquid Separation Unit and a Contactless Conductivity Detector for the Direct Determination of Sulfite in Clear and Turbid Food Samples. Membranes. 2020;10(5).</p> <p>Wannasiri C, Chanmungkalakul S, Bunchuay T, Chuenchom L, Uraisin K, Ervithayasuporn V, et al. Cross-Linking Silsesquioxane Cages with Polyaromatics as Fluorescent Porous Polymers for Fluoride Sensing and Removal. ACS Appl Polym Mater. 2020;2(3):1244-55.</p> <p>Kraikaew P, Pluangklang T, Ratanawimarnwong N, Uraisin K, Wilairat P, Mantim T, Nacapricha D. Simultaneous determination of ethanol and total sulfite in white wine using on-line cone</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2020</p> <p>2020</p> <p>2019</p>
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	reservoirs membraneless gas-liquid separation flow system. Microchem J. 2019;149:104007.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 732	Instrumental Analysis Laboratory	3 (1-6-4)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 732	Instrumental Analysis Laboratory	3 (1-6-4)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

20. Name Assistant Professor Dr. Pawaret Leowanawat

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Pennsylvania, USA	2013
B.Sc.	Chemistry	Mahidol University	2004

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Chumsri N, Kuhakarn C, Leowanawat P , Reutrakul V, Soorukram D. Concise synthesis and confirmation of the absolute configurations of naturally occurring bioactive 2,7'-cycloignans. Tetrahedron Lett. 2021;66:152827.	12, 1	2021
	Kantarod K, Worakul T, Soorukram D, Kuhakarn C, Reutrakul V, Surawatanawong P, Wattanathana W, Leowanawat P . Dibenzopleiadiene-embedded polyaromatics via [4 + 3] annulative decarbonylation/decarboxylation. Org Chem Front. 2021;8(3):522-30.	12, 1	2021
		12, 1	2020

	<p>Chatpreecha R, Kuhakarn C, Leowanawat P, Reutrakul V, Soorukram D. Bioinspired stereoselective synthesis of chiral 2,5-diaryl-3,4-dimethyltetrahydrofurans from unprotected 1,4-diarylbutane-1,4-diols (20-11276YP). <i>Arkivoc</i> 2020. 2020:299-311.</p> <p>La-ongthong K, Naweephattana P, Khaikate O, Surawatanawong P, Soorukram D, Pohmakotr M, et al. Alkanethiol-mediated cyclization of o-alkynylisocyanobenzenes: synthesis of bis-thiolated indole derivatives. <i>J Org Chem</i>. 2020;85(10):6338-51.</p> <p>Kantarod K, Naweephattana P, Reutrakul V, Pohmakotr M, Soorukram D, Kuhakarn C, Kuhakarn C, Surawatanawong P, Leowanawat P. Synthesis of peri-diarylated naphthalimides via double decarboxylative cross-coupling reaction. <i>Synthesis</i>. 2019;51(15):2915-22.</p> <p>Khaikate O, Inthalaeng N, Meesin J, Kantarod K, Pohmakotr M, Reutrakul V, Soorukram D, Leowanawat P, Kuhakarn C. Synthesis of indolo- and benzothieno[2,3-b]quinolines by a cascade cyclization of o-alkynylisocyanobenzene derivatives. <i>J Org Chem</i>. 2019;84(23):15131-44.</p> <p>Khaikate O, Soorukram D, Leowanawat P, Pohmakotr M, Reutrakul V, Kuhakarn C. Azide-Triggered Bicyclization of o-Alkynylisocyanobenzenes: synthesis of tetrazolo[1,5-a]quinolines. <i>Eur J Org Chem</i>. 2019;2019(42):7050-7.</p> <p>Racochote S, Pohmakotr M, Kuhakarn C, Leowanawat P, Reutrakul V, Soorukram D.</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2019</p> <p>2019</p> <p>2019</p> <p>2019</p> <p>2019</p>
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	Asymmetric synthesis of trifluoromethylated ent-fragransin C ₁ . Eur J Org Chem. 2019;2019(12):2212-23. Wilson DA, Andreopoulou KA, Peterca MI, Leowanawat P , Sahoo DI, Partridge BE, et al. Supramolecular spheres self-assembled from conical dendrons are chiral. J Am Chem Soc. 2019;141(15):6162-6.	12, 1	2019
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Current Teaching Duty

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 704 Seminar in Chemistry	1 (1-0-2)
SCCH 705 Progress in Chemistry	3 (3-0-6)
SCCH 706 Research Skill Development I	3 (3-0-6)
SCCH 707 Research Skill Development II	3 (3-0-6)
SCCH 708 Special Problems in Chemistry	3 (3-0-6)
SCCH 711 Organic Structure Determination	3 (3-0-6)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 709 State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887 Research Project Development II	2 (2-0-4)
SCCH 888 Innovations in Chemistry	3 (3-0-6)
SCCH 889 Seminar in Chemistry II	1 (1-0-2)
SCCH 711 Organic Structure Determination	3 (3-0-6)
SCCH 712 Molecular Structure and Functions	3 (3-0-6)
SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

21. Name Assistant Professor Dr. Phoonthawee Saetear

Education

Degree	Field	Institution	Year
Ph.D.	Analytical Chemistry	Mahidol University	2014
M.Sc.	Applied Analytical and Inorganic Chemistry	Mahidol University	2010
B.Sc.	Chemistry	Mahidol University	2007

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Flow-based analysis in tubular- and paper-based formats
2. Method development for chemical analysis and diagnosis
3. Refractive index-based detection

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Ayuning Tyas A, Sonsa-ard T, Uraisin K, Nacapricha D, Saetear P . Simple Flow-Based System with an In-Line Membrane Gas-Liquid Separation Unit and a Contactless Conductivity Detector for the Direct Determination of Sulfite in Clear and Turbid Food Samples. <i>Membranes</i> . 2020;10(5).	12, 1	2020
	Leclercq LA, Saetear P , Rolland-Sabaté AG, Biron J-P, Chamieh JO, Cipelletti LU, et al. Size-Based Characterization of Polysaccharides	12, 1	2019

	by Taylor Dispersion Analysis with Photochemical Oxidation or Backscattering Interferometry Detections. <i>Macromolecules</i> . 2019;52(12):4421-31. Wichit S, Hamel RO, Yainoy S, Gumpangseth N, Panich S, Phuadraksa T, et al. Interferon-inducible protein (IFI) 16 regulates Chikungunya and Zika virus infection in human skin fibroblasts. <i>EXCLI J</i> . 2019;18:467-76.	12, 1	2019
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 731	Advanced Techniques in Analytical Chemistry	3 (3-0-6)
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)
SCCH 739	Current Topics in Analytical Chemistry I	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 731	Advanced Techniques in Analytical Chemistry	3 (3-0-6)
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)
SCCH 739	Current Topics in Analytical Chemistry I	3 (3-0-6)

SCCH 699 Dissertation	36 (0-108-0)
SCCH 799 Dissertation	48 (0-144-0)
SCCH 898 Dissertation	48 (0-144-0)

22. Name Assistant Professor Dr. Soraya Pornsuwan

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of Pittsburgh	2007
M.S.	Chemistry	University of Wisconsin-Madison, USA	2001
B.Sc.	Chemistry	Mahidol University	1997

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Biological enzymatic activity of metalloproteins.
2. Applying spectroscopic techniques for protein dynamics.

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Boochakiatab S, Tantraviwat D, Thongsook O, Pornsuwan S , Nattestad A, Chen J, Channei D, Inceesungvorn B. Effect of exposed facets of bismuth vanadate, controlled by ethanolamine, on oxidative coupling of primary amines, J Coll Int Sci 2021; 602, 168-176.	12, 1	2021
	Juntrapirom S, Tantraviwat D, Thongsook O, Anuchai S, Pornsuwan S , Channei D, Inceesungvorn B. Natural sunlight driven photocatalytic coupling of primary amines over	12, 1	2021

	<p>TiO₂/BiOBr heterojunction, Appl Surf Sci. 2021; 545, 149015.</p> <p>Phasayavan W, Japa M, Pornsuwan S, Tantraviwat D, Kielar F, Golovko VB, Jungsuttiwong S, Inceesungvorn B. Oxygen-deficient bismuth molybdate nanocatalysts: Synergistic effects in boosting photocatalytic oxidative coupling of benzylamine and mechanistic insight, J Coll Int Sci. 2021; 581, 719-728.</p> <p>Kingchok S, Pornsuwan S. Comparison of spherical and rod-like morphologies of SBA-15 for enzyme immobilization, J Por Mat. 2020; 27(5), 1547-1557.</p> <p>Juntrapirom S, Anuchai S, Thongsook O, Pornsuwan S, Meepowpan P, Thavornyutikarn P, Phanichphant S, Tantraviwat D, Inceesungvorn B. Photocatalytic activity enhancement of g-C₃N₄/BiOBr in selective transformation of primary amines to imines and its reaction mechanism, Chem Eng J. 2020; 394, 124934.</p> <p>Khampuanbut A, Santalelat S, Pankiew A, Channei D, Pornsuwan S, Faungnawakij K, Phanichphant S, Inceesungvorn B. Visible-light-driven WO₃/BiOBr heterojunction photocatalysts for oxidative coupling of amines to imines: Energy band alignment and mechanistic insight, J Coll Int Sci. 2020; 560, 213-224.</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2021</p> <p>2020</p> <p>2020</p> <p>2019</p> <p>2019</p>
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	<p>Chongkae S, Nosanchuk JD, Pruksaphon K, Laliam A, Pornsuwan S, Youngchim S. Production of melanin pigments in saprophytic fungi in vitro and during infection, J Basic Microb. 2019; 59 (11), 1092-1104.</p> <p>Poonsawat T, Techalertmanee T, Chumkaeo P, Yunita I, Meechai T, Namkajorn M, Pornsuwan S, Somsook, E. Facile synthesis of high performance iron oxide/carbon nanocatalysts derived from the calcination of ferrocenium for the decomposition of methylene blue, Catalysts. 2019; 9 (11), 948.</p> <p>Khunoad N, Krittametaporn N, Pornsuwan S, Kongsaree P, Demeshko S, Sangtrirutnugul P. Self-assembled Cu(II) cluster from aerobic oxidation of Cu(I)Br with tris(triazolyl)methanol, Inorg Chim Acta. 2019; 488, 141-144.</p>	<p>12, 1</p> <p>12, 1</p>	<p>2019</p> <p>2019</p>
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 785	Advanced physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 702	Chemical Safety and Risk Management	1 (1-0-2)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 772	Thermodynamics and Statistical Mechanics	3 (3-0-6)
SCCH 775	Modern Chemical Physics	3 (3-0-6)
SCCH 776	Mathematical Methods	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 780	Special Topics in Physical Chemistry	3 (3-0-6)
SCCH 785	Advanced physical Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

23. Name Assistant Professor Dr.Teera Chantarojsiri

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	University of California, Berkeley, USA	2015
B.S.	Chemistry	Stanford University, USA	2010

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Small Molecule Activations
2. Homogeneous Catalysis
3. Molecular Electrochemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Léonard NG, Dhaoui R, Chantarojsiri T , Yang JY. Electric fields in catalysis: from enzymes to molecular catalysts. ACS Catal. 2021; 11(17): 10923–10932.	12, 1	2021
	Kittikool T, Phakdeeyothin K, Chantarojsiri T , Yotphan S. Manganese-promoted regioselective direct C3-phosphinoylation of 2-pyridones. Eur J Org Chem. 2021; 2021(21): 3071–3078.	12, 1	2021
	Krittametaporn N, Chantarojsiri T , Virachotikul A, Phomphrai K, Kuwamura N, Kojima T, Konno T, Sangtrirutnugul P. Influence of catalyst	12, 1	2020

	nuclearity on copper-catalyzed aerobic alcohol oxidation. Dalton Trans. 2020;49(3):682-9.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 763	Inorganic Structure and Bonding	3 (3-0-6)
SCCH 769	Bioinorganic Chemistry: from Metals in Biology to Modern Applications	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 763	Inorganic Structure and Bonding	3 (3-0-6)
SCCH 821	Chemistry of Small Molecules	3 (3-0-6)
SCCH 825	Bioinorganic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

24. Name Assistant Professor Dr. Torsak Luanphaisarnnont

Education

Degree	Field	Institution	Year
Ph.D.	Chemistry	Harvard University, USA	2012
M.A.	Chemistry	Harvard University, USA	2008
B.S.	Chemistry	Massachusetts Institute of Technology, USA	2005

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Saejong P, Somprasong S, Rujirasereesakul C, Luanphaisarnnont T. Direct synthesis of coumarin derivatives from alkynoic esters via dual organocatalysis. SynLett. 2022, DOI: 10.1055/a-1797-0386.	12, 1	2022
	Prasitwatcharakorn W, Rujirasereesakul C, Luanphaisarnnont T. Synthesis of 4-aryl-1,2-naphthoquinones via a conjugate addition-oxidation reaction catalyzed by p-toluenesulfonic acid. Results Chem. 2022;4:100319.	12, 1	2022
	Somprasong S, Prasitwatcharakorn W, Luanphaisarnnont T. Efficient synthesis of 2H-	12, 1	2020

	chromene derivatives via a dual-organocatalytic reaction. Tetrahedron Lett. 2020;61(42):152402.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 720	Current Topics in Organic Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

25. Name Lecturer Dr. Nopporn Ruangsapapichat

Education

Degree	Field	Institution	Year
Ph.D.	Organic Chemistry	University of Groningen, the Netherland	2011
M.Sc.	Organic Chemistry	Mahidol University	2006
B.Sc.	Chemistry	Mahidol University	2002

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Organic chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Tongsuk S, Malatong R, Unjarern T, Wongkaew C, Surawatanawong P, Sudyoadsuk T, Promarak V, Ruangsapapichat N. Enhancement of performance of OLEDs using double indolo[3,2-b]indole electron-donors based emitter. J Luminescence. 2021; 238: 118287	12, 1	2021
	Ruamyart C, Chasing P, Sudyoadsuk T, Promarak V, Ruangsapapichat N. Double anchor indolo[3,2-b]indole-derived metal-free dyes with extra electron donors as efficient sensitizers for dye-sensitized solar cells. New J Chem. 2021;45(17):7542-54.	12, 1	2021

	Sermmai P, Ruangsupapichat N, Thongpanchang T. Oxiranyl remote anions from epoxy cinnamates and their application towards the synthesis of α,β -epoxy- γ -butyrolactones. Tetrahedron Lett. 2020;61(50):152609.	12, 1	2020
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 712	Molecular Structures and Functions	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 711	Organic Structure Determination	3 (3-0-6)
SCCH 712	Molecular Structures and Functions	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

26. Name Lecturer Dr. Suarwee Akavipat

Education

Degree	Field	Institution	Year
Ph.D.	Environmental Science	New Jersey Institute of Technology, USA	2013
M.S.	Environmental Science	New Jersey Institute of Technology, USA	2008
B.Sc.	Chemistry	Chulalongkorn University	2003

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Physical chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Snitsiriwat S , Hudzik JM, Chaisaward K, Stoler LR, Bozzelli JW. Thermodynamic properties: enthalpy, entropy, heat capacity, and bond energies of fluorinated carboxylic acids. J Phys Chem A, 2022; 126(1): 3–15.	12, 1	2022
	Snitsiriwat S , Yommee S, Bozzelli JW. Kinetic analysis of unimolecular reactions following the addition of the hydroxyl radical to 1,1,2-trifluoroethene. J Phys Chem A. 2021;125(24):5375-84.	12, 1	2021
	Snitsiriwat S , Yommee S, Bozzelli JW. Thermochemistry of intermediates and products in the oxidation reaction of 1,1,2-	12, 1	2019

	trifluoroethene via OH radical. J Phys Chem A. 2019;123(37):8017-27.		
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Current Teaching Duty

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 704	Seminar in Chemistry	1 (1-0-2)
SCCH 705	Progress in Chemistry	3 (3-0-6)
SCCH 706	Research Skill Development I	3 (3-0-6)
SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

27. Name Lecturer Dr. Thanthapatra Bunchuay

Education

Degree	Field	Institution	Year
D.Phil	Inorganic Chemistry	University of Oxford, UK	2018
M.Sc.	Applied Analytical and Inorganic Chemistry	Mahidol University	2014
B.Sc.	Chemistry	Mahidol University	2011

Affiliation Department of Chemistry, Faculty of Science, Mahidol University

Research Interest/Expertise

1. Inorganic Chemistry

Academic work as not part of the study for degree certificate and published and disseminated in accordance with the stipulated criteria regarding academic rank appointment in five retrospective years *

Types of Academic Work	Title	Standard Criteria and Weights	Year of Publication
Published research work	Docker A, Bunchuay T , Ahrens M, Martinez-Martinez AJ, Beer PD. Chalcogen Bonding Ion-Pair Cryptand Host Discrimination of Potassium Halide Salts. Chemistry – A European Journal. 2021;27(29):7837-41.	12, 1	2021
	Bunchuay T , Docker A, Eiamprasert U, Surawatanawong P, Brown A, Beer PD. Chalcogen Bond Mediated Enhancement of Cooperative Ion-Pair Recognition. Angew Chem Int Ed. 2020;59(29):12007-12.	12, 1	2020
	Chaisiwamongkhol K, Labaidae S, Pon-in S, Pinsrithong S, Bunchuay T , Phonchai A.	12, 1	2020

	<p>Smartphone-based colorimetric detection using gold nanoparticles of sibutramine in suspected food supplement products. <i>Microchem J.</i> 2020;158:105273.</p> <p>Chutimasakul T, Na Nakhonpanom P, Tirdtrakool W, Intanin A, Bunchuay T, Chantiwas R, Tantirungrotechai J. Uniform Cu/chitosan beads as a green and reusable catalyst for facile synthesis of imines via oxidative coupling reaction. <i>RSC Adv.</i> 2020;10(35):21009-18.</p> <p>Ruengsuk A, Khamphaijun K, Pananusorn P, Docker A, Tantirungrotechai J, Sukwattanasinitt M, Harding DJ, Bunchuay T. Pertosylated pillar[5]arene: self-template assisted synthesis and supramolecular polymer formation. <i>Chem Commun.</i> 2020;56(62):8739-42.</p> <p>Wannasiri C, Chanmungkalakul S, Bunchuay T, Chuenchom L, Uraisin K, Ervithayasuporn V, et al. Cross-Linking Silsesquioxane Cages with Polyaromatics as Fluorescent Porous Polymers for Fluoride Sensing and Removal. <i>ACS Appl Polym Mater.</i> 2020;2(3):1244-55.</p> <p>Bunchuay T, Docker A, Martinez-Martinez AJ, Beer PD. A Potent Halogen-bonding donor motif for anion recognition and anion template mechanical bond synthesis. <i>Angew Chem Int Ed.</i> 2019;58(39):13823-7.</p>	<p>12, 1</p> <p>12, 1</p> <p>12, 1</p> <p>12, 1</p>	<p>2020</p> <p>2020</p> <p>2020</p> <p>2019</p>
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Current Teaching Duty

SCCH 701 Frontiers in Chemistry	3 (3-0-6)
SCCH 704 Seminar in Chemistry	1 (1-0-2)
SCCH 705 Progress in Chemistry	3 (3-0-6)
SCCH 706 Research Skill Development I	3 (3-0-6)

SCCH 707	Research Skill Development II	3 (3-0-6)
SCCH 708	Special Problems in Chemistry	3 (3-0-6)
SCCH 765	Main Group Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Assigned Teaching Load for the Proposed Program

SCCH 701	Frontiers in Chemistry	3 (3-0-6)
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)
SCCH 887	Research Project Development II	2 (2-0-4)
SCCH 888	Innovations in Chemistry	3 (3-0-6)
SCCH 889	Seminar in Chemistry II	1 (1-0-2)
SCCH 765	Main Group Chemistry	3 (3-0-6)
SCCH 767	NMR Spectroscopy in Inorganic Chemistry	3 (3-0-6)
SCCH 823	Macrocyclic and Supramolecular Chemistry	3 (3-0-6)
SCCH 699	Dissertation	36 (0-108-0)
SCCH 799	Dissertation	48 (0-144-0)
SCCH 898	Dissertation	48 (0-144-0)

Attachment

Appendix C Curriculum Mapping

● Major Responsibility ○ Minor Responsibility

Course	1. Morality and Ethics				2. Knowledge		3. Intellectual Development			4. Interpersonal Skills and Responsibility		5. Skills in Numerical Analysis, Communication, and Information Technology				
	1	2	3	4	1	2	1	2	3	1	2	1	2	3	4	5
1) Required Courses																
SCCH 701 Frontiers in Chemistry	○	○		●	○	●		●		○	○			●		○
SCCH 702 Chemical Safety and Risk Management				●		●		○	○	●			○	●		●
SCCH 703 Scientific Communications	○	○	●	●		●				○	○	●	●	●	●	●
SCCH 709 State-of-the-Art of Instrumentation			●		●		●	●		○	○	●				
SCCH 710 Business Models of Chemical Industries					○	●			●	●				●		●
SCCH 887 Research Project Development II		●	●	●	●	●	●	●	●	●	●	●	●	●	○	●
SCCH 888 Innovations in Chemistry				●	●		●	●	●	○	○	○		●		●
SCCH 889 Seminar in Chemistry II	●	○	●	●	●	●	○	○	○	●	●	●	●	●		●
2) Elective																
SCCH 711 Organic Structure Determination		●		●	●	●	●	●		○	●		○	○		●

SCCH 712 Molecular Structures and Functions		●		●	●	●	○	●			●		○	○		●
SCCH 713 Advanced Organic Synthesis		●		●	●	●	○	●			●		○	○		●
SCCH 714 Advanced Organic Reaction Mechanism		●		●	●	●	●	●		●	●		○			●
SCCH 715 Frontiers in Medicinal Chemistry		●		●	●	●	●	●		●	●		○	○		●
SCCH 716 Chemical Biology		●		●	●	●	●	●		●	●		○	○		●
SCCH 717 Advanced Natural Product Chemistry		●		●	●	●	○	●		●	●		●	○		●
SCCH 718 Asymmetric Synthesis		●		●	●	●	●	●		●	●		●	●		●
SCCH 719 Advanced Heterocyclic Chemistry		●		●	●	●	○	●		●	●		●	●		●
SCCH 720 Current Topics in Organic Chemistry		●		●	●	●	●	●		●	●		●	●		●
SCCH 731 Advanced Techniques in Analytical Chemistry		●		●	●	●	●	●		○	●	○	●		○	●
SCCH 732 Instrumental Analysis Laboratory	○	●		●	●	●	●	●		●	●	●	○		●	●
SCCH 733 Separation Techniques		●		●	●	●	●	●		○	●	○	○			○
SCCH 734 Fluidic Technology for Analytical Science		●		●	●	●	●	●		○	●		○			○
SCCH 735 Chemometrics		●		●	●	●	●	●		○	●	●	○		●	○
SCCH 738 Special Topics in Analytical Chemistry		●		●	●	●		○		○	●		○			○
SCCH 739 Current Topics in Analytical Chemistry I	●	●	●	●	●	●		○		○	●		●	●		●

SCCH 740 Current Topics in Analytical Chemistry II	●	●	●	●	●	●		○			●		●	●		●
SCCH 753 Homogeneous Catalysis		●		●	●	●	●	●	●	●	●			●		●
SCCH 754 Organotransition Metal Chemistry		●		●	●	●	●	●		●	●		●	●		●
SCCH 756 Heterogeneous Catalysis		●		●	●	●	●	●	●	●	●		○	●		●
SCCH 757 Solid State Chemistry		●		●	●	●	●	●		●	●		○	●		●
SCCH 758 Small Molecule Activation		●		●	●	●	○	●	●	●	●		○	●		●
SCCH 759 Olefin Polymerization Catalysis		●		●	●	●	○	●	●	●	●		○	●		●
SCCH 760 Biorefinery		●		●	●	●	○	●	●	●	●		○	●		●
SCCH 761 Nanocatalysis		●		●	●	●	○	●	●	●	●		○	●		●
SCCH 763 Inorganic Structure and Bonding		●		●	●	●	●	●		●	●		○	○		●
SCCH 764 Characterization Techniques in Inorganic Chemistry		●		●	●	●	●	●		○	●		○	●	○	●
SCCH 765 Main Group Chemistry		●		●	●	●	●	●		●	●		○	●		●
SCCH 766 Inorganic Reaction Mechanisms		●		●	●	●	●	●		●	●		○	●		●
SCCH 767 NMR Spectroscopy in Inorganic Chemistry		●		●	●	●	●	●		●	●		○	●		●
SCCH 768 Special Topics in Inorganic Chemistry		●		●	○	●	●	●		●	●		○	●		●
SCCH 769 Bioinorganic Chemistry		●		●	○	●	●	●		●	●		○	●		●
SCCH 771 Quantum Chemistry		●	○	●	●	●		●		○	●	●	●	●	●	●
SCCH 772 Thermodynamics and Statistical Mechanics		●	○	●	●	●		●		○	●	●	●	●	●	●

SCCH 774 Chemical Kinetics and Molecular Dynamics		●	○	●	●	●		●		○	●	●	●	●	●	●
SCCH 775 Modern Chemical Physics		●	○	●	●	●		●		○	●	●	●	●	●	●
SCCH 776 Mathematical Methods		●	○	●	●	●	○	●		○	●	●	●	●	●	●
SCCH 778 Physico-Chemical Techniques		●	●	●	●	●		●		○	●	●	●	●	●	●
SCCH 779 Surface Chemistry and Advanced Electrochemistry		●	○	●	●	●	●	●		○	●	●	●	●	●	●
SCCH 780 Special Topics in Physical Chemistry		●	○	●	●	●	○	○		○	●	●	●	●	●	●
SCCH 781 Special Topics in Chemical Physics		●	○	●	●	●	○	○		○	●	●	●	●	●	●
SCCH 785 Advanced Physical Chemistry		●	●	●	●	●	●	●		○	●		●	●	●	●
SCCH 801 Environmental Materials			●	●	●	●	●	●		○	●		○	○		●
SCCH 802 Lignocellulosic Chemistry	○	●	●	○	●	●	●	●		○	●		○			
SCCH 803 Chemistry of Waste and Pollution		●		○	●	●	●	●			●	○			●	
SCCH 804 Concepts in Sustainability	●	●	○	○	●	●	●	●		●	●	○	●	●	○	●
SCCH 805 Natural Fibers		●	○		●		●	●		●	●	○		●		
SCCH 806 Industrial Chemistry	●	●	○	●	●	●	●	●		●	●		○	○		●
SCCH 821 Chemistry of Small Molecules		●		○	●	●	●	○		●	●		○	●		●
SCCH 822 Inorganic Materials		●		○	●	●	●	○		●	●		○	●		●
SCCH 823 Macrocyclic and Supramolecular Chemistry		●		○	●	●	●	○		●	●		○	●		●

SCCH 824 Functional Dyes, Polymers and Advanced Materials		●		○	●	●	●	○		●	●		○	●		●
SCCH 825 Bioinorganic Chemistry		●		●	○	●	●	●		●	●		○	●		●
SCCH 841 Cutting-Edge Technologies for Bio-Circular-Green Economy				●	●	●		●	●	●	●		○	●		●
SCCH 842 Computational Design of Catalysts and Materials				●	●	●		●	●	●	●	●	●	●	●	●
SCCH 843 Business Strategies for Entrepreneurs				●	●	●		●	●	●	●			●		●
SCCH 844 Digital Transformation for Entrepreneurs				●	●	●		●	●	●	●	●	●	●	●	●
SCCH 845 Learning Design for Chemistry Classrooms				●	●	●		●	●	●	●		●	●		●
SCCH 846 Digitization, Miniaturization, and Advanced Manufacturing for Chemistry Classrooms				●	●	●		●	●	●	●		●	●		●
SCCH 847 Metaverse for Chemistry Classrooms				●	●	●		●	●	●	●		●	●		●
SCCH 848 NMR Quantum Computation				●	●	●		●	●	●	●		●	●		●
SCCH 849 Chemistrobot				●	●	●		●	●	●	●		●	●		●
3) Dissertation																
SCCH 898 Dissertation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SCCH 699 Dissertation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SCCH 799 Dissertation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Mapping of the TQF Learning Outcomes to the Core Values of Mahidol University

Learning Outcome (According to TQF)	Core values of Mahidol University
1. Morality and Ethics	
1.1 Have professional integrity and compassion.	Altruism, Integrity
1.2 Have self-discipline and self-responsibility.	Altruism, Integrity
1.3 Respect rules and regulations of the program and institution.	Integrity
1.4 Possess professional ethics.	Integrity
2. Knowledge	
2.1 Possess comprehensive knowledge, theories and concepts, and in-depth understanding of relevant to chemistry.	Originality, Mastery
2.2 Remain updated on new knowledge.	Originality
3. Intellectual Development	
3.1 Systematically perform analysis.	Mastery, Determination , Originality
3.2 Solve problems analytically and logically.	Mastery, Determination , Originality
3.3 Propose new ideas in chemistry	Mastery, Originality
4. Interpersonal Skills and Responsibility	
4.1 Be open-minded toward different opinions and possess good human relations.	Harmony
4.2 Be responsible for assigned task and duty.	Altruism, Determination

Learning Outcome (According to TQF)	Core values of Mahidol University
5. Skills in Numerical Analysis, Communication, and Information Technology	
5.1 Utilize data using appropriate technology.	Mastery, Determination, Originality
5.2 Choose appropriate information technology platforms that suit research inquiry.	Mastery, Determination
5.3 Use English speaking, listening, reading, and writing skills to communicate with others.	Mastery, Harmony
5.4 Analyze numerical data and use basic statistics correctly.	Mastery, Determination
5.5 Communicate chemical information to other people effectively by using appropriate media.	Mastery, Originality

Attachment
Appendix D AUN-QA

Table 1: Comparison between before and after revised objective of the programs

Objective of the Program in 2018	Revised Objectives of the Program in 2023
1. Graduates have good moral understanding and conform to scientific ethics. 2. Graduates possess comprehensive knowledge and experience in chemistry for their future careers in private and government sectors. 3. Graduates have capability of making well-informed decisions, conducting a task effectively, and creating original work. 4. Graduates show good responsibility and are able to work as a team. 5. Graduates attain analytical, communication, and information technology skills that enable them to compete at the international level.	1. Graduates have good moral understanding and conform to scientific ethics and social responsibility. 2. Graduates possess comprehensive knowledge and experience in chemistry 3. Graduates show analysis and synthesis thinking, problem solving, and original work creation. 4. Graduates show good human relations, leadership, and responsibility. 5. Graduates attain analytical, communication, and information technology skills.

Table 2: Program objectives and expected program learning outcomes

Objective of the Program	Program Learning Outcome*					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
1. Graduates have good moral understanding and conform to scientific ethics and social responsibility.	✓	✓				

Objective of the Program	Program Learning Outcome*					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
2. Graduates possess comprehensive knowledge and experience in chemistry.				✓		✓
3. Graduates show analysis and synthesis thinking, problem solving, and original work creation.			✓			
4. Graduates show good human relations, leadership, and responsibility.					✓	
5. Graduates attain analytical, communication, and information technology skills.						

***Program Learning Outcomes (PLOs)**

1. Graduates must be concerned about the ethical and social aspects when applying chemical knowledge.
2. Graduates are capable of describing chemical knowledge, designing chemical research and conducting experiments safely for the benefit of mankind.
3. Graduates are capable of working with others in the global enterprises.
4. Graduates are capable of adapting themselves to the latest chemical skills and knowledge to become life-long learners.
5. Graduates are capable of strengthening the competitiveness of their work by means of digital technologies and/or automation.
6. Graduates are capable of working as independent researchers.

Table 3: Standard domains of learning outcome and Program Learning Outcomes

Domains	Standard Learning Outcomes (TQF)	Program Learning Outcomes					
		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
Morality and Ethics	1.1 Have professional integrity and compassion.	✓					
	1.2 Have self-discipline and self-responsibility.	✓					
	1.3 Respect rules and regulations of the program and institution.	✓					
	1.4 Possess professional ethics.	✓					
Knowledge	2.1 Possess comprehensive knowledge, theories and concepts, and in-depth understanding of relevant to chemistry.		✓				✓
	2.2 Remain updated on new knowledge.		✓				✓
Intellectual Development	3.1 Systematically perform analysis.				✓		✓
	3.2 Solve problems analytically and logically.				✓		✓
	3.3 Propose new ideas in chemistry				✓		✓
Interpersonal Relationship and Responsibility	4.1 Be open-minded toward different opinions and possess good human relations.			✓			
	4.2 Be responsible for assigned task and duty.			✓			
Math, Communication, IT Skills	5.1 Utilize data using appropriate technology.					✓	
	5.2 Choose appropriate information technology platforms.					✓	

Domains	Standard Learning Outcomes (TQF)	Program Learning Outcomes					
		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
	5.3 Use English speaking, listening, reading, and writing skills to communicate with others.					✓	
	5.4 Analyze numerical data and use basic statistics correctly.					✓	
	5.5 Communicate chemical information to other people effectively by using appropriate media.					✓	

Table 4: Learning and Assessment Strategies for Program Learning Outcomes Evaluation

PLOs	Learning Method	Assessment
1. Graduates must be concerned about the ethical and social aspects when applying chemical knowledge.	1.1 Give advice, directly or indirectly, during the teaching of the courses and the dissertation period. 1.2 Give a clear timeline emphasis on assignments and class attendance. 1.3 Arrange group activities and encourage group assignments in relevant courses.	1.1 Monitor students' behavior. 1.2 Observe and make record of punctuality for class attendance and assignments. 1.3 Evaluate the performance of group activities or assignments.
2. Graduates are capable of describing chemical knowledge, designing chemical research and conducting experiments safely for the benefit of mankind.	2.1 Qualifying examination 2.2 Dissertation period that includes proposal, progress report, and defense 2.3 Participation in national or international conferences 2.4 Workshops on English skills 2.5 Manuscript preparation	2.1 Evaluation of qualifying examination 2.2 Dissertation progress reports, proposal examination, and defense 2.3 Record of conference participations 2.4 Examinations and self-evaluation 2.5 Publication of the manuscript

PLOs	Learning Method	Assessment
3. Graduates are capable of working with others in the global enterprises.	3.1 Courses 3.2 Participation in national or international academic conference	3.1 Course evaluation, as well as dissertation proposal examinations and defense 3.2 Record of conference participations
4. Graduates are capable of adapting themselves to the latest chemical skills and knowledge to become life-long learners.	4.1 Courses 4.2 Workshops to enhance 21 st -century skills to students	4.1 Evaluation of qualifying examination 4.2 Evaluation of the performance in the workshops
5. Graduates are capable of strengthening the competitiveness of their work by means of digital technologies and/or automation.	5.1 Courses 4.2 Workshops to enhance 21 st -century skills to students	5.1 Course evaluation 5.2 Evaluation of the performance in the workshops
6. Graduates are capable of working as independent researchers.	6.1 Laboratory sessions in appropriate courses 6.2 Dissertation period that includes proposal, progress report, and defense 6.3 Group activities and group assignments in relevant courses	6.1 Course evaluation, as well as dissertation proposal examinations and defense 6.2 Evaluation of group activities or assignments

Table 5: Relationship between Courses of the Program and Program Learning Outcomes (PLOs)

Code	Name	Credits	PLOs					
			1	2	3	4	5	6
Required Courses								
SCCH 701	Frontiers in Chemistry	3 (3-0-6)	I	I	I		I	I
SCCH 702	Chemical Safety and Risk Management	1 (1-0-2)	I	I	I	I	I	I
SCCH 703	Scientific Communications	1 (1-0-2)	I	I	I	I		I
SCCH 709	State-of-the-Art of Instrumentation	3 (3-0-6)	P	P		P	P	P
SCCH 710	Business Models of Chemical Industries	1 (1-0-2)		R	R	R	R	R
SCCH 887	Research Project Development II	2 (2-0-4)	R	R	R	R	R	R
SCCH 888	Innovations in Chemistry	3 (3-0-6)	R	R		M	R	M
SCCH 889	Seminar in Chemistry II	1 (1-0-2)	M	M	M	M	M	M
Elective Courses								
SCCH 711	Organic Structure Determination	3 (3-0-6)	R	R		R	R	R
SCCH 712	Molecular Structures and Functions	3 (3-0-6)	R	R		R	R	R
SCCH 713	Advanced Organic Synthesis	3 (3-0-6)	R	R		R	R	R
SCCH 714	Advanced Organic Reaction Mechanism	3 (3-0-6)	R	R	R	R	R	R
SCCH 715	Frontiers in Medicinal Chemistry	3 (3-0-6)	R	R	R	R	R	R

SCCH 716	Chemical Biology	3 (3-0-6)	R	R	R	R	R	R
SCCH 717	Advanced Natural Product Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 718	Asymmetric Synthesis	3 (3-0-6)	R	R	R	R	R	R
SCCH 719	Advanced Heterocyclic Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 720	Current Topics in Organic Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 731	Advanced Techniques in Analytical Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 732	Instrumental Analysis Laboratory	3 (1-6-4)	R	R	R	R	R	R
SCCH 733	Separation Techniques	3 (3-0-6)	R	R	R	R		R
SCCH 734	Fluidic Technology for Analytical Science	3 (3-0-6)	R	R	R	R		R
SCCH 735	Chemometrics	3 (2-3-5)	R	R	R	R	R	R
SCCH 738	Special Topics in Analytical Chemistry	3 (3-0-6)	R	R	R			R
SCCH 739	Current Topics in Analytical Chemistry I	3 (3-0-6)	R	R	R		R	R
SCCH 740	Current Topics in Analytical Chemistry II	3 (3-0-6)	R	R	R		R	R
SCCH 753	Homogeneous Catalysis	3 (3-0-6)	R	R	R	R	R	R
SCCH 754	Organotransition Metal Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 756	Heterogeneous Catalysis	3 (3-0-6)	R	R	R	R	R	R
SCCH 757	Solid State Chemistry	3 (3-0-6)	R	R	R	R	R	R

SCCH 758	Small Molecule Activation	3 (3-0-6)	R	R	R	R	R	R
SCCH 759	Olefin Polymerization Catalysis	3 (3-0-6)	R	R	R	R	R	R
SCCH 760	Biorefinery	3 (3-0-6)	R	R	R	R	R	R
SCCH 761	Nanocatalysis	3 (3-0-6)	R	R	R	R	R	R
SCCH 763	Inorganic Structure and Bonding	3 (3-0-6)	R	R	R	R	R	R
SCCH 764	Characterization Techniques in Inorganic Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 765	Main Group Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 766	Inorganic Reaction Mechanisms	3 (3-0-6)	R	R	R	R	R	R
SCCH 767	NMR Spectroscopy in Inorganic Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 768	Special Topics in Inorganic Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 771	Quantum Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 772	Thermodynamics and Statistical Mechanics	3 (3-0-6)	R	R	R	R	R	R
SCCH 774	Chemical Kinetics and Molecular Dynamics	3 (3-0-6)	R	R	R	R	R	R
SCCH 775	Modern Chemical Physics	3 (3-0-6)	R	R	R	R	R	R
SCCH 776	Mathematical Methods	3 (3-0-6)	R	R	R	R	R	R
SCCH 778	Physico-Chemical Techniques	3 (2-3-5)	R	R	R	R	R	R
SCCH 779	Surface Chemistry and Advanced Electrochemistry	3 (3-0-6)	R	R	R	R	R	R

SCCH 780	Special Topics in Physical Chemistry	3 (3-0-6)	R	R	R		R	R
SCCH 781	Special Topics in Chemical Physics	3 (3-0-6)	R	R	R		R	R
SCCH 785	Advanced Physical Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 801	Environmental Materials	3 (3-0-6)	R	R	R	R	R	R
SCCH 802	Lignocellulosic Chemistry	3 (3-0-6)	R	R	R	R		R
SCCH 803	Chemistry of Waste and Pollution	3 (3-0-6)	R	R	R	R	R	R
SCCH 804	Concepts in Sustainability	3 (3-0-6)	R	R	R	R	R	R
SCCH 805	Natural Fibers	3 (3-0-6)	R	R	R	R	R	R
SCCH 806	Industrial Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 821	Chemistry of Small Molecules	3 (3-0-6)	R	R	R	R	R	R
SCCH 822	Inorganic Materials	3 (3-0-6)	R	R	R	R	R	R
SCCH 823	Macrocyclic and Supramolecular Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 824	Functional Dyes, Polymers and Advanced Materials	3 (3-0-6)	R	R	R	R	R	R
SCCH 825	Bioinorganic Chemistry	3 (3-0-6)	R	R	R	R	R	R
SCCH 841	Cutting-Edge Technologies for Bio-Circular-Green Economy	3 (3-0-6)	R	R	R	R	R	R

SCCH 842	Computational Design of Catalysts and Materials	3 (3-0-6)	R	R	R	R	R	R
SCCH 843	Business Strategies for Entrepreneurs	3 (3-0-6)	R	R	R	R	R	R
SCCH 844	Digital Transformation for Entrepreneurs	3 (3-0-6)	R	R	R	R	R	R
SCCH 845	Learning Design in Chemistry Classrooms	3 (3-0-6)	R	R	R	R	R	R
SCCH 846	Digitization, Miniaturization, and Advanced Manufacturing for Chemistry Classrooms	3 (3-0-6)	R	R	R	R	R	R
SCCH 847	Metaverse for Chemistry Classrooms	3 (3-0-6)	R	R	R	R	R	R
SCCH 848	NMR Quantum Computation	3 (3-0-6)	R	R	R	R	R	R
SCCH 849	Chemistrobot	3 (3-0-6)	R	R	R	R	R	R
	Dissertation							
SCCH 699	Dissertation	36 (0-108-0)	M	M	M	M	M	M
SCCH 799	Dissertation	48 (0-144-0)	M	M	M	M	M	M
SCCH 898	Dissertation	48 (0-144-0)	M	M	M	M	M	M

I = ELO is introduced & assessed
 R = ELO is reinforced & assessed

P = ELO is practiced & assessed
 M = Level of Mastery is assessed

Table 6

Plan 1.1; The expectation of learning outcomes at the end of the academic year for students holding M.Sc. degree

Year of Study	Knowledge, skills, and any other expected learning outcomes
1 st	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation.
2 nd	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.
3 rd	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments.

	<input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.
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Plan 2.1; for students holding M.Sc. degree

Year of Study	Knowledge, skills, and any other expected learning outcomes
1 st	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation.
2 nd	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.
3 rd	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge.

	<input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.
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Plan 2.2; for students holding B.Sc. degree.

Year of Study	Knowledge, skills, and any other expected learning outcomes
1 st	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able describe chemical knowledge, to design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation.
2 nd	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge.

	<input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.
3 rd	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to describe chemical knowledge, design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.
4 th	<input type="checkbox"/> Students are concerned about the ethical and social aspects when applying chemical knowledge. <input type="checkbox"/> Students are able to design chemical research and conduct experiments safely for the benefit of mankind. <input type="checkbox"/> Students are able to work with others in the global environments. <input type="checkbox"/> Students are able to adapt themselves to the latest chemical skills and knowledge. <input type="checkbox"/> Students are able to strengthen their capability of their work by using digital technologies and/or automation. <input type="checkbox"/> Students are able to work as independent researchers.

Attachment Appendix E
The Revision of the Doctor of Philosophy Program in Chemistry
(International Program)
Revised Program 2023
Faculty of Science and Faculty of Graduate Studies
Mahidol University

1. The curriculum was approved by the Office of the Higher Education Commission on December 20, 2012, and was revised twice. The first and the second revisions were approved by the Office of the Higher Education Commission on April 8, 2015, and December 16, 2017, respectively.
2. The Mahidol University Council has approved this revised curriculum in the 586 meeting on November 16, 2022
3. The revised curriculum will be effective in the first semester of the academic year 2023 onward.

4. Rationale of Revision

A highly trained and skilled personnel who also has thorough knowledge in chemistry with proficient English skills is highly desirable to the industry and the academics both in Thailand and outside. The Doctor of Philosophy Program in Chemistry at the Faculty of Science, Mahidol University, strives to produce graduates of such quality to the society at large. Nevertheless, the expertise in chemistry required by the domestic and international markets can change rapidly due to government policy and global crisis of COVID-19. These new normals inevitably change the picture of the modern workforce, calling for every sector of human resource development to adjust and refocus accordingly.

Along with the abovementioned economic and social transformation, the quality assurance for higher education has recently been updated. Nationally, the Office of the Higher Education Commission already revised its Thai Qualifications Framework for Higher Education (TQF) in 2015. Internationally, many universities around the world significantly

restructured their curriculums to emphasize more on the learning outcomes of students, rather than insular academic excellence in conventional disciplines. Mahidol University likewise embraces the philosophy of outcome-based education and adopts the ASEAN University Network–Quality Assurance (AUN-QA) as its quality guideline.

Therefore, the Doctor of Philosophy Program in Chemistry was revised to maintain the highest quality of curriculum under changing environments. The curriculum was revised using feedbacks from all stakeholders and the new social and economic developments mentioned above. In addition, the curriculum was also revised with conscience of an increasingly borderless, more interconnected global society. The goal of the program then lies not only in academic and professional excellence for the modern-day workforce, but also in the cultivation of sensible global citizens who contribute constructively to others and the society.

5. Contents of Revision

5.1 Revision of the Members of the Program

Current Program 2018	Revised Program 2023
Faculty Responsible of the Program	Faculty Responsible of the Program
1. Assoc. Prof. Dr. Siwaporn Meejoo Smith	1. Assoc. Prof. Siwaporn Meejoo Smith
2. Assist. Prof. Dr. Chutima Jiarpinitnun	-
3. Assist. Prof. Dr. Rattikan Chantiwas	-
4. Assoc. Prof. Ekasith Somsook	2. Assoc. Prof. Ekasith Somsook
5. Assist. Prof. Soraya Pornsuwan	3. Assist. Prof. Soraya Pornsuwan
6. Assoc. Prof. Supavadee Kiatisevi	4. Assoc. Prof. Supavadee Kiatisevi
	5. Assoc. Prof. Jonggol Tantirungrotechai
	6. Assoc. Prof. Dr. Sirilata Yotphan

Faculty of the Program	Faculty of the Program
1. Assoc. Prof. Dr. Atitaya Siripinyanond	1. Assoc. Prof. Dr. Atitaya Siripinyanond
2. Assoc. Prof. Dr. Chutima Kuhakarn	2. Prof. Dr. Chutima Kuhakarn
3. Assoc. Prof. Dr. Duangjai Nacapricha	3. Assoc. Prof. Dr. Duangjai Nacapricha
4. Assoc. Prof. Dr. Ekasith Somsook	4. Assoc. Prof. Dr. Ekasith Somsook
5. Assoc. Prof. Dr. On-Uma Kheowan	-
6. Assoc. Prof. Dr. Palangpon Kongsaree	5. Assoc. Prof. Dr. Palangpon Kongsaree
7. Assoc. Prof. Dr. Preeyanuch Sangtrirutnugul	6. Assoc. Prof. Dr. Preeyanuch Sangtrirutnugul
8. Assoc. Prof. Dr. Siwaporn Meejoo Smith	7. Assoc. Prof. Dr. Siwaporn Meejoo Smith
9. Assoc. Prof. Dr. Taweechai Amornsakchai	8. Assoc. Prof. Dr. Taweechai Amornsakchai
10. Assoc. Prof. Dr. Tienthong Thongpanchang	9. Assoc. Prof. Dr. Tienthong Thongpanchang
11. Assoc. Prof. Dr. Vuthichai Ervithayasuporn	10. Assoc. Prof. Dr. Vuthichai Ervithayasuporn
12. Assist. Prof. Dr. Chutima Jiarpinitnun	11. Assist. Prof. Dr. Chutima Jiarpinitnun
13. Assist. Prof. Dr. Darunee Soorukram	12. Assoc. Prof. Dr. Darunee Soorukram
14. Assist. Prof. Dr. Jonggol Tantirungrotechai	13. Assist. Prof. Dr. Jonggol Tantirungrotechai
15. Assist. Prof. Dr. Kanchana Uraisin	14. Assist. Prof. Dr. Kanchana Uraisin
16. Assist. Prof. Dr. Pasit Pakawatpanurut	15. Assist. Prof. Dr. Pasit Pakawatpanurut
17. Assist. Prof. Dr. Panida Surawatanawong	16. Assoc. Prof. Dr. Panida Surawatanawong
18. Assist. Prof. Dr. Rattikan Chantiwas	17. Assoc. Prof. Dr. Rattikan Chantiwas
19. Assist. Prof. Dr. Sirilata Yotphan	18. Assoc. Prof. Dr. Sirilata Yotphan
20. Assist. Prof. Dr. Soraya Pornsuwan	19. Assist. Prof. Dr. Soraya Pornsuwan
21. Assist. Prof. Dr. Supavadee Kiatisevi	20. Assoc. Prof. Dr. Supavadee Kiatisevi
22. Lecturer Dr. Nopporn Ruangsapapichat	21. Lecturer Dr. Nopporn Ruangsapapichat
23. Lecturer Dr. Pawaret Leowanawat	22. Assist. Prof. Dr. Pawaret Leowanawat
24. Lecturer Dr. Phoonthawee Saetear	23. Assist. Prof. Dr. Phoonthawee Saetear

25. Lecturer Dr. Teera Chantarojsiri	24. Assist. Prof. Dr. Teera Chantarojsiri
26. Lecturer Dr. Tinnakorn Tiensing	-
27. Lecturer Dr. Torsak Luanphaisarnnont	25. Asst. Dr. Torsak Luanphaisarnnont
28. Lecturer Dr. Thanthapatra Bunchuay	26. Lecturer Dr. Thanthapatra Bunchuay
-	27. Lecturer Dr. Suarwee Akavipat

5.2 Revision of the Course Contents Based on Feedbacks and Current Situation

Program 2018	Revised Program 2023	Remark
Required Courses		
SCCH 701 Frontiers in Chemistry 3 (3-0-6) วทคม ๗๐๑ เคมีแนวหน้า	SCCH 701 Frontiers in Chemistry 3 (3-0-6) วทคม ๗๐๑ เคมีแนวหน้า	No change
SCCH 702 Chemical Safety and Risk Management 1 (1-0-2) วทคม ๗๐๒ ความปลอดภัยทางเคมีและการจัดการความเสี่ยง	SCCH 702 Chemical Safety and Risk Management 1 (1-0-2) วทคม ๗๐๒ ความปลอดภัยทางเคมีและการจัดการความเสี่ยง	No change
SCCH 703 Scientific Communications 1 (1-0-2) วทคม ๗๐๓ การสื่อสารทางวิทยาศาสตร์	SCCH 703 Scientific Communications 1 (1-0-2) วทคม ๗๐๓ การสื่อสารทางวิทยาศาสตร์	No change
SCCH 704 Seminar in Chemistry 1 (1-0-2) วทคม ๗๐๔ สัมมนาทางเคมี	-	Not available for the Ph.D. program
SCCH 705 Progress in Chemistry 3 (3-0-6) วทคม ๗๐๕ ความก้าวหน้าทางเคมี	-	Closed
SCCH 706 Research Skill Development I 3 (3-0-6) วทคม ๗๐๖ การพัฒนาทักษะการวิจัย ๑	-	Closed
SCCH 707 Research Skill Development II 3 (3-0-6) วทคม ๗๐๗ การพัฒนาทักษะการวิจัย ๒	-	Closed
SCCH 708 Special Problems in Chemistry 3 (3-0-6) วทคม ๗๐๘ ปัญหาพิเศษทางเคมี	-	Closed
-	SCCH 709 State-of-the-Art of Instrumentation 3 (3-0-6) วทคม ๗๐๙ การใช้เครื่องมือที่ทันสมัย	New course

-	SCCH 710 Business Models in Chemical Industries 1 (1-0-2) วทคม ๗๑๐ แบบจำลองธุรกิจของอุตสาหกรรมเคมี	New course
SCCH 711 Organic Structure Determination 3 (3-0-6) วทคม ๗๑๑ การหาโครงสร้างของสารอินทรีย์	-	Move to the elective courses
SCCH 712 Molecular Structures and Functions 3 (3-0-6) วทคม ๗๑๒ โครงสร้างและหน้าที่ระดับโมเลกุล	-	Move to the elective courses
SCCH 731 Advanced Techniques in Analytical Chemistry 3 (3-0-6) วทคม ๗๓๑ เทคนิคทางเคมีวิเคราะห์ขั้นสูง	-	Move to the elective courses
SCCH 732 Instrumental Analysis Laboratory 3 (1-6-4) วทคม ๗๓๒ ปฏิบัติการห้องทดลองการวิเคราะห์โดยอุปกรณ์	-	Move to the elective courses
SCCH 763 Inorganic Structure and Bonding 3 (3-0-6) วทคม ๗๖๓ โครงสร้างอนินทรีย์และพันธะเคมี	-	Move to the elective courses
SCCH 764 Characterization Techniques in Inorganic Chemistry 3 (3-0-6) วทคม ๗๖๔ เทคนิคการพิสูจน์เอกลักษณ์ในเคมีอนินทรีย์	-	Move to the elective courses
SCCH 778 Physico-Chemical Techniques 3 (2-3-5) วทคม ๗๗๘ เทคนิคทางเคมีเชิงฟิสิกส์	-	Move to the elective courses
SCCH 785 Advanced Physical Chemistry 3 (3-0-6) วทคม ๗๘๕ เคมีเชิงฟิสิกส์ขั้นสูง	-	Move to the elective courses

SCCH 801 Environmental Materials 3 (3-0-6) วทคม ๘๐๑ วัสดุเชิงสิ่งแวดล้อม	-	Move to the elective courses
SCCH 802 Lignocellulosic Chemistry 3(3-0-6) วทคม ๘๐๒ เคมีเชิงลิกโนเซลลูโลส	-	Move to the elective courses
-	SCCH 887 Research Project Development II 2 (2-0-4) วทคม ๘๘๗ การพัฒนาโครงการวิจัย ๒	New course
-	SCCH 888 Innovation in Chemistry 3 (3-0-6) วทคม ๘๘๘ นวัตกรรมทางเคมี	New course
-	SCCH 889 Seminar in Chemistry II 1 (1-0-2) วทคม ๘๘๙ สัมมนาทางเคมี ๒	New course
Elective Courses		
-	SCCH 711 Organic Structure Determination 3 (3-0-6) วทคม ๗๑๑ การหาโครงสร้างของสารอินทรีย์	Moved from the required courses
-	SCCH 712 Molecular Structures and Functions 3 (3-0-6) วทคม ๗๑๒ โครงสร้างและหน้าที่ระดับโมเลกุล	Moved from the required courses
SCCH 713 Advanced Organic Synthesis 3 (3-0-6) วทคม ๗๑๓ เคมีอินทรีย์สังเคราะห์ขั้นสูง	SCCH 713 Advanced Organic Synthesis 3 (3-0-6) วทคม ๗๑๓ เคมีอินทรีย์สังเคราะห์ขั้นสูง	No change
SCCH 714 Advanced Organic Reaction Mechanism 3 (3-0-6) วทคม ๗๑๔ กลไกปฏิกิริยาเคมีอินทรีย์ขั้นสูง	SCCH 714 Advanced Organic Reaction Mechanism 3 (3-0-6) วทคม ๗๑๔ กลไกปฏิกิริยาเคมีอินทรีย์ขั้นสูง	No change
SCCH 715 Frontiers in Medicinal Chemistry 3 (3-0-6) วทคม ๗๑๕ เคมีทางยาแนวหน้า	SCCH 715 Frontiers in Medicinal Chemistry 3 (3-0-6) วทคม ๗๑๕ เคมีทางยาแนวหน้า	No change
SCCH 716 Chemical Biology 3 (3-0-6) วทคม ๗๑๖ เคมีชีววิทยา	SCCH 716 Chemical Biology 3 (3-0-6) วทคม ๗๑๖ เคมีชีววิทยา	No change

SCCH 717 Advanced Natural Product Chemistry 3 (3-0-6) วทคม ๗๑๗ เคมีของสารผลิตภัณฑ์ธรรมชาติขั้นสูง	SCCH 717 Advanced Natural Product Chemistry 3 (3-0-6) วทคม ๗๑๗ เคมีของสารผลิตภัณฑ์ธรรมชาติขั้นสูง	No change
SCCH 718 Asymmetric Synthesis 3 (3-0-6) วทคม ๗๑๘ การสังเคราะห์แบบอสมมาตร	SCCH 718 Asymmetric Synthesis 3 (3-0-6) วทคม ๗๑๘ การสังเคราะห์แบบอสมมาตร	No change
SCCH 719 Advanced Heterocyclic Chemistry 3 (3-0-6) วทคม ๗๑๙ เคมีของสารเฮเทอโรไซคลิกขั้นสูง	SCCH 719 Advanced Heterocyclic Chemistry 3 (3-0-6) วทคม ๗๑๙ เคมีของสารเฮเทอโรไซคลิกขั้นสูง	No change
SCCH 720 Current Topics in Organic Chemistry 3 (3-0-6) วทคม ๗๒๐ หัวข้อที่เป็นปัจจุบันทางเคมีอินทรีย์	SCCH 720 Current Topics in Organic Chemistry 3 (3-0-6) วทคม ๗๒๐ หัวข้อที่เป็นปัจจุบันทางเคมีอินทรีย์	No change
-	SCCH 731 Advanced Techniques in Analytical Chemistry 3 (3-0-6) วทคม ๗๓๑ เทคนิคทางเคมีวิเคราะห์ขั้นสูง	Moved from the required courses
-	SCCH 732 Instrumental Analysis Laboratory 3 (1-6-4) วทคม ๗๓๒ ปฏิบัติการห้องทดลองการวิเคราะห์โดยอุปกรณ์	Moved from the required courses
SCCH 733 Separation Techniques 3 (3-0-6) วทคม ๗๓๓ เทคนิคการแยก	SCCH 733 Separation Techniques 3 (3-0-6) วทคม ๗๓๓ เทคนิคการแยก	No change
SCCH 734 Fluidic Technology for Analytical Science 3 (3-0-6) วทคม ๗๓๔ เทคโนโลยีของไหลสำหรับศาสตร์วิเคราะห์	SCCH 734 Fluidic Technology for Analytical Science 3 (3-0-6) วทคม ๗๓๔ เทคโนโลยีของไหลสำหรับศาสตร์วิเคราะห์	No change
SCCH 735 Chemometrics 3 (2-3-5) วทคม ๗๓๕ เคมีเมตริกส์	SCCH 735 Chemometrics 3 (2-3-5) วทคม ๗๓๕ เคมีเมตริกส์	No change
SCCH 736 Solution Chemistry 3 (3-0-6) วทคม ๗๓๖ เคมีของสารละลาย	-	Closed
SCCH 737 Environmental Chemistry 3(3-0-6) วทคม ๗๓๗ เคมีสิ่งแวดล้อม	-	Closed
SCCH 738 Special Topics in Analytical Chemistry 3 (3-0-6) วทคม ๗๓๘ หัวข้อเรื่องพิเศษทางเคมีวิเคราะห์	SCCH 738 Special Topics in Analytical Chemistry 3 (3-0-6) วทคม ๗๓๘ หัวข้อเรื่องพิเศษทางเคมีวิเคราะห์	No change
SCCH 739 Current Topics in Analytical Chemistry I 3 (3-0-6) วทคม ๗๓๙ หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๑	SCCH 739 Current Topics in Analytical Chemistry I 3 (3-0-6) วทคม ๗๓๙ หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๑	No change

SCCH 740 Current Topics in Analytical Chemistry II 3 (3-0-6) วทคม ๗๔๐ หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๒	SCCH 740 Current Topics in Analytical Chemistry II 3 (3-0-6) วทคม ๗๔๐ หัวข้อที่เป็นปัจจุบันทางเคมีวิเคราะห์ ๒	No change
-	SCCH 753 Homogeneous Catalysis 3 (3-0-6) วทคม ๗๕๓ การเร่งปฏิกิริยาเอกพันธ์	New Course
SCCH 754 Organotransition Metal Chemistry 3 (3-0-6) วทคม ๗๕๔ เคมีของโลหะทรานซิชันอินทรีย์	SCCH 754 Organotransition Metal Chemistry 3 (3-0-6) วทคม ๗๕๔ เคมีของโลหะทรานซิชันอินทรีย์	No change
-	SCCH 756 Heterogeneous Catalysis 3 (3-0-6) วทคม ๗๕๖ การเร่งปฏิกิริยาวิวิธพันธ์	New Course
SCCH 757 Solid State Chemistry 3 (3-0-6) วทคม ๗๕๗ เคมีของสถานะของแข็ง	SCCH 757 Solid State Chemistry 3 (3-0-6) วทคม ๗๕๗ เคมีของสถานะของแข็ง	No change
-	SCCH 758 Small Molecule Activation 3 (3-0-6) วทคม ๗๕๘ การกระตุ้นโมเลกุลเล็ก	New Course
-	SCCH 759 Olefin Polymerization Catalysis 3 (3-0-6) วทคม ๗๕๙ การเร่งปฏิกิริยาพอลิเมอไรเซชันของโอเลฟิน	New Course
-	SCCH 760 Biorefinery 3 (3-0-6) วทคม ๗๖๐ การแปรรูปและการแยกผลิตภัณฑ์จากชีวมวล	New Course
-	SCCH 761 Nanocatalysis 3 (3-0-6) วทคม ๗๖๑ การเร่งปฏิกิริยานาโน	New Course
-	SCCH 763 Inorganic Structure and Bonding 3 (3-0-6) วทคม ๗๖๓ โครงสร้างอนินทรีย์และพันธะเคมี	Moved from the required courses
-	SCCH 764 Characterization Techniques in Inorganic Chemistry 3 (3-0-6) วทคม ๗๖๔ เทคนิคการพิสูจน์เอกลักษณ์ในเคมีอนินทรีย์	Moved from the required courses
SCCH 765 Main Group Chemistry 3 (3-0-6) วทคม ๗๖๕ เคมีของธาตุหมู่หลัก	SCCH 765 Main Group Chemistry 3 (3-0-6) วทคม ๗๖๕ เคมีของธาตุหมู่หลัก	No change

SCCH 766 Inorganic Reaction Mechanisms 3 (3-0-6) วทคม ๗๖๖ กลไกปฏิกิริยาอนินทรีย์	SCCH 766 Inorganic Reaction Mechanisms 3 (3-0-6) วทคม ๗๖๖ กลไกปฏิกิริยาอนินทรีย์	No change
SCCH 767 NMR Spectroscopy in Inorganic Chemistry 3 (3-0-6) วทคม ๗๖๗ เอ็นเอ็มอาร์ สเปกโตรสโกปีสำหรับเคมีอนินทรีย์	SCCH 767 NMR Spectroscopy in Inorganic Chemistry 3 (3-0-6) วทคม ๗๖๗ เอ็นเอ็มอาร์ สเปกโตรสโกปีสำหรับเคมีอนินทรีย์	No change
SCCH 768 Special Topics in Inorganic Chemistry 3 (3-0-6) วทคม ๗๖๘ หัวข้อพิเศษทางเคมีอนินทรีย์	SCCH 768 Special Topics in Inorganic Chemistry 3 (3-0-6) วทคม ๗๖๘ หัวข้อพิเศษทางเคมีอนินทรีย์	No change
SCCH 769 Bioinorganic Chemistry: from Metals in Biology to Modern Applications 3 (3-0-6) วทคม ๗๖๙ เคมีชีวอนินทรีย์: จากโลหะในชีวิตประจำวันสู่การประยุกต์ใช้ในปัจจุบัน	-	Closed
SCCH 771 Quantum Chemistry 3 (3-0-6) วทคม ๗๗๑ เคมีควอนตัม	SCCH 771 Quantum Chemistry 3 (3-0-6) วทคม ๗๗๑ เคมีควอนตัม	No change
SCCH 772 Thermodynamics and Statistical Mechanics 3 (3-0-6) วทคม ๗๗๒ อุณหพลศาสตร์และกลศาสตร์เชิงสถิติ	SCCH 772 Thermodynamics and Statistical Mechanics 3 (3-0-6) วทคม ๗๗๒ อุณหพลศาสตร์และกลศาสตร์เชิงสถิติ	No change
SCCH 774 Chemical Kinetics and Molecular Dynamics 3 (3-0-6) วทคม ๗๗๔ จลนพลศาสตร์และพลศาสตร์โมเลกุล	SCCH 774 Chemical Kinetics and Molecular Dynamics 3 (3-0-6) วทคม ๗๗๔ จลนพลศาสตร์และพลศาสตร์โมเลกุล	No change
SCCH 775 Modern Chemical Physics 3 (3-0-6) วทคม ๗๗๕ ฟิสิกส์เชิงเคมีแผนใหม่	SCCH 775 Modern Chemical Physics 3 (3-0-6) วทคม ๗๗๕ ฟิสิกส์เชิงเคมีแผนใหม่	No change
SCCH 776 Mathematical Methods 3 (3-0-6) วทคม ๗๗๖ วิธีทางคณิตศาสตร์	SCCH 776 Mathematical Methods 3 (3-0-6) วทคม ๗๗๖ วิธีทางคณิตศาสตร์	No change
-	SCCH 778 Physico-Chemical Techniques 3 (2-3-5) วทคม ๗๗๘ เทคนิคทางเคมีเชิงฟิสิกส์	Moved from the required courses
SCCH 779 Surface Chemistry and Advanced Electrochemistry 3 (3-0-6) วทคม ๗๗๙ เคมีพื้นผิวและเคมีไฟฟ้าขั้นสูง	SCCH 779 Surface Chemistry and Advanced Electrochemistry 3 (3-0-6) วทคม ๗๗๙ เคมีพื้นผิวและเคมีไฟฟ้าขั้นสูง	No change

SCCH 780 Special Topics in Physical Chemistry 3 (3-0-6) วทคม ๗๘๐ หัวข้อเรื่องพิเศษทางเคมีเชิงฟิสิกส์	SCCH 780 Special Topics in Physical Chemistry 3 (3-0-6) วทคม ๗๘๐ หัวข้อเรื่องพิเศษทางเคมีเชิงฟิสิกส์	No change
SCCH 781 Special Topics in Chemical Physics 3 (3-0-6) วทคม ๗๘๑ หัวข้อเรื่องพิเศษทางฟิสิกส์เชิงเคมี	SCCH 781 Special Topics in Chemical Physics 3 (3-0-6) วทคม ๗๘๑ หัวข้อเรื่องพิเศษทางฟิสิกส์เชิงเคมี	No change
SCCH 782 Seminar in Physical Chemistry and Chemical Physics I 1(1-0-2) วทคม ๗๘๒ สัมมนาทางเคมีเชิงฟิสิกส์และฟิสิกส์เชิงเคมี ๑	-	Closed
SCCH 783 Seminar in Physical Chemistry and Chemical Physics II 1(1-0-2) วทคม ๗๘๓ สัมมนาทางเคมีเชิงฟิสิกส์และฟิสิกส์เชิงเคมี ๒	-	Closed
SCCH 784 Seminar in Physical Chemistry and Chemical Physics III 1(1-0-2) วทคม ๗๘๔ สัมมนาทางเคมีเชิงฟิสิกส์และฟิสิกส์เชิงเคมี ๓	-	Closed
-	SCCH 785 Advanced Physical Chemistry 3 (3-0-6) วทคม ๗๘๕ เคมีเชิงฟิสิกส์ขั้นสูง	Moved from the required courses
-	SCCH 801 Environmental Materials 3 (3-0-6) วทคม ๘๐๑ วัสดุเชิงสิ่งแวดล้อม	Moved from the required courses
-	SCCH 802 Lignocellulosic Chemistry 3(3-0-6) วทคม ๘๐๒ เคมีเชิงลิกโนเซลลูโลส	Moved from the required courses
SCCH 803 Chemistry of Waste and Pollution 3 (3-0-6) วทคม ๘๐๓ เคมีของกากของเสียและมลพิษ	SCCH 803 Chemistry of Waste and Pollution 3 (3-0-6) วทคม ๘๐๓ เคมีของกากของเสียและมลพิษ	No change

SCCH 804 Concepts in Sustainability 3 (3-0-6) วทคม ๘๐๔ หลักการความยั่งยืน	SCCH 804 Concepts in Sustainability 3 (3-0-6) วทคม ๘๐๔ หลักการความยั่งยืน	No change
SCCH 805 Natural Fibers 3 (3-0-6) วทคม ๘๐๕ เส้นใยธรรมชาติ	SCCH 805 Natural Fibers 3 (3-0-6) วทคม ๘๐๕ เส้นใยธรรมชาติ	No change
SCCH 806 Industrial Chemistry 3 (3-0-6) วทคม ๘๐๖ เคมีเชิงอุตสาหกรรม	SCCH 806 Industrial Chemistry 3 (3-0-6) วทคม ๘๐๖ เคมีเชิงอุตสาหกรรม	No change
-	SCCH 821 Chemistry of Small Molecules 3 (3-0-6) วทคม ๘๒๑ เคมีของสารโมเลกุลเล็ก	New Course
-	SCCH 822 Inorganic Materials 3 (3-0-6) วทคม ๘๒๒ วัสดุอนินทรีย์	New Course
-	SCCH 823 Macrocyclic and Supramolecular Chemistry 3 (3-0-6) วทคม ๘๒๓ เคมีซูปราและสารประกอบแมโครไซคลิก	New Course
-	SCCH 824 Functional Dyes, Polymers and Advanced Materials 3 (3-0-6) วทคม ๘๒๔ สีย้อม พอลิเมอร์ และวัสดุเชิงฟังก์ชันขั้นสูง	New Course
-	SCCH 825 Bioinorganic Chemistry 3 (3-0-6) วทคม ๘๒๕ เคมีชีวอนินทรีย์	New Course
-	SCCH 841 Cutting-Edge Technologies for Bio-Circular-Green Economy 3 (3-0-6) วทคม ๘๔๑ เทคโนโลยีก้าวหน้าสำหรับเศรษฐกิจชีวภาพ หมุนเวียน สีเขียว	New Course
-	SCCH 842 Computational Design of Catalysts and Materials 3 (3-0-6) วทคม ๘๔๒ การออกแบบตัวเร่งปฏิกิริยาและวัสดุด้วยการคำนวณ	New Course
-	SCCH 843 Business Strategies for Entrepreneurs 3 (3-0-6) วทคม ๘๔๓ กลยุทธ์ในการทำธุรกิจสำหรับผู้ประกอบการ	New Course
-	SCCH 844 Digital Transformation for Entrepreneurs 3 (3-0-6) วทคม ๘๔๔ การผันแปรดิจิทัลสำหรับผู้ประกอบการ	New Course

-	SCCH 845 Learning Design for Chemistry Classrooms 3 (3-0-6) วทคม ๘๔๕ การออกแบบการเรียนรู้ในห้องเรียนวิชาเคมี	New Course
-	SCCH 846 Digitization, Miniaturization, and Advanced Manufacturing for Chemistry Classrooms 3 (3-0-6) วทคม ๘๔๖ การแปลงเป็นดิจิทัล การย่อขนาด การผลิตขั้นสูง สำหรับห้องเรียนวิชาเคมี	New Course
-	SCCH 847 Metaverse for Chemistry Classrooms 3 (3-0-6) วทคม ๘๔๗ อภิจักรวาลในห้องเรียนวิชาเคมี	New Course
-	SCCH 848 NMR Quantum Computation 3 (3-0-6) วทคม ๘๔๘ การคำนวณควอนตัมเชิงเอ็นเอ็มอาร์	New Course
-	SCCH 849 Chemistrobot 3 (3-0-6) วทคม ๘๔๙ หุ่นยนต์นักเคมี	New Course
Dissertation		
SCCH 699 Dissertation 36 (0-108-0) วทคม ๖๙๙ วิทยานิพนธ์	SCCH 699 Dissertation 36 (0-108-0) วทคม ๖๙๙ วิทยานิพนธ์	No change
SCCH 898 Dissertation 48 (0-144-0) วทคม ๘๙๘ วิทยานิพนธ์	SCCH 898 Dissertation 48 (0-144-0) วทคม ๘๙๘ วิทยานิพนธ์	No change
SCCH 799 Dissertation 48 (0-144-0) วทคม ๗๙๙ วิทยานิพนธ์	SCCH 799 Dissertation 48 (0-144-0) วทคม ๗๙๙ วิทยานิพนธ์	No change

6. The Comparison Table of the Curriculum Structure between the Current Program and Revised Program Based on Criteria on Graduate Studies B.E. 2558 (set by Ministry of Education)

6.1 Plan 1.1 for Students Holding M.Sc. Degree

Course Category	Credit		
	Criteria on Graduate Studies B.E.2558	Curriculum Structure of the Current Program	Curriculum Structure of the Revised Program
Dissertation	Not less than 48	48	48
Total Not less than	48	48	48

6.2 Plan 2.1 for Students Holding M.Sc. Degree

Course Category	Credit			
	Criteria on Graduate Studies B.E.2558	Curriculum Structure of the Current Program		Curriculum Structure of the Revised Program
		M.Sc. in Chemistry	M.Sc. in Related Fields	M.Sc. in Chemistry or Related Fields
1. Required	} Not less than 12	6	9	6
2. Elective		Not less than 6	Not less than 3	Not less than 6
3. Dissertation	36	36	36	36
Total not less than	48	48	48	48

6.3 Plan 2.2 for Students Holding B.Sc. Degree

Course Category	Credit		
	Criteria on Graduate Studies B.E.2558	Curriculum Structure of the Current Program	Curriculum Structure of the Revised Program
1. Required	} Not less than 24	21	15
2. Elective		Not less than 9	Not less than 9
3. Dissertation	48	48	48
Total not less than	72	78	72