

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
90245099 ฝึกงานอุตสาหกรรม
(Industrial Internship)
- จำนวนหน่วยกิต - Number of Credits
12 Credits
- หลักสูตรและประเภทของรายวิชา - Type of Curriculum and Type of Course
Master of Engineering Program in Electrical and Software Systems Engineering (International Program)
Internship
- อาจารย์ผู้รับผิดชอบรายวิชา และอาจารย์ผู้สอน - Responsible Professor/ Internship Advisor
Asst. Prof. Dr. Wijarn Wangdee
- ภาคการศึกษา/ ชั้นปีที่เรียน - Semester / Course Year
Sem 2/60
- วันที่จัดทำหรือปรับปรุงรายละเอียดของรายวิชาประสบการณ์ภาคสนามครั้งล่าสุด - Industrial description last updated on Day/Month/Year
4-May-16

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.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
90245099				○			●						○			○				○					

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
		90245099	ฝึกงานอุตสาหกรรม (Industrial Internship)		●		●		●		●	

<p>ผลการเรียนรู้ Learning Outcomes</p>	<p>วิธีสอนที่ระบุใน รายละเอียดรายวิชา Specified Teaching Method</p>	<p>วิธีการประเมินผล – Evaluation method</p>
<p>ELO 2 Ability to explain phenomena in Electrical and Software Systems Engineering by referring theories in Electrical and Software Systems Engineering</p>	<p>The concept of each topic in each chapter will be introduced with basic or fundamental definitions, visualization and correlations. The explanation will be based on the theories in Electrical and Software Systems engineering. The student will be asked to explain the discussed topics using the theories, which the students have known before the lecturer gives the correct explanation. By this approach, the students will practice how to apply the learned theories by themselves to explain the discussed phenomena.</p>	<p>ELO2 will be evaluated by questions and assignment during the class or during the exams.</p>
<p>ELO 4 Ability to analyze and find reasons to explain relationships between experimental results and theory in Electrical and Software Systems Engineering</p>	<p>During the classes, some topics will be explained using experimental data obtained from literature. The student will be asked to analyze the presented experimental data and explain the observed behavior using the theories, which the students have known before the lecturer gives the correct explanation. Furthermore, the students will be asked to find reasons of the deviation from the theories to gain the practical view of the discussed topic.</p>	<p>This ELO2 will be evaluated by questions and assignment during the class or during the exams.</p>
<p>ELO 6 Ability to demonstrate self-reliance and teamwork skill for defining and solving specific problems in Electrical and Software Systems Engineering</p>	<p>During the course, the students will get individual and group assignments for solving problems related to the content of the course. By the assignments, the students have to work alone or as a team to solve the given problems or tasks.</p>	<p>he students have to submit their work in paper forms for corrections. As appropriate, students have to present their works by oral presentation.</p>

<p>ผลการเรียนรู้ Learning Outcomes</p>	<p>วิธีสอนที่ระบุใน รายละเอียดรายวิชา Specified Teaching Method</p>	<p>วิธีการประเมินผล – Evaluation method</p>
<p>ELO 8 Ability to read and comprehend contents in international academic books, documents and research articles in Electrical and Software Systems Engineering</p>	<p>During the course, some additional advanced articles will be given to the students as practices of self-reading. The contents of the paper will be discussed in the class later. In additions, some assignments will require the student to find more information from the international research articles. The students can obtain guidance from the lecturer, as appropriate, when the contents of the articles are beyond their knowledge and experiences.</p>	<p>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.</p>

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 TGGGS 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. การเตรียมพนักงานที่เลี้ยงในสถานที่ฝึก - 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 comprehensible 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. ความรับผิดชอบของพนักงานที่เลี้ยงต่อการประเมินนักศึกษา – 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. ความรับผิดชอบของอาจารย์ผู้รับผิดชอบประสานภาคสนามต่อการประเมินนักศึกษา – 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.