



## Course 090125198

### Master Thesis

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

#### Section 1: General Information

**1. Course code and course Title**

090125198      Master Thesis

**2. Total credits**

12 credits

**3. Curriculum and course category:**

Curriculum:      *Master of Engineering in Mechanical and Automotive Engineering Program*

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(s): Curriculum Chairman: Assoc. Prof. Dr. Ekachai Juntasaro

Program Coordinators: Assoc. Prof. Dr. Ekachai Juntasaro (MESD)

Assoc. Prof. Dr. Julaluk Carmai (ASAE)

Advisors: Assoc. Prof. Dr. Ekachai Juntasaro

Assoc. Prof. Dr. Julaluk Carmai

Assoc. Prof. Dr. Saiprasit Koetniyom

Asst. Prof. Dr. Karuna Tuchinda

Asst. Prof. Dr. Saharat Chanthanumataporn

Dr.-Ing. Alex Brezing

Dr. Ampol Likitchatchawankun

**5. Semester/ year of study**

Semester 1 (Aug. to Dec.)

Semester 2 (Jan. to May)

Academic Year: 2023

**6. Pre-requisite (if any)**



Program: MAE  
Degree Level: Master of Engineering

Faculty/College: TGGS

No  Yes, please provide: .....

**7. Co-requisites (if any)**

No  Yes, please provide: .....

**8. Venue of study**

Thesis  Research Center  Industry  
 RWTH Aachen University  MoU Partner University

**9. Information for quality assurance in education**

This course shows evidence of:

- Development of implementation from previous practices, e.g. the improvement of class teaching, course content, content classification and methods used for learning assessment
- 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
- Combination of cultural heritage preservation efforts into instruction or student activities

**10. Date of latest revision**

June 2023

**Section 2: Course Description and Implementation**

**1. Course Description** *(As written in the Official Approved Curriculum)*

“Research in an interesting topic in Mechanical and Automotive Engineering. The student will submit the thesis to summarize the thesis work content, deliverables and confirmed outcomes.”

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 students to display the knowledge and capability required for independent work.

**2. Number of hours per semester**

Lecture	Practice	Self-study
	720 hours/ 18 weeks	30 hours/ semester



Program: MAE  
Degree Level: Master of Engineering

Faculty/College: TGGS

Lecture	Practice	Self-study
	(40 hours/week*)	(5 hours/3 weeks*)

Remark: \* Based on at least 18 weeks

Course Category:             Lecture                             Practice                             Laboratory  
 Course Evaluation:         A-F                                     S/U                                     P

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

- 1. Giving academic advice (minimally number hour per week) during the office hour  
 1             2             3             4             5             .....
- 2. Adopting information technology-based academic advising  
 Email     Phone     Communication Apps                             Meeting Online:  
 Other (specify) .....
- 3. ....

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

The student will develop the intellectual skills and the multi-discipline in the research and development for industrial application by focusing on the followings:

- CLO 1        To critically and systematically integrate/apply all knowledge from the lectures into the research project.
- CLO 2        To acquire more in-depth knowledge of the research project, including deeper insight into current research and development work.
- CLO 3        To use a holistic view to critically, independently and creatively identify, formulate and deal with complex issues including planning and using adequate methods to conduct qualified tasks in given frameworks.
- CLO 4        To analyze and critically evaluate different technical, scientific and industrial solutions, including to evaluate the thesis work.
- CLO 5        To create the advanced/innovative/novel technologies for industrial application.
- CLO 6        To develop the soft skills such as presentation skills, leadership and teamwork, especially in the research group, and the writing skill for the publication and thesis summarizing their research methodology and findings.

**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 a subject-specific course/ a specific curriculum)*

ELOs/CLOs consistency	CLO	CLO	CLO	CLO	CLO	CLO
	1	2	3	4	5	6
GELO1 - Competence in the definition and solving of technical tasks	✓	✓	✓			
GELO2 - Awareness of engineering responsibility			✓			
GELO3 - Report writing skills				✓		✓
GELO4 - Ability to work as team member						
GELO5 - Competence in literature research and summary				✓		✓
GELO6 - Presentation skills				✓		✓
GELO7 - Project management and team leadership skills			✓			✓
GELO8 - Self-Guided Learning (Lifelong Learning)			✓			
SELO1 - Knowledge and understanding in methodology of simulation and design	✓	✓				
SELO2 - Knowledge and understanding in scientific fundamentals of technical systems	✓	✓				
SELO3 - Knowledge of technical systems and technologies in the field	✓	✓				
SELO4 - Competence in analysis and modelling of technical scenarios	✓	✓	✓	✓		
SELO5 - Skills of using commercial software for simulation in engineering applications	✓	✓			✓	
SELO6 - Skills of using commercial software for design in engineering applications	✓	✓			✓	
SELO7 - Knowledge of engineering materials, failure modes and production techniques	✓	✓				
SELO8 - Knowledge of applicable laws, guidelines, regulations	✓		✓			
SELO9 - Knowledge, understanding and ability to consider the human body in simulation and design	✓	✓				

*Remark: All ELOs and CLOs for the course (highlighted row) are as written in the Official Approved Curriculum.*



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

Course Learning Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
CLO 1	Project-based learning Project presentation	Research group discussion
CLO 2	Literature survey and review Project presentation	Research group discussion/report evaluation
CLO 3	Project-based learning Project presentation	Research group discussion
CLO 4	Literature survey and review Project presentation	Research group discussion/report evaluation
CLO 5	Project-based learning Project presentation	Research group discussion
CLO 6	Project presentation/report/article/thesis	Research group discussion/report evaluation/peer review/thesis committee



**Example:**

<b>Course Learning Outcomes (CLOs)</b>	<b>Teaching Methods compliant with CLOs</b>	<b>Evaluation Methods compliant with CLOs</b>
<i>CLO1</i>	<i>Lecture, case studies, assignment</i>	<i>- Midterm exams Assignment evaluation</i>
<i>CLO2</i>	<i>Case studies, project-based learning</i>	<i>- Evaluation of presentations and group projects Assessment of assigned exercises</i>
<i>CLO3</i>	<i>Case studies, group discussions, project-based learning</i>	<i>- Presentation and group project assessment; teacher observation, idea sharing Alternative peer evaluation</i>
<i>CLO4</i>	<i>Group discussion, project presentation</i>	<i>- Peer evaluation of in-group project Teacher observation</i>

### Section 4: Learning Activities

#### 1. Student activities

All students must register and perform the thesis project within 6 months with a maximum of 3-month extension. Prior starting the thesis work, during the second semester of the first academic year, the results of selected thesis topic are announced in advance to the student. So that the student can discuss about the objective, scope, methodology and expected results for the project. The period to start working on the thesis project will be announced after the internship report have been submitted to the curriculum chairman/program coordinator.

The student will be integrated into the thesis advisor's research group in which the student will have regular meetings with the thesis advisor and his/her research group to discuss about the progress and obstacle of the thesis work. While solving the problem, the student will seek for assistance/guidance from other colleagues in the research group with fellow Master Students, PhD Students, Research Assistants and/or Engineers or other research groups. Moreover, the student will participate in the research group's orientation, lab tour and safety training during the second semester of the first academic year prior registering for the thesis proposal as well as social activities throughout the thesis work period. This will strengthen the relationship among the co-researchers.

Besides the student performs the actual experiments and obtains the correlations from the experiments, the engineering calculations, modeling and computer simulations will be used as tools to solve the engineering problems.



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 Discussion, Conclusions, Suggestions/Recommendations for Future Work.
- Master Thesis Progress Examination
- Continuation of Thesis Work and Preparation of Master Thesis: Methodology, Results and Discussion, Conclusions, Suggestions/Recommendations for Future Work
- Master Thesis Defense Examination and Master Thesis Submission

Since the student will be treated as one of thesis advisor's researchers, the student must follow his/her rules and regulations along with the TGGS rules and regulations. In addition, the student must consider the morality, confidentiality and engineering ethics in every step in solving the engineering problems. The advisor will regularly give advice or guidance to the student and discuss every aspect of the thesis.

## 2. Reports or assignments

Audit visit: Responsible advisors pay a visit every 6 weeks to assist or give guidance to students and the main objectives of each time for students are described as follows:

Reports or assignments	Deadline
Literature Review	Prior to 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



*Remark: Number of meetings and deadlines can be redesigned to suit the company working style.*

### **3. Monitoring student learning outcome in a master thesis research work**

The thesis advisor will regularly meet the student to discuss about the progress and obstacle of the thesis work, update literature review from texts, research journals and other publications, and evaluate the student's performance; critically and systematically thinking skills; interpersonal and professional working relationship and working atmosphere; and analytical, communications and IT skills, from the following items:

- The student's weekly/monthly report
- The student's thesis proposal, progress and final presentations
- The student's thesis

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.

### **4. Duties and responsibilities of a workplace mentor for the master thesis research work**

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. In each meeting, the supervisor/mentor will evaluate the performance of the student in each listed aspect 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. In each meeting, the thesis advisor will evaluate the performance of the student in each listed aspect 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**

#### **6.1 Orientation Day (During the first semester of the first academic year):**

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





- Lab Tour and Safety Training
- 6.2 Regular Master Research Project Progress Meeting (depending on each research group):
  - Students doing the master thesis give the presentation of their work to their belonged research group.
- 6.3 Course Work: Provide all the skills that students need during the master thesis. For example,
  - Research and Presentation Skills: Students will do some literature surveys/reviews and presentations in all the courses.
  - Computer Programming Skill: Students will learn how to write the computer programs in solving engineering problems within the related courses.
  - Computer Simulation Skill: Students will learn how to use the computer simulation tools such as ANSYS in solving engineering problems within the related courses.

## 7. Facilities and support required by the workplace

The MAE program currently has 9 laboratories: (1) Solid Mechanics Lab, (2) CFD Research Lab, (3) Structural Dynamics Lab, (4) Design and Innovation Lab, (5) Automotive Virtual Safety Simulation Laboratory, (6) Automotive Test Track, (7) Automotive Component Impact Test Laboratory, (8) Full Vehicle Crash Test Laboratory, and (9) Automotive Brake Performance Test Area. Inside the Solid Mechanics Lab, there are 4 sub-areas for the following 4 laboratories: (1.1) Strength of Material Lab, (1.2) Material Processing and Characterization Lab, (1.3) Material Treatment Lab, and (1.4) Contact Mechanics and Surface Engineering Lab.

## 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 to the master thesis period. In order to have a successful thesis, 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 Problem solving skill



2.4 Presentation skill

2.5 Writing skill for the project and/or technical report, article and thesis

2.6 Social skill

### **3. Advisor/ supervisor preparation**

The curriculum chairman/program coordinator will assign the lecturer to be the thesis advisor for his/her interest research topic and provide the master thesis plan for 6 months in advance. The thesis advisor must be familiar with the TGGS Master Thesis Guidelines and Procedures and following the procedures and regulations very closely. In addition, the advisor must regularly meet the student to assist or give guidance.

### **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**

The lecturers will announce the master thesis topics in advance during the second semester of the first academic year. The student will make the appointment with the lecturers of his/her interested topics and have discussion on the research background, objective, and scope. Then, the student will select the announced master thesis topics. The lecturers will accept the appropriate student for their master thesis project.

5.1 The student will select the announced master thesis topics.

5.2 The student will be accepted by the thesis advisor based on his/her background that is appropriate to the master thesis project.

5.3 The student will be supervised by the thesis advisor and the supervisor/mentor that are familiar with the project.

5.4 The thesis advisor and the supervisor/mentor will carefully plan the project tasks for the student.

5.5 The student will receive the orientation, lab tour and safety training from the thesis advisor's research group prior starting the thesis work.

5.6 The student will participate in the Regular Master Research Project Progress Meeting to exchange the ideas and discuss about the project.

5.7 The responsible thesis advisor and supervisor/mentor regularly meet the student to assist or give guidance.

## **Section 6: Student Evaluation**

### **1. Evaluation criteria**



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

**2. Evaluation process**

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

**3. Responsibilities of monitoring and student evaluation by the mentor**

Only relevant for Master Thesis Project with the industry. The supervisor/mentor regularly meets the student to assist or give guidance during the office hour and the regular research group meeting. In each meeting, the supervisor/mentor will evaluate the performance of student in each listed aspect and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the TGGGS Master Thesis Proposal, Progress and Defense Examinations by the thesis committee. The thesis committee will provide the comments on the TGGGS Evaluation Form and finally provide the grade on the Master Thesis Defense Examination Evaluation Form.

**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. In each meeting, the thesis advisor will evaluate the performance of the student in each listed aspect and the student will be informed in order to improve those aspects. Moreover, the student will be evaluated during the TGGGS Master Thesis Proposal Progress and Defense Examinations by the thesis committee. The thesis committee will provide the comments on the TGGGS 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 the 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 a Master Thesis Research Work****1. Evaluation process conducted by:****1.1 Student**

The student will evaluate the Master Thesis course using the TGGGS Course Evaluation form.

**1.2 Supervisor at work place**



**Program: MAE**  
**Degree Level: Master of Engineering**

**Faculty/College: TGGS**

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Only relevant for Master Thesis Project with the industry. The supervisors/mentors will evaluate the student using the TGGS Master Thesis Proposal, Progress and Defense Examination Evaluation Forms in which they can provide additional comment.

**1.3 Advisor/teacher in charge**

The thesis advisor will evaluate the student using the TGGS Master Thesis Proposal, Progress and Defense Examination Evaluation Forms in which they can provide additional comment.

**1.4 Others**

None

**2. Review of evaluation procedures and improvement planning**

None



**Instruction for OBE 4 Preparation  
Section 1: General Information**

Topic	Description
1. Course code/ title	XXXXXXXXXX Course title (Thai and English)
2. Number of credits	Credits (Lecture/Practice/Self-study Hours)
3. Course category	Specify the program of study and course classification e.g. general core courses for several disciplines, required, major, electives, specific elective categories
5. Semester / year of study	Specify semester/ year of study consistent with the curriculum
8. Information for quality assurance in education	Put check marks in the appropriate boxes

**Section 2: Course Description and Implementation**

Topic	Description
1. Course description	As defined in Program Specification (OBE2)
2. Time length per week	Indicate lecture hours – lab/practice hours – self study hours
3. Time length per week for individual academic consulting	Identify time and modes of consultation outside classroom, e.g. <i>consulting via mobile phone, e-mail, social media</i>
4. Course Learning Outcomes: CLOs	Complete the form (●) in accordance with the statements of responsibilities in OBE2 (program specification) and fill out the Table indicating the ELOs-CLOs Consistency
5. Expected Learning Outcomes of the study program(ELOs)	Define ELOs as specified in OBE2, section 4 (Table 5.1 -Specific course for a particular program; Table 5.2- Course for multiple programs)  Put check marks to the ones that apply.

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

Topic	Description
Teaching methods, learning experience and assessment in line with CLOs	See statements in OBE2 (Program specification) section 4.  ELOs can be applied to determine course implementation and learning outcomes assessment on the basis of CLOs.