รายละเอียดของประสบการณ์ภาคสนาม

Details of Field Work Experience

ชื่อสถาบันอุดมศึกษา	มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าพระนครเหนือ
University	King Mongkut's University of Technology North Bangkok
วิทยา เขต/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**

   090245099 ฝึกทำงานอุตสาหกรรม

   (Industrial Internship)

2. **จำนวนหน่วยกิต - Number of Credits**

   12 Credits

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

   Master of Engineering Program in Electrical and Software Systems Engineering (International Program)

   Core course

4. **อาจารย์ผู้รับผิดชอบรายวิชา และอาจารย์ผู้สอน – Responsible Professor/ Internship Advisor**

   All Lecturers

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

   2/2562

6. **วันที่จัดทำหรือปรับปรุงรายละเอียดของรายวิชาประสบการณ์ภาคสนามครั้งล่าสุด – Industrial description last updated on Day/Month/Year**

   31 July 2019

หมวดที่ 2 จุดมุ่งหมายและวัตถุประสงค์
Item 2 Purposes and Objectives

1. จุดมุ่งหมายของประสบการณ์ภาคสนาม – Industrial Internship's Objectives

The objective of internship is for students to directly learn from actual practices and hands-on experiences in engineering at the related companies/plants, so the students are ready to work professionally for the industry. Students have to conduct technical work with a duration of at least 18 weeks under supervision of suitable engineering staff (industry mentors) in the hosting company in order,

1) to become acquainted with the activities of engineers in enterprises in different areas, in particular development, production and applications-oriented research, equipment and production optimization as well as project planning, acquisition and organization,

2) to get insight into the structure, organization and operation of enterprises considering aspects of quality, economy, ecology, acceptance of products by the market and adherence to delivery dates,

3) to learn to contribute to the development, production and quality assurance of goods, components and systems in the field of study,

4) to become acquainted with the company cultures, social structures (among other things team work, hierarchy, social situation) and safety at work, from the point of view of a higher level employee.

Furthermore, the internship is aimed to develop the students' own initiative and problem solving capability, taking into account the boundary conditions under which industry operates. Apart from these educational aspects, it offers to the student the opportunity to analyze possible professional career perspectives and eases for him/her and the hosting company a later transition into firm employment. Enterprises in return, should take an active role in helping to qualify students in the field of engineering. Doing so, they will further raise interest in the issues the enterprise is dealing with to their own benefit. In due course, the company gets into contact with talented students, which could be recruited after completion of their study. Such recruitment has (in Germany) proven to be a rather effective knowledge transfer mechanism from university to industry which in Thailand is expected to support technology upgrading and competitiveness of the enterprises.

By joint supervision of the internship by a member of both the enterprise (industry mentor) and TGGS (university supervisor), links between those are developed, which may lead to co-operation in areas of mutual interest (joint projects in development and industry-oriented research, mutual exchange of experience and expertise, as well as advanced training of employees). After a well-conducted successful internship, the hosting industry mentor and the university supervisor should envisage a follow-up master thesis project, which fits to the enterprises' needs, but gives also room for science-based creativity on the graduate student side.

- Students will utilize all knowledge to solve or analyze engineering problems that occur in a plant, as well as to work in an industrial environment. In addition, students must write a working report summarizing their jobs and outcomes.

2. วัตถุประสงค์ในการพัฒนา/ปรับปรุงประสบการณ์ภาคสนาม – Objectives to improve/modify the internship

To integrate knowledge learned in course works to the actual situations in the industry to solve or analyze engineering problems.

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.ทักษะความสัมพันธ์ระหว่างบุคคลและความรับผิดชอบ Interpersonal skill and responsibility					5.ทักษะการวิเคราะห์เชิงตัวเลข การสื่อสาร และการใช้เทคโนโลยีสารสนเทศ 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
090245099		○		●	○				○	○	○	○				○		○							○	

ตารางความเชื่อมโยงผลการเรียนรู้ที่คาดหวังของรายวิชาที่ระบุในหลักสูตรตามมาตรฐานการเรียนรู้ของสกอ.

ผลการเรียนรู้ที่คาดหวัง Expected Learning Outcomes	1.คุณธรรม จริยธรรม Morale and Ethics					2.ความรู้ Knowledge				3.ทักษะทางปัญญา Intellectual skill					4.ทักษะความสัมพันธ์ระหว่างบุคคลและความรับผิดชอบ Interpersonal skill and responsibility					5.ทักษะการวิเคราะห์เชิงตัวเลข การสื่อสาร และการใช้เทคโนโลยีสารสนเทศ 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			✓	✓																					

ผลการเรียนรู้ที่คาดหวังของหลักวิชา

รายวิชา Courses		หน่วยกิต Credits	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8	ELO9	ELO10
090245099	ฝึกทำงานอุตสาหกรรม (Industrial Internship)	3 Credits (3-0-6)	●					●	●	●	●	●

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุในรายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล –** **Evaluation method**
ELO 1. 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(s). When the student presents the progress of the internship 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(s) assesses this ability at every meeting and gives the appropriate guidance. The internship approval 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.
ELO 6. Demonstrate self-reliance and teamwork skill for defining and solving specific problems in Electrical and Software Systems Engineering	During the internship, the assigned project will be so designed, that the student has to work with self-reliance. The teamwork skill can be developed, when the student must acquire help form someone in the working place.	This ELO will be assessed by the supervisor's observation together with the work progress reported in every meeting.
ELO 7. Demonstrate skills of interpersonal communication and presenting works in Electrical and Software Systems Engineering to publics	During the internship, the student will be integrated to the working team at the company. The student will gain experience how to communicate in the team. By the assignments, the students basically work with the team at the company to solve the given problems or tasks.	The students will be observed and evaluated by the company's supervisor during the internship period.

ผลการเรียนรู้ **Learning Outcomes**	วิธีสอนที่ระบุในรายละเอียดรายวิชา **Specified Teaching Method**	**วิธีการประเมินผล –** **Evaluation method**
ELO 8 Read and comprehend contents in international academic books, documents and research articles in Electrical and Software Systems Engineering	During the internship, the student has to study technical documents, such as datasheet, manual, reports, and publications, for starting working in the specific field. The supervisor will provide appropriate documents for self-reading. The contents of the paper will be discussed in the progress report meeting. The students can obtain guidance from the lecturer, as appropriate, when necessary.	This ELO will be evaluated by oral interview or questions during the meeting. For written assignments, the students have to submit paper works for corrections.
ELO 9 Indicate and show good attitude and professional ethics in Electrical and Software Systems Engineering	The professional attitude and ethics are covered in the lecture topics. The student will learn of best-practice techniques of ethics in software engineering in the group assignments.	This ELO will be evaluated using individual assignments, group assignments, and exams.
ELO 10. Demonstrate participation in social contribution and to provide correct guidance according to engineering principles to society	During the course, several aspects concerning the standardization and regulations are covered. Along with the technical content, morality and regulation on how such techniques should be implemented are given.	This ELO will be evaluated by oral interview or questions during the class. For written assignments, the students have to submit paper works for corrections.

หมวดที่ 4 ลักษณะและการดำเนินการ
Item 4 Operations and Procedures

1. คำอธิบายโดยทั่วไปของประสบการณ์ภาคสนามหรือคำอธิบายรายวิชา – Industrial Internship description/explanation or course description

Utilize knowledge to solve or analyze engineering problems that occur in a factory, as well as to work in an industrial environment. Students must write a working report summarizing their jobs and outcomes.

2. กิจกรรมของนักศึกษา – Student activities

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

3. รายงานหรืองานที่นักศึกษาได้รับมอบหมาย – Report or work assignment

รายงานหรืองานที่ได้รับมอบหมาย Report or work assignment	กำหนดส่ง Due Date
Internship report	After the internship period.

4. การติดตามผลการเรียนรู้การฝึกประสบการณ์ภาคสนามของนักศึกษา - Monitoring of internship learning outcome

Both supervisors from the industry and university will evaluate the performance of students in each listed aspects and provide the grade on the evaluation form. Students will be informed in order to improve those aspects.

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

The industry mentor in the respective enterprise should be an experienced engineer preferably with at least having a Master's degree him/herself. Since currently the South East Asian industry will not yet employ engineering masters to sufficient extent, an industry mentor with a Bachelor's degree, 5-10 years of experience in the respective technical field and with engineering development background is acceptable as a transitional alternative. This person serves as an advisor and point of contact for any problem arising within the enterprise. He is

responsible there for the fulfillment of the internship guidelines and for issuing the final reference letter.

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

The university supervisor should be a professor actively engaged in the respective engineering field of study and qualified to supervise the master thesis (must have a Ph.D. degree in engineering). He is the contact person for the industry mentor if a problem with the student and his internship arises. At the end of the internship, the industry mentor has to issue a written approval statement and brief judgment of the student's performance. The TGGS Cooperative Engineering Education/Internship office then is responsible for a final check of the internship record (report with list of daily activities, company reference letter, and supervisor's technical judgment), for completeness and formal correctness and will then give the final approval signature and stamp for the acceptance of the internship as part of the studies.

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

7.1 Orientation Day (During the first week of the first semester of the first year:

- Previous interned students give the presentation of their work at the industries to the new students.

- The TGGS Internship Guidelines and Procedures will be provided to students.

- New students will discuss all the issues with students whom had been at the company.

7.2 Course Work: Provide all the skills that students need during the internship. For example,

- Research and Presentation Skills: Students will have to do the projects in all the courses and then they have to present their findings to the audience.

- Computer Programming Skill: Students will learn how to write the computer programming in solving engineering problems within the related courses.

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

The focus group is engineering- and technology-related industry with a sufficient number of engineers (minimum of 5). In the respective branch/department selected for the students internship work; SMEs with less than 50 employees qualify only under exceptional circumstances (e.g. if the SME is an entrepreneurial high-tech company) to be recorded in writing by the university supervisor. These enterprises should typically provide opportunities to get acquainted with development and industry-oriented research, simulation and design (in particular CAD, Computer-aided Design), conceptual planning, construction, production, assembly, machine operation, maintenance and testing.

หมวดที่ 5 การวางแผนและการเตรียมการ
Item 5 Planning and Preparation

1. การกำหนดสถานที่ฝึก – Work place identification

The coordinator will send the internship proposal letter to the selected/qualified companies in Thailand and foreign countries requesting for the internship support along with the TGGS Internship Guidelines and Procedures. The coordinator will coordinate this activity and also provide additional information to the companies to establish the understanding about the Aachen model for internship program. The students will go through the same selection process as they are seeking for a job at the company. The selection process involves the following aspects: preparation for CV, applying for a position at the company, interview with the company. After this selection process, the company will select the internship student that appropriate to the internship project. In addition, the company will assign the company supervisors/mentors for this internship project.

2. การเตรียมนักศึกษา – Student preparations

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

2.1 Research skill

2.2 Experimental skill including in the laboratory and simulations

2.3 Solving problems skill

2.4 Presentation skill

2.5 Writing the project and/or technical report skill

2.6 Social skill

3. การเตรียมอาจารย์ที่ปรึกษา/อาจารย์นิเทศ – Advisor preparations

The coordinator will assign the lecturer to advise the internship project based on his/her experience and provide the internship plan for 18 weeks and the internship project topic in advance. The advisor must be familiar with the TGGS Internship Guidelines and Procedures and following the procedures and regulations very closely.

4. การเตรียมพนักงานพี่เลี้ยงในสถานที่ฝึก - Preparation of supervisor at work place

Since, the supervisors/mentors are already familiar with the internship project; they only need to understand the TGGS Internship Guidelines and Procedures. The coordinator will provide the internship plan for 18 weeks and stress the important of the visit and the monthly meeting.

5. การจัดการความเสี่ยง – Risk management

5.1 The internship student is selected by the company based on his/her background that appropriate to the internship project.

5.2 The internship student has been supervised by the advisors and supervisors/mentors that are familiar with the internship project.

5.3 The supervisors/mentors have clearly planned the internship project tasks for the internship student.

5.4 The internship student receives the orientation and safety training from the company during the first several weeks of internship.

หมวดที่ 6 การประเมินนักศึกษา
Item 6 Student Evaluation

1. หลักเกณฑ์การประเมิน – Evaluation criteria

According to the Evaluation Form for Internship Project, the students will be evaluated in the followings:

- Was the student scientifically approached the project in a systematic way?
- Has the student obtained and evaluated available scientific literature in sufficient detail?
- Has the student developed a fundamental understanding of the research topic?
- Was the student worked independently?
- Has the student efficiently taken into account suggestions and specifications?
- Did the student contributed own ideas for solving the task?
- Has the student completely solved the task with appropriate means, worked thoroughly with sufficiently sophisticated methods?
- Is the written report written comprehendible and logically structured?
- Has the student worked carefully when writing the report?
- Has the student worked efficiently on the project (motivation, commitment)?

2. กระบวนการประเมินผลการปฏิบัติงานของนักศึกษา – Evaluation procedure

Both supervisors from the industry and university will evaluate the performance of students in each listed aspects and provide the grade on the evaluation form. Students will be informed in order to improve those aspects.

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

Both supervisors from the industry and university will evaluate the performance of students in each listed aspects and provide the grade on the evaluation form. Students will be informed in order to improve those aspects. In addition, the supervisors/mentors can discuss freely with the advisors on any aspects related to the internship project including the performance of the internship student.

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

Both supervisors from the industry and university will evaluate the performance of students in each listed aspects and provide the grade on the evaluation form. Students will be informed in order to improve those aspects. In addition, the advisors will discuss with supervisors/mentors on any aspects related to the internship project including the performance of the internship student.

5. การสรุปผลการประเมินที่แตกต่าง – Evaluation difference's summary

The students will be informed in order to improve those aspects during the internship. The advisors and supervisors/mentors can observe the improvement of the student's performance.

หมวดที่ 7 การประเมินและปรับปรุงการดำเนินการของการฝึกประสบการณ์ภาคสนาม
Item 7 Industrial Internship Evaluation and Improvement

1. **กระบวนการประเมินการฝึกประสบการณ์ภาคสนามโดยผู้เกี่ยวข้องต่อไปนี้ – Evaluation procedures of following stakeholders**

   (1) นักศึกษา - Student

   The internship student will evaluate the internship course using the Course Evaluation form provided from the TGGS.

   (2) พนักงานพี่เลี้ยงหรือผู้ประกอบการ – Supervisor at work place

   The supervisors/mentors will evaluate the internship student using the Evaluation Form for Internship Project in which they can provide additional comment.

   (3) อาจารย์ที่ดูแลกิจกรรมภาคสนาม – Advisor/lecturer

   The advisors will evaluate the internship student using the Evaluation Form for Internship Project in which they can provide additional comment.

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

   None

2. **กระบวนการทบทวนผลการประเมินและการวางแผนปรับปรุง – Evaluation review procedure and improvement planning**

   The internship evaluation results will be discussed with the supervisors/mentors and the advisors at the final meeting. The new strategies and procedures will be suggested to improve the internship program. The revision and improvement planning of internship procedure and program will be discussed prior to the internship period.