



Course 090116198

Dissertation

King Mongkut's University of Technology North Bangkok
The Sirindhorn International Thai-German Graduate School of Engineering
Chemical and Process Engineering Program

Section 1: General Information

1. Course code and course Title

090116198 Dissertation

2. Total credits

9 credits

3. Curriculum and course category:

Curriculum: *Doctor of Engineering Program in Chemical and Process Engineering*

Course category: Required Courses

☐ Core Course

☐ Specific Core Course

☐ Industrial Internship

☒ Dissertation

Elective Courses

☐ General Elective

☐ Specific Elective

☐ Other Elective

4. Course coordinator/ instructors

Course coordinator(s): Curriculum Chairman: Asst. Prof. Dr. Suksun Amornraksa

Program Coordinator: Asst. Prof. Dr. Atthasit Tawai

Advisors:

Asst. Prof. Dr. Suksun Amornraksa

Assoc. Prof. Dr. Tawiwat Kangsadan

Assoc. Prof. Dr. Unalome Wetwatana Hartley

Assoc. Prof. Dr. Malinee Sriariyanun

Asst. Prof. Dr. Atthasit Tawai

5. Semester/ year of study

☒ Semester 1 (Aug. to Dec.)

☐ Semester 2 (Jan. to May)

Academic Year: 2022

6. Pre-requisite (if any)

☒ No

☐ Yes, please provide:

7. Co-requisites (if any)

☒ No

☐ Yes, please provide:



Program: CPE
Degree Level: Doctoral

Faculty/College: TGGS

8. Venue of study

- ☒ KMUTNB University ☐ Research Center ☐ Industry
☐ RWTH Aachen University ☐ MoU Partner University

9. Information for quality assurance in education

This course shows evidence of:

- ☐ Development of implementation from previous practices, e.g. the improvement of class teaching, course content, content classification and methods used for learning assessment
- ☐ Involvement from professional bodies/ external agencies in instruction; thus Enhancing student academic and professional experiences
- ☒ Integration of research or creative activities with instruction; use of research-based learning management; knowledge management practices for learning improvement
- ☐ Integration of academic services and course implementation
- ☐ Combination of cultural heritage preservation efforts into instruction or student activities

10. Date of latest revision

December 2021

Section 2: Course Description and Implementation**1. Course Description** (*As written in the Official Approved Curriculum*)

Research on an interesting topic in Chemical and Process Engineering or related areas to deal with scientific demands involving theoretical or computing works, engineering design studies, and case studies or experimental works in any process-engineering laboratories. Industrial-oriented Basic or applied research with/without collaboration with the industry. Defining objectives, scope and thesis outline. Literature survey, prototype development, experimental design, data analysis, result and discussion, and conclusion with suggestions and recommendations. Qualifying examination, thesis proposal, thesis progress examination and thesis defense examination. Research paper preparation for an international journal. Well-written dissertation.

2. Number of hours per semester

Lecture	Practice	Self-study
	720 hours/ 18 weeks (40 hours/week*)	30 hours/ semester (5 hours/3 weeks*)

*Remark: * Based on at least 18 weeks*

Course Category: ☐ Lecture ☒ Practice ☒ Laboratory



Program: CPE
Degree Level: Doctoral

Faculty/College: TGGS

Course Evaluation: ☐ A-F ☒ S/U ☐ P

3. Number of hours per week for academic guidance to individual students

☒ 1. Giving academic advice (minimally number hour per week) during the office hour

☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐

☒ 2. Adopting information technology-based academic advising

☒ Email ☒ Phone ☒ Communication Apps ☒ Meeting Online:

☐ Other (specify)

☐ 3.

4. Course Learning Outcomes (CLOs): Students should be able to:

By nature, the dissertation is typically and consecutively conducted for six semesters. Due to the great variety in nature of a research topic, it is difficult to split and identify the learning outcomes that a student will achieve at the end of one semester. However, at the end of the study program, the students are expected to achieve the curriculum's expected learning outcomes which can be summarized as follows.

- | | |
|-------|---|
| LOK 1 | Deep Knowledge: They must have deep knowledge on the research topic that they study. They must be able to explicitly explain the problems, theories and phenomena related to their own research topic. |
| LOK 2 | Inquiring Mind: They should be able to find answers and knowledge needed from various sources to increase their existing knowledge about research works in chemical and process engineering. Moreover, they should be able to search, review and understand international literature on their own. |
| LOK 3 | Good Morale and Ethics: The graduates are expected to understand professionalism, ethics, morality, and responsibility according to professional standards. |
| LOS 1 | Address Fundamental Questions: They should be able to apply the knowledge, theories, and various related tools to identify the root cause of problem and address the right research problem. |
| LOS 2 | Plan and Conduct Research: They should be able to specify necessary resources, select appropriate methodology, and devise realistic work plan to accomplish the research goal. Also, they should be able to conduct the research as planned and suitably solve any problems that may arise during the course of research. |
| LOS 3 | Analyze and Interpret Findings: They should be able to appropriately analyze the experimental results or research findings and professionally interpret the result in a clear and concise manner. |



- LOS 4 Effective Communications: They should be able to communicate effectively in verbal and writing, enough to publish and present their work to the public community in the field. Also, they should be able to prepare a research proposal for funding grant.
- LOS 5 Multi-disciplinary Knowledge Integration: They should be able to integrate and apply knowledge/methods from different disciplines to solve a complex problem that requires knowledge from many disciplines.
- LOS 6 Commercial Awareness: They should have some awareness of the impact or limitation of their work to the commercials. For example, how to meet the market needs under the limitations and realities of economic, environmental, social, political, ethical, health and safety conditions.

5. The mapping between the curriculum's Expected Learning Outcomes (ELOs) and Course Learning Outcomes (CLOs)

The CPE doctoral curriculum is a full research program with only one course in the curriculum, the dissertation. Therefore, the ELOs of the curriculum are the same as the course's learning outcomes. However, the students are not expected to achieve all the ELOs in one semester. Instead, they will gradually achieve the learning outcomes one by one during the course of study, which consists of six semesters. A timeline for the ELOs to achieve is loosely formulated and presented in Table 5.1. The checkmark in the table represents the major period that the students will perform tasks to achieve the target learning outcome.

Table 5.1 Timeline for the ELOs to achieve during the three-year study program

ELOs/CLOs consistency	Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6
LOK1 - Deep Knowledge				✓	✓	✓
LOK2 - Inquiring Mind	✓	✓	✓			
LOK3 - Good Morale and Ethics					✓	✓
LOS1 - Address Fundamental Questions	✓	✓				
LOS2 - Plan and Conduct Research		✓	✓	✓	✓	
LOS3 - Analyze and Interpret Findings				✓	✓	✓
LOS4 - Effective Communications		✓				✓
LOS5 - Multi-disciplinary Knowledge Integration						✓
LOS6 - Commercial Awareness						✓



Section 3: Student Improvement in relation to CLOs

Organizing learning experiences to develop skills/knowledge; assessment of CLOs in accordance with the ones identified in Section 2.4

Course Learning Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
LOK1 - Deep Knowledge	<ul style="list-style-type: none"> Literature review from texts, research journals and other publications Regular meeting with thesis advisor 	<ul style="list-style-type: none"> Observation and evaluation by thesis advisor throughout the period. Evaluation of the thesis' proposal, progress, and final presentations. Evaluation of thesis report
LOK2 - Inquiring Mind	<ul style="list-style-type: none"> Regular meeting with thesis advisor Group discussion with research team 	<ul style="list-style-type: none"> Observation and evaluation by thesis advisor throughout the period. Evaluation of the thesis' proposal, progress, and final presentations.
LOK3 - Good Morale and Ethics	<ul style="list-style-type: none"> Learning by doing Regular meeting with thesis advisor Group discussion with research team 	<ul style="list-style-type: none"> Observation and evaluation by thesis advisor throughout the period. Evaluation of the thesis' proposal, progress, and final presentations. Evaluation of thesis report
LOS1 - Address Fundamental Questions	<ul style="list-style-type: none"> Regular meeting with thesis advisor Group discussion with research team 	<ul style="list-style-type: none"> Observation and evaluation by thesis advisor throughout the period. Evaluation of the thesis' proposal, progress, and final presentations. Evaluation of thesis report
LOS2 - Plan and Conduct Research	<ul style="list-style-type: none"> Learning by doing Regular meeting with thesis advisor Group discussion with research team 	<ul style="list-style-type: none"> Observation and evaluation by thesis advisor throughout the period. Evaluation of the thesis' proposal, progress, and final presentations. Evaluation of thesis report
LOS3 - Analyze and Interpret Findings	<ul style="list-style-type: none"> Learning by doing Regular meeting with thesis advisor Group discussion with research team 	<ul style="list-style-type: none"> Evaluation of the thesis' proposal, progress, and final presentations. Evaluation of thesis report Journal Publication Accepted



Course Learning Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
	<ul style="list-style-type: none">• Thesis' proposal, progress, and final presentations.• Thesis report• Journal Publication	
LOS4 - Effective Communications	<ul style="list-style-type: none">• Learning by doing• Regular meeting with thesis advisor• Group discussion with research team• Thesis' proposal, progress, and final presentations.• Thesis report• Journal Publication	<ul style="list-style-type: none">• Observation and evaluation by thesis advisor throughout the period.• Evaluation of the thesis' proposal, progress, and final presentations.• Evaluation of thesis report• Journal Publication Accepted
LOS5 - Multi-disciplinary Knowledge Integration	<ul style="list-style-type: none">• Thesis' proposal, progress, and final presentations.• Thesis report	<ul style="list-style-type: none">• Observation and evaluation by thesis advisor throughout the period.• Evaluation of the thesis' proposal, progress, and final presentations.• Evaluation of thesis report
LOS6 - Commercial Awareness	<ul style="list-style-type: none">• Thesis' proposal, progress, and final presentations.• Thesis report	<ul style="list-style-type: none">• Evaluation of the thesis' proposal, progress, and final presentations.• Evaluation of thesis report

Section 4: Learning Activities

1. Student activities

In the first year, the students will be assigned to do a comprehensive literature review in the interested research topic, to find out the state-of-the-art in the field, identify a research opportunity or research gap. They will gradually develop and acquire the specific outcomes related to deep knowledge, inquiring mind, and address fundamental questions skills. Also, during this period, the students may be able to attend some coursework offered in the CPE master program, under the recommendation of the student's adviser, to help strengthen and broaden their fundamental knowledge. After the students finish the literature study, they should be able to identify a research topic to study and formulate clear research objectives. They will plan for research tasks and prepare and organize necessary resources. In the second year, they will usually perform the tasks according to the plan and solve any problem that arises. All of these activities lead to the achievement of the



plan and conduct research skills of the students. In the third year, the students will focus on analyzing and interpreting their research findings. They will eventually conclude the results, write a thesis report, and publish or present the results of their works in a journal or to a reputable public community in the field. The learning outcomes of analyzing and interpreting the findings and effective communications skills will be mainly developed during this period.

The students will have a regular meeting with their advisor, typically once or twice a week, to report the progress of their work. In some labs, where a postdoc or research assistant to the professor is available, the students will work closely with them to discuss the results or seek additional suggestions. Moreover, the students must present their work progress in a monthly group meeting with the people working in the same lab.

As required by the Regulations for Examination in the Doctoral of Engineering Programs (RED), the students must pass the qualifying and proposal examinations by the third semester, followed by the progress examination and defense examination at the end of the study program. Also, they are asked to give an oral presentation on their research work in a colloquium organized by KMUTNB, in addition to the requirement of at least two publications before they graduate. These regular practices and requirements encourage the students to be active in the learning process.

2. Reports or assignments

At the end of first year, the student must take a qualification examination. After passing the qualification examination, the student proceeds with the research work. The student will have regular consultant meetings with the advisor for reporting the progress and obtaining necessary guidance. The official examinations are listed in the table below. As a graduation requirement, the student must publish his works in two international journal publications. The student may also present his work in conferences to gain more experiences, when possible.

Reports or assignments	Deadline
Doctoral Qualifying Examination	In the second year of study, not earlier than the given period by the regulation.
Thesis Proposal Examination	In the second year of study, not earlier than the given period by the regulation.
Thesis Progress Examination	After passing the thesis proposal not earlier than the given period by the regulation.
Thesis Defense Examination	After passing the thesis progress not earlier than the given period by the regulation.
Final Thesis Report Submission	After the Doctoral Thesis defense examination.

3. Monitoring student learning outcome in the dissertation



The student will have regular meetings with the advisor to report the work progress and obtain necessary guidance. The advisor will continually monitor the student's learning outcome during the course of study. Also, the learning outcomes will be critically assessed in the following examinations.

- (1) Qualification examination
- (2) Thesis proposal examination
- (3) Thesis progress examination
- (4) Thesis defense examination

For each examination, a committee will be appointed for evaluation. The advisor will be a member of the examination committee. In the evaluation, the advisor together with the committees will monitor the student's developed skills according to ELOs.

4. Duties and responsibilities of a workplace mentor for the dissertation

This is only relevant when the student has to conduct the research work in the industry site for a long period. The advisor will regularly visit the industry site to observe and give guidance to the student. The advisor also communicates with the company's responsible person to follow-up the progress of the students. In case the student conduct the research abroad, the communication will be done through e-mail and online-meeting.

5. Duties and responsibilities of the advisor / faculty supervisor

The thesis advisor regularly meets student to assist or give guidance during the office hour and the regular research group meeting. In each meeting, the thesis advisor will observe and evaluate the performance of student in each aspect and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the Proposal Progress and Defense Examinations by the thesis committee. The thesis committee will provide the comments on the TGGs Evaluation Form and finally provide the grade on the Doctoral Thesis Defense Examination Evaluation Form.

6. Preparation in guiding and assisting the students

[In addition to the advisor, the TGGs academic affair is available for students for providing consultancy in topics of procedures, formalities, appeal etc. The TGGs Doctoral Thesis Guidelines and Procedures will be provided to students in the TGGs student handbooks.](#)

7. Facilities and support required by the workplace

The program currently has 4 laboratories including computer lab, Bioprocess Engineering Laboratory, Catalysis & Reaction Engineering Laboratory, System & Control Laboratory, and Novel Technology Research Lab, respectively. For computer lab, it is well equipped with PC computers



and work stations and LAN and Wi-Fi connections. Each computer was installed with software required for CPE teaching and research (Aspentech, ANSYS Fluent, COMSOL Multiphysics, Mathcad, Mathematica, Visual Fortran, and Visual Studio) which allow students to develop their computational and simulation skills.

The analytical lab has GCs, MS, GCMS, HPLC, Spectrophotometer, UV-VIS, and other basic instruments and analyzers besides equipments, instruments and analyzers in each research group.

Section 5: Planning and Preparation

1. Work place identification

In general, the students conduct their research work in the laboratories in TGGS building, if necessary the student can also conduct research in the industry sites.

2. Student preparation

At the beginning of the first semester, the student will attend an orientation meeting. The student will be informed about objectives of doctoral thesis, course structure, graduation requirement, appeal procedures, etc.

3. Advisor/ supervisor preparation

The TGGS advisor will be informed about the guideline of doctoral thesis before starting the doctoral thesis.

4. Preparation of mentor at work place

This is only relevant when the students are sent to conduct research in the industry's sites. The supervisor in the company will be informed about the framework of the Doctoral Thesis and the Guidelines and. In addition, the TGGS supervisor will keep communication with the company's supervisor by regular visits, E-mails and phone.

5. Risk management

The student is supervised by the thesis advisor and the supervisor/mentor that are familiar with the project. The responsible thesis advisor and supervisor/mentor must regularly meet the student to monitor the progress and give guidance.

Section 6: Student Evaluation



1. Evaluation criteria

The students will be evaluated based on the ELOs together with the progress of the research works. The evaluation criteria can be summarized as,

- Completeness of the research work
- Correctness of the research work
- Difficulty level of the research work
- Ability to present and to give argument
- Ability to conduct research work independently
- Skills in writing reports
- Skills in communication, presentation and Q&A.

2. Evaluation process

The student will be evaluated by the following examinations.

- Qualification examination
- Thesis proposal examination
- Thesis progress examination
- Thesis defense examination

For each examination, an examination committee will be appointed to evaluate the student. In these examinations, the student must submit a paper work in the form of report and give an oral presentation to the examination committee. The thesis committee will evaluate the student's performance from the submitted report, presentation and interviewing. The committee will give the evaluation result for each examination on the TGGS Evaluation Form and submit it to the TGGS academic affairs.

3. Responsibilities of monitoring and student evaluation by the mentor

Not applicable.

4. Responsibilities of evaluation by the faculty in charge

The thesis advisor regularly meets student to assist or give guidance during the office hour and the regular research meeting. Each meeting, the thesis advisor will evaluate the performance of student in each aspect and the student will be informed in order to improve those aspects. The advisor will evaluate the student as a member of the examination committee.

5. Conclusion of assessment discrepancies



The evaluation results will be discussed during this meeting and students will be informed in order to improve those aspects. Since the grade is assigned for each evaluation, the advisor and the thesis committee can observe the improvement of the student's performance.

Section 7: Evaluation and Improvement of a Master Thesis Research Work

1. Evaluation process conducted by:

1.1 Student intern

Evaluation survey by student will be conducted at the end of each semester.

1.2 Mentor at work place

Only relevant when the student conducts research works outside TGGS, the advisors collect the comments and bring them to discussions in the meeting for reviewing the operation of the curriculum held at the end of each semester.

1.3 Advisor/ teacher in charge

Advisors provide feedbacks in the meeting for reviewing the operation of the curriculum held at the end of each semester.

1.4 Others

Evaluation survey by graduates will be conducted at the end of each semester.

2. Review of evaluation procedures and improvement planning

The evaluation results and feedbacks from stakeholders will be discussed in the meeting for reviewing the operation of the curriculum held at the end of each semester.