

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

- รหัสและชื่อรายวิชา - Course ID and Course Name
90245098 วิทยานิพนธ์ (ภาคการศึกษาที่ 1)
(Master Thesis)
- จำนวนหน่วยกิต - Number of Credits
4 Credits
- หลักสูตรและประเภทของรายวิชา - Type of Curriculum and Type of Course
Master of Engineering Program in Electrical and Software Systems Engineering (International Program)
Core course
- อาจารย์ผู้รับผิดชอบรายวิชา และอาจารย์ผู้สอน - Responsible Professor/ Master Thesis Advisor
All Lecturers
- ภาคการศึกษา/ ชั้นปีที่เรียน - Semester / Course Year
1/2561
- วันที่จัดทำหรือปรับปรุงรายละเอียดของรายวิชาประสบการณ์ภาคสนามครั้งล่าสุด- Master Thesis course description last updated on Day/Month/Year
31 July 2018

หมวดที่ 2 จุดมุ่งหมายและวัตถุประสงค์
Item 2 Purposes and Objectives

1. จุดมุ่งหมายของประสบการณ์ภาคสนาม – Master Thesis Course’s Objectives

The purpose of a thesis is to enable the student to develop deeper knowledge, understanding, capabilities and attitudes in the context of the program of study. The thesis should be written at the end of the program and offers the opportunity to develop more deeply into and synthesize knowledge acquired in previous studies. A thesis should emphasize on the technical, scientific and industrial application aspects of the subject matter. The overall goal of the thesis is for the student to display the knowledge and capability required for independent work.

2. วัตถุประสงค์ในการพัฒนา/ปรับปรุงประสบการณ์ภาคสนาม– Objectives to improve/modify the master thesis course

To integrate knowledge learned in course works to develop the research with advanced/innovative/novel technologies for industrial application. To match with needs and requirements of Thai and international industries.

หมวดที่ 3 การพัฒนาผลการเรียนรู้

Item 3 Learning Outcome Development

ผลการเรียนรู้ที่คาดหวังของรายวิชาที่ระบุในหลักสูตรตามมาตรฐานการเรียนรู้ของสกอ.

(● ความรับผิดชอบหลัก ○ ความรับผิดชอบรอง)

รายวิชา Courses	1.คุณธรรม จริยธรรม Morale and Ethics					2.ความรู้ Knowledge				3.ทักษะทางปัญญา Intellectual skill					4.ทักษะความสัมพันธ์ ระหว่างบุคคลและความ รับผิดชอบ Interpersonal skill and responsibility					5.ทักษะการวิเคราะห์ เชิงตัวเลข การสื่อสาร และการใช้ เทคโนโลยีสารสนเทศ Analytical, communications and IT skills					
	1	2	3	4	5	1	2	3	4	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6
90245098	○	○	○	○	○	●	○	○	○	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○

ตารางความเชื่อมโยงผลการเรียนรู้ที่คาดหวังของรายวิชาที่ระบุในหลักสูตรตามมาตรฐานการเรียนรู้ของสกอ.

ผลการเรียนรู้ ที่คาดหวัง Expected Learning Outcomes	1.คุณธรรม จริยธรรม Morale and Ethics					2.ความรู้ Knowledge				3.ทักษะทางปัญญา Intellectual skill					4.ทักษะความสัมพันธ์ ระหว่างบุคคลและความ รับผิดชอบ Interpersonal skill and responsibility					5.ทักษะการวิเคราะห์ เชิงตัวเลข การสื่อสาร และการใช้ เทคโนโลยีสารสนเทศ Analytical, communications and IT skills					
	1	2	3	4	5	1	2	3	4	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6
ELO1						●	●			●			●							●	●				
ELO2						●	●			●			●												
ELO3						●	●			●			●							●	●				
ELO4						●	●			●			●							●	●				
ELO5	●					●	●	●	●	●	●	●	●			●								●	
ELO6		●	●	●	●									●	●	●	●	●				●			
ELO7		●			●													●	●			●	●	●	●
ELO8						●	●					●	●		●							●	●	●	●
ELO9	●	●	●	●	●																		●		
ELO10	●	●	●	●	●			●	●							●			●						
ELO11		●	●	●												●									

ผลการเรียนรู้ที่คาดหวังของหลักวิชา

รายวิชา Courses	หน่วยกิต Credits	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8	ELO9	ELO10	ELO11
		90245098	วิทยานิพนธ์ (ภาคการศึกษาที่ 1) (Master Thesis)	4 Credits	●	●	●	●	○	○	○	○

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 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 proposal, progress and defense examination.

<p>ผลการเรียนรู้ Learning Outcomes</p>	<p>วิธีสอนที่ระบุใน รายละเอียดรายวิชา Specified Teaching Method</p>	<p>วิธีการประเมินผล – Evaluation method</p>
<p>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</p>	<p>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 verify the correctness of the model.</p>	<p>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 proposal, progress and defense examination.</p>
<p>4. Ability to analyze and find reasons to explain relationships between experimental results and theory in Electrical and Software Systems Engineering</p>	<p>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.</p>	<p>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 proposal, progress and defense examination.</p>

<p>ผลการเรียนรู้ Learning Outcomes</p>	<p>วิธีสอนที่ระบุใน รายละเอียดรายวิชา Specified Teaching Method</p>	<p>วิธีการประเมินผล – Evaluation method</p>
<p>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</p>	<p>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.</p>	<p>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 proposal, progress and defense examination.</p>
<p>6. Ability to demonstrate self-reliance and teamwork skill for managing research projects in Electrical and Software Systems Engineering</p>	<p>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.</p>	<p>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 proposal, progress and defense examination.</p>

<p>ผลการเรียนรู้ Learning Outcomes</p>	<p>วิธีสอนที่ระบุใน รายละเอียดรายวิชา Specified Teaching Method</p>	<p>วิธีการประเมินผล – Evaluation method</p>
<p>7. Ability to demonstrate skills of interpersonal communication and presenting research works in Electrical and Software Systems Engineering to publics</p>	<p>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.</p>	<p>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 proposal, progress and defense examination.</p>
<p>8. Ability to search, review and comprehend international literature in Electrical and Software Systems Engineering by themselves</p>	<p>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.</p>	<p>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 proposal, progress and defense examination.</p>

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 proposal, progress and defense examination.
10. Ability to demonstrate participation in social contribution and to provide correct guidance according to engineering principles to society	The advisor will arrange activities, such as big cleaning days for the laboratory, as a small practice for the student to contribute efforts for the society or publics.	The advisor observes and evaluates the behavior of the student during such activities.
11. Ability to initiate or to participate activities in promoting cultures or religious virtues	The advisor will encourage the student to arrange cultural activities to strengthen the relationships among international students in the same working group.	The advisor observes and evaluates the behavior of the student during such activities.

หมวดที่ 4 ลักษณะและการดำเนินการ
Item 4 Operations and Procedures

1. คำอธิบายโดยทั่วไปของประสบการณ์ภาคสนามหรือคำอธิบายรายวิชา – Master Thesis course description/explanation or course description

Research on a current topic in electrical and software systems engineering.

2. กิจกรรมของนักศึกษา – Student activities

All students must register and perform the thesis project within 6 months. The period to start working on the thesis project will be announced after the internship and student project reports have been submitted to the TGGS.

- Discuss with advisor to prepare necessary skills before start master thesis
- Keep reporting to show the progress to advisor
- Have regular meeting when problems cannot be handled by students
- Write the final report and give a final presentation

The list of specific qualifying activities depends on the field of study and is part of the prevailing regulations for each course. This list may be supplemented by individual agreement between the thesis advisor and the supervisor/mentor, if activities shall be covered which are not listed as standard topics.

The standard topics are:

- Literature Review
- Master Thesis Proposal Examination
- Start with Thesis Work and Preparation of Master Thesis: Methodology, Results and Discussions, Conclusions, Suggestions/Recommendations and Future Work.
- Master Thesis Progress Examination
- Continuation of Thesis Work and Preparation of Master Thesis: Methodology, Results and Discussions, Conclusions, Suggestions/Recommendations and Future Work
- Master Thesis Defense Examination and Master Thesis Submission
- Additional activities can be added, for example big cleaning day, international day and etc.

3. รายงานหรืองานที่นักศึกษาได้รับมอบหมาย – Report or work assignment

รายงานหรืองานที่ได้รับมอบหมาย Report or work assignment	กำหนดส่ง Due Date
Literature Review	Prior the Master Thesis Proposal Examination Deadline: by the end of the second semester of the first academic year.
Master Thesis Proposal Examination	By the end of the second semester of the first academic year. Officially counting as Day 1.
Master Thesis Progress Examination	30 days after the thesis topic is approved from the Master Thesis Proposal Examination. (Possible to be on the Month No. 2, 3, 4 or 5)
Master Thesis Defense Examination	30 days after passing the Master Thesis Progress Examination. (Possible to be on the Month No. 3, 4, 5 or 6)
Final Master Thesis Submission	By the end of Month No. 6

4. การติดตามผลการเรียนรู้การฝึกประสบการณ์ภาคสนามของนักศึกษา - Monitoring of master thesis course learning outcome

The student will be evaluated during the TGGs Master Thesis 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 Master Thesis Defense Examination Evaluation Form.

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

Only relevant for Master Thesis Project with the industry. The supervisor/mentor regularly meets student to assist or give guidance during the office hour and the regular research group meeting. Each meeting, the supervisor/mentor will evaluate the performance of student in each listed aspects and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the TGGs Master Thesis 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 Master Thesis Defense Examination Evaluation Form.

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

The thesis advisor regularly meets student to assist or give guidance according to the teaching methodology listed in Item 3 Learning Outcome Development during the office hour and the regular research group meeting. Each meeting, the thesis advisor will evaluate the performance of student in each listed aspects and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the TGGs Master Thesis 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 Master Thesis Defense Examination Evaluation Form.

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

- The TGGs Master Thesis Guidelines and Procedures will be provided to students. It is also available on the website.
- Provide templates for reports and forms related to master thesis process

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

Based on each master thesis topic and the research group. Work desk, furniture, computers, accessories, materials, allowance and welfare as appropriate.

หมวดที่ 5 การวางแผนและการเตรียมการ
Item 5 Planning and Preparation

1. การกำหนดสถานที่ฝึก – Work place identification

Based on each master thesis topic.

2. การเตรียมนักศึกษา – Student preparations

To review and gain understanding of the objectives of the master thesis and prepare the students for the thesis work, the orientation will be held prior the master thesis period. In order to have a success thesis, students must have the following skills which are taught in the related courses:

- Research skill
- Experimental skill including in the laboratory and simulations
- Solving problems skill
- Presentation skill
- Writing the project and/or technical report skill
- Social skill

3. การเตรียมอาจารย์ที่ปรึกษา/อาจารย์นิเทศ – Advisor preparations

Provide the guideline of master thesis, prepare suggestions or talks to students before they start master thesis.

4. การเตรียมพนักงานพี่เลี้ยงในสถานที่ฝึก - Preparation of supervisor at work place

Only relevant for Master Thesis Project with the industry. Since, the supervisor/mentor are already familiar with the industrial project; he/she only needs to understand the TGGs Master Thesis Guidelines and Procedures and following the procedures and regulations very closely. In addition, the supervisor/mentor must regularly meet the student to assist or give guidance.

5. การจัดการความเสี่ยง – Risk management

None

หมวดที่ 6 การประเมินนักศึกษา
Item 6 Student Evaluation

1. หลักเกณฑ์การประเมิน – Evaluation criteria

According to the Regulations for Examination in the Master of Science Programs (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS)

- Students can work and achieve the specified goal of their master thesis.
- Students can join and work with other people.
- Students can present their works.

2. กระบวนการประเมินผลการปฏิบัติงานของนักศึกษา – Evaluation procedure

TGGS Master Thesis Proposal, Progress and Defense Examinations. The evaluation procedure is according to the Regulations for Examination in the Master of Science Programs (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS)

- Evaluate master thesis proposal, daily, and final reports.
- Have meeting with students.
- Attend the presentation given by students.

3. ความรับผิดชอบของพนักงานที่เลี้ยงต่อการประเมินนักศึกษา – Responsibility of supervisor at work place toward student evaluation

Only relevant for Master Thesis Project with the industry. The supervisor/mentor regularly meets student to assist or give guidance during the office hour and the regular research group meeting. Each meeting, the supervisor/mentor will evaluate the performance of student in each listed aspects and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the TGGS Master Thesis 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 Master Thesis Defense Examination Evaluation Form.

- Provide suggestions to students when their come with problems.
- Keep following the progress of students.

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 group meeting. Each meeting, the thesis advisor will evaluate the performance of student in each listed aspects and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the TGGs Master Thesis 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 Master Thesis Defense Examination Evaluation Form.

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 การประเมินและปรับปรุงการดำเนินการของการฝึกประสบการณ์ภาคสนาม

Item 7 Master Thesis Evaluation and Improvement

1. กระบวนการประเมินการฝึกประสบการณ์ภาคสนามโดยผู้เกี่ยวข้องต่อไปนี้ – Evaluation procedures of following stakeholders

(1) นักศึกษา - Student

Students evaluate the course effectiveness, i.e., field activities, supporting materials and documents that affect the learning outcome and output, with comments and suggestions.

(2) พนักงานพี่เลี้ยงหรือผู้ประกอบการ – Supervisor at work place

Advisors evaluate the performance of students in various aspects like technical skills, personal discipline, team work, communication skills

(3) อาจารย์ที่ดูแลกิจกรรมภาคสนาม – Advisor/lecturer

Advisors get the feedback from students to evaluate the effectiveness of this course and procedure whether we can reach the objective of this course.

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

None

2. กระบวนการทบทวนผลการประเมินและการวางแผนปรับปรุง – Evaluation review procedure and improvement planning

- Have meeting with students after the end of master thesis
- Prepare evaluation and plan for improvement