รายละเอียดของประสบการณ์ภาคสนาม

Details of Field Work Experience

ชื่อสถาบันอุดมศึกษา มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าพระนครเหนือ

University King Mongkut's University of Technology North Bangkok

วิทยาเขต/คณะ/ บัณฑิตวิทยาลัยวิศวกรรมศาสตร์นานาชาติสิรินธร ไทย-เยอรมัน

Faculty/Dept. The Sirindhorn International Thai-German Graduate School of Engineering

Department of Electrical and Software Systems Engineering

หมวดที่ 1 ข้อมูลทั่วไป

Item 1 General Information

1. **รหัสและชื่อรายวิชา - Course ID and Course Name**

   090206198 วิทยานิพนธ์

   Dissertation

2. **จำนวนหน่วยกิต - Number of Credits**

   9 credits

3. **หลักสูตรและประเภทของรายวิชา – Type of Curriculum and Type of Course**

   Doctor of Engineering in Electrical and Software Systems Engineering

   Doctoral thesis

4. **อาจารย์ผู้รับผิดชอบรายวิชา และอาจารย์ผู้สอน – Responsible Professor/ Doctoral Thesis Advisor**

   Assoc. Prof. Nisai Fuengwarodsakul – Responsible lecturer

   Assoc. Prof. Thanaphong Suwansri

   Assist. Prof. Wijarn Wangdee

   Assist. Prof. Suramate Chalermwisutkul

   Assist. Prof. Chaiyod Pirak

   Assist. Prof. Soamsiri Jantarasakul

   Dr. Chayakorn Netaramai

   Dr. Sansiri Thanachutiwat

   Assist. Prof. Wannida Sea-Tang

5. **ภาคการศึกษา/ ชั้นปีที่เรียน – Semester / Course Year**

Semester 1/2018

6. วันที่จัดทำหรือปรับปรุงรายละเอียดของรายวิชาวิทยานิพนธ์ครั้งล่าสุด– Doctoral Thesis course description last updated on Day/Month/Year

31/07/2018

หมวดที่ 2 จุดมุ่งหมายและวัตถุประสงค์
Item 2 Purposes and Objectives

1. **จุดมุ่งหมายของประสบการณ์ภาคสนาม – Doctoral thesis (Dissertation) Course's Objectives**

   The purpose of a doctoral thesis is to enable the student to develop deeper knowledge, understanding, capabilities and ability to conduct independent research in a specific technical area, following the designed ELOs. The research topic will be related to industry's need. The doctoral thesis offers the opportunity to develop more deeply into and synthesize knowledge from the research results. In addition, social and soft skills must be simultaneously developed. The doctoral thesis should also emphasize on the technical, scientific and industrial application aspects of the subject matter.

2. **วัตถุประสงค์ในการพัฒนา/ปรับปรุงประสบการณ์ภาคสนาม– Objectives to improve/modify the Doctoral thesis (Dissertation) course**

   The objective of the improvement is to update the procedures in the doctoral thesis to achieve the designed ELOs.

หมวดที่ 3 การพัฒนาผลการเรียนรู้

Item 3 Learning Outcome Development

Mapping of ELOs of Doctoral thesis (Dissertation)

● **Major responsibility** ○ **Minor responsibility**

Course		Credit	ELO 1	ELO 2	ELO 3	ELO 4	ELO 5	ELO 6	ELO 7	ELO 8	ELO 9
090136198	Dissertation	54	●	●	●	●	○	○	○	●	○

ELOs of IDEEE curriculum

1. Ability to apply stem knowledge (science, technology, engineering and mathematics) for solving advanced problems, conducting advanced researching and building new knowledge in Electrical and Software Systems Engineering
2. Ability to explain phenomena in Electrical and Software Systems Engineering by referring theories in Electrical and Software Systems Engineering
3. Ability to build mathematical models for solving advanced and complicated problems including conducting advanced research and building new knowledge in Electrical and Software Systems Engineering
4. Ability to analyze and find reasons to explain relationships between experimental results and theory in Electrical and Software Systems Engineering
5. Ability to design and build electrical circuits and systems or software and software systems following specific knowledge in Electrical and Software Systems Engineering following applicable specialized knowledge in Electrical and Software Systems Engineering, safety principles in Electrical and Software Systems Engineering and relevant industry standards
6. Ability to demonstrate self-reliance and teamwork skill for managing research projects in Electrical and Software Systems Engineering
7. Ability to demonstrate skills of interpersonal communication and presenting research works in Electrical and Software Systems Engineering to publics

8. Ability to search, review and comprehend international literature in Electrical and Software Systems Engineering by themselves

9. Ability to indicate and show good attitude and professional ethics in Electrical and Software Systems Engineering

Mapping of ELOs of IDEEE curriculum to CHE's ELOs standard

CHE's ELO standard	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8	ELO9
1.									
1.1					●	●			●
1.2						●			●
1.3					●	●			●
1.4					●				●
1.5						●	●	●	●
2.									
2.1	●	●	●		●			●	
2.2	●	●	●	●					
2.3					●	●			●
2.4					●	●			●
3.									
3.1	●	●	●	●					
3.2	●	●	●	●					
3.3			●					●	
3.4	●	●	●	●					
3.5	●				●	●			
4.									
4.1						●			
4.2	●					●			
4.3						●			
4.4						●	●		
4.5						●	●		
5.									
5.1	●	●	●	●				●	
5.2	●	●	●	●					
5.3						●	●	●	

CHE's ELO standard	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8	ELO9
5.4			●		●		●	●	
5.5			●		●			●	
5.6							●	●	

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุใน รายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล – Evaluation method**
1. Ability to apply stem knowledge (science, technology, engineering and mathematics) for solving advanced problems, conducting advanced researching and building new knowledge in Electrical and Software Systems Engineering	This ability will be developed by the literature review process and the problem assignments related to the research topic given by the advisor after each meeting. The student will be demanded to solve the problems in their research work using scientific approaches based on stem knowledge. The student must present the obtained the solution to the advisor. Then, the advisor will help verify the approach and provide further guidance to the student to develop this ability.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.
2. Ability to explain phenomena in Electrical and Software Systems Engineering by referring theories in Electrical and Software Systems Engineering	This ability will be developed by the discussion during the meeting with the advisor. When the student presents the progress of the research work, the results and relevant phenomena must be explained by referring well-accepted theories. This procedure will be iteratively repeated, so that the student gets used to the approach and automatically builds up this ability.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุใน รายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล – Evaluation method**
3. Ability to build mathematical models for solving advanced and complicated problems including conducting advanced research and building new knowledge in Electrical and Software Systems Engineering	The student will be assigned to build a mathematical model to represent the behaviors of the system of interest, so that the student can get insight and understanding of the considered research problem. Using the built mathematical model, the student can derive the solution for the considered problem systematically. The advisor will give the guidance and help verifying the correctness of the model.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.
4. Ability to analyze and find reasons to explain relationships between experimental results and theory in Electrical and Software Systems Engineering	When the student reports the progress of the research work with experimental results. The student must verify the correctness of the results and compare them to the theoretical results. The advisor help develop this ability by giving guidance or giving examples how to analyze and find reasons.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุใน รายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล – Evaluation method**
5. Ability to design and build electrical circuits and systems or software and software systems following specific knowledge in Electrical and Software Systems Engineering following applicable specialized knowledge in Electrical and Software Systems Engineering, safety principles in Electrical and Software Systems Engineering and relevant industry standards	This ability will be developed in the details work of the research projects. The student will report the designed circuits or software to the advisors for verification. The advisor gives appropriate guidance following the technical correctness, safety and standard.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.
6. Ability to demonstrate self-reliance and teamwork skill for managing research projects in Electrical and Software Systems Engineering	The research work will be assigned in the form of project, which needs planning and collaborations to different partners. So the student develops the ability to manage the project together with teamwork skill, when contacting to partners. The advisor will accompany the student to run the research project and adjusts the level of guidance accordingly to let the student become more self-relying gradually.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุใน รายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล – Evaluation method**
7. Ability to demonstrate skills of interpersonal communication and presenting research works in Electrical and Software Systems Engineering to publics	This ability will be practiced, when the student reports the progress to the advisor. The advisor will observe the development and gives appropriate guidance. This ability can be also developed by doing rehearsals of the presentations of the research work for conferences or examinations. The advisor will observe the rehearsals and give comments for improvement.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.
8. Ability to search, review and comprehend international literature in Electrical and Software Systems Engineering by themselves	The student will be assigned to review literature intensively in the beginning phase of the research work. The advisor gives guidance, how to conduct the literature review effectively, e.g. searching technique, reading technique. The student must report the progress to the advisor within the assigned period. The contents of the paper will be discussed in the meeting. The student's understanding will be checked and verified by the advisor.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุใน รายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล – Evaluation method**
9. Ability to indicate and show good attitude and professional ethics in Electrical and Software Systems Engineering	The advisor gives appropriate guidance to the student The students' behaviors and attitude will be observed in different occasions, e.g. conference presentations, meetings, defense examination, when he expresses professional opinion during the presentations to the public and answering questions.	The advisor assesses this ability at every meeting and gives the appropriate guidance. The examination committee will evaluate the student's development from the report, the presentation, and questioning the students This ability will be assessed by the report presented in the qualification, proposal, progress and defense examination.

หมวดที่ 4 ลักษณะและการดำเนินการ
Item 4 Operations and Procedures

1. คำอธิบายโดยทั่วไปของประสบการณ์ภาคสนามหรือคำอธิบายรายวิชา – Doctoral thesis (Dissertation) course description/explanation or course description

090206198 Dissertation

Prerequisite: Department Permission

Research on an interesting topic in Electrical Engineering or Software Systems or related areas

2. กิจกรรมของนักศึกษา – Student activities

In the first year, the student will be assigned to do literature review intensively in the interested research field to find out the state-of-the-art. The results of the literature review will help the student to formulate the research topic. During this period, the student will have regular consultant meetings with the advisor for reporting the progress and obtaining necessary guidance. In this first year period, the student should prepare himself ready for the qualification examination. The student may start the research work in this first year, when possible.

At the end of first year, the student must take a qualification examination. When 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. For following-up the progress of the students, there are three examinations in the following:

- Doctoral Thesis Proposal Examination
- Doctoral Thesis Progress Examination
- Doctoral Thesis Defense Examination

During the course of the research work, the student can attend additional activities organized by the curriculum, e.g. block-lecture by visiting professors, advanced course on specific topics, public seminar, excursion and short research stay in industry or abroad. As a graduation requirement, the student has to publish his works in two international journal publications. The student may also present his work in conferences to gain more experiences, when possible.

3. รายงานหรืองานที่นักศึกษาได้รับมอบหมาย – Report or work assignment

รายงานหรืองานที่ได้รับมอบหมาย Report or work assignment	กำหนดส่ง Due Date
Regular assignments given by supervisor	as determined by supervisor
Literature review report for qualification examination	At the end of the first year before the qualification examination.
Doctoral Thesis Proposal	In the second year of study, not earlier than the given period by the regulation.
Doctoral Thesis Progress Report	After passing the thesis proposal not earlier than the given period by the regulation.
Doctoral Thesis (Dissertation)	After passing the thesis progress not earlier than the given period by the regulation.
Final Doctoral Thesis Submission	After the Doctoral Thesis defense examination.

4. การติดตามผลการเรียนรู้การฝึกประสบการณ์ภาคสนามของนักศึกษา - Monitoring of doctoral thesis course learning outcome

The student will be evaluated by the following process:

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 supervisor will be one member of the examination committee. In the evaluation, the supervisor together with the committees will monitor the student's developed skills according to ELOs.

4. หน้าที่และความรับผิดชอบของพนักงานพี่เลี้ยงในสถานประกอบการที่ดูแลกิจกรรมในภาคสนาม – Responsibility and duty of supervisor at work place

This is only relevant, when the student has to conduct the research work in the industry site for a long period. The supervisor will regularly visit the industry site to observe and give guidance to the student. The supervisor also communicates with the company's responsible person to follow-up the progress of the students.

5. หน้าที่และความรับผิดชอบของอาจารย์ที่ปรึกษา/อาจารย์นิเทศ – Responsibility and duty of advisor/lecturer

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.

7. การเตรียมการในการแนะแนวและช่วยเหลือนักศึกษา – Preparation to provide guidelines and suggestions to student

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.

8. สิ่งอำนวยความสะดวกและการสนับสนุนที่ต้องการจากสถานที่ที่จัดประสบการณ์ภาคสนาม/สถานประกอบการ- Facilities and supports needed from work places/firms

TGGS has laboratories and equipment adequate for conducting advanced research in different field as listed below:

(1) RF & Microwave Laboratory

(2) High Voltage Laboratory

(3) Energy Conversion Laboratory

(4) Mobile Communications and Embedded Systems Laboratory

(5) Enterprise Software Laboratory

(6) Machine Vision Laboratory

(7) Communication Networks Laboratory

(8) Power Grid Analytics Laboratory

(9) Image Processing Laboratory

(10) Electrical laboratory building

The students have the access to the listed laboratory above according to their research field. It is also possible for the students to access all technical equipment and facilities from different laboratories. The KMUTNB library offers the students good access to many databases of research publications, which are helpful for literature review.

หมวดที่ 5 การวางแผนและการเตรียมการ
Item 5 Planning and Preparation

1. การกำหนดสถานที่ฝึก – 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. การเตรียมนักศึกษา – Student preparations

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. การเตรียมอาจารย์ที่ปรึกษา/อาจารย์นิเทศ – Advisor preparations

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

4. การเตรียมพนักงานพี่เลี้ยงในสถานที่ฝึก - Preparation of supervisor 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. การจัดการความเสี่ยง – Risk management

None

หมวดที่ 6 การประเมินนักศึกษา
Item 6 Student Evaluation

1. หลักเกณฑ์การประเมิน – 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. กระบวนการประเมินผลการปฏิบัติงานของนักศึกษา – Evaluation procedure

The student will be evaluated by the following examinations.

1. Qualification examination
2. Thesis proposal examination
3. Thesis progress examination
4. 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. ความรับผิดชอบของพนักงานพี่เลี้ยงต่อการประเมินนักศึกษา – Responsibility of supervisor at work place toward student evaluation

Not applicable

4. ความรับผิดชอบของอาจารย์ผู้รับผิดชอบประสบการณ์ภาคสนามต่อการประเมินนักศึกษา – Responsibility of advisor/lecturer toward student evaluation

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 aspects 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. การสรุปผลการประเมินที่แตกต่าง – Evaluation difference's summary

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.

หมวดที่ 7 การประเมินและปรับปรุงการดำเนินการของวิทยานิพนธ์
Item 7 Doctoral Thesis Evaluation and Improvement

1. กระบวนการประเมินการฝึกประสบการณ์ภาคสนามโดยผู้เกี่ยวข้องต่อไปนี้ – Evaluation procedures of following stakeholders

(1) นักศึกษา - Student

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

(2) พนักงานพี่เลี้ยงหรือผู้ประกอบการ – Supervisor 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.

(3) อาจารย์ที่ดูแลกิจกรรมภาคสนาม – Advisor/lecturer

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

(4) อื่นๆ เช่น บัณฑิตจบใหม่ – Others such as new graduates

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

2. กระบวนการทบทวนผลการประเมินและการวางแผนปรับปรุง – Evaluation review procedure 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.