Program: ECE
Degree Level: Master

Faculty/College: TGGS

Course 090245098

Master Thesis

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

Section 1: General Information

1. Course code and course Title
   090245098 Master Thesis
2. Total credits
   12 credits
3. Curriculum and course category:
   Curriculum: *Master of Engineering in Electrical and Computer Engineering*
   Course category: Required Courses
   ☐ Core Course ☐ Specific Core Course
   ☐ Industrial Internship ☑ Master Thesis
   Elective Courses
   ☐ General Elective ☐ Specific Elective ☐ Other Elective
4. Course coordinator/ instructors
   Course coordinator .....
   Instructors All lecturers
5. Semester/ year of study
   ☑ Semester 1 (Aug. to Dec.) ☐ Semester 2 (Jan. to May) Academic Year: 2021
6. Pre-requisite (if any)
   ☑ No ☐ Yes, please provide: .....
7. Co-requisites (if any)
   ☑ No ☐ Yes, please provide: .....
8. Information for quality assurance in education
   This course shows evidence of:
   - 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

9. Date of latest revision

July 2021

Section 2: Course Description and Implementation

1. Course Description

Research on an interesting topic in Electrical and Computer Engineering.

2. Number of hours per semester

Lecture	Practice	Self-study
--	Full time	--

Course Category ☑ Practice ☐ Cooperative Education

Course Evaluation ☑ A-F ☐ S/U ☐ P

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

Giving academic advice (minimally 2 hour per week)

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

CLO 1 To develop deeper knowledge, understanding, capabilities and attitudes in the context of the program of study.

CLO 2 To comprehend research articles and synthesize technical and scientific knowledge acquired in previous studies along with industrial application aspects.

CLO 3 To solve or analyze engineering problems that occur in an industry or valid research issues.

CLO 4 To conduct mathematical model or mechanism employed in the proof of proposed solution or study.

CLO 5 To display the capability required for independent work and good ethics in research operations.

CLO 6 To write research findings/outcomes and able to communicate that with other researchers in the related fields.

5. The mapping between the curriculum's Expected Learning Outcomes (ELOs) and Course Learning Outcomes (CLOs) (*Table 5.1: for subject-specific courses designed for a specific curriculum; Table 5.2 is purposed for courses designed for various curriculums)*

Table 5.1 ELOs-CLOs Consistency: for subject-specific courses for a specific curriculum

ELOs/CLOs consistency	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	CLO 6
ELO1	✓					
ELO2		✓				
ELO3			✓			
ELO4				✓		
ELO5						
ELO6						
ELO7						✓
ELO8		✓				
ELO9					✓	
ELO10						

Table 5.2 Mapping of desirable characteristics of KMUTNB graduates and CLOs (for non-specific courses, designed for various curriculums)

Consistency between desirable characteristics of KMUTNB Graduates- CLOs	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	CLO 6
1. Professional credentials with critical thinking skills		✓	✓	✓		
2. Integrity and social responsibility					✓	
3. Innovative and technopreneur mindset						
4. Global Competence						✓

Section 3: Student Improvement in relation to Course Learning Outcomes (CLOs)

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

Program: **ECE** **Faculty/College**: **TGGS**
Degree Level: **Master**

Course Learning Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
CLO 1	• 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.
CLO 2	• 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 helps developing this ability by giving guidance or giving examples how to analyze and find reasons. • The student has 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 proposal, progress and defense examination.
CLO 3	• Through meeting with advisor(s), the student will be have to present the results of their critical understanding along with proposed problem solving ideas. Advisor(s) then can give guidance along with the directions towards to issues.	• This CLO will be evaluated by oral discussion along with examination throughout the studying period. • The examination committee will evaluate the student's proposed solution 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.
CLO 4	• The student will have to build a mathematical model or tool 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 or tool, the student can derive the solution for the considered problem systematically. • The advisor will give the guidance and help in verifying the correctness of the conducted model or tool.	• The advisor assesses this ability at every meeting and gives the appropriate guidance. • The examination committee will evaluate the student's skill 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.

Course Learning Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
CLO 5	• Throughout the research operation, the good ethics can be discussed and guided by the advisor(s) in each process. • The student will learn of best-practice techniques of ethics in software engineering via the participation in industry/organization.	• This CLO will be assessed by the advisor's observation together with the work progress reported in every meeting. • In case of industrial collaboration research, feedback from the industry/organization is considered.
• CLO 6	• Throughout the research operation, the student will have to write the findings as the articles and have to present the work during examinations or in conference. Guidance and preparation will be given by the advisor(s). • Through such repeated experience, the student will gradually increase performance.	• The development will be observed and evaluated by the advisor(s) throughout the study course. • The examination committee will evaluate the student's interpersonal communication and presentation skill 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.

Section 4: Learning Activities

1. 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.

2. Reports or assignments

Reports or assignments	Deadline
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.
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

3. Monitoring student learning outcome in an internship experiences

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. Duties and responsibilities of a workplace internship mentor

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. Duties and responsibilities of the advisor / faculty supervisor

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.

6. Preparation in guiding and assisting the students

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

7. Facilities and support required by the workplace

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

Section 5: Planning and Preparation

1. Work place identification

Based on each master thesis topic.

2. Student preparation

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:

(1) Research skill
(2) Experimental skill including in the laboratory and simulations
(3) Solving problems skill
(4) Presentation skill

(5) Writing the project and/or technical report skill

(6) Social skill

3. Advisor/ supervisor preparation

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

4. Preparation of mentor 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. Risk management

None

Section 6: Student Evaluation

1. 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 theirs master thesis.
- Students can join and work with other people.
- Students can present their works.

2. Evaluation process

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. Responsibilities of monitoring and student evaluation by the mentor

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. 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 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. 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 an Internship Program

1. Evaluation process conducted by:

1.1 Student intern

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

1.2 Mentor at work place

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

1.3 Advisor/ teacher in charge

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

1.4 Others

None

2. Review of evaluation procedures and improvement planning

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