

The Sirindhorn International  
**TGGS**

Industry-Oriented Graduate Education and Research in Thailand based on the **RWTH** Aachen Model

Thai-German  
Graduate School  
of Engineering



**KMUTNB**

# Student Handbook

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Thai-German Graduate School of Engineering



August 2020



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Thai-German Graduate School of Engineering

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# ACADEMIC CALENDAR

## General Information:

Important Information	First Semester	Second Semester	Summer Semester
1. Regular Registration Period			
1.1 Student ID 59-62	21– 23 Jul. 2020	14 – 18 Dec. 2020	31 May – 4 Jun. 2021
1.2 Student ID 63	31 Jul. 2020		
2. Study Time			
2.1 First Day of Class	3 Aug. 2020	4 Jan. 2021	7 Jun. 2021
2.2 Last Day of Class	20 Nov. 2020	30 Apr 2021	16 Jul .2021
2.3 End of Semester	4 Dec. 2020	14 May 2021	16 Jul. 2021
3. Enrollment and Reinstatement			
3.1 Consultation with TGGS Program Coordinator or TGGS Advisor or Head of Department, and Register for Courses or Retaining Student Status	3 Jul. – 22 Oct. 2020	4 Jan. – 2 Apr. 2021	31 May – 4 Jun. 2021
3.2 Period for Late Registration with Late Fee or Study Leave of Absence	26 Oct. – 9 Nov. 2020	5 –19 Apr. 2021	-
3.3 Period for Reinstatement of Student Status (Only for the student that has been retired from the program because he/she not complete the registration during the specified period.)	10 – 24 Nov. 2020	20 Apr. – 3 May. 2021	-
3.4 Period to Add Courses	3 – 24 Aug. 2020	4 – 18 Jan. 2021	-
3.5 Period to Withdraw Courses	3 Aug. – 26 Oct. 2020	4 Jan. – 29 Mar. 2021	-
4. Examination			
4.1 Mid-Term Examination Period	28 Sep. – 2 Oct. 2020	1 – 5 Mar. 2021	-
4.2 Final Examination Period	23 Nov. – 4 Dec. 2020	3 – 14 May 2021	-
4.3 Last Day for Submission of Application for Thesis/Dissertation Defense Examination and Approval of Graduation			
▪ Doctoral Degree	13 Nov. 2020	2 Apr. 2021	18 Jun. 2021
▪ Master Degree	20 Nov. 2020	9 Apr. 2021	25 Jun. 2021
4.4 Last Day for Submission of Thesis/Dissertation Book	18 Dec. 2020	28 Apr. 2021	23 Jul. 2021

Important Information	First Semester	Second Semester	Summer Semester
<b>5. Evaluation and Grade Approval</b>			
5.1 Course Evaluation and Evaluation of Student Achievement	26 Oct. – 4 Dec. 2020	29 Mar. – 14 May 2021	-
5.2 Grade Approval	6 Jan. 2021	2 Jun. 2021	-
5.3 Official Grade Announcement	25 Jan. 2021	21 Jun. 2021	-

**Other activities:**

	Semester 1/2020	Semester 2/2020
<b>TGGS New Student Orientation Day</b>	29 Jul. 2020	
<b>The wreath laying ceremony at the royal shrine dedicated to King Rama IV. (Science week)</b>	18 Aug. 2020	
<b>TGGS Advisory Board Meeting</b>	11 Sep. 2020	
<b>TGGS Sport Day</b>	Student Activities are possibly postponed due to the spread of COVID-19.	
<b>The wreath laying ceremony at the royal shrine dedicated to King Rama IV. (the Memorial day birthday demise)</b>	1 Oct. 2020	
<b>KMUTNB Commencement Day for Academic Year 2018</b>	13 Nov. 2020	
- Rehearsal at KMUTNB	2 Nov. 2020	
- Group Photo	8 Nov. 2020	
- Rehearsal at BITEC	11 Nov. 2020	
<b>TGGS International Day</b>	Student Activities are possibly postponed due to the spread of COVID-19.	
<b>National University Sport Day</b>	Student Activities are possibly postponed due to the spread of COVID-19.	
<b>KMUTNB Anniversary Ceremony Day</b>		19 Feb. 2021
<b>KMUTNB and TGGS Open House</b>	Nov. 2020 (To be announced later.)	Feb. 2021 (To be announced later.)
<b>TGGS Thai New Year</b>		8 Apr. 2021
<b>RWTH Summer School</b>		Jul. 2021

TGGS Academic Calendar is available on our website: <https://tggs.kmutnb.ac.th/academic-calendars>.

## TGGS ADMINISTRATION/USEFUL CONTACTS

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Assoc. Prof. Dr.-Ing. Piyada Suwanpinij <i>Lecturer and Researcher</i>	Ext. 2918	MPE Lecturer Offices 6th Floor	<a href="mailto:piyada.s@tggs.kmutnb.ac.th">piyada.s@tggs.kmutnb.ac.th</a>
Asst. Prof. Dr.-Ing. Kumpanat Sirivedin <i>Lecturer and Researcher</i>	Ext. 2918	MPE Lecturer Offices 6th Floor	<a href="mailto:kumpanat.s@tggs.kmutnb.ac.th">kumpanat.s@tggs.kmutnb.ac.th</a>
Asst. Prof. Dr. Rungsima Yeetsorn <i>Lecturer and Researcher</i>	Ext. 2920	MPE Lecturer Offices 6th Floor	<a href="mailto:rungsima.y@tggs.kmutnb.ac.th">rungsima.y@tggs.kmutnb.ac.th</a>

More information, please visit our website: <https://tggs.kmutnb.ac.th/lecturers-researchers>.

### **Railway Vehicles and Infrastructure Engineering (RVIE)**

Asst. Prof. Dr.-Ing. Chayakorn Netramai <i>RVIE Master Curriculum Chairman</i>	Ext. 2911	SSE Lecturer Offices 8th Floor	<a href="mailto:chayakorn.n@tggs.kmutnb.ac.th">chayakorn.n@tggs.kmutnb.ac.th</a>
Asst. Prof. Dr. Kittichai Sojiphan <i>TGGS-RVIE Program Coordinator Lecturer and Researcher</i>	Ext. 2911	RVIE Lecturer Offices 8th Floor	<a href="mailto:kittichai.s@tggs.kmutnb.ac.th">kittichai.s@tggs.kmutnb.ac.th</a>
Asst. Prof. Dr.-Ing. Kumpanat Sirivedin <i>Lecturer and Researcher</i>	Ext. 2918	MPE Lecturer Offices 6th Floor	<a href="mailto:kumpanat.s@tggs.kmutnb.ac.th">kumpanat.s@tggs.kmutnb.ac.th</a>
Asst. Prof. Dr. Karuna Tuchinda <i>Lecturer and Researcher</i>	Ext. 2915	MESD Lecturer Offices 7th Floor	<a href="mailto:karuna.t@tggs.kmutnb.ac.th">karuna.t@tggs.kmutnb.ac.th</a>
Dr.-Ing. Alexander Brezing <i>Lecturer and Researcher</i>	Ext. 2915	MESD Lecturer Offices 7th Floor	<a href="mailto:alex.b@tggs.kmutnb.ac.th">alex.b@tggs.kmutnb.ac.th</a>

More information, please visit our website: <https://tggs.kmutnb.ac.th/lecturers-researchers>.

### **Electrical and Software Systems Engineering Program (ESSE)**

Assoc. Prof. Dr. Soamsiri Chantaraskul <i>Master and Doctoral Curriculum Chairmen</i>	ext. 2929	CSE Lecturer Offices 4th Floor	soamsiri.c@tggs.kmutnb.ac.th
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### **Minor: Communication and Smart System Engineering (CSE):**

Assoc. Prof. Dr. Soamsiri Chantaraskul <i>CSE Program Coordinator Lecturer and Researcher</i>	ext. 2929	CSE Lecturer Offices 4th Floor	soamsiri.c@tggs.kmutnb.ac.th
Assoc. Prof. Dr. Chaigyod Pirak <i>SGE Coordinator Lecturer and Researcher</i>	ext. 2910	CSE Lecturer Offices 4th Floor	chaigyod.p@tggs.kmutnb.ac.th
Asst. Prof. Dr.-Ing. Suramate Chalermwisutkul <i>RWTH-TGGS Dual Degree Coordinator/ Lecturer and Researcher</i>	ext. 2910	CSE Lecturer Offices 4th Floor	suramate.c@tggs.kmutnb.ac.th

### **Minor: Electrical Power and Energy Engineering (EPE):**

Assoc. Prof. Dr. Wijarn Wangdee <i>EPE Program Coordinator Lecturer and Researcher</i>	ext. 2904	EPE Lecturer Offices 4th Floor	wijarn.w@tggs.kmutnb.ac.th
Prof. Dr.-Ing. Nisai Fuengwarodsakul <i>Lecturer and Researcher</i>	ext. 2904	EPE Lecturer Offices 4th Floor	nisai.f@tggs.kmutnb.ac.th
Assoc. Prof. Dr.-Ing. Thanapong Suwanasri <i>Lecturer and Researcher</i>	ext. 2904	EPE Lecturer Offices 4th Floor	thanapong.s@tggs.kmutnb.ac.th

### **Minor: Software Systems Engineering (SSE):**

Dr. Sansiri Tanachutiwat <i>SSE Program Coordinator Lecturer and Researcher</i>	ext. 2916	SSE Lecturer Offices 8th Floor	sansiri.t@tggs.kmutnb.ac.th
Asst. Prof. Dr. Wannida Sae-Tang <i>Lecturer and Researcher</i>	ext. 2911	SSE Lecturer Offices 8th Floor	wannida.s@tggs.kmutnb.ac.th
Asst. Prof. Dr.-Ing. Chayakorn Netramai <i>RVIE Curriculum Chairman Lecturer and Researcher</i>	ext. 2911	SSE Lecturer Offices 8th Floor	chayakorn.n@tggs.kmutnb.ac.th
Asst. Prof. Dr. Rachata Ausavarungnirun <i>Lecturer and Researcher</i>	ext. 2911	SSE Lecturer Offices 8th Floor	rachata.a@tggs.kmutnb.ac.th
Dr. Yodsawalai Chodpathumwan <i>Lecturer and Researcher</i>	ext. 2911	SSE Lecturer Offices 8th Floor	yodsawalai.c@tggs.kmutnb.ac.th
Dr.rer.nat. Ekkapot Charoenwanit <i>Lecturer and Researcher</i>	ext. 2916	SSE Lecturer Offices 8th Floor	ekkapot.c@tggs.kmutnb.ac.th

More information, please visit our website: <https://tggs.kmutnb.ac.th/lecturers-researchers>.

## GENERAL INFORMATION

### **About TGGS**

The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) is a public-private partnership established with strong support from the Thai and German government for engineering education, technology, innovation, and business development in Thailand and South-East Asia. Its industry-oriented engineering master and doctorate education concept combines teaching and research based on the successful model of RWTH-Aachen University, Germany, one of Europe's leading technical university.

### **Mission (2019-2022)**

1. Industry-oriented engineering education – HR development
2. R&D service - Academic excellence
3. International & Industry collaboration

### **Vision (2019-2022)**

National Frontier Engineering Graduate School with strong orientation to industry and international collaboration.

### **History**

Following more than 60 years of Thai-German cooperation in King Mongkut's University of Technology North Bangkok (KMUTNB), TGGS is now the living continuation of this long lasting partnership. KMUTNB, the partner to the Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH Aachen University) in developing TGGS, has over many years adopted elements of the German system and has grown up to be a university since 1986. Today, KMUTNB is one of the larger technical universities in Thailand with more than 30,000 students. TGGS is an autonomous International Graduate School of Engineering within KMUTNB (Teaching in English) and has its own autonomous Thai-German administration.

### **Location**

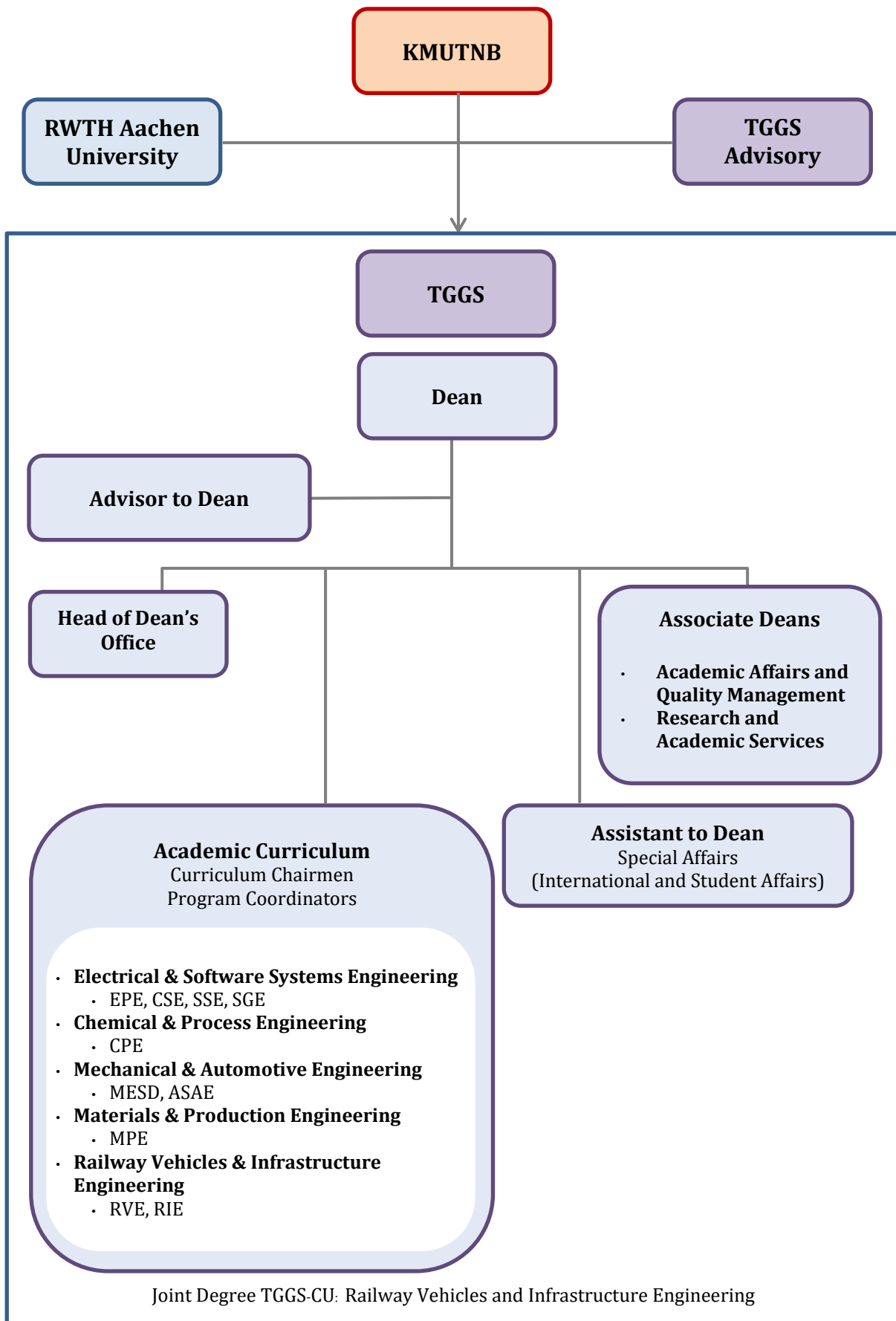
TGGS is located inside the King Mongkut's University of Technology North Bangkok (KMUTNB) main campus in Bangkok, Thailand. The TGGS building is the first building near the main gate of campus.

Address: The Sirindhorn International Thai-German Graduate School of Engineering (TGGS)  
King Mongkut's University of Technology North Bangkok (KMUTNB)  
1518 Pracharat 1 Rd.  
Wongsawang, Bangsue  
Bangkok 10800, Thailand

### **Administrative Board of Management**

TGGS is headed by the TGGS Council, established on June 9, 2008, as its supervisory body which ensures the autonomy of TGGS. The TGGS Council is equally driven by its two partners with a balanced Thai-German representation from the TGGS network of industry, industry associations and government organizations.

In the Administrative Board of Management, Prof. Dr.-Ing. Nisai Fuengwarodsakul is the TGGS Dean, Assoc. Prof. Dr. h. c. Banleng Sornil is the TGGS Advisory to TGGS Dean, Asst. Prof. Dr. Karuna Tuchinda is the TGGS Associate Dean for Research and Academic Services and Assoc. Prof. Dr. Tawiwat Kangsadan is the TGGS Associate Dean for Academic Affairs and Quality Management.

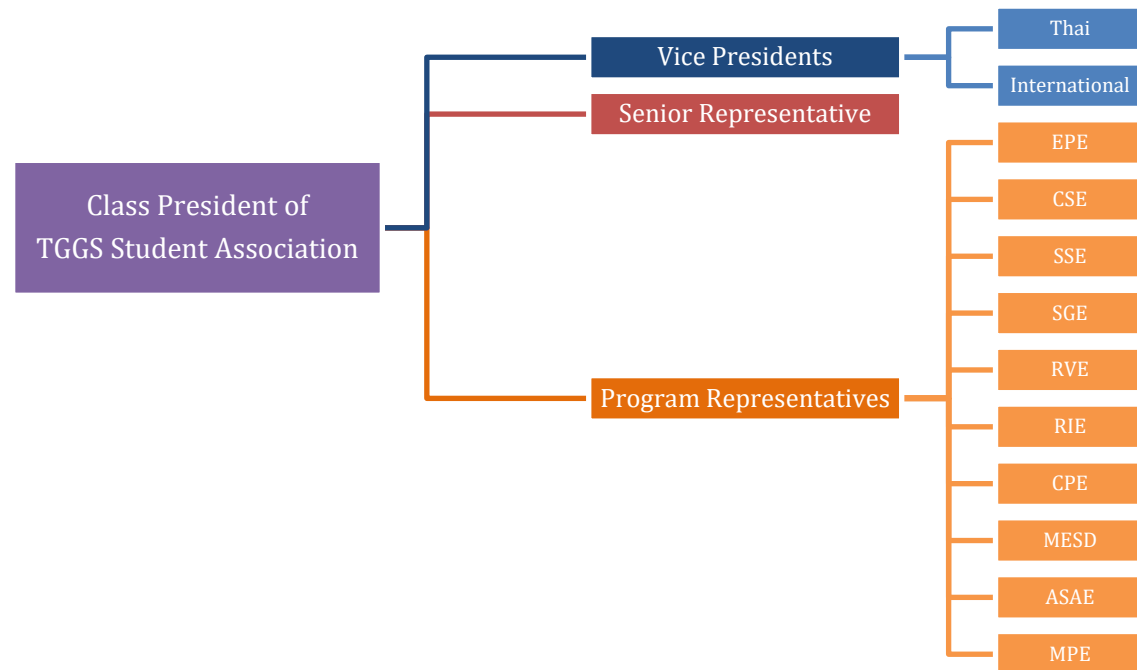




## TGGS Student Association

The TGGS student association is an organization that consists of representatives from study programs at TGGS. Its function is to initiate and support activities that will of benefit to fellow students, faculty and the university. TGGS student association also acts as a communication channel between students and the TGGS administration. Last but not least, it gives an opportunity for students from different study programs and nationalities to meet, exchange ideas and to share their common interests.

The following chart shows the structure of the TGGS Student Association:



# THE THAI-GERMAN GRADUATE SCHOOL

## The Thai-German Relation

TGGS has established an academic cooperation with RWTH Aachen to send master students to do internship and thesis in Germany. Each year selected students are eligible for internships and thesis in German industry or in related institutes and laboratories of RWTH Aachen under the care of RWTH professors while most doctoral students are going to RWTH Aachen for one year to develop their research and thesis and come back to TGGS to conclude the research and thesis.

Furthermore, the cooperation among the professors in various research institutes of RWTH Aachen and the professors and lecturers of KMUTNB are also formed. This includes the research collaboration, exchange of post graduate students as well as the regular block lectures given by the German professors.

## The Industry-Oriented Engineering Education

The essence of the industrial oriented engineering education is the closely linkage between the school and the industry professors and experts from industry and RWTH Aachen are invited as lecturers and all students must pass an internship in the industry to raise their level of experiences and to bring in problems from the industry to research under the care of the supervisors. This education model can help solving problems from the industry and can lead to innovation as well.

## Graduate Degrees Offered

The Thai-German Graduate School offers Master of Engineering (M.Eng.) and Doctor of Engineering (D.Eng.) degrees in the following international programs.

### *TGGS M.Eng. programs*

The International TGGS M.Eng. programs originate from the same international Master courses (taught in English) offered at RWTH Aachen University. They are similar in content, but adapted to the Thai education system in terms of credits and in the number of modules. The TGGS courses have been developed to better meet the industrial needs in Thailand through practical training in industry (mandatory project-oriented internships and industry-oriented Master theses). The direct participation of RWTH professors, contributing by block lectures in Bangkok, and by building up industry links, makes sure that the teaching contains elements of advanced engineering practice and research.

For outstanding students, opportunities are provided to experience an internship in Germany and to write the Master thesis in Germany as well under the supervision of RWTH Aachen University professors.

Currently, TGGS offers the following international M.Eng. programs:

- Chemical and Process Engineering Program (CPE)
- Mechanical and Automotive Engineering Program (MAE)
  - Minor: Mechanical Engineering Simulation and Design (MESD)
  - Minor: Automotive Safety and Assessment Engineering (ASAE)
- Materials and Production Engineering Program (MPE)
- Electrical and Software Systems Engineering Program (ESSE)
  - Minor: Communication and Smart System Engineering (CSE)\*
  - Minor: Electrical Power and Energy Engineering (EPE)\*
  - Minor: Software Systems Engineering (SSE)
  - Minor: Smart Grids Engineering (SGE)

Remark: \* Option for qualified students. **Dual Degree** awarded: Master of Science in Electrical Engineering Information Technology and Computer Engineering from Faculty of Electrical Engineering and Information Technology, RWTH Aachen University.

### Study Plan A1 (Research Only, External Master, equivalent to M.Phil.)

Degree awarded: Master of Engineering (M.Eng.) Program duration: two years   Language of instruction: English			
Semester	1	<b>Master Thesis</b> (6 months)	<b>12 Credits</b> (30 ECTS credits)
	2	<b>Master Thesis</b> (6 months)	<b>12 Credits</b> (30 ECTS credits)
	3	<b>Master Thesis</b> (6 months)	<b>12 Credits</b> (30 ECTS credits)
	4	<b>Master Thesis</b> (6 months)	<b>10 Credits</b> (30 ECTS credits)
	<b>Total</b>		<b>46 Credits</b> (120 ECTS credits)

### Study Plan A2 (TGGS Original: Coursework, Internship and Thesis)

Degree awarded: Master of Engineering (M.Eng.) Program duration: two years   Language of instruction: English			
Semester	1.	<b>Coursework</b> Core courses and elective courses (total 5 courses)	<b>15 credits</b> (30 ECTS credits)
	2.	<b>Coursework</b> Core courses and elective courses (total 5 courses)	<b>15 credits</b> (30 ECTS credits)
	3.	<b>Industrial internship</b> (at least 18 weeks)	<b>4 credits</b> (30 ECTS credits)
	4.	<b>Master thesis</b> (6 months)	<b>12 credits</b> (30 ECTS credits)
	<b>Total</b>		<b>46 credits</b> (120 ECTS credits)

### Study Plan B (Coursework, Internship and Master Project, No Thesis)

Degree awarded: Master of Engineering (M.Eng.) Program duration: two years   Language of instruction: English			
Semester	1.	<b>Coursework</b> Core courses elective courses (total 5 courses)	<b>15 Credits</b> (30 ECTS credits)
	2.	<b>Coursework</b> Core courses elective courses (total 5 courses)	<b>15 Credits</b> (30 ECTS credits)
	3.	<b>Industrial internship</b> (at least 18 weeks)	<b>4 Credits</b> (30 ECTS credits)
	4.	<b>Coursework</b> Elective courses (total of 2 courses)	<b>6 Credits</b> (15 ECTS credits)
	5.	<b>Master Project/Independent Study</b>	<b>6 Credits</b> (15 ECTS credits)
	<b>Total</b>		<b>46 Credits</b> (120 ECTS credits)

- **Joint-Degree with Chulalongkorn University**

- Railway Vehicles and Infrastructure Engineering Program (RVIE)
  - Minor: Railway Vehicles Engineering Program (RVE)
  - Minor: Railway Infrastructure Engineering Program (RIE)

Remark: Joint-Degree awarded from both Faculty of Engineering, Chulalongkorn University and The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut's University of Technology North Bangkok.

### Study Plan A2 (3 Years Program: Coursework, Internship and Thesis)

Joint Degree International Master Program at TGGS				
Degree awarded: Master of Engineering (M.Eng.) Program duration: three years   Language of instruction: English				
			RVE	RIE
Semester	1.	<b>Coursework</b>	12 credits	15 credits
	2.	• 1st year: coursework in Bangkok (both TGGS and Chula campuses) • 2nd year: coursework in Aachen, Germany at RWTH Aachen University	12 credits	12 credits
	3.	Total 15 courses (45 credits): • 12 Core and Specific Core courses • 3 Elective courses	9 credits	11 credits
	4.		12 credits	7 credits
	5.	<b>Industrial internship and Master thesis</b>	4 credits	
	6.	• 3rd year: Industrial Internship (18 weeks) and Master Thesis (6 months) in Thailand or Germany	12 credits	
Total			61 credits	

### TGGS D.Eng. programs

The TGGS D.Eng. Programs provide opportunities for D.Eng. work under the joint supervision of a German and Thai supervisor (German RWTH professor with a Thai professor acting as the co-supervisor). Part of this program is a one-year research stay at RWTH Aachen. For high-level D.Eng. work, to a large extent conducted on industry-oriented research projects, RWTH Aachen provides excellent boundary conditions in terms of experienced research supervisors, advanced technology equipment and project funding. The D.Eng. degree obtained at TGGS is a Thai degree within the framework of CHE, the Commission of Higher Education.

Currently, TGGS offers the following international D.Eng. programs:

- Doctor of Engineering Program in Electrical and Software Systems Engineering
- Doctor of Engineering Program in Mechanical and Automotive Engineering
- Doctor of Engineering Program in Chemical and Process Engineering
- Doctor of Engineering Program in Materials and Process Engineering

### Study Plan 1.1 (3 Years Program: Research Only)

Degree awarded: Doctor of Engineering (D.Eng.) Program duration: three years   Language of instruction: English		
Semester 1-6	<b>Dissertation</b> <i>(Research work only)</i>	9 credits/semester
Total		54 credits

# ADMISSION TO TGGS

## Admission Requirements

### ***TGGS M.Eng. programs***

#### Study Plan A1 (Research Only)

- Bachelor degree in engineering, or related fields, awarded by an international recognized university
- Minimum GPA of 3.00 (or 2.50 plus adequate experience)
- Good reading, writing and communication skills in English
- To graduate, a minimum score of TOEFL 525, IELTS 5.5 or equivalent is required.

#### Study Plan A2 (Coursework, Internship and Thesis)

- Bachelor degree in engineering, or related fields, awarded by an international recognized university
- Minimum GPA of 2.75 (or 2.50 plus adequate experience)
- Good reading, writing and communication skills in English
- To graduate, a minimum score of TOEFL 525, IELTS 5.5 or equivalent is required.

#### Study Plan B (Coursework, Internship and Master Project)

- Bachelor degree in engineering, or related fields, awarded by an international recognized university
- Minimum GPA of 2.50 with work experience
- Good reading, writing and communication skills in English
- To graduate, a minimum score of TOEFL 525, IELTS 5.5 or equivalent is required.

### ***TGGS D.Eng. programs***

#### Study Plan 1.1 (Research Only)

- Master degree in engineering, or related fields, awarded by an international recognized university
- Minimum GPA of 3.50 (or lower plus adequate experience)
- Good reading, writing and communication skills in English
- To graduate, a minimum score of TOEFL 550, IELTS 6.0 or equivalent is required.

### ***CU-TGGS M.Eng. program in Railway Vehicles and Infrastructure Engineering***

#### Study Plan A2 (Coursework, Internship and Thesis)

- Bachelor degree in engineering, or related fields, awarded by an international recognized university
- Minimum GPA of 3.00 (or 2.50 plus adequate experience)
- Good reading, writing and communication skills in English
- To graduate, a minimum score of TOEFL 525, IELTS 5.5 or equivalent is required

## Admission Procedure

### Responsible and Contact Persons:

TGGS Academic Affairs:

- Miss Thanunpon Songmuangsuk (Coordinator to KMUTNB and Thai Students)
- Miss Piyatida Rakangthong (International Students)
- Miss Tanaporn Phunbanlam (Student Activities and Quality Assurance for Academic and Student Affairs)

Program Secretaries:

- Miss Pattama Mookhiruntana (CSE, EPE, SSE, SGE and RVIE)
- Miss Arpawan Petang (ASAE, CPE, MESD and MPE)

E-mail: [admissions@tggs-bangkok.org](mailto:admissions@tggs-bangkok.org)

Website: <https://tggs.kmutnb.ac.th/admission>

The TGGS Application Form can be obtained at the TGGS Academic Affairs Office or simply download them from our website: <https://tggs.kmutnb.ac.th/apply-now>

### Summary procedure for Admission Process: Enrollment in First Semester (August to December)

Step	Approximated Period	Task	Remark
Application			
1	January-April	Call for applications	Application Documents: 1. Completion of the Application Form 2. Two Letters of Recommendations 3. One page of Motivation Letter 4. Curriculum Vitae (CV) or Resumé 5. Official copy of final transcript 6. Official copy of English Proficiency test result 7. Financial statement or bank certification (for self-support) 8. Copy of your identification card (for Thai Students) or passport (for International Students)
2	Mid of April	Deadline for applications	Deadline for DAAD Scholarships.
	End of April		First-round deadline, except DAAD Scholarships.
	End of May		Second-round deadline, except DAAD Scholarships.
Selection process			
3	Until 1 <sup>st</sup> week of May (First round) and Until 1 <sup>st</sup> week of June (Second round)	Review the applications with supporting documents	
4	2 <sup>nd</sup> week of May (First round) and 2 <sup>nd</sup> week of June (Second round)	Interview applicants	TGGS Admission Committee for each program: Program Coordinator Program Lecturers/Researchers TGGS Committee Representative TGGS Academic Affairs Officer
	3 <sup>rd</sup> week of May (First round) and 3 <sup>rd</sup> week of June (Second round)	List of candidates Official Announcement of TGGS New Students (Candidates)	Submitted to TGGS Committee to be approved. List of candidates who is eligible to TGGS will be announced on the website. TGGS Academic Affairs will issue the acceptance/reject letter to applicants. Candidates will return the Enrollment Contract Form

Step	Approximated Period	Task	Remark
<b>Scholarship Granting Process</b>			
5	3 <sup>rd</sup> week of June (First round)* and 3 <sup>rd</sup> week of July (Second round)*	KMUTNB Tuition Fee-Waiving Scholarship	TGGS Admission Committee will interview applicants and recommend receiving the scholarship. Scholarships will be approved by KMUTNB Committee. List of candidates who receive the scholarship will be announced on the website.
6	1 <sup>st</sup> week of June (First round) and 1 <sup>st</sup> week of July (Second round)	TGGS Character Scholarship	TGGS Advisor must submit the application on behalf of the applicant. Scholarships will be approved by TGGS Committee.
7	TBA	Industrial Scholarship	Call for applications and details information on the scholarships including important dates are announced at each scholarship website.
<b>Registration Process</b>			
8	4 <sup>th</sup> week of June (First round) and 3 <sup>rd</sup> week of July (Second round)	Candidates return the enrollment contract form	
9	Wednesday 4 <sup>th</sup> week of July	TGGS New Students Orientation Day	
10	Friday 4 <sup>th</sup> week of July	TGGS Registration for New Students Enrollment	
11	1 <sup>st</sup> week of August	TGGS First Day of Class	
<b>Special Activity</b>			
12	3 <sup>rd</sup> week of July	RWTH Summer Camp	RWTH Summer Camp, optional (1 week)

Remark:

*\* Subjected to change according to the result from KMUTNB Committee Meeting.*

**Summary procedure for Admission Process: Enrollment in Second Semester (January to May)**

Step	Approximated Period	Task	Remark
Application			
1	August-October	Call for applications	Application Documents: 1. Completion of the Application Form 2. Two Letters of Recommendations 3. One page of Motivation Letter 4. Curriculum Vitae (CV) or Resumé 5. Official copy of final transcript 6. Official copy of English Proficiency test result 7. Financial statement or bank certification (for self-support) 8. Copy of your identification card (for Thai Students) or passport (for International Students)
2	End of October	Deadline for applications	
Selection process			
3	Until 1 <sup>st</sup> week of November	Review the applications with supporting documents	
4	2 <sup>nd</sup> week of November	Interview applicants	TGGS Admission Committee for each program: Program Coordinator Program Lecturers/Researchers TGGS Committee Representative TGGS Academic Affairs Officer
	3 <sup>rd</sup> week of November	List of candidates	Submitted to TGGS Committee to be approved.
		Official Announcement of TGGS New Students (Candidates)	TGGS Academic Affairs will issue the acceptance/reject letter to applicants. Candidates will return the Enrollment Contract Form
Scholarship Granting Process			
5	2 <sup>nd</sup> week of December*	KMUTNB Tuition Fee-Waiving Scholarship	If the scholarships are available, please consult the announcement for more details. TGGS Admission Committee will interview applicants and recommend receiving the scholarship.
6	2 <sup>nd</sup> week of December	TGGS Character Scholarship	
7	TBA	Industrial Scholarship	
Registration Process			
8	3 <sup>rd</sup> week of December	Candidates return the enrollment contract form	
9	1 <sup>st</sup> week of January	TGGS New Students Orientation Day	Subject to change depending on the New Year Holiday!
10	1 <sup>st</sup> week of January	TGGS Registration for New Students Enrollment	Subject to change depending on the New Year Holiday!
11	2 <sup>nd</sup> week of January	TGGS First Day of Class	Subject to change depending on the New Year Holiday!

Remark:

\* Subjected to change according to the result from KMUTNB Committee Meeting.

More information on Admission process go to <https://tggs.kmutnb.ac.th/admission>.



### ***Oral Interview by the TGGs Admission Committee***

The admission to the program will be decided through oral interview. The applicants will be interviewed by the TGGs admission committee to evaluate their background knowledge and attitudes including problem solving skills, motivation, leadership, IQ and EQ, etc. In case of foreign applicants, the interview may be conducted by telephone or video conference.

### **Financial Assistance**

For qualified students who need financial aid, the TGGs Coordinators and Committee will make a serious effort to organize scholarships from industry or government organizations. For more information, please consult the website at <https://tggs.kmutnb.ac.th/scholarships>.

The students from South East Asia countries (except Thailand) may be eligible to apply for DAAD scholarship which covers tuition fees and all living expenses during the first-year study at TGGs and the second year study at RWTH Aachen University in Germany. (<https://tggs.kmutnb.ac.th/daad>)

# STUDENT LIFE AT TGGS

## Housing

### ***KMUTNB Student Dormitory***

The accommodation center for learning and recreation (student dormitory), KMUTNB at Bangkok, has been servicing the accommodation for vocational certificate student level and bachelor's degree level who are from remote provinces since the academic year 2009. Besides, there is the accommodation serviced for foreign students.

The student dormitory was built to be the good quality accommodations with welfare, living atmosphere and proper environmental condition which facilitate quality of living and an academic quality. Furthermore, the student dormitory is also a development mechanism for the students to experience lifelong learning, living skills, social skills, sharing and generosity which are beneficial for living together with others. There are two building where are able to be served for 960 students; the 240 rooms-male dormitory and the 240 rooms-female dormitory. Each room is set for two students. The first priority would be for the undergraduate students.

### Facilities provided

The common area:

- 2 elevators for each dormitory
- Keycard and fingerprint scanner systems
- Security guards for 24 hrs.
- CCTV
- Bike lot
- First- aid room and ambulance
- Food and beverage kiosk
- Washing machine and vending machine

The personal room:

- Room with or without air conditioner for foreign student
- Bunk bed, wardrobe, desk, and chair
- Wet room (including sanitary ware)

Open:	Mon – Fri	8.30 – 11.30 and 12.30 – 19.00
	Sat – Sun	9.30 – 16.00
Phone:	+66 2555 2000 ext. 1812, 1813, 1814	

## Student Services

### Language Center

A “German Centre” was established at TGGs in cooperation with Goethe Institute Bangkok in November 2007 to offer German Language Education to KMUTNB and TGGs students, particularly those who plan to do their internship and master thesis in Germany.

#### German courses

- Intensive courses in March and April (40 Units)
- Extensive courses: evening classes from June to August (40 Units)
- Extensive courses: evening classes from November to January (40 Units)

Besides German language courses, we also have cultural programs such as “Afternoon-Film”, “Info-Day of studying in Germany” etc.

Location:	Office on 5th floor of the TGGs Building
Open:	Tue and Thu 14.00 to 16.30
Email:	<a href="mailto:panupong.chantawat@bangkok.goethe.org">panupong.chantawat@bangkok.goethe.org</a>

### German Academic Exchange Service (DAAD)

The DAAD Information Center provides free and comprehensive counseling on all matters related to study and research in Germany such as graduate and postgraduate courses, admission requirements, application procedures, scholarships, etc.

Location:	Office on 5th floor of the TGGs Building
Open:	Mon, Wed, and Fri 10.00 to 16.00
Email:	<a href="mailto:info@daad.or.th">info@daad.or.th</a>

### Cafeteria and Dining

Our canteens provide ready-made and cooked-to-order food, bakery, beverage and ice cream. They are located in several areas, such as the 40th anniversary building, the Suan Palm building, the Faculty of Technical Education building etc.

Location:	2nd floor of the 40th Anniversary Building 2nd floor of the Building No. 46 1st Floor of the Faculty of Technical Education Building
Open:	Mon – Fri 08.00 – 19.00 Sat 09.00 – 18.00

### Sport Facilities

Sports facilities at KMUTNB include a gymnasium for basketball, volleyball, badminton, tennis, table-tennis, and a stadium for soccer and a fitness center.

Location:	3rd and 7th floor of the 40th Anniversary Building
Open:	Mon – Fri 08.00 – 20.30 Sat 09.00 – 16.00
Phone:	+66 2555 2000 ext. 1135

### ***KMUTNB Health Center***

Primary health care services, including clinical consultations, health education & physical and mental consulting, medication, first-aid, and physical check-up, are provided to all staff and students. Furthermore, the institute provides accident insurance for all full-time students.

Location:	1st floor of the KMUTNB Staff Club Building
Open:	Mon – Fri    08.00 – 19.30 Sat            08.00 – 16.00
Phone:	+66 2555 2000 ext. 1126

### **Post Office**

KMUTNB post office provides all mailing services as well as many bill/payment services.

Location:	1st floor of Anake-Prasong Building
Open:	Mon – Fri    08.30 – 16.30
Phone:	+66 2555 2000 ext. 1315

### **Bank**

Location:	1st floor of the 40th Anniversary Building
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## FACILITIES AND ACADEMIC SUPPORT

### TGGS Academic Affairs

The TGGS Academic Affairs support the academic mission of TGGS by providing service to our current and former students, staff, and administration. These services include maintaining and protecting the integrity and security of the official academic record, registration, degree verification, scheduling and reporting. Our specific services include but are not limited to:

- Enrollment and degree verification
- Transcripts
- Course and room scheduling
- Academic and enrollment reporting
- Grade collection, reporting and changes

Location:	3rd floor of TGGS Building		
Open:	Mon – Fri	09.00 – 16.00	
Office	Tues	08.30 – 16.30	
Hour:	Thurs	08.30 – 16.30	
Phone:	+66 2555 2000 ext. 2931		

### KMUTNB Library

To support studying and teaching activities as well as research and development and to provide the best academic environment for students, the central library of KMUTNB provides access to electronic resources and other library services and includes academic service and facilities such as borrowing and returning books, interlibrary loan and copying, printing etc. The central library provides academic information resources to all faculty, staff and students, as well as to the general public. It holds more than 200,000 books, a variety of audio-visual aids including CD-ROMs, databases for research, and access via internet to all Thai university libraries and to international libraries. A modern electronic library management system, including many online services and electronic book inventories, is employed to provide the best and most effective services.

Location:	2nd – 7th floor of the Academic Service Building		
Open:	Mon – Fri	08.00 – 20.00	
	Sat	09.00 – 16.00	
Website:	<a href="http://library.kmutnb.ac.th/en/">http://library.kmutnb.ac.th/en/</a>		
Email:	<a href="mailto:info@lib.kmutnb.ac.th">info@lib.kmutnb.ac.th</a>		
Facebook:	<a href="http://www.facebook.com/Central.Library.Kmutnb">www.facebook.com/Central.Library.Kmutnb</a>		
Phone:	+66 2555 2000 ext. 2147		

### Institute of Computer and Information Technology

The Institute of Computer and Information Technology is responsible for providing computer information services to students, teaching staff and other personnel at KMUTNB and for offering computing resources for education, research and administrative purposes.

The Institute of Computer and Information Technology provides services to students and personnel both inside and outside the institute as follows:

- Minicomputer CPU time for teaching, learning, training and researching by students and staff as well as academic support.
- Engineering Workstation under UNIX application system, including compiler, multimedia system, CAD/CAM/CAE/CAI applications such as electronics, mechanical and civil engineering for the purposes of design, analysis, manufacture, synthesis and prototype.
- The provision of internet and e-mail services for research work and communication. This also includes WWW servers both on KMUTNB campuses or via modem at home.
- Computer systems and other facilities services for internal and external organizations.
- Training services for both internal and external personnel and organizations.

- Pradoodang Net, KMUTNB's campus network is also provided by ICIT for learning and teaching administration and internal communication.

Location:	3rd floor of Anake-Prasong Building
Open:	Mon – Fri    08.00 – 22.00 Sat            08.00 – 16.00
Website:	<a href="http://www.icit.kmutnb.ac.th">www.icit.kmutnb.ac.th</a> <a href="http://icit.kmutnb.ac.th/privilege_student">http://icit.kmutnb.ac.th/privilege_student</a>
Email:	<a href="mailto:icit_admin@kmutnb.ac.th">icit_admin@kmutnb.ac.th</a>
Facebook:	<a href="http://www.facebook.com/ICIT.KMUTNB">www.facebook.com/ICIT.KMUTNB</a>
Phone:	+66 2555 2000 ext. 2205

### **KMUTNB International Cooperation Centre**

The International Cooperation Centre administered by the Student Affairs foster and facilitate international education and research at KMUTNB. They have responsibilities to develop and to make readiness for international students to become good graduates and good residents who are perfectly in physical, mind, intelligence, and society and they are promptly to alteration and plays important role in country development in a future.

Location:	10th floor of Anake-Prasong Building
Website:	<a href="http://www.icc.kmutnb.ac.th/">http://www.icc.kmutnb.ac.th/</a>
Remark:	Contact via TGGs Academic Affairs – International Affairs

### **IAESTE Thailand**

The International Association for the Exchange of Students for Technical Experience was founded in 1948 at Imperial College, London. Imperial College Vacation Work Committee headed by Mr. James Newby initiated a meeting with national organizations from 10 European countries in a post war effort to promote better understanding between countries and cultures.

Since 1948, the association has grown to include more than 93 countries world-wide and has exchanged in excess of 300,000 students. This means that yearly IAESTE exchanges around 6000 students playing a key role in the development of technical undergraduates able to make their mark in a global economy.

Location:	Room 1003 on 10th floor of Anake-Prasong Building
Website:	<a href="http://www.iaeste-thailand.org/">http://www.iaeste-thailand.org/</a>
Email:	iaeste@kmutnb.ac.th sdcp@kmutnb.ac.th web@iaeste-thailand.org
Phone:	+66 2555 2000 ext. 1025, 1193, 1194

# REGISTRATION

## General Registration Requirements

To remain active in their degree program, students must register and pay tuition fees continuously each semester. Failing to register and pay tuition fees will result in the loss of student status.

## Late Registration and Reinstatement

Students must complete their registration and pay tuition fees by the deadline specified in the Academic Calendar. Students who fail to complete their registration during this time will be assessed a late registration fee or a reinstatement fee according to the university announcement.

## Late Registration with Late Fee or Study Leave of Absence

1. In case that the student cannot register during the Regular Registration Period (as indicated in the academic calendar), the student can submit Request for Registration to TGGs Academic Affairs during the Late Registration Period but the student is obligated to pay the Late Registration Fee of 400 THB in CASH and purchase the CASHIER CHEQUE from the authorized bank according for the tuition fee according to the student status listed in Tuition Fee Section.
2. In case that the student cannot register in person, the student can give the authorization to the friend or the family member to act on his/her behave and must notify TGGs Academic Affairs in writing using the attached form (KMUTNB 01).
3. In the case that the Request for Registration and the payment are not submitted to TGGs Academic Affairs by Noon on the deadline (as indicated in the academic calendar), TGGs will refuse to complete the registration procedure for the student and TGGs is not obligated to request for the refund or transfer back the payment on the student's behave. The student must request the refund with KMUTNB Registrar Office in person.

## Reinstatement of Student Status

1. In case that the student cannot register during the Late Registration Period (as indicated in the academic calendar), the student can submit Request for Registration to TGGs Academic Affairs during the Reinstatement of Student Status Period but the student is obligated to pay the Reinstatement Student Status Fee of 1,500 THB in CASH and purchase the CASHIER CHEQUE from the authorized bank according for the tuition fee according to the student status listed in Tuition Fee Section.
2. In case that the student cannot register in person, the student can give the authorization to the friend or the family member to act on his/her behave and must notify TGGs Academic Affairs in writing using the attached form (KMUTNB 01).
3. In the case that the Request for Registration and the payment are not submitted to TGGs Academic Affairs by Noon on the deadline (as indicated in the academic calendar), TGGs will refuse to complete the registration procedure for the student and TGGs is not obligated to request for the refund or transfer back the payment on the student's behave. The student must request the refund with KMUTNB Registrar Office in person.
4. In case that the student cannot register during the Reinstatement of Student Status Period, TGGs cannot reinstate the student status in any case and the student status will be automatically terminated.

## Important Remarks

### 1. KMUTNB Authorization Letter for Registration Procedure (KMUTNB 01 Form):

- a. The student must complete the KMUTNB 01 Form and provide the photocopy of the valid official identification card (certified as an original copy with signature). If the student is living outside of Thailand, the student must submit KMUTNB 01 Form along with the request documents stated in KMUTNB 01 Form via email at [academic@tggs.kmutnb.ac.th](mailto:academic@tggs.kmutnb.ac.th).
- b. The authorized person must submit KMUTNB 01 Form along with the request documents stated in KMUTNB 01 Form with he/she in order to complete the registration procedure on the student's behave. In addition, the authorized person must show the valid official identification card.

## 2. Payment:

### “Cashier Cheque” Payment:

The student must pay the tuition fee at TGGs Academic Affairs. The payment must be in “CASHIER CHEQUE” only paid to “King Mongkut’s University of Technology North Bangkok” from the authorized bank. (KMUTNB accepts the cashier cheque from any banks in Bangkok and Metropolitan Areas.)

### “Bank Transfer” Payment:

For the student living outside of Thailand and cannot complete the registration procedure in person, the student can transfer the tuition fee, late registration fee or reinstate student status fee, the transfer fee (approximately 1,000 THB) and “Cashier Cheque” fee (20 THB) to the KMUTNB University Bank Account.

<b>Bank Name:</b>	KASIKORN BANK
<b>Account Name:</b>	King Mongkut’s University of Technology North Bangkok
<b>Account Number:</b>	033-1-00226-7

The international bank transfer from the foreign country to Thailand may take from 4-10 working days depending on the policies of the individual country. The student must consult the bank transfer policy in that country. It is recommended to transfer the payment 2-4 weeks in advance.

KMUTNB is not responsible for the bank transfer fee and the differences in the currency exchange rate. If the tuition fee along with late registration fee or reinstate student status fee in the currency of THB are not transferred to KMUTNB Bank Account in Full, the registration procedure will not be completed. This may result in further delay of 1-2 months and the student registration is not completed by the specified period. The student status will be automatically terminated.

After the payment is being transferred, please submit the bank transfer slip or proof of transfer to TGGs Academic Affairs immediately via email at [academic@tggs.kmutnb.ac.th](mailto:academic@tggs.kmutnb.ac.th). Please be informed that this process with KMUTNB Registrar will take 2-4 weeks to complete the registration procedure. After the payment has been verified, TGGs Academic Affairs will purchase “Cashier Cheque” on your behalf. Without the bank transfer slip or proof of transfer, KMUTNB cannot verify the payment and TGGs cannot complete the registration procedure for the student. This may result in further delay of 1-2 months and the student registration is not completed by the specified period. The student status will be automatically terminated.

## 3. Completion of Registration Procedure

The student will receive the completion of registration status only when the following conditions have been fulfilled:

- The Request for Registration and the payment (tuition fee and other fees) in Cash or Cashier Cheque are submitted to TGGs Academic Affairs by the deadline.
- The Request for Registration is submitted to TGGs Academic Affairs and the payment (tuition fee and other fees) by the bank transfer has been verified by KMUTNB Finance Division by the deadline.

## 4. Summer Semester Registration

To be eligible for the summer semester registration, the student must have one of the following conditions for the graduation requirement during that summer semester:

- The student will schedule for the Thesis/Dissertation Defense Examination including the submission of Book and complete the publication.
- The student will complete the publication.

Please consult **TGGs Registration Procedure** for the updated information, procedure and deadlines at <https://tggs.kmutnb.ac.th/registration>.



# GRADUATION

## Graduation Requirements

To graduate, students must be registered during the term in which they complete their program and fulfil the following requirements:

### Required English Proficiency Test

English Proficiency Test	Master Degree	Doctoral Degree
TOEFL (Paper Based)	525+	550+
TOEFL (Computer Based)	196+	213+
TOEFL (Internet Based)	69-70+	79-80+
IELTS (Academic Module)	5.5+	6.0+
CU-TEP (120 Score)	69-70+	79-80+

The student can submit the request for a special consideration for approval of English language score requirement to the TGGs Academic Affairs Office.

(See the TGGs Request Form for Special Consideration for Approval of English Language Score Requirement (TG96). The official test score is required; more documents can be attached if needed.)

### Required Coursework

#### *TGGs Master Degree*

Study Plan A1 (Research Only)		
Master Thesis (1st Semester)	12 credits	30 ECTS
Master Thesis (2nd Semester)	12 credits	30 ECTS
Master Thesis (3rd Semester)	12 credits	30 ECTS
Master Thesis (4th Semester)	10 credits	30 ECTS
<b>Total</b>	<b>46 credits</b>	<b>120 ECTS</b>
Study Plan A2 (Coursework, Internship and Master Thesis)		
Courses (1st Semester)	15 credits	30 ECTS
Courses (2nd Semester)	15 credits	30 ECTS
Industrial Internship (3rd Semester)	4 credits	30 ECTS
Master Thesis (4th Semester)	12 credits	30 ECTS
<b>Total</b>	<b>46 credits</b>	<b>120 ECTS</b>
Study Plan B (Coursework, Internship and Master Project)		
Courses (1st Semester)	15 credits	30 ECTS
Courses (2nd Semester)	15 credits	30 ECTS
Industrial Internship (3rd Semester)	4 credits	30 ECTS
Courses (4th Semester)	6 credits	30 ECTS
Master Project (4th Semester)	6 credits	
<b>Total</b>	<b>46 credits</b>	<b>120 ECTS</b>

### ***TGGS Doctoral Degree***

<b>Study Plan 1.1</b>	
Dissertation (1st Semester)	9 credits
Dissertation (2nd Semester)	9 credits
Dissertation with Qualifying Examination (3rd Semester)	9 credits
Dissertation with Proposal Examination (4th Semester)	9 credits
Dissertation with Progress Examination (5th Semester)	9 credits
Dissertation with Defense Examination (6th Semester)	9 credits
<b>Total</b>	<b>54 credits</b>

### ***CU-TGGS Joint-Master Degree in Railway Vehicles and Infrastructure Engineering***

<b>Minor</b>	<b>RVE (TGGS)</b>		<b>RIE (CU)</b>	
Courses (1st Semester)	12 credits	24 ECTS	15 credits	30 ECTS
Courses (2nd Semester)	12 credits	24 ECTS	12 credits	24 ECTS
Courses (3rd Semester)	9 credits	18 ECTS	11 credits	24 ECTS
Courses (4th Semester)	12 credits	24 ECTS	7 credits	18 ECTS
Industrial Internship (5th Semester)	4 credits	30 ECTS	4 credits	30 ECTS
Master Thesis (6th Semester)	12 credits	30 ECTS	12 credits	30 ECTS
<b>Total</b>	<b>61 credits</b>	<b>150 ECTS</b>	<b>61 credits</b>	<b>150 ECTS</b>

## ***RWTH-TGGS Dual Master Degrees in Electrical and Software Systems Engineering***

### **TGGS Students: CSE and EPE Program Only\*\***

	<b>University</b>	<b>Period</b>	<b>KMUTNB</b>	<b>RWTH</b>
Courses (1st Semester)	TGGS	Aug.-Dec.	15 credits	30 ECTS
Courses (2nd Semester)	TGGS	Jan.-Jun.	15 credits	30 ECTS
German Language Courses (Summer Semester)	Goethe at TGGS	Jul.-Sep.		8 ECTS
Courses (3rd Semester)	RWTH	Oct.-Mar.		32 ECTS
Industrial Internship + Seminar + Additional Qualification* (4th Semester)	RWTH	Apr.-Sep.	4 credits	30 ECTS*
Master Thesis (5th Semester)	RWTH	Oct.-Mar.	12 credits	30 ECTS
<b>Total</b>			<b>46 credits</b>	<b>160 ECTS*</b>

*Remark: \* Additional qualification is defined by RWTH. Students with exemption, total credits is 152 ECTS.*

*\*\* Students in SSE program must contact the RWTH-TGGS Dual Degree Coordinator.*

### **RWTH Students:**

	<b>University</b>	<b>Period</b>	<b>KMUTNB</b>	<b>RWTH</b>
Courses (1st Semester)	RWTH	Oct.-Mar.		30 ECTS
Courses (2nd Semester)	RWTH	Apr.-Sep.		30 ECTS
Supervised Project	TGGS	Oct.-Dec.		8 ECTS
Courses (1st Semester)	TGGS	Jan.-Jun.	15 credits	30 ECTS
Courses (2nd Semester)	TGGS	Aug.-Dec.	15 credits	30 ECTS
Industrial Internship + Seminar (4th Semester)	RWTH or TGGS	Jan.- Apr./May	4 credits	22 ECTS
Master Thesis (5th Semester)	RWTH	May-Oct.	12 credits	30 ECTS
<b>Total</b>			<b>46 credits</b>	<b>180 ECTS</b>

## Industrial Internship

The student must complete at least 18 weeks of industrial internship with 4 KMUTNB credits or 30 ECTS. The evaluation/assessment result of the industrial internship is in the form of Letter Grade as S or U. If the student cannot submit the report within two months after the ending date of industrial internship work, the student will receive Ip.

Assessment	Performance's Quality
S	Pass / Satisfactory
U	Fail with inadequate achievement / Unsatisfactory
Ip	Incomplete / In-progress

## Master Thesis

The student must conduct the master thesis work, pass the proposal, progress, defense examinations and complete and submit the thesis book. Grading system used for the evaluation of the master thesis is presented as follows:

Letter Grade	Grade Score	Performance's Quality	
A	4.0	Excellent	Sufficient to Pass
B+	3.5	Very Good	
B	3.0	Good	
C+	2.5	Above Average	Insufficient to Pass
C	2.0	Average	
D+	1.5	Below Average	
D	1.0	Poor	
F	0.0	Fail	Fail

If the student cannot complete the thesis work but still in progress, the student will receive Ip.

## Cumulative GPA

To graduate, students must have a minimum cumulative GPA of 3.00 out of 4.00 scale according to the regulations set forth by the Commission of Higher Education (CHE).

- (1) A student who has the Cumulative GPA less than 2.50 will be automatically retired from the study program.
- (2) A student who has the Cumulative GPA of at least 2.50 but still lower than 3.00 will be on the "probation" status.
- (3) A student who has completed the coursework according to the study program and received the Cumulative GPA of at least 2.90 but still lower than 3.00 can register for additional course(s) that have not been previously taken with the consent of a thesis advisor and the program to achieve the Cumulative GPA of at least 3.00 within the next semester. Otherwise, the student will be automatically retired from the study program.
- (4) A student is not allowed to register for the course(s) that have been previously taken, except for the repetition according to Item (3).

## Required Publication

Master Degree	1 International Conference Proceeding or International Journal
Doctoral Degree	2 International Journals

Partial or entire of thesis work must be published in the international conference or international journal according to the study program. In the case of the international conference proceeding, the student must attend the conference and submit both the conference proceeding and the Conference Certificate. In the case of the international journal, the student must submit the journal, if not the acceptance letter from the publisher is acceptable.

According to Commission of Higher Education (CHE) regulations, in order for students to be graduated, they must complete the publication requirement as follows,

1. All graduate students in the master study program (Study Plan A2) must partially publish their thesis work in at least the international conference proceeding (paper) with full paper. Conference abstract is not acceptable. The international conference proceeding must be

(1) peer-reviewed,

(2) in the approved CHE database (Web of Science, SCOPUS, TCI (Thai-Journal Citation Index Centre), other database listed in CHE and TRF (The Thailand Research Fund)) and importantly

(3) not listed in the Beall's List: Predatory Open-Access Publishers, <http://scholarlyoa.com/>.

Oral or poster presentation is acceptable but the student must ATTEND the conference AND PRESENT THE WORK. After returning from the conference, the student must submit the following documents:

- a. Full Conference Proceeding
- b. Conference Certificate
- c. Conference Program (indicating the student's name inside the program/session)

The photograph of poster and presenter is recommended and good proof of the student presence in the conference. In the case that the student would like to publish the work in the international journal, please follows the regulation as stated in the item 4.

2. All graduate students in the master study program (Study Plan A1) must partially publish their thesis work in at least one international journal and the international journal must be as stated in the item 4 or one international conference proceeding (paper) with full paper in the SCOPUS database. Conference abstract is not acceptable. The international conference proceeding must be as stated in the item 1.

(1) peer-reviewed,

(2) in the approved CHE database (Web of Science, SCOPUS, TCI (Thai-Journal Citation Index Centre), other database listed in CHE and TRF (The Thailand Research Fund)) and importantly

(3) not listed in the Beall's List: Predatory Open-Access Publishers, <http://scholarlyoa.com/>.

Oral or poster presentation is acceptable but the student must ATTEND the conference AND PRESENT THE WORK. After returning from the conference, the student must submit the following documents:

- a. Full Conference Proceeding
- b. Conference Certificate
- c. Conference Program (indicating the student's name inside the program/session)

The photograph of poster and presenter is recommended and good proof of the student presence in the conference. In the case that the student would like to publish the work in the international journal, please follows the regulation as stated in the item 4.

3. All graduate students in the master study program (Study Plan B) must partially publish their master project work in any form that can be searched.

4. All graduate students in the doctoral study program must partially publish their thesis work in at least two international journals. The international journal must be

(1) peer-reviewed,

(2) in the approved CHE database (Web of Science, SCOPUS, TCI (Thai-Journal Citation Index Centre), other database listed in CHE and TRF (The Thailand Research Fund)) and importantly

(3) not listed in the Beall's List: Predatory Open-Access Publishers, <http://scholarlyoa.com/>.

Since publishing in the international journal takes a long time, the acceptance letter is acceptable. Typically, the acceptance letter states the following information: (1) Name of Journal to be published, (2) Volume and (3) Issue. Without this information, the acceptance letter is not considered to be the proof of publication.

After the completion of the thesis defense, the student is still waiting for the publication requirement, the student must maintain his/her student status until the publication requirement and documents are met. For example, if the thesis defense is completed in December 2018 but the conference is scheduled in April 2019, the student must register for one semester and cannot be graduated in December 2018. If the student status is not maintained, the student cannot graduate. If the student has not registered by the deadline of each semester, TGGs/KMUTNB will announce the student status to be RETIRED from the program. In order to re-enroll as the student, the student must pay the fee. This is the KMUTNB regulations!

TGGs Students must also FOLLOW BOTH CHE regulations as stated above and TGGs Regulations as stated in the TGGs Student Handbook (Latest Version) and TGGs Announcement. Moreover, the student's name on the international conference proceeding or international journal must affiliate the institute as "The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut's University of Technology North Bangkok, Thailand" (and with RWTH Aachen University, if needed), but cannot have only RWTH Aachen University. The student must use tgg's email (name@tgg's.kmutnb.ac.th). If the student does not put TGGs as affiliate, there is no proof as TGGs, KMUTNB student, so CHE will not approve the degree.

The Master students (ID 55 onwards) with self-support (paid the full/partial tuition fee) and scholarships (except the KMUTNB full-tuition fee waiving scholarship) are eligible to apply for the international conference scholarship. The scholarship supports no more than 5,000 THB on the following items:

- Actual Registration Fee up to 3,500 THB
- Travelling and Accommodation Cost up to 1,500 THB

Note: The student must consult the Department Office regarding the financial support.

The procedure to acquire the scholarship is as follows:

Step 1: The student submits an international conference scholarship request form from the TGGs Academic Affairs Office. The submission of this request form can be done after your conference abstract/paper has been accepted for the oral presentation/poster. In addition, it must be at least one to two months prior the registration of the conference. The registration fee cannot be reimbursed if the registration date is prior the approval date.

(See the TGGs Request Form for International Conference Scholarship (TG92). The application basically consists of TGGs request form, information on international conference and abstract, more documents can be attached if needed.)

Step 2: After the approval, the student can register for the conference and arrange for travelling and accommodation. All charges will be paid in advanced by the student first. After attending the conference, the student will receive the reimbursement. Note that the official receipt is required for the reimbursement; the electronic receipt is not acceptable. If the student needs a letter for applying VISA to attend the conference, please tick the option in the form and submit the TGGs Request Form for Student Certification and Unofficial TGGs Transcript (TG93).

Step 3: The student must immediately submit the Publication Submission when returning back to TGGs in order to receive the reimbursement and fulfill the graduation requirement. (See the Publication Submission Form (TG81), the copy of conference proceeding and conference certificate are required.)

## Procedure for Issuing Transcript

### *Responsible and Contact Persons*

TGGS Academic Affairs:

- Miss Thanunpon Songmuangsuk  
(Official KMUTNB Transcript and Unofficial TGGS Transcript)

Program Secretaries:

- Miss Pattama Mookhiruntara (CSE, EPE, SSE, SGE, and RVIE)
- Miss Arpawan Petang (ASAE, CPE, MESD and MPE)

### *Summary procedure for Unofficial TGGS Transcript*

- Step 1: The student submits the TGGS Request Form for Student Certification and Unofficial TGGS Transcript (TG93) to the TGGS Academic Affairs Office.
- Step 2: TGGS Academic Affairs will check the curriculum, course structure, study plan, course list and grades to ensure that the student meets all graduation requirement. Verification is done by TGGS Academic Affairs officer, program coordinator and TGGS Associate Dean for Academic Affairs.
- Step 3: TGGS Academic Affairs will issued Student Certification and Unofficial TGGS Transcript.

This process takes 3-5 working days. In the case with the Official KMUTNB Transcript, additional steps are processed.

### *Summary procedure for Official KMUTNB Transcript*

- Step 1: After the completion of Unofficial TGGS Transcript, it will be sent to KMUTNB Academic Services. All signatures of the program coordinator and TGGS Associate Dean for Academic Affairs on Unofficial TGGS Transcript will verify that all the grades sending to the KMUTNB Academic Services are correct.
- Step 2: TGGS Dean will sign the Official KMUTNB Transcript and the KMUTNB Academic Services will notarize the document.

This process takes at least 15 working days. Delay can be expected in the case that the student status is not correct.

The official KMUTNB Transcript can be issued after all the graduation requirement is completed. As for the degree certificate, the student will receive the degree certificate from the hand of HRH Princess Maha Chakri Sirindhorn **one year** after the completion from the study program during the commencement day which is typically scheduled in November every year. All the graduation documents: KMUTNB Degree Certificate along with the pin and TGGS Certification Letter will not be available until after the commencement day due to the Royal House Regulations. These documents must be handed to the class graduates first by HRH Princess Sirindhorn, then the unattended graduates can receive these documents. Please understand all the circumstances.

### **Termination of TGGS Student Status (For Graduation)**

After completed with all graduation requirement, the student must submit TGGS Request Form for Termination of Student Status (TG100) to the TGGS Academic Affairs Office. Moreover, the student must follow KMUTNB procedure and submit KMUTNB Request Form for Termination of Student Status to KMUTNB Registrar Office.

Please consult **TGGS Graduation Procedure** for the updated information, procedure, fees and deadlines at <https://tggs.kmutnb.ac.th/graduation>.

## TUITION FEES

### Master Program

Thai Students:	60,000 THB per semester
International Students:	85,000 THB per semester

#### Other Expenses (if applicable):

Expenses for doing industrial internship at RWTH Aachen University or in other industrial companies in Germany:	About 750 EUR per month
Additional fees for retaining student status after two years of program but not more than five years:	10,000 THB per semester

#### Important Note:

Students without any scholarships (self-support) or granted with KMUTNB Partial Tuition-Fee Waiving Scholarship (30,000 THB per semester for Thai Students and 42,500 THB per semester for International Students) must submit Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according to the stated tuition fee each semester for the first two years.

After two years of program but not more than five years, students must maintain the student status by submitting Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according to the stated retaining student status fee each semester.

### Master Program (for KMUTNB Full-Tuition Fee Waiving Scholarship Holders)

University fee for all students:	4,750 THB per semester
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#### Other Expenses (if applicable):

Expenses for doing industrial internship at RWTH Aachen University or in other industrial companies in Germany:	About 750 EUR per month
Additional fees for retaining student status after two years of program but not more than five years:	10,000 THB per semester

#### Important Note:

Students granted with KMUTNB Full Tuition-Fee Waiving Scholarship must submit Request for Registration to TGGS Academic Affairs and pay in CASH for the stated university fee each semester for the first two years.

After two years of program but not more than five years, students must maintain the student status by submitting Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according to the stated retaining student status fee each semester.



## Doctoral Program

D.Eng. Candidates: 100,000 THB per semester

### Other Expenses (if applicable):

Expenses for doing industrial internship at RWTH Aachen University or in other industrial companies in Germany: About 750 EUR per month

Additional fees for retaining student status after three years of program but not more than six years: 20,000 THB per semester

### Important Note:

Students without any scholarships (self-support) or granted with KMUTNB Partial Tuition-Fee Waiving Scholarship (50,000 THB per semester) must submit Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according the stated tuition fee each semester for the first three years.

After three years of program but not more than six years, students must maintain the student status by submitting Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according the stated retaining student status fee each semester.

## Doctoral Program (for KMUTNB Full-Tuition Fee Waiving Scholarship Holders)

University fee for all candidates: 7,100 THB per semester

### Other Expenses (if applicable):

Expenses for doing industrial internship at RWTH Aachen University or in other industrial companies in Germany: About 750 EUR per month

Additional fees for retaining student status after three years of program but not more than six years: 20,000 THB per semester

### Important Note:

Students granted with KMUTNB Full Tuition-Fee Waiving Scholarship must submit Request for Registration to TGGS Academic Affairs and pay in CASH for the stated university fee each semester for the first three years.

After three years of program but not more than six years, students must maintain the student status by submitting Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according the stated retaining student status fee each semester.

## CU-TGGS Joint Master Program

Thai Students:	60,000 THB per semester*
International Students:	85,000 THB per semester*

### Other Expenses (if applicable):

Expenses for doing industrial internship at RWTH Aachen University or in other industrial companies in Germany:	About 750 EUR per month
Additional fees for retaining student status after submission of the thesis book but still waiting for other requirements to be completed, not more than four years:	15,000 THB per semester

### Important Note:

Students without any scholarships (self-support) or granted with KMUTNB Partial Tuition-Fee Waiving Scholarship (30,000 THB per semester for Thai Students and 42,500 THB per semester for International Students) must submit Request for Registration to TGGS Academic Affairs and purchase the CASHIER CHEQUE from the authorized bank according the stated tuition fee each semester until the graduation.

Please consult **TGGS Registration Procedure** for the updated information, procedure and fees at <https://tggs.kmutnb.ac.th/registration>.

# TGGS REGULATIONS FOR EXAMINATION

## Regulations for Examination in the Master of Science Programs (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) (For Student ID 54-59 who enrolled in the academic year of 2011-2016)

### PREAMBLE

By virtue of clause 22(20) of the University Act of B.E. 2550 (2007), on the 28th Day of May, B.E. 2551 (2007), at the 3/2554(2011) University Council Meeting, King Mongkut's University of Technology North Bangkok, and based on the Rules and Regulations for International Master Programs at RWTH Aachen, Germany, these regulations are hereby enacted in order to ensure the standardization, quality and direction of the Regulations for Examination in the Master of Science Program of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS), North Bangkok Campus of King Mongkut's University of Technology North Bangkok (KMUTNB), as well as to be accepted by the Commission on Higher Education of Thailand (CHE).

Article 1 These regulations shall be called "Regulations for Examination in the Master of Science Programs (REM) for the Master Programs of The Sirindhorn International Thai-German Graduate School of Engineering."

Article 2 The Directors, Thai and German, of The Sirindhorn International Thai-German Graduate School of Engineering are charged with administering these Regulations for Examination and have the authority to issue announcements or alter procedures related to be conformal with these Regulations and will also seek approval for this by the KMUTNB Council.

In the event of any ambiguity in these Regulations for Examination or other problems regarding procedures not specified in these Regulations, the issue should be brought to the Sirindhorn International Thai-German Graduate School of Engineering to be resolved case by case.

Article 3 In these regulations:

"**University**" means King Mongkut's University of Technology North Bangkok.

"**University Council**" means King Mongkut's University of Technology North Bangkok's Council.

"**The President/Rector**" means the President of King Mongkut's University of Technology North Bangkok and the Rector of RWTH Aachen.

"**Graduate School**" means The Sirindhorn International Thai- German Graduate School of Engineering (TGGS).

"**The Directors**" means both the Thai and the German Director of The Sirindhorn International Thai-German Graduate School of Engineering.

"**TGGS Leadership**" means administration board of TGGS.

"**Graduate Studies**" means educational organization and management of the Sirindhorn International Thai-German Graduate School of Engineering for Master Degrees and PhD Degrees.

"**Curricula**" means any graduate curricula approved by the Council of KMUTNB and by the Rectorate of RWTH Aachen.

"**Program**" means all graduate programs curricular and regulations offered for the Master Degree Engineering Education approved by the Directors of The Sirindhorn International Thai-German Graduate School of Engineering.

"**Program Coordinators**" means the Lecturers/Researchers (on the Thai and the German side) who act as the Academic Group Leaders for each program offered and are entitled to do so following the TGGS academic selection procedures.

"**TGGS Examination Board**" means a committee appointed by The Directors of the Sirindhorn International Thai-German Graduate School of Engineering for the organization of the examination, and for the task assigned to it in these regulations.

**“Lecturer/Researcher”** means Permanent Lecturer/Researcher of The Sirindhorn International Thai-German Graduate School of Engineering approved by the TGGs academic selection procedures.

**“Student”** means master level student of The Sirindhorn International Thai-German Graduate School of Engineering.

**“External Lecturer”** means individual outside The Sirindhorn International Thai-German Graduate School of Engineering who has been approved as qualified to give a lecture according to The Sirindhorn International Thai-German Graduate School of Engineering’s rules.

**“Examiner”** means TGGs Lecturers/Researchers or external person of high professional standing who has been approved as such by The Sirindhorn International Thai-German Graduate School of Engineering.

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## I General Issues

### § 1. Objectives of the Master studies and purpose of the master examinations

- 1) The Master of Science Programs at TGGs intend to provide the students with profound scientific basics, as well as with the knowledge, skills and methods of the engineering science, in each special field of study covered by the TGGs Master Programs, currently a total of eight (8) as listed below.

#### Mechanical and Process Engineering

1. Automotive Engineering
2. Chemical and Process Engineering
3. Mechanical Engineering-Simulation and Design
4. Materials and Metallurgical Engineering
5. Production Engineering

#### Electrical and Computer Engineering

1. Communications Engineering
2. Electrical Power and Energy Engineering
3. Software Systems Engineering

- 2) The examination process for TGGs Master of Science Degree represents the completion of study on a scientifically and professionally qualified level. The examination is intended to determine whether the examinees have obtained the special knowledge gained for usage in professional practice and associated scientific bodies.

- 3) The studies are held in English. All written work will be completed in English.

### § 2. Master Degree

If the examination for the Master Degree is passed, TGGs will confer the academic degree of a Master of Science in Engineering, abbreviated 'M.Sc.in (specific program as of §1. Engineering).'

### § 3. Entry requirements

A recognized first university degree by which the educational background in the field of the Master course is proven. A relevant educational background exists if the degree accounts for a spectrum of subjects and knowledge pursuant to the standards of the German TU9 Group of Technical universities having their joint office in Berlin, Germany (RWTH Aachen, partner of TGGs, is one of those) as well as a particular aptitude for the courses pursuant to §1. Specifically, this implies a bachelor degree in one of the eight engineering fields listed in §1 awarded by an internationally recognized university with a minimum GPA of 3.0 (or 2.75 plus adequate experience), good reading, writing and communication skills in English, successful passing of the TGGs English interview. Only under specific circumstances, applicants with a GPA lower than 2.75 will be taken into consideration, subjects to approval by TGGs Leadership.

Remarks: Students have to prove the sufficient command of the English language, which will be achieved by passing TOEFL 525 or Computer TOEFL 196 (Test of English as Foreign Language), or by passing IELTS 5.5 (International English Language Testing System, or passing CU-TEP 525 before graduate and receive a master degree certificates.

### § 4. Regular duration of study, extent of studies, and credits

- 1) The regular duration of study including the Master thesis amounts to four semesters, but less than five years according to the Ministry of Education Regulation on Graduate Study 2005.
- 2) The total extent of study of compulsory and elective subjects is 45 weekly lecture hours (WLH) (full hours i.e. 60 minutes; a typical subject has 3 WLH). Additional compulsory subjects must be chosen from a subject list, see Annex I of TGGs Study Rules. Thematically connected courses are combined to modules. A module is completed by an examination. Upon successful completion of the exams, a certain number of credits will be given.
- 3) Credits are not only given according to the extent of the courses but are also intended to be a measure for the time students must spend on the preparation, follow-up, and examinations of a module.
- 4) The content of studies comprises of the fundamentals of the subject in each special field of study of the TGGs Master Programs and the technologies used in it.

- 5) The TGGGS Examination board determines the content of studies in these regulations. Noncompliance of these rules can only be exempted in justified exceptional cases and with the consent of the examination board.
- § 5. Examination process and examination periods
- 1) The examinations for the Master Degree comprises of the elements given in §10.1, which must all be taken concurrently with the studies. The examination process for the Master Degree is supposed to be completed within the regular duration of study laid down in §4.1
  - 2) Registration for all classes and examinations of the semester has to be done at the beginning of the semester.
  - 3) The examination period immediately follows the period of lectures of the respective term and follows the KMUTNB academic calendar of each semester.
  - 4) If the examinee can prove with a doctor's certificate that due to a longer lasting or permanent physical disablement he or she is not able to completely or partly take the examination in the prescribed form, the examination board must, upon application of the examinee, allow him/her to retake examination of equal standard in a different form. The same applies for the approval and documentation.
- § 6. Examination Board
- 1) TGGGS Directors will appoint an examination board to supervise the organization of the examinations (conducted under the responsibility of the TGGGS Group Coordinators) and for the tasks assigned to it in these regulations. The examination board will be appointed by the TGGGS Directors.
  - 2) The examination board constitutes an administrative body to take care of all aspects of the examinations as outlined in these regulations.
  - 3) The examination board ensures that the provisions of these regulations are adhered to and sees to it that the examinations are properly conducted. In particular, it is the board's responsibility to decide on appeals regarding decisions taken during the examination procedure.
- § 7. Examiner and Co-examiner
- 1) Lecturers/Researchers act as examiners for their own courses and the thesis work, which they supervise, etc. However, in exceptional cases, the coordinator of each master program can also find examiners and co-examiners, if necessary, who have independently taught in the respective specialized field on the same level of expertise and been approved by the TGGGS Directors.
  - 2) In their examining work, the examiners are independent.
  - 3) The examinee has the right to suggest examiners for the Master thesis and for the oral examinations. If possible, the suggestion of an examinee shall be taken into account. However, suggestions do not constitute a legal claim.
  - 4) If the examiner selected is not the regular course or thesis supervisor, the chairperson is responsible that the examinee is informed of the names of the examiners in time, at least two weeks prior to the date of the respective examination.
- § 8. Crediting of times of studies, study performance and results of examinations, and enrolling into TGGGS semesters.
- 1) Times of study, study performance, and examination results conducted in the same study program at other universities following the standards of the German TU 9 Group of Technical Universities will be credited once the equal value has been established within TGGGS following the quality standards of its partner RWTH Aachen.
  - 2) Times of study, study performance, and examination results in other study programs or those conducted at academic schools other than the group of universities mentioned in §8.1 will be credited once the equal value has been established within TGGGS following the quality standards of its partner RWTH Aachen. Times of study, study performance, and examination results obtained at universities outside the group of universities mentioned in §8.1 will be credited on application to the examination board, if the equal value has been established. An equal value can be acknowledged if, regarding contents, scope, and requirements, the times of study,

study performance, and examinations are essentially equivalent to those of the TGGS master programs. The value shall not be established by schematic comparison but by applying an overall view and overall assessment.

- 3) Study performance and examination results which are required for the admission to the master programs will not be credited.
- 4) The TGGS Examination board is in charge of the crediting according to §8.1 and 8.2. Before deciding on the equal value, the relevant specialist representatives must be heard.
- 5) In the case of study performance and examination results being credited, and as far as the grading systems are comparable, grades must be transferred and included in the calculation of the total grade.

§ 9. Absence from an examination, withdrawal, fraud, and violation of regulations

- 1) The performance in an examination will be marked as 'failed' (0), if the examinee fails to appear at a fixed examination date without acceptable justification or if he/she backs out of the examination without acceptable justification after the examination has started. The same applies if a written examination, for which the students have registered, has not been taken within the respective examination period.
- 2) The examination board must immediately be notified in writing and must be satisfied of the reasons advanced for the walking out of or missing of an examination. In case of an illness of the examinee, a doctor's certificate is required. In individual cases, the chairperson can demand a doctor's certificate of a medical examiner appointed by the examination board. If the examination board does not accept the reasons, the examinee will be notified in writing.
- 3) If the examinee tries to influence the results of an examination by fraud, for example, by using unauthorized auxiliary material, the respective examination performance will be marked as 'failed' (0). The fraud will be identified by the respective examiner or by the person responsible for supervision and will go on record. An examinee who interferes with the orderly progress of the examination can be expelled by the respective examiner or supervisor, generally after being given a warning. In this case, the respective examination performance will be marked as 'failed' (0). The reasons for the expulsion must go on record. In severe cases, the examination board can exclude the examinee from taking any further examination.
- 4) Within 14 days, the examinee has the right to demand that decisions according to § 9.3 are reviewed by the examination board. The examinee must be informed of this right in writing. He/she must be immediately notified of an unfavorable decision in writing.

II Examination process for the Master Degree (Master examinations)

§ 10. Extent and nature of the Master examinations

- 1) The Master examination process consists of
  1. A number of examinations as listed in each program (the Curriculum).
  2. an eighteen-week industrial internship or longer
  3. the Master thesis pursuant to §15 and 16, for details see the respective curricula.

The examination must be taken on the examination date which immediately follow the lecture period of the respective semester, based on KMUTNB Academic Calendar.

- 2) The examinations in program specific subjects consist of either a written test or an oral examination in the subjects or courses indicated in each specific master program (curriculum).
- 3) The topics of the examinations are determined by the contents of the courses assigned to the subjects.
- 4) The format of the examination (written (§ 13) or oral (§ 14)) will be determined for each subject at the beginning of the registration period (§ 5.2)) and announced in the lectures.

- § 11. Admission to the examination process for the Master Degree (Master Examinations)
- 1) Only persons can be admitted to master examinations who
    1. fulfill the entry requirements listed in § 3 REM which
    2. are enrolled in the respective TGGs Master Program
  - 2) Student must be registered for courses, internship and thesis in order to take any examinations.
  - 3) The topic of the Master thesis can be set if the examinee has fulfilled all admission requirements pursuant to §11.1 and has passed all elements of the Master examinations as listed in related curriculum.
  - 4) If the examinee can prove that, without him/her being responsible, it is not possible for him/her to enclose a document required according to §13.1 and 13.2, the examination board may allow him/her, on application, to give the respective proof in a different way.
- § 12. Admission to examination procedure
- 1) The examination board or, pursuant to §6, the chairperson of this board decides on admission to the Master examinations.
  - 2) Admission will be refused if:
    1. the requirements listed in § 11.1 are not fulfilled, or
    2. the required documents are not completed, or
    3. the examinee is already undergoing another examination procedure in this or procedure in this or in a comparable course of studies.
- § 13. Test papers written under supervision
- 1) In the test papers, the examinee has to prove that he/she is able to understand a problem posed and find a way to solve it, using the common methods of the subject, within a time limit and with limited auxiliary material.
  - 2) The examinee must be given the opportunity to inspect the marked test paper within, at the most, four weeks after publication of the test results.
  - 3) The time limit for completing written test papers is a minimum of one and a half hours for subjects with three hours per week of lecturing/ exercises.
- § 14. Oral examinations
- 1) In the oral examinations, the examinee has to prove that he/she sees the larger context of the tested subject and that he/she is able to deal with specific problems within this larger technical context. Additionally, the oral examinations are intended to find out whether the examinee has a broad basic knowledge.
  - 2) Oral examinations are held in the presence of at least one examiner and one competent assistant in the form of an examination of a group or an individual. In group examinations, maximally four examinees can be questioned at the same time. In a individual examination, each examinee is questioned in one subject by one examiner only. Before fixing the grade pursuant to §18.1, the examiner must hear the other examiners or the assistant.
  - 3) The essential topics and results of the examination in the individual subjects must be written down in examination notes.
  - 4) The duration of an oral examination is generally 20-30 minutes per examinee.
- § 15. Master Thesis
- 1) The master thesis has the objective to demonstrate that the examinee is able to handle and solve on a technical-scientific problem of his/her special field in the area of his/her Master Program, with guidance but mainly by him/herself, using scientific methods and doing this within a given time limit.
  - 2) The master thesis can be issued and supervised by any TGGs Lecturer/Researcher or RWTH Aachen Professor who is active in research and teaching in this master program. Research Assistants can participate in the supervision. By way of exception and with the agreement of the examination board, the master thesis can be written outside TGGs or outside the RWTH, if it is supervised by one of the persons mentioned above.



- 3) On application of the examinee, the respective TGGs Program Coordinator will support examinees to receive the topic of their master thesis at a scheduled date. The examinee must be given the opportunity to make suggestions for the topic.
  - 4) The master thesis has to be written in English.
  - 5) The respective TGGs Program Coordinator notifies the examinee of the deadline for handing the thesis in. The date of handing out the master thesis' topic must go on record.
  - 6) The time limit for the master thesis is six months. The topic and the specific problem must be of a nature that makes it possible to complete the thesis within this time limit. The topic can only be changed once and only within the first month of working on the thesis (§19 REM). By way of exception, the examination board can prolong the time limit in any individual case once, by up to three months, on justified application by the examinee and with the endorsement of the supervisor who issued the thesis. The master thesis must be finished and related documents submitted for completion at the end of the specified period, otherwise the thesis will be considered as 'failed' (0) (§18.1).
  - 7) When submitting the master thesis, the examinee must declare in writing that he/she wrote it on his/her own, that he/she did not use any other than the stated sources and auxiliary means, and that he/she correctly references sources.
- § 16. Acceptance and assessment of the Master thesis
- 1) The Master thesis must be delivered to the supervisor, respectively the examination board, within the deadline. The delivery date must go on record. If the Master thesis is not delivered within the deadline, it will be marked as 'failed' (0) (§ 18.1).
  - 2) The Master thesis must be assessed and marked by two examiners. The person who issued the thesis should be one of the examiners, and the research assistant who co-supervised is usually acting also as a co-examiner. Otherwise, the second examiner will be appointed by the chairperson of the examination board. The grading shall be carried out pursuant to §18.1.
  - 3) The grade must be made known eight weeks after the respective delivery date, at the latest.
- § 17. Elective subjects
- 1) The examinee can undergo an examination in subjects additional to the compulsory ones (elective subjects), according to the related curriculum.
  - 2) The result of the examination in these subjects is included in the transcript and included in the calculation of the total grade.
- § 18. Evaluation of the examination performance, calculation of the grades, and passing of the examination for the Master degree.
- 1) The grades for the individual examinations are given by the respective examiners. The following grades must be used :
 

A (4.0)	=	excellent, an excellent performance
B+ (3.5)	=	very good, a performance considerably above the average requirements
B (3.0)	=	good
C+ (2.5)	=	fairly good, above average
C (2.0)	=	fair, a performance meeting the average requirements
D+ (1.5)	=	satisfactory, a performance which, despite its shortcomings, still meets the requirements
D (1.0)	=	just passed
F (0.0)	=	failed, a performance which, due to considerable shortcomings, does not meet the requirements

- 2) The grading must be announced after six weeks, at the latest. Notification on notice board will suffice. Data security and privacy issues must be considered.
  - 3) The Master examination is passed if the grade point average (GPA) of all examinations in specialized fields and the grade of the Master thesis are at least 'good' (3.0).
  - 4) The total grade of the passed Master examination results from the weighted arithmetic mean of the grades of the examinations in specialized subjects and the grade of the Master thesis.
  - 5) If students have passed all required master examinations and other graduation criteria as specified in related curriculum, students are eligible to graduate before normal master degree's study period (2 years).
- § 19. Retaking the examinations for the Master Thesis  
A new Master thesis can be written once if the first thesis failed. However, a change of the topic of the Master thesis within the time frame specified in §15.6 is only allowed, if the examinee did not make use of this possibility when writing his/her first Master thesis.
- § 20. Invalidity of the Master Examination, adjudication of the Master Degree  
If an examinee cheated in an examination and this becomes known only after issuing the certificate, the examination board may subsequently alter the grades for the results of the examinations in which the examinee cheated, accordingly, and it may declare the complete examination or parts of the examination as failed. The consequences of unethical activities of students will be decided based on related KMUTNB student's regulations.
- III Supplementary
- § 21. REM official language,  
The Thai text of these regulations is the official text, any English translation is an explanatory.
- § 22. Other requirements to graduate with a TGGS master degree  
Other requirements for graduation with a TGGS master degree are specified in each related curriculum that has been approved by KMUTNB University Council and Commission of Higher Education (CHE). In case where there are conflicts or discrepancies between requirements in these regulations and the requirements in the official curriculum, the requirements in the officially approved curriculum will be used to resolve all related issues.
- § 23. Conflicts with CHE regulations  
In case where these regulations are in conflict with CHE regulations, CHE regulations will be used as a basis for all considerations.
- § 24. Effective date and publication  
These regulations become effective for students as of 25th May, 2011 and effective with current students and students whose ID begins with 53 onwards.

These regulations are announced on 16 June, 2011.

Prof. Dr. Kasem Suwannagul  
Chairman of KMUTNB Council

## **Regulations for Examination in the Master of Engineering Programs (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) Version 2017 (For Student ID 60-62 who enrolled in the academic year of 2017-2019)**

It is deemed necessary to revise the regulation of the master degree education of The Sirindhorn International Thai-German Graduate School of Engineering (announced on 16 June 2011) in accordance with an announcement of the Ministry of Education entitled "Graduate Studies Program Standard Criteria 2015" along with the academic philosophy following the memorandum of understanding between King Mongkut's University of Technology North Bangkok and RWTH Aachen University signed on 22 October 2004 (B.E. 2547) and 7 October 2015 (B.E. 2558).

By virtue of Articles 22(2) and (9) of the King Mongkut's University of Technology North Bangkok Act 2007 (B.E. 2550) and the Academic Council's resolution on its 4/2017 meeting on 15 May 2017, the University Council on its 7/2017 meeting on 27 September 2017 thus established this regulation.

Item 1            This regulation is hereby entitled "the Regulation of King Mongkut's University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) 2017"

Item 2            This regulation is applied to all new students enrolled in semester 1/2017 onwards.

Item 3            "The Regulation of King Mongkut's University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) 2011" signed on 16 June 2011 is no longer valid.

All existing regulations and notices that are found inconsistent with the provisions of this regulation shall be annulled and henceforth will be replaced by this regulation.

Item 4            This regulation has been drafted in Thai and English versions. In case of any discrepancies in the interpretation, the version of the regulation in Thai language shall prevail.

Item 5            This regulation is overseen by the President of King Mongkut's University of Technology North Bangkok and the President has the authority to issue related regulations or announcements.

In case of any diagnostics or discrepancies in the interpretation, the President has the sole authority in the interpretation and the decision.

Any procedures related to master degree education, but remain unstated, must be proposed to the University's Academic Council for further consideration and then the University Council for the final approval.

Item 6            In this regulation,  
**"University"** means King Mongkut's University of Technology North Bangkok.

**"University Council"** means the Council of King Mongkut's University of Technology North Bangkok.

**"Academic Council"** means the Academic Council of King Mongkut's University of Technology North Bangkok.

**"President"** means the President of King Mongkut's University of Technology North Bangkok.

**“TGGS”** means The Sirindhorn International Thai-German Graduate School of Engineering.

**“Dean”** means the Dean of The Sirindhorn International Thai-German Graduate School of Engineering.

**“Program”** means all curricular graduate programs offered for the doctoral degree programs in The Sirindhorn International Thai-German Graduate School of Engineering.

**“Department”** means department or other equivalent sector which offers doctoral degree program in The Sirindhorn International Thai-German Graduate School of Engineering.

**“Head of Department”** means head of department or head of other equivalent sector in The Sirindhorn International Thai-German Graduate School of Engineering.

**“Lecturer”** means a lecturer in The Sirindhorn International Thai-German Graduate School of Engineering.

**“TGGS Committee”** means a committee appointed to manage The Sirindhorn International Thai-German Graduate School of Engineering.

**“Program Coordinator”** means the head of field of study in The Sirindhorn International Thai-German Graduate School of Engineering appointed by Dean with the approval from Administrative Committee of The Sirindhorn International Thai-German Graduate School of Engineering.

**“Student”** means the student in master degree program in The Sirindhorn International Thai-German Graduate School of Engineering.

**“External Expert”** means individual outside The Sirindhorn International Thai-German Graduate School of Engineering who has a high professional standing and has been approved as qualified to give a lecture or be an examiner according to The Sirindhorn International Thai-German Graduate School of Engineering’s rules.

**“Examination Committee”** means TGGS Lecturers/Researchers or external person of high professional standing who has been approved as such by The Sirindhorn International Thai-German Graduate School of Engineering and appointed by the Dean.

**“Master thesis”** means a written document reporting an independent study or a research project aiming to develop and construct the body of knowledge in a field of study, which is supervised by the thesis advisor and is a part of the degree requirements.

## **Section 1**

### **Educational System**

- Item 7            Educational system
- The educational system of the master degree program of the TGGS is an international program using English language as a medium of instruction.
- Item 8            Educational management
- The program is a two-semester system. The academic calendar consists of two regular semesters. Each regular semester is not less than 16 weeks, but not more than 18 weeks.
- Item 9            Length of the program
- (1) The study load has a minimum of 4 semesters and a maximum of 10 semesters.
- (2) Length of the program is counted from the semester in which a student once registers in the program.
- Item 10           The program structure focuses on research according to the Master Study Program Plan A Model A2. The thesis module normally has a minimum of 12 credits and the coursework for additional 34 credits.

## **Section 2**

### **Student Admission**

- Item 11           Qualifications of an applicant
- (1) An applicant must hold a Bachelor's degree or an equivalent qualification by which the educational background in the field of the Master course is proven. A relevant educational background exists if the degree accounts for a spectrum of subjects and knowledge pursuant to the standards of the German TU9 Group of Technical universities having their joint office in Berlin, Germany (RWTH Aachen, partner of TGGS, is one of those). (The Alliance of Leading Institutes of Technology in Germany 9 is abbreviated as TU9.) The degree must be awarded by an internationally recognized university with a minimum GPA of 2.75 from 4.00 scale or an equivalent GPA.
- An individual lacking a minimum GPA of 2.75 but more than 2.50 must have work experience in related field and may apply under the consent of the TGGS committee.
- (2) An applicant must have English language proficiency according to the rules of the TGGS.
- (3) An applicant must have other qualifications as noted by the program or the TGGS.

- Item 12                      Criteria for admission
- (1) An applicant must pass entrance examinations by any means requested and announced by the TGGS, or
  - (2) In exceptional circumstances, an applicant is selected in special cases for study under the consent of the department committee and the TGGS committee.
- Item 13                      Enrollment
- (1) An applicant who accepted to study must enroll for credits in order to hold a student status.
  - (2) An applicant who accepted to study must enroll according the procedure announced by the TGGS.
  - (3) An applicant who accepted to study is not permitted to enroll in more than one program at the same time.

### **Section 3**

#### **Program Management**

- Item 14                      Study plan
- Study plan means the course work, the industrial internship and the master thesis that a student must study or complete in each semester as assigned by the program.
- Item 15                      Registration
- (1) Registration must follow the academic calendar. A student who has not completed the registration process within 15 days after the beginning of the semester will no longer be considered as a student.
  - (2) A student is allowed to register for a minimum of 3 credits and a maximum of 15 credits in each regular semester, except a student has less than 3 credits to complete the study program or only has the thesis work to be completed.  
  
Any registration with less than the allowed minimum credits or the allowed maximum credits as stated in (2) must receive the consent from the Head of Department and approval from the Dean.
  - (3) A student can register to maintain the student status in the summer semester if only has the thesis work to be completed for the last semester in order to fulfill the graduation requirement.
  - (4) Registration for Audit Course
    - a. Registration for Audit Course means that the audit course is a special and/or additional course which will not be counted toward the graduation requirement for the study program.
    - b. The course evaluation results will be recorded as “AUD” on the transcript if the student’s attendance is more than 80% of the entire lecture time.

(5) Maintaining student status

- a. A student who has completed his/her course requirements and is working on other degree requirements that do not require enrollment in courses must nevertheless maintain his/her active student status for continued advising services until graduation, or terminated from their academic program.
- b. To retain a student status, a student must complete the registration process and pay the fees within 15 days after the semester begins. Failure to comply with this regulation will result in termination of student status.

Item 16 Add or Withdraw Courses

- (1) Add courses can be accomplished within 3 weeks after the semester begins or within the first week of the summer semester.
- (2) Withdraw courses can be accomplished within 12 weeks after the semester begins or within the first two weeks of the summer semester.
- (3) Add and withdraw courses stated in (1) and (2) must not violate the registration regulations and procedures stated in Item 15 (2) and (3).
- (4) Any add and withdraw courses not according to (1), (2) and (3) must receive the consent from the Head of Department and approval from the Dean.

Item 17 Leave of absence

A leave of absence is a temporary interruption of one's studies for a period of one or two semesters. A student wishing to make a leave of absence needs to maintain the student status.

- (1) A student may personally request for absence from the advisor and the head of department, and receive approval from the Dean within the period specified in the university announcement. It can be requested under the following conditions:
  - a. A leave of absence for military service for the duration of military service obligation.
  - b. A leave of absence due to study or conduct the research abroad with exchange scholarship or other scholarship.
  - c. Illness with absence for more than 20 percent of class attendance; a medical certificate is required.
  - d. Other personal reasons can be considered if a student has studied for at least one semester and have a minimum GPA of 2.75.
- (2) Leave in item (1)a. is granted according to the conditions and the requirements of the military. Leave in item (1)b. is granted according to the conditions and the requirements of the scholarship funding resources. Leaves in items (1)c. and (1)d. are granted for no longer than two consecutive semesters. If necessary, only one more semester of leave is granted.
- (3) When the leave of absence is granted, the duration of absence is counted as part of the maximum length of study except absence in item (1)a.

- (4) Before the period of approved leave of absence, a student must retain student status by paying the fees within 15 days after the semester begins. The student must retain status when the leave is granted. Failure to comply with this regulation will result in termination of student status, except the absence in Item (1)a.
- (5) After a period of approved leave, a student can resume studies by submitting the request to the Head of Department and with approval by the Dean at least one week prior the registration period begins.
- (6) Special circumstances other than (1)-(5) shall be subjected to the consideration of the President.

#### Item 18

##### End of student status

A student status is ended according to the following reasons:

- (1) Death
- (2) Approved resignation from the program
- (3) Disqualifications for admission mentioned in Item 11
- (4) As approved by the Dean, a student status can be terminated under any of the following reasons:
  - a. A student does not complete the program within the maximum period mentioned in Item 9.
  - b. A student does not register or does not pay the tuition fees within the deadlines.
  - c. A student does not follow the conditions specified for leave of absence.
  - d. A student does not follow the rules and guidelines mentioned in Section 7 Measurement and Evaluation.
- (5) Breach of discipline mentioned in Item 38.

#### Item 19

##### Resumption (Reinstatement) of student status

- (1) A student who is terminated from reasons in Items 18(4)b can resume a student status within 15 days after being terminated.
- (2) Resumption of student status must be approved by the Dean with the consent of the Head of Department.
- (3) A student must pay the resumption fee, the maintenance fee and the tuition fees in order to resume studies.
- (4) Once resumption of status is approved, a student officially regains status and resumes studies. However, the duration of study must be according to Item 9.

#### Item 20

##### Resignation

A student requesting a resignation from the program must submit the request to the Dean through the program coordinator or the main advisor and the Head of Department.

The resignation became effective with the Dean's approval.



- Item 21                      Change of study plan, study program or study track
- (1) A student may request to change the study plan, the study program or the study track in the same department with the consent of Head of Department and the approval from the Dean.
  - (2) A student may request to change the study program in another department if he/she studies in the present department for at least one semester with the consent of Head of Department and the approval from the Dean.
  - (3) A student must pay the fee to change the study plan, the study program or the study track.

## **Section 4**

### **Faculty Members**

- Item 22                      Faculty members in the master degree program
- (1) A permanent program lecturer (regular lecturer) is a person employed in the TGGS as a lecturer, assistant professor, associate professor or professor. The permanent program lecturer is in charge of a full-time teaching in the program. The permanent program lecturer must hold a minimum of doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The permanent program lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.
  - (2) At least 3 permanent program lecturers appointed to be responsible curriculum lecturers and they must hold a minimum of doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The responsible curriculum lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.
- In the case that the program does not have at least 3 responsible curriculum lecturers or the program has less than 10 students, the program can request for a special consideration and approval for the current number of responsible curriculum lecturers and their the qualifications to the university council and the Commission of Higher Education.
- (3) A thesis advisor
    - a. A thesis main advisor must be a permanent program lecturer who holds a doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The thesis main advisor must have at least 3 papers in the past 5 years and with that at least one research paper.

- b. A thesis co-advisor (if any) must have the qualifications as follows:

A thesis co-advisor must be a permanent lecturer with the same qualifications as the thesis main advisor.

For an external expert as the thesis co-advisor, he/she must hold a doctoral degree or equivalent and must have papers (publications) published in journals which are in the nationally recognized database. The external expert must have at least 10 papers related to the thesis topic.

In the case that an external expert does not have number of papers according to the requirement, he/she must specialize in the field of research and have experience in conducting research with recognition. The program can request for a special consideration and approval to the university council and then inform the Commission of Higher Education.

- (4) A thesis examination committee consists of a program lecturer and an external expert for at least 3 members. However, the chairman cannot be a thesis advisor or a thesis co-advisor. The thesis examination committee must have the following qualifications:

- a. A permanent program lecturer as the thesis examination committee member must hold a doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The permanent program lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.
- b. For an external expert as the thesis examination committee member, he/she must hold a doctoral degree or equivalent and must have papers (publications) published in journals which are in the nationally recognized database. An external expert must have at least 10 papers related to the thesis topic.

In the case that an external expert does not have number of papers according to the requirement, he/she must specialize in the field of research and have experience in conducting research with recognition. The program can request for a special consideration and approval to the university council and then inform the Commission of Higher Education.

- (5) A course instructor must be a permanent program lecturer or external lecturer who holds a doctoral degree or equivalent in the study program or related study program or in the study program which the course being taught. The course instructor must have experience in teaching and papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The course instructor must have at least 1 paper in the past 5 years and with that at least one research paper. However, the external lecturer can give the lecture no more than 50% of the course together with the permanent program lecturer responsible for that course.

#### Item 23

#### Workload of Thesis Advisor

- (1) One permanent program lecturer can advise and supervise the thesis of master and doctoral students according to the following regulations:

A permanent program lecturer with a doctoral degree or equivalent and have publications according to the regulation allows to be a thesis advisor up to 5 master and doctoral students each semester.

A permanent program lecturer with a doctoral degree or equivalent and the academic title of assistant professor or higher and have publications according to the regulation allows to be a thesis advisor up to 10 master and doctoral students each semester.

In the case that a permanent program lecturer with a doctoral degree or equivalent and the academic title of professor is needed to supervise more than 10 master and doctoral students, the permanent program lecturer can request for a special consideration and approval to the university council to be a thesis advisor up to 15 master and doctoral students each semester. For more than 15 master and doctoral students each semester, the permanent program lecturer must request for a special consideration and approval to the university council and the consent from the Commission of Higher Education.

- (2) A responsible curriculum lecturer must be a thesis advisor and/or a thesis examination committee member and/or a course instructor in the study program as well.

Item 24 Appointment of a master thesis advisor and defense examiner

The Dean will approve the appointment of an advisor and examiner. The appointment will be confirmed by the TGGS committee.

## **Section 5**

### **Examination Process and Procedure for the Master Degree**

Item 25 Scope and Format of Examination for the Master Degree

- (1) Examination process includes the followings:

- a. A number of examinations as listed in each program ( the Curriculum).
- b. An eighteen-week industrial internship or longer
- c. The Master thesis as stated in Section 6

The examination must be taken on the examination date which immediately follow the lecture period of the respective semester, based on KMUTNB Academic Calendar.

- (2) The examinations in program specific subjects consist of either a written test or an oral examination in the subjects or courses indicated in each specific master program (curriculum).
- (3) The topics of the examinations are determined by the contents of the courses assigned to the subjects.

- (4) The format of the examination (written as stated in Item 28 or oral as stated in Item 29) will be determined for each subject at the beginning of the registration period (Item 15)) and announced in the lectures.
- Item 26 Admission to the examination process for the Master Degree
- Only persons can be admitted to master examinations who are enrolled in the respective TGGs Master Program.
- Item 27 Admission to the examination procedure for the Master Degree
- (1) Chairman of examination board decides on admission to the Master examinations.
- (2) Admission will be refused if:
- the requirements listed in Item 26 are not fulfilled, or
  - the required documents are not completed, or
  - the examinee is already undergoing another examination procedure in this or procedure in this or in a comparable course of studies.
- Item 28 Written Examinations
- (1) In the test papers, the examinee has to prove that he/ she is able to understand a problem posed and find a way to solve it, using the common methods of the subject, within a time limit and with limited auxiliary material.
- (2) The examinee must be given the opportunity to inspect the marked test paper within, at the most, four weeks after publication of the test results.
- (3) The time limit for completing written test papers is a minimum of one and a half hours for subjects with three hours per week of lecturing/ exercises.
- Item 29 Oral Examinations
- (1) In the oral examinations, the examinee has to prove that he/she sees the larger context of the tested subject and that he/ she is able to deal with specific problems within this larger technical context. Additionally, the oral examinations are intended to find out whether the examinee has a broad basic knowledge.
- (2) Oral examinations are held in the presence of at least one examiner and one competent assistant in the form of an examination of a group or an individual.
- In group examinations, maximally four examinees can be questioned at the same time.
  - In an individual examination, each examinee is questioned in one subject by one examiner only.
- (3) Before fixing the grade, the examiner must hear the other examiners or the assistant.
- (4) The essential topics and results of the examination in the individual subjects must be written down in examination notes.

- (5) The examination notes consists of questions, answers and other essential topics during the examination.
- (6) The duration of an oral examination is generally 20- 30 minutes per examinee.

## **Section 6**

### **Thesis Preparation and Thesis Examination**

Item 30                      The process of master thesis preparation and thesis examination

- (1) Appointment of Thesis Advisory Committee
- (2) Thesis Evaluation
  - a. Thesis Proposal Examination
  - b. Thesis Progress Examination
  - c. Thesis Defense Examination

Item 31                      Appointment and Change of a main dissertation advisor

A graduate student must have at least one main advisor at the beginning of enrollment. The co-advisor is optional.

The student can submit a request form to change a main dissertation advisor with the consent of both the current and proposed advisors. The student has to ensure that the new advisor will undertake their work before getting approval. The student requesting the change of a main thesis advisor must submit the request to the Dean through the Head of Department and must be approved by the TGGS committee.

Item 32                      Thesis Examination

- (1) Thesis Proposal Examination:

A student could submit the request form for the Master Thesis Proposal Examination to the TGGS through their main advisor and Head of Department. The submission process conforms to the announcement of TGGS.

A student who wishes to change the topic after the initial one has been approved must submit a request for Thesis Proposal Examination. The thesis starting time would be counted from the new date of approval for the thesis title.

- (2) Thesis Progress Examination:

The purpose of this examination is to evaluate students' thesis progress including their understanding of the content. It assesses the organizational and conceptual skills of the students necessary for their defense.

A student could submit a request for the Thesis Progress Examination after 30 days of the approval date for the thesis title (Thesis Proposal Examination).

a. Submission of Request Form for Master Thesis Progress Examination

Prior to the progress examination, a student must submit the request form for Master Thesis Progress Examination form to the TGGs through the main advisor and the Head of Department.

b. Appointment of Master Thesis Progress Examination Committee

The main thesis advisor will propose the committee members to the Dean for further official appointment. The Master Thesis Progress Examination Committee normally comprises of the following members:

1. The chairman who has the qualification as stated in the item 22 (4), who should not be the main advisor or a co-advisor.
2. The main advisor as a member

However, at least one more committee member with the qualification as stated in the item 22, who should not be the co-advisor, can be proposed.

c. Progress Examination Procedure

1. A student must submit the request form for the Thesis Progress Examination to TGGs through the main advisor and Head of Department.
2. After the examination, the advisor will report the result to the TGGs through the Head of Department and announce the result within one week from the examination date.

The student who fails the first progress examination must submit a request form for retaking of the Thesis Progress Examination within the duration specified by the Thesis Progress Examination Committee.

A student who passes the progress examination could submit a request form for the Thesis Defense Examination after at least 30 days of the approval date for the result of Thesis Progress Examination.

The process and procedure of the Thesis Progress Examination will comply with TGGs rules and announcements.

(3) Thesis Defense Examination:

The thesis defense examination is an opportunity for students to demonstrate the knowledge of their research area and overall process undertaken. The committee will evaluate the student's performance and overall understanding of their academic knowledge to graduate.

a. Submission of Request Form for Master Thesis Defense Examination

After 30 days of acknowledgement of the progress examination result, a student can submit the request form for the Master Thesis

Defense Examination to TGGs through the main advisor and Head of Department.

b. Appointment of the Master Thesis Defense Examination Committee

The main thesis advisor will propose the committee members to the Dean for further official appointment. The Master Thesis Defense Examination Committee normally comprises of the following members:

1. The chairman who has the qualification as stated in the item 22 (4), who should not be the main advisor or a co-advisor.
2. The main advisor as a member
3. The external member who has the qualification as stated in the item 22 (4).

However, at least two more committee members with the qualification as stated in the item 22, who should not be the co-advisor, can be proposed.

c. Defense Examination Procedure:

1. A student must submit the request form for the Thesis Defense Examination to TGGs through the main advisor and Head of Department.
2. After the examination, the advisor will report the result to the TGGs through the Head of Department and announce the result within one week from the examination date.

The student who fails the first defense examination must submit a request form for retaking of the Thesis Defense Examination within the duration specified by the Thesis Defense Examination Committee. This will be considered as the last attempt.

The process and procedure of the Thesis Defense Examination will comply with TGGs rules and announcements.

Item33 Thesis Format

1. The thesis must be written in English.
2. The manuscript format will be according to the TGGs Announcement.

## Section 7

### Measurement and Evaluation

Item 34 Evaluation

Grading system used for educational evaluation based on defined accomplishment at the end of each semester is presented as follows

Letter Grade	Grade Score	Performance's Quality
A	4.0	Excellent
B+	3.5	Very Good
B	3.0	Good
C+	2.5	Above Average
C	2.0	Average
D+	1.5	Below Average
D	1.0	Poor
F	0	Fail
Fa	0	Fail, Insufficient Attendance
Fe	0	Fail, Absent from Examination
S		Pass/Satisfactory
U		Fail/Unsatisfactory
I		Incomplete
Ip		In-progress
W		Withdrawal
AUD		Audit

Item 35

Cumulative Credits and Grade Point Average (GPA) Calculations

- (1) Cumulative credits and GPA must be calculated at the end of each semester.
- (2) Cumulative credits are registered coursework credits which earns the score according to Item 34.
- (3) Two categories of GPA: Semester GPA and Cumulative GPA in which can be calculated as follows:
  - a. Semester GPA is calculated from the academic performance of the student in the respective semester by summing the product of credits and grade score for each course, then dividing by total of credits in the respective semester.



- b. Cumulative GPA is calculated from the academic performance of the student in the first semester to the latest one by summing the product of credits and grade score for each course, then dividing by total of credits.

Item 36                      Transfer of Credits

- (1) Credits of the graduate course can be transferred with the consent of the Head of Department and the Dean only for the course with the grade of at least 3.0. The eligible course to be transferred must be taken when he/she was the student at the university or another university no more than 5 academic years from the year that the course registered. Total of credits to be transferred cannot exceed 40% of the study program that the student enrolled at TGGS.
- (2) The transferred course and its credits will be recorded with the course name, number of credits and the grade on the transcript without calculating toward the GPA. The name of university, besides KMUTNB, will be recorded on the transcript as well.

Item 37                      Student Status and Repetition

- (5) A student who has the Cumulative GPA less than 2.50 will be automatically retired from the study program.
- (6) A student who has the Cumulative GPA of at least 2.50 but still lower than 3.00 will be on the “probation” status.
- (7) A student who has completed the coursework according to the study program and received the Cumulative GPA of at least 2.90 but still lower than 3.00 can register for additional course(s) that have not been previously taken with the consent of a thesis advisor and the Head of Department to achieve the Cumulative GPA of at least 3.00 within the next semester. Otherwise, the student will be automatically retired from the study program.
- (8) A student is not allowed to register for the course(s) that have been previously taken, except for the repetition according to Item 37(3).

Item 38                      Penalty for academic dishonesty ( cheating) on course examinations and plagiarism on other theses or publications.

- (1) In the case that the incidents have been found or have reasonable doubts to believe that the student has been cheating on the course examination, the dean will form the investigation committee and the outcomes of this investigation will be report to TGGS committee for consideration. If the student is found guilty, the student will get one of following penalties:
  - a. Fail that examination that the student has cheated
  - b. Fail that course that the student has cheated and the student will be ordered to take a leave of absence in the next regular semester for at least one semester.
  - c. Fail that course that the student has cheated including not to consider all courses in that respective semester and the student will

be ordered to take the leave of absence in the next regular semester for at least one semester.

d. Terminate the student status

(2) In the case that the incidents have been found or have reasonable doubts to believe that the student has been plagiarized on other thesis or publications or have someone write the thesis or publication, the dean will form the investigation committee and the outcomes of this investigation will be report to TGGs committee for consideration. If the student is found guilty, the TGGs Committee will proceed the followings:

a. If the student is not completed with the study, the committee will consider not to approve or to withdraw the thesis and the student will get one of following penalties:

1. The student will be ordered to take a leave of absence for a maximum of one academic year.
2. The student status will be terminated.

b. If the degree is granted, the committee will report to the university council for degree revocation.

## Section 8

### Measurement and Evaluation of Thesis

Item 39 Thesis Submission

A student is required to submit two copies of the manuscript with signatures of all committee members including an electronic version and abstract to the TGGs within the period specified by the KMUTNB Academic Calendar for the Dean approval.

Failure to comply, the student will not be able to graduate. The student must register in order to maintain his/her student status until submit the thesis, or until his/her student status is terminated.

Item 40 Measurement of Master thesis is considered from progress and success of research work assign in each semester together with outcomes of the progress and defense examinations.

Item 41 Grading system used for educational evaluation based on defined accomplishment is presented as follows:

Assessment	Performance's Quality
S	Pass proficiency exam / Satisfactory
U	Fail with inadequate achievement / Unsatisfactory
Ip	Incomplete thesis work / In-progress

- Item 42 Evaluation of Master Thesis Progress Examination and Master Thesis Defense Examination
- "Pass"** refers that the student has outstanding knowledge to conduct the research in their academic area together with the ability to analyze and apply their knowledge in a wider context. The student is allowed to take the proposal, progress and defense examinations. The student is expected to answer questions in the manner indicates his/her comprehensive knowledge in the field of research.
- "Fail"** refers that the student does not have sufficient knowledge and competence in research work. His/her abilities do not meet minimum requirements. Therefore, the student is not allowed to submit a request for the proposal, progress and defense examinations. It means that the student does not have sufficient understanding of the research he/she has studied so the student has to prepare more to retake the exam and make an effective presentation.
- Item 43 The result of defense examination will be recorded on the student's transcript when he/she graduates with the assessment according to Item 34.
- Item 44 The thesis approved by the Dean of TGGS is considered to be official and complete thesis.

## Section 9

### Graduation and Degree Approval

- Item 45 A student who is eligible to graduate must complete the following requirements.
1. Pass the Master Thesis Defense Examination
  2. Complete the thesis, in compliance with submission guidelines in item 39, and approved by the TGGS Dean
  3. Complete the coursework according to the study program with a minimum GPA of 3.00
  4. Pass English Proficiency Examination with score according to the TGGS Regulation and Announcement
  5. Publish (or acceptance to be publish) the entire or part(s) of the thesis in the international conference proceeding (paper) with full paper or an international academic journal or other accepted academic publications as stated in the TGGS Regulation and Announcement
- Item 46 Degree Approval
- The degree will be approved by the university council. To be eligible for a degree, a student must fulfill the following qualifications:
- (1) The student must meet requirements as stated in the item 45.
  - (2) The student must be cleared of any outstanding academic debts in relation to his/her studies to the university.

- (3) The student must be free from any disciplinary actions imposed upon his/her out of disciplinary punishment, except in the case of petty offences according to the university disciplinary regulation.
- (4) The student must follow the TGGGS regulations and procedure.

## **Section 10**

### **Quality Accreditation and Assessment of the Curriculum**

- Item 47            All current Master degree programs of TGGGS are under the quality accreditation according to the Ministry of Education's Qualifications Framework for Higher Education. The assessment for revision must be conducted at least every 5 years.

### **Temporary Provision**

- Item 48            While regulations and procedures conferring to this regulation have not been announced, regulations and procedures conferring to "the Regulation of King Mongkut's University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGGS) 2011" signed on 16 June 2011 can be applied.
- Item 49            This regulation will apply to TGGGS students who are pursuing their degree and enrolled at the university prior semester 1/ 2017 and have not graduated, the students must follow "the Regulation of King Mongkut's University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGGS) 2011" signed on 16 June 2011 and its regulations and procedures until graduated.

Announced on September 27, 2017.

(Dr. Siritach Rojanaphruk)

Vice-Chairman of KMUTNB University Council  
Acting as Chairman of KMUTNB University Council

## Regulations for Examination in the Master of Engineering Programs (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) Version 2020 (For Student ID 63 onward who enrolled in the academic year of 2020 onward)

It is deemed necessary to revise the regulation of the master degree education of The Sirindhorn International Thai-German Graduate School of Engineering that announced on 27 September 2017 (B.E. 2560) in accordance with additional study plans to fulfil the industrial needs and with an announcement of the Ministry of Education entitled “Graduate Studies Program Standard Criteria 2015 (B.E. 2558)” along with the academic philosophy following the memorandum of understanding between King Mongkut’s University of Technology North Bangkok and RWTH Aachen University signed on 22 October 2004 (B.E. 2547) , 20 September 2011 (B.E. 2554) and 7 October 2015 (B.E. 2558).

By virtue of Articles 22(2) and (9) of the King Mongkut’s University of Technology North Bangkok Act 2007 (B.E. 2550) and the Academic Council’s resolution on its 6/2020 meeting on 16 July 2020, the University Council on its 7/2020 meeting on 19 August 2020 thus established this regulation.

- |        |  |
|--------|--|
| Item 1 | This regulation is hereby entitled “the Regulation of King Mongkut’s University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) 2020”   |
| Item 2 | This regulation is applied to all new students enrolled in semester 1/2020 onwards.  |
| Item 3 | <p>“The Regulation of King Mongkut’s University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) 2017” signed on 27 September 2017 is no longer valid.</p> <p>All existing regulations and notices that are found inconsistent with the provisions of this regulation shall be annulled and henceforth will be replaced by this regulation.</p>  |
| Item 4 | This regulation has been drafted in Thai and English versions. In case of any discrepancies in the interpretation, the version of the regulation in Thai language shall prevail.   |
| Item 5 | <p>This regulation is overseen by the President of King Mongkut’s University of Technology North Bangkok and the President has the authority to issue related regulations or announcements.</p> <p>In case of any diagnostics or discrepancies in the interpretation, the President has the sole authority in the interpretation and the decision.</p> <p>In case of any reasonable and expedient to request a formal waiver in complying with this regulation, The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) has the authority to consider a waiver on a case-by-case basis, with the exception on the extension on the duration of study that must be complied with Article 9 Paragraph 2.</p> <p>Any procedures related to master degree education, but remain unstated, must be proposed to the University’s Academic Council for further consideration and then the University Council for the final approval.</p> |
| Item 6 | <p>In this regulation,</p> <p><b>“University”</b> means King Mongkut’s University of Technology North Bangkok.</p> <p><b>“University Council”</b> means the Council of King Mongkut’s University of Technology North Bangkok.</p> <p><b>“Academic Council”</b> means the Academic Council of King Mongkut’s University of Technology North Bangkok.</p> <p><b>“President”</b> means the President of King Mongkut’s University of Technology North Bangkok.</p>  |

**“TGGS”** means The Sirindhorn International Thai-German Graduate School of Engineering.

**“Dean”** means the Dean of The Sirindhorn International Thai-German Graduate School of Engineering.

**“Curriculum”** means all curricular graduate programs offered for the master degree curriculums at The Sirindhorn International Thai-German Graduate School of Engineering, except the Joint Master Degree Program in Railway Vehicles and Infrastructure Engineering (International Program).

**“Curriculum Chairman”** means the head of responsible curriculum lecturers for the curriculum teaching and learning at The Sirindhorn International Thai-German Graduate School of Engineering appointed by Dean with the approval from TGGS Committee of The Sirindhorn International Thai-German Graduate School of Engineering.

**“Program Coordinator”** means the head of field of study at The Sirindhorn International Thai-German Graduate School of Engineering appointed by Dean with the approval from TGGS Committee of The Sirindhorn International Thai-German Graduate School of Engineering.

**“Permanent Lecturer”** means a permanent and full-time lecturer at The Sirindhorn International Thai-German Graduate School of Engineering.

**“Program Lecturer”** means a permanent and full-time lecturer with the qualifications according or related to the field of study offered in the program at The Sirindhorn International Thai-German Graduate School of Engineering. The program lecturer is responsible for teaching and researching in the aforementioned disciplines and able to serve as program lecturers for several curriculums at the same time but must be a curriculum in which that program lecturer has direct qualifications or related to the field of study of that curriculum.

**“Responsible Curriculum Lecturer”** means a program lecturer with the obligation of curriculum management and development and teaching from planning, quality control, monitoring and evaluating the results, and curriculum development. Responsible curriculum lecturer must remain at the program during the duration of the study and is not permitted to be a responsible curriculum lecturer for more than one curriculum at the same, except it is the multidisciplinary or interdisciplinary curriculum that he/she can be a responsible curriculum lecturer for one more curriculum. Responsible curriculum lecturers for one curriculum can be the same at most two responsible curriculum lecturers.

**“TGGS Committee”** means a committee appointed to manage The Sirindhorn International Thai-German Graduate School of Engineering.

**“Expert”** means an individual outside The Sirindhorn International Thai-German Graduate School of Engineering, but still in the university as **Internal Expert** or outside the university as **External Expert**, who has a high professional standing and has been approved as qualified to give a lecture or be an examiner according to The Sirindhorn International Thai-German Graduate School of Engineering’s rules/regulations.

**“Curriculum Management Committee”** means a committee consists of curriculum chairman, responsible curriculum lecturers and program coordinator who are responsible for the management and development of curriculum in the graduate levels at The Sirindhorn International Thai-German Graduate School of Engineering.

**“Examination Committee”** means a committee appointed by Dean with the approval from TGGS Committee of The Sirindhorn International Thai-German Graduate School of Engineering to administer the examination and other duties related to the examination as specified in this regulation.

**“Student”** means a student in the master degree program at The Sirindhorn International Thai-German Graduate School of Engineering.

**“Master thesis”** means a written document reporting on a research project aiming to develop and construct the body of knowledge in a field of study, which is supervised by the thesis advisor. The student will use several methods for managing and solving engineering and scientific problems including techniques in that field of study. The student will submit the thesis to summarize the thesis work content, deliverables and confirmed outcomes as a part of the degree requirements.

**“Master project”** means a written document reporting on an independent study which is supervised by the thesis advisor and is a part of the degree requirements for the study plan B. This study plan is focused on the coursework without the master thesis, however, the study must complete the master project.

**“Audited course”** means a course that specified in the curriculum for further study. The student must study and pass the course with a grade of S, however, the grade is not counted for the graduation.

## Section 1

### Educational System

- |         |  |
|---------|--|
| Item 7  | <p>Educational system</p> <p>The educational system of the master degree program of the TGGs is an international program using English language as a medium of instruction.</p>  |
| Item 8  | <p>Educational management</p> <p>The program is a two-semester system. The academic calendar consists of two regular semesters. Each regular semester is not less than 16 weeks, but not more than 18 weeks.</p>   |
| Item 9  | <p>Duration of Study</p> <p style="margin-left: 40px;">(1) The duration of study has a maximum of 10 semesters.</p> <p style="margin-left: 40px;">(2) The duration of study is counted from the semester in which a student once registers in the program.</p> <p>In the case that the student cannot complete their studies within the period specified in Paragraph 1 due to the master thesis/the master project awaiting publication or waiting for an acceptance letter for publication, the health problems or with an impossible event such as flooding in the disaster areas or other causes which are not the student's fault. The student must submit a request for an extension of study time along with the proof of evidence such as proof of submission for publication, medical certificate or written summary report of the flood or disasters, etc. in advance prior the end of study period to TGGs. The request will be considered by TGGs Committee and forward to Commission of Higher Education for the final approval and reported to University Council.</p> |
| Item 10 | <p>Program Structure</p> <p>The program structure shall be a total number of credits throughout the curriculum of not less than 46 credits which is classified into 2 Study Plans as follows:</p> <p style="margin-left: 40px;">(1) Study Plan A focuses on research with master thesis.</p> <p style="margin-left: 80px;">a. Type A1 consists of master thesis with a minimum of 46 credits. Additional courses or academic activities may be scheduled without credits; however, they must have the achievements as specified in the course.</p> <p style="margin-left: 80px;">b. Type A2 consists of master thesis with a minimum of 12 credits, industrial internship of 4 credits and the coursework for additional 30 credits.</p>   |

(2) Study Plan B focuses on coursework without master thesis. This study plan has a minimum of 6 credits for master project, industrial internship of 4 credits and the coursework for additional 36 credits.

## **Section 2**

### **Student Admission**

#### **Item 11**

#### **Qualification of an applicant**

##### **(1) Curriculum with Study Plan A Type A1**

a. An applicant must hold a Bachelor's degree or an equivalent qualification by which the educational background in the field of the Master course is proven.

In the case that the field of study graduated is not according to the program, it must be approved by the Curriculum Management Committee on a case by case basis.

b. The degree must be awarded with a minimum GPA of 3.00 from 4.00 scale or an equivalent GPA.

An individual lacking a minimum GPA of 3.00 but more than 2.50 must have the industrial internship, the work experience or the research in related field and may apply under the consent of the Curriculum Management Committee.

c. An applicant must have English language proficiency according to the rules of the TGGS.

d. An applicant must have other qualifications as stated in the curriculum or announced by the TGGS.

##### **(2) Curriculum with Study Plan A Type A2**

a. An applicant must hold a Bachelor's degree or an equivalent qualification by which the educational background in the field of the Master course is proven.

In the case that the field of study graduated is not according to the program, it must be approved by the Curriculum Management Committee on a case by case basis.

b. The degree must be awarded with a minimum GPA of 2.75 from 4.00 scale or an equivalent GPA.

An individual lacking a minimum GPA of 2.75 but more than 2.50 must have the work experience in related field and may apply under the consent of the Curriculum Management Committee.

c. An applicant must have English language proficiency according to the rules of the TGGS.

d. An applicant must have other qualifications as stated in the curriculum or announced by the TGGS.

##### **(3) Curriculum with Study Plan B**

a. An applicant must hold a Bachelor's degree or an equivalent qualification by which the educational background in the field of the Master course is proven.

In the case that the field of study graduated is not according to the program, it must be approved by the Curriculum Management Committee on a case by case basis.



b. The degree must be awarded with a minimum GPA of 2.50 from 4.00 scale or an equivalent GPA and must have the work experience or is working on the job that can increase the competence by integrating the education into the curriculum. An individual may apply under the consent of the Curriculum Management Committee.

c. An applicant must have English language proficiency according to the rules of the TGGS.

d. An applicant must have other qualifications as stated in the curriculum or announced by the TGGS.

**Item 12**                      **Criteria for admission**

(1) An applicant must pass entrance examinations as announced by the TGGS, or

(2) In exceptional circumstances, an applicant is selected with the consent of the Curriculum Management Committee and the TGGS Committee.

**Item 13**                      **Enrollment**

(1) An applicant who accepted to study must enroll for credits in order to hold a student status.

(2) An applicant who accepted to study must enroll according the procedure announced by the TGGS.

(3) An applicant who accepted to study is not permitted to enroll in more than one program at the same time.

**Section 3**  
**Program Management**

**Item 14**                      **Study plan**

Study plan means the coursework, the industrial internship and the master thesis or the master project that a student must study or complete in each semester as assigned by the program.

**Item 15**                      **Registration**

(1) Registration must follow the university academic calendar. A student who has not completed the registration process within 15 days after the beginning of the semester will no longer be considered as a student.

(2) A student is allowed to register for a minimum of 3 credits and a maximum of 15 credits in each regular semester, except a student has less than 3 credits to complete the study program or only has the thesis work to be completed.

Any registration with less than the allowed minimum credits or the allowed maximum credits as stated in (2) must receive the consent from the Curriculum Chairman and approval from the Dean.

(3) A student can register to maintain the student status in the summer semester if only has the thesis work to be completed for the last semester in order to fulfill the graduation requirement.

(4) **Registration for Audit Course**

a. Registration for Audit Course means that the audit course is a special and/or additional course which will not be counted toward the graduation requirement for the study program.

b. The course evaluation results will be recorded as "AUD" on the transcript if the student's attendance is more than 80% of the entire lecture time.

(5) Maintaining student status

a. A student who has completed his/her course requirements and is working on other degree requirements that do not require enrollment in courses must nevertheless maintain his/her active student status for continued advising services until graduation, or terminated from their academic program.

b. To retain a student status, a student must complete the registration process and pay the maintain student status fee and other fees within 15 days after the semester begins. Failure to comply with this regulation will result in termination of student status.

Item 16

Add or Withdraw Courses

(1) Add courses can be accomplished within 3 weeks after the semester begins or within the first week of the summer semester.

(2) Withdraw courses can be accomplished within 12 weeks after the semester begins or within the first two weeks of the summer semester.

(3) Add and withdraw courses stated in (1) and (2) must not violate the registration regulations and procedures stated in Item 15 (2) and (3).

(4) Any add and withdraw courses not according to (1), (2) and (3) must receive the consent from the Curriculum Chairman and approval from the Dean.

Item 17

Leave of absence

A leave of absence is a temporary interruption of one's studies for a period of one or more semesters. A student wishing to make a leave of absence needs to maintain the student status and must be qualified according to the following criteria:

(1) A student may personally request for absence from the advisor and the Curriculum Chairman and receive the approval from the Dean within the period specified in the university announcement. It can be requested under the following conditions:

a. A leave of absence for military service for the duration of military service obligation.

b. A leave of absence due to study or conduct the research abroad with exchange scholarship or other scholarship which can be beneficial to the program and with the support from the university.

c. Illness with absence for more than 20 percent of class attendance; a medical certificate is required.

d. Other personal reasons can be considered if a student has studied for at least one semester and have a minimum GPA of 2.75.

(2) Leave in item (1)a. is granted according to the conditions and the requirements of the military. Leave in item (1)b. is granted according to the conditions and the requirements of the scholarship funding agencies. Leaves in items (1)c. and (1)d. are granted for no longer than two consecutive semesters. If necessary, only one more semester of leave is granted.

(3) When the leave of absence is granted, the duration of absence is counted as part of the study duration except absence in item (1)a.

(4) During the period of approved leave of absence, a student must retain student status by paying the fees according to the university's regulations within 15 days after the semester begins. The student must retain status when the leave is granted. Failure to comply with this regulation will result in termination of student status, except the absence in Item (1)a.

(5) A student who received the approved leave of absence can resume studies by submitting the request to the Curriculum Chairman and with approval by the Dean at least one week prior the registration period begins.

(6) Special circumstances other than (1)-(5) shall be subjected to the consideration of the President.

Item 18 Termination of student status

A student status is terminated according to the following reasons:

(1) Death

(2) Approved resignation from the program

(3) Disqualifications for admission mentioned in Item 11

(4) As approved by the Dean, a student status can be terminated under any of the following reasons:

a. A student does not complete the program within the maximum period mentioned in Item 9.

b. A student does not register or does not pay the tuition fees within the deadlines.

c. A student does not follow the conditions specified for leave of absence.

d. A student does not follow the rules and guidelines mentioned in Section 8 Measurement and Evaluation, Section 9 Measurement and Evaluation of Master Thesis and Section 10 Measurement and Evaluation of Master Project.

(5) Breach of discipline mentioned in Item 47.

Item 19 Reinstatement of student status

(1) A student who is terminated from reasons stated in Item 18(4)b can resume a student status within 15 days after being terminated.

(2) Reinstatement of student status must be approved by the Dean with the consent of the Curriculum Chairman.

(3) A student must pay the reinstatement fee, the maintenance fee and the tuition fees according to the university's regulations in order to resume studies.

(4) Once reinstatement of student status is approved, a student officially regains status and resumes studies. However, the duration of study must be according to Item 9.

Item 20 Resignation

A student requesting a resignation from the program must submit the request to the Dean through the Program Coordinator or the main advisor and the Curriculum Chairman. The resignation becomes effective with the Dean's approval.

Item 21 Change of study plan, study program or minor

(1) A student may request to change the study plan, the study program or the minor within the period for add, change section and withdraw of course stated in the university academic calendar with the consent of Curriculum Chairman and the approval from the Dean.

(2) A student must pay the fee to change the study plan, the study program or the minor.

## **Section 4**

### **Faculty Members**

**Item 22**                      Faculty members in the master degree program

(1) A program lecturer must hold a minimum of doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The program lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.

(2) At least 3 program lecturers appointed to be responsible curriculum lecturers and they must hold a minimum of doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The responsible curriculum lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.

In the case that the program does not have at least 3 responsible curriculum lecturers or the program has less than 10 students, the program can request for a special consideration and approval for the current number of responsible curriculum lecturers and their the qualifications to the university council and the Commission of Ministry of Higher Education, Science, Research and Innovation.

(3)        Master thesis and master project advisors are classified into 2 categories as follows:

a.    A master thesis main advisor and a master project main advisor must be a program lecturer who holds a doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The thesis main advisor must have at least 3 papers in the past 5 years and with that at least one research paper.

b.    A master thesis co-advisor (if any) and a master project co-advisor (if any) must have the qualifications as follows:

A master thesis co-advisor or a master project co-advisor must be a permanent lecturer with the same qualifications as the master thesis main advisor or the master project main advisor.

For an external expert as the master thesis co-advisor or the master project co-advisor, he/she must hold a doctoral degree or equivalent and must have papers (publications) published in journals which are in the nationally or internationally recognized database. The external expert must have at least 10 papers related to the master thesis/the master project topic.

In the case that an external expert does not have number of papers according to the requirement, he/she must specialize in the field of research and have experience in conducting research with recognition. The program can request for a special consideration and approval to the university council and then inform the Commission of Ministry of Higher Education, Science, Research and Innovation.

(4) A master thesis examination committee and a master project examination committee

a.    A master thesis examination committee consists of a program lecturer, an external expert, and a master thesis advisor for at least 3 members. However, the chairman cannot be a master thesis advisor or co-advisor.

b. A master project examination committee consists of a program lecturer or an external expert and a master project advisor for at least 3 members. However, the chairman cannot be a master project advisor or co-advisor.

The master thesis examination committee member and the master project examination committee member must have the following qualifications:

a. A program lecturer as the examination committee member must hold a doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The program lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.

b. For an external expert as the examination committee member, he/she must hold a doctoral degree or equivalent and must have papers (publications) published in journals which are in the nationally or internationally recognized database. An external expert must have at least 10 papers related to the master thesis/master project topic.

In the case that an external expert does not have number of papers according to the requirement, he/she must specialize in the field of research and have experience in conducting research with recognition. The program can request for a special consideration and approval to the university council and then inform the Commission of Ministry of Higher Education, Science, Research and Innovation.

c. In the case that an internal expert must be a permanent lecturer in the university, but not the program lecturer of TGGS, and must have qualifications stated in Item 22.

(5) A course instructor must be a permanent lecturer or external lecturer who holds a doctoral degree or equivalent in the study program or related study program or in the study program which the course being taught. The course instructor must have experience in teaching and papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The course instructor must have at least 1 paper in the past 5 years.

However, the external lecturer can give the lecture no more than 50% of the course content together with the permanent program lecturer responsible for that course.

#### Item 23

#### Workload of Master Thesis Advisor and Master Project Advisor

(1) One program lecturer can advise and supervise the thesis of master and doctoral students according to the following regulations:

A program lecturer with a doctoral degree or equivalent and have publications according to the regulation allows to be a thesis advisor up to 5 master and doctoral students each semester.

A program lecturer with a doctoral degree or equivalent and the academic title of assistant professor or higher and have publications according to the regulation allows to be a thesis advisor up to 10 master and doctoral students each semester.

In the case that a program lecturer with a doctoral degree or equivalent and the academic title of professor is needed to supervise more than 10 master and doctoral students, the program lecturer can request for a special consideration and approval to the university council to be a thesis advisor up to 15 master and doctoral students each semester. For more than 15 master and doctoral students each semester, the program lecturer must request for a special consideration and approval to the university council and the consent from the Commission of Ministry of Higher Education, Science, Research and Innovation.

(2) One program lecturer can advise the master projects up to 15 master students.

In the case that the program lecturer is also advised both master thesis and master project, one of master thesis is equivalent to 3 master projects, however, no more than 15 master students each semester.

(3) A responsible curriculum lecturer must be a master thesis/project advisor and/or a master thesis/project examination committee member and/or a course instructor in the study program as well.

- Item 24 Appointment of a master thesis/project advisor and a master thesis/project examination committee member will be appointed by the Dean with the consent of the TGGs committee.

## **Section 5**

### **Examination Process and Procedure for the Master Degree**

- Item 25 Scope and Format of Examination for the Master Degree

(1) Examination process includes the followings:

- a. Study Plan A Type A1
  - 1. Master Thesis as stated in Section 6
- b. Study Plan A Type A2
  - 1. Examination by course subjects
  - 2. Industrial internship for 18 weeks or more
  - 3. Master Thesis as stated in Section 6
- c. Study Plan B
  - 1. Examination in the course subjects
  - 2. Industrial internship for 18 weeks or more
  - 3. Comprehensive examination
  - 4. Master Project as stated in Section 7

The examination must be taken on the examination date specified in the respective semester according to the university academic calendar.

(2) The examinations in program specific subjects consist of either a written test or an oral examination in the subjects or courses indicated in each specific master program (curriculum).

(3) The topics of the examinations are determined by the contents of the courses assigned to the subjects.

(4) Two formats of the examination are a written examination as stated in Item 28 and an oral examination as stated in Item 29 which informed in each subject at the beginning of the registration period (Item 15) and announced during the lectures by the course instructor.

- Item 26 Admission to the examination process for the Master Degree

Only persons can be admitted to master examinations who are enrolled in the respective TGGs Master Program.

- Item 27 Admission to the examination procedure for the Master Degree
- (1) Chairman of examination committee can approve the admission to the Master examinations.
- (2) Admission will be refused if:
- the qualifications listed in Item 26 are not fulfilled, or
  - the required documents are not completed.
- Item 28 Written Examinations
- (1) In the test papers, the examinee has to prove that he/she is able to understand a problem posed and find a way to solve it, using the common methods of the subject, within a time limit and with limited auxiliary material.
- (2) The examinee must be given the opportunity to inspect the marked test paper within, at the most, four weeks after the test results are published.
- (3) The time limit for completing written test papers according to the nature of that course either the lecture or laboratory.
- Item 29 Oral Examinations
- (1) In the oral examinations, the examinee has to prove that he/she sees the larger context of the tested subject and that he/she is able to deal with specific problems within this larger technical context. Additionally, the oral examinations are intended to find out whether the examinee has a broad basic knowledge.
- (2) Oral examinations are held in the presence of at least one examiner and one competent assistant in the form of an examination of a group or an individual.
- In group examinations, a maximum of four examinees can be questioned at the same time.
  - In an individual examination, an examinee is questioned by the examiner with one question at the time.
- (3) Prior approving the exam results, the examiner must consider the evaluation from other examiners or the assistant.
- (4) The essential topics, questions, and results of the examination in the individual subjects must be written down/recorded in examination notes.
- (5) The examination notes consist of questions, answers, and other essential topics during the examination.
- (6) The duration of an oral examination is generally 20-30 minutes per examinee.
- Item 30 Comprehensive Examination
- The comprehensive examination is the exam to measure the ability and potential of examinee in applying the principles and knowledge learned in courses. This examination is only for students in the Master's Degree Program Study Plan B.
- (1) Appointment of Comprehensive Examination Committee
- Curriculum Management Committee will appoint a comprehensive examination committee with at least of 3 program lectures with the nomination by the curriculum chairman and one program lecturer is acted as the chairman.
- The comprehensive examination committee is responsible in organizing the examination and report the result to the Curriculum Management Committee via the curriculum chairman within two weeks after the examination date.

## (2) Comprehensive Examination Procedure

a. Comprehensive examination includes a written examination and/or an oral examination and is organized for all categories of courses at one time.

b. After the student submits the application of comprehensive examination, the program is responsible to organize the comprehensive examination prior the defense of master project with the discretion of the Curriculum Chairman.

The student must submit the application through the master project advisor and the curriculum chairman to the Curriculum Management Committee.

c. The student is eligible to take the comprehensive examination once completed at least 27 credits in the following categories of courses: the core course, the specific core course, and the specific elective course at the beginning of registered semester.

## Section 6

### Master Thesis Preparation and Examination

Item 31

The process of master thesis preparation and examination are as follows:

(1) Appointment of Master Thesis Advisory Committee

(2) Master Thesis Evaluation in Study Plan A Type A1

a. Master Thesis Proposal Examination

b. Master Thesis Progress Examination

c. Appointment of Master Thesis Defense Examination

Committee

d. Master Thesis Defense Examination

(3) Master Thesis Evaluation in Study Plan A Type A2

a. Master Thesis Proposal Examination

b. Appointment of Master Thesis Defense Examination

Committee

c. Master Thesis Defense Examination

Item 32

Appointment and Change of Master Thesis Main Advisor

A student must have at least one main advisor at the beginning of enrollment. The co-advisor is optional.

The student can submit a request form to change a master thesis main advisor with the consent of both the current and proposed advisor. The student has to ensure that the new advisor will undertake their work before getting approval. The student requesting the change of a master thesis main advisor must submit the request to the Dean through the Curriculum Chairman and must be approved by the TGGS committee.

Item 33

Master Thesis Examination

(1) Master Thesis Proposal Examination:

a. A student could submit the request form for the Master Thesis Proposal Examination to the TGGS through the main advisor and the Curriculum Chairman. The submission process conforms to the announcement of TGGS.

In the case of students in Study Plan A Type A1 can take the thesis proposal examination in the first semester and must successfully register for the thesis in that semester.

b. A student who wishes to change the topic after the initial one has been approved must submit a request for Thesis Proposal Examination and the thesis starting time would be counted from the new date of approval for the



thesis title as well as the time to submit the request form for the Master Thesis Progress Examination for the student in Study Plan A Type A 1 or the Master Thesis Defense Examination for the student in Study Plan A Type A2.

In case of a student in Study Plan A Type A1, the thesis title must be approved within 2 semesters starting from the first semester of study. Failure to comply with this regulation will result in termination of student status. Exception with proper cause can be considered for extension of one more semester by TGGs Committee.

#### c. Appointment of Master Thesis Proposal Examination Committee

The main thesis advisor will nominate the committee members to the Dean for further official appointment. The Master Thesis Proposal Examination Committee comprises of a main advisor who has the qualification as stated in Item 22 (3) a. Up to 2 names with the qualification as stated in Item 22 may be nominated as committee member(s).

#### d. Master Thesis Proposal Examination Procedure

1. A student must submit the request form for Master Thesis Proposal Examination to TGGs through the main advisor and Curriculum Chairman.

2. After the examination, the advisor will report the result to the TGGs through the Curriculum Chairman and announce the result within one week from the examination date.

The student who fails the first proposal examination must submit a request form for retaking of the Master Thesis Proposal Examination within the duration specified by the Master Thesis Proposal Examination Committee.

The process and procedure of the Master Thesis Proposal Examination will comply with TGGs rules and announcements.

#### (2) Master Thesis Progress Examination

The purpose of this examination is to evaluate students' thesis progress including their understanding of the content for students in both Study Plan A Type A1 and A2. It assesses the organizational and conceptual skills of the students necessary for their defense.

A student could submit a request for the Master Thesis Progress Examination after the approval date of the thesis title (Master Thesis Proposal Examination) at least 1 time per semester, except for the semester with Master Thesis Proposal Examination.

#### a. Submission of Request Form for Master Thesis Progress Examination.

Prior to the progress examination, a student must submit the request form for Master Thesis Progress Examination to the TGGs through the main advisor

#### b. Appointment of Master Thesis Progress Examination Committee

The main thesis advisor will nominate the committee members to the Dean for further official appointment. The Master Thesis Progress Examination Committee comprises of the following members:

1. Chairman who has the qualification as stated in Item 22 (4), who should not be the main advisor or a co-advisor.

2. Main advisor as a member

One more name with the qualification as stated in Item 22, who should not be the co-advisor, may be nominated as a committee member.

### c. Master Thesis Progress Examination Procedure

1. A student must submit the request form for the Master Thesis Progress Examination to TGGS through the main advisor.

2. After the examination, the advisor will report the result to the TGGS through the Curriculum Chairman and announce the result within one week from the examination date.

The student who fails the first progress examination must submit a request form for retaking of the Master Thesis Progress Examination within the duration specified by the Master Thesis Progress Examination Committee.

A student who fails the second progress examination will receive the grade "U" as the evaluation result for all registered credits of master thesis. The student must register the master thesis with a new topic and start the entire master thesis process. The duration of the study must be in accordance with the student's status conditions.

The process and procedure of the Master Thesis Progress Examination will comply with TGGS rules and announcements.

### (3) Master Thesis Defense Examination:

The thesis defense examination is an opportunity for students to demonstrate the knowledge of their research area and overall process undertaken. The committee will evaluate the student's performance and overall understanding of their academic knowledge to graduate.

#### a. Submission of Request Form for Master Thesis Defense Examination

Prior to the defense examination, a student must submit the request form for Master Thesis Defense Examination to the TGGS through the main advisor and the Curriculum Chairman with the following conditions:

##### 1. Study Plan A Type A1

A student must receive the result and pass the latest Master Thesis Progress Examination.

##### 2. Study Plan A Type A2

2.1 The master thesis title must be approved. In the case of taking the Master Thesis Progress Examinations, a student must receive the result and pass the latest Master Thesis Progress Examination.

2.2 A student must complete all courses as specified in the program, except the industrial internship.

2.3 Pass on other qualifications as specified by TGGS Committee.

#### b. Appointment of Master Thesis Defense Examination Committee

The main thesis advisor will nominate the committee members to the Dean for further official appointment. The Master Thesis Defense Examination Committee comprises of at least 3 members but no more than 5 members as follows:

1. Chairman who should not be the main advisor or a co-advisor.

2. Expert(s) as member(s) with a maximum of two members who has the qualification as stated in the item 22 (4). At least one member is the external expert.

3. Main advisor and co-advisor (if any) as a member.

Additional names with the qualification as stated in Item 22 may be nominated as committee member(s). However, the committee shall not be more than 5 members.

c. Master Thesis Defense Examination Procedure

1. A student must submit the request form for the Master Thesis Defense Examination to TGGs through the main advisor and the curriculum chairman.

2. After the examination, the advisor will report the result to the TGGs through the Curriculum Chairman and announce the result within one week from the examination date.

The student who fails the first defense examination must submit a request form for retaking of the Master Thesis Defense Examination within the duration specified by the Master Thesis Defense Examination Committee. Failure to submit within the specified time, the student will receive the grade "U" as the evaluation result. The student must register the master thesis with a new topic and start the entire master thesis process. This is considered as the second time and the duration of the study must be in accordance with the student's status conditions.

The process and procedure of the Master Thesis Defense Examination will comply with TGGs rules and announcements.

Item34

Master Thesis Format

1. The master thesis must be written in English.
2. The manuscript format will be according to the TGGs Announcement.

## Section 7

### Master Project Preparation and Examination

Item 35

The process of master project preparation and examination are as follows:

- (1) Appointment of Master Project Advisory Committee
- (2) Master Project Evaluation in Study Plan B
  - a. Master Project Proposal Examination
  - b. Appointment of Master Project Defense Examination Committee
  - c. Master Project Defense Examination

Item 36

TGGs will appoint one master project advisor with the qualification as stated in Item 22 (3) to provide the guidance and monitor the master project.

Item 37

The main thesis advisor will nominate the committee members to the Dean for further official appointment. The Master Project Defense Examination Committee comprises of the program lecturer, the expert, and the master project main advisor with at least 3 members in total and the committee members must have the qualification as stated in Item 22 (4). However, the chairman should not be the main advisor or a co-advisor.

Item 38

Master Project Proposal Examination Procedure

A student who is eligible to take the Master Project Proposal Examination must register for the master project in that semester and comply with the followings:

- (1) Complete at least 18 credits of coursework
- (2) The Master Project Proposal Examination must be completed within 30 days after the master project title is approved and the advisor is

appointed. Failure to comply within the specified time, the student must propose a new topic and a new advisor.

(3) The advisor will report the progress of master project to the Curriculum Chairman every semester until the student has completed the master project.

Item 39 Master Project Format

1. The master project manuscript must be written in English.
2. The manuscript format will be according to the TGGS Announcement.

Item 40 Master Project Defense Examination Procedure

(1) A student is eligible to take the Master Project Defense Examination after the title has been approved at least 30 days.

(2) A student must submit the request form for the Master Project Defense Examination and one copy of abstract according to the TGGS announcement with the consent of the main advisor and the curriculum chairman.

(3) The Master Project Defense Examination is in a form of an oral examination in public and allow students and people who are interested to attend on the scheduled date, time and venue as announced by TGGS. Attendees cannot question the examinee except with the permission from the Master Project Defense Examination Committee.

(4) All Master Project Defense Examination Committee members must presence during the examination.

Item 41 A student must submit a copy of the master project manuscript to the agency that has an obligation.

Item 42 After the examination, the program will report the result to the TGGS within one week from the master project submission date. The manuscript of master project will be approved and fulfil the graduation requirement.

## Section 8

### Measurement and Evaluation

Item 43 Grading system used for educational evaluation based on defined accomplishment at the end of each semester is presented as follows

Letter Grade	Grade Score	Performance's Quality
A	4.0	Excellent
B+	3.5	Very Good
B	3.0	Good
C+	2.5	Above Average
C	2.0	Average
D+	1.5	Below Average
D	1.0	Poor

Letter Grade	Grade Score	Performance's Quality
F	0	Fail
Fa	0	Fail, Insufficient Attendance
Fe	0	Fail, Absent from Examination
S		Pass/Satisfactory
U		Fail/Unsatisfactory
I		Incomplete
Ip		In-progress
W		Withdrawal
AUD		Audit

**Item 44 Cumulative Credits and Grade Point Average (GPA) Calculations**

(1) Cumulative credits and GPA must be calculated at the end of each semester.

(2) Cumulative credits are registered coursework credits which earns the score according to Item 43.

(3) Two categories of GPA: Semester GPA and Cumulative GPA in which can be calculated as follows:

a. Semester GPA is calculated from the academic performance of the student in the respective semester by summing the product of credits and grade score for each course, then dividing by total of credits in the respective semester.

b. Cumulative GPA is calculated from the academic performance of the student in the first semester to the latest one by summing the product of credits and grade score for each course, then dividing by total of credits.

**Item 45 Transfer of Credits**

(1) Credits of the graduate course can be transferred with the consent of the Curriculum Management Committee and the Dean only for the course with the grade of at least 3.0. The eligible course to be transferred must be taken when he/she was the student at the university or another university.

(2) The eligible course to be transferred(1) must be no more than 5 academic years from the year that the course registered.

(3) Total of credits to be transferred cannot exceed 40% of the study program that the student enrolled at TGGs. And in the event that the number of credits is divided into no match, round off the decimal point unless in any of the following cases, the following shall be done without an unlimited number of credits.

(4) The transferred course and its credits will be recorded with the course name, number of credits and the grade on the transcript without calculating toward the GPA. The name of university, besides KMUTNB, will be recorded on the transcript as well.

**Item 46 Student Status and Repetition**

(1) A student who has the Cumulative GPA less than 2.50 will be automatically retired from the study program.

(2) A student who has the Cumulative GPA of at least 2.50 but still lower than 3.00 will be on the "probation" status.

(3) A student who has completed the coursework according to the study program and received the Cumulative GPA of at least 2.90 but still lower than 3.00 can register for additional course(s) that have not been previously taken with the consent of an advisor and the Curriculum Chairman to achieve the Cumulative GPA of at least 3.00 within the next semester. Otherwise, the student will be automatically retired from the study program.

(4) A student is not allowed to register for the course(s) that have been previously taken, except for the repetition according to Item 46(3).

(5) A student who fails the Master Thesis Defense Examination twice will be automatically retired from the study program.

(6) A student who fails to take the Master Thesis Proposal Examination or Master Project Proposal Examination within the specified time will be automatically retired from the study program.

(7) A student in Study Plan B who fails to take the comprehensive examination within the specified time will be automatically retired from the study program.

Item 47

Penalty for academic dishonesty (cheating) on course examinations and plagiarism on other theses or publications, or have someone write the master thesis/master project or publication.

(1) In the case that the incidents have been found or have reasonable doubts to believe that the student has been cheating on the course examination, the dean will form the investigation committee and the outcomes of this investigation will be report to TGGs Committee for consideration. If the student is found guilty, the student will get one of following penalties:

- a. Fail that examination that the student has cheated.
- b. Fail that course that the student has cheated and the student will be ordered to take a leave of absence in the next regular semester for at least one semester.
- c. Fail that course that the student has cheated including not to consider all courses in that respective semester and the student will be ordered to take the leave of absence in the next regular semester for at least one semester.
- d. Terminate the student status

(2) In the case that the incidents have been found or have reasonable doubts to believe that the student has been plagiarized on other thesis or publications or have someone write the master thesis/master project or publication, the dean will form the investigation committee and the outcomes of this investigation will be report to TGGs committee for consideration. If the student is found guilty, the TGGs Committee will proceed the followings:

- a. If the student is not completed with the study, the committee will consider not to approve or to withdraw the master thesis/master project and the student will get one of following penalties:
  1. The student will be ordered to take a leave of absence for a maximum of one academic year.
  2. The student status will be terminated.
- b. If the degree is already granted, the committee will report to the university council for degree revocation.

## Section 9

### Measurement and Evaluation of Master Thesis

- Item 48      Master Thesis Submission
- A student is required to submit one copy of the manuscript with signatures of all committee members including the manuscript and abstract in an electronic version to the TGGs within the period specified by the KMUTNB Academic Calendar for the Dean approval.
- Failure to comply as stated in Paragraph 1, the student will not be able to graduate. The student must register in order to maintain his/her student status until submit the manuscript, or until his/her student status is terminated.
- Item 49      Measurement of Master thesis is considered from progress and success of research work assign in each semester together with outcomes of the progress and defense examinations.
- Item 50      Grading system used for educational evaluation based on defined accomplishment is presented as follows:

Assessment	Performance's Quality
S	Pass proficiency exam / Satisfactory
U	Fail with inadequate achievement / Unsatisfactory
Ip	Incomplete thesis work / In-progress

- Item 51      Evaluation of Master Thesis Progress Examination
- (1) "Pass" refers that the student has outstanding knowledge to conduct the research in their academic area together with the ability to analyze and apply their knowledge in a wider context. The student is allowed to continue the thesis work and the student is expected to answer questions in the manner indicates his/her comprehensive knowledge in the field of research.
- (2) "Fail" refers that the student does not have sufficient knowledge and competence in research work. His/her abilities do not meet minimum requirements. Therefore, the student is not allowed to submit a request for the examinations. It means that the student does not have sufficient understanding of the research he/she has studied so the student has to prepare more to retake the exam and make an effective presentation.
- Item 52      Evaluation of Master Thesis Defense Examination
- (1) "Pass" refers that the student presents the thesis work and answers questions in the manner indicates his/her comprehensive knowledge in the field of research with satisfactory without any amendments or essential content.
- A student is required to submit one copy of the manuscript with signatures of all committee members immediately but no more than 30 days after the examination date.
- (2) "Pass with revision" refers that the student presents the thesis work and answers questions in the manner indicates his/her comprehensive knowledge in the field of research with satisfactory. The examination committee requests the student to include amendments or essential content and/or rewrite the manuscript according to the committee's comments and suggestions as stated in the evaluation form.
- A student is required to revise according to the committee's comments and suggestions and submit one copy of the manuscript with signatures of all

committee members immediately but no more than 60 days after the examination date.

(3) "Fail" refers that the student cannot present the thesis work and answer questions because he/she does not have sufficient knowledge and competence in research work.

A student who fails the first defense examination must submit a request form for retaking of the defense examination within the duration specified by the examination committee. Failure to comply within the specified time, the student will receive the grade "U" as the evaluation result for all registered credits of master thesis. The student must register the master thesis with a new topic and start the entire master thesis process. The duration of the study must be in accordance with the student's status conditions.

- Item 53 The result of defense examination will be recorded on the student's transcript when he/she graduates with the assessment of the letter grade (A to F) according to Item 43.
- Item 54 The master thesis approved by the Dean is considered to be official and complete master thesis.

## Section 10

### Measurement and Evaluation of Master Project

- Item 55 A student is required to submit the master project manuscript with complete content and format as specified by TGGS and with signatures of all committee members including the manuscript and abstract in an electronic version to the TGGS within the period specified by the KMUTNB Academic Calendar for the Dean approval.
- Failure to comply as stated in Paragraph 1, the student will not be able to graduate. The student must register in order to maintain his/her student status until submit the master project manuscript, or until his/her student status is terminated.
- Item 56 Measurement of Master thesis is considered from progress and success of research work assign together with outcomes of the defense examination.
- Item 57 Evaluation of Master Project Proposal Examination
- (1) "Pass" refers that the title is approved.
- (2) "Pass with revision" refers that the student must revise the master project and submit to TGGS through the advisor and the curriculum chairman within 30 days after the examination date. The title will be approved.
- (3) "Fail" refers that the student must retake the exam with a new title and a new advisor.
- Item 58 Evaluation of Master Project Defense Examination
- After the Master Project Defense Examination, the examination committee will discuss, comment, and make the decision according to the following criteria:
- (1) "Pass" refers that the student presents the project work and answers questions with satisfactory without any amendments or essential content.
- A student is required to submit one copy of the manuscript with signatures of all committee members immediately but no more than 15 days after the examination date.



(2) "Pass with revision" refers that the student presents the project work and answers questions with satisfactory. However, the examination committee requests the student to include amendments or essential content and/or rewrite the manuscript according to the committee's comments and suggestions as stated in the evaluation form.

A student is required to revise according to the committee's comments and suggestions and submit one copy of the manuscript with signatures of all committee members immediately but no more than 30 days after the examination date.

(3) "Fail" refers that the student cannot present the project work and answer questions because he/she does not have sufficient knowledge and competence in research work.

A student who fails the first defense examination must submit a request form for retaking of the defense examination within the duration specified by the examination committee. Failure to comply within the specified time, the student will receive the grade "U" as the evaluation result for all registered credits of master project. The student must register the master project with a new topic and start the entire master thesis process. The duration of the study must be in accordance with the student's status conditions.

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|---------|---|
| Item 59 | The result of defense examination will be recorded on the student's transcript when he/she graduates with the assessment of the letter grade (A to F) according to Item 43. |
| Item 60 | The master project approved by the Dean is considered to be official and complete master project.   |

## **Section 11**

### **Graduation and Degree Approval**

- |         |   |
|---------|---|
| Item 61 | <p>A student who is eligible to graduate must complete the following requirements.</p> <p style="padding-left: 40px;">(1) Study Plan A Type A1</p> <ul style="list-style-type: none"><li>a. Register the master thesis according to the study program and the submission of the master thesis within the duration of study, no more than 5 academic years, with a minimum GPA of 3.00</li><li>b. Pass the Master Thesis Defense Examination</li><li>c. Submit the complete master thesis including the manuscript and abstract in an electronic version and abstract to the TGGs within the period specified by the KMUTNB Academic Calendar and the Dean has approved.</li><li>d. Publish (or acceptance to be publish) the entire or part(s) of the master thesis in an international academic journal or other accepted academic publications in the database announced by the Commission of Ministry of Higher Education, Science, Research and Innovation or Civil Service Commission in Higher Education Institutions (OCSC); or in the international conference proceeding (paper) with full paper in the SCOPUS database. The publication must be written in English and according to the TGGs Regulation and Announcement. The student is required to submit at least one publication.</li><li>e. Pass English Proficiency Examination with score according to the TGGs Regulation and Announcement</li></ul> <p style="padding-left: 40px;">(2) Study Plan A Type A2</p> <ul style="list-style-type: none"><li>a. Complete the coursework and pass all examinations according to the study program and the submission of the master thesis within</li></ul> |
|---------|---|

the duration of study, no more than 5 academic years, with a minimum GPA of 3.00

b. Pass the Master Thesis Defense Examination

c. Submit the complete master thesis including the manuscript and abstract in an electronic version to the TGGs within the period specified by the KMUTNB Academic Calendar and the Dean has approved.

d. Publish (or acceptance to be publish) the entire or part(s) of the master thesis in the international conference proceeding (paper) with full paper or an international academic journal or other accepted academic publications. The publication must be written in English and according to the TGGs Regulation and Announcement. The student is required to submit at least one publication.

e. Pass English Proficiency Examination with score according to the TGGs Regulation and Announcement

(3) Study Plan B

a. Complete the coursework and pass all examinations according to the study program and the submission of the master thesis within the duration of study, no more than 5 academic years, with a minimum GPA of 3.00

b. Pass the Comprehensive Examination

c. Propose the Master Project Title and pass the Master Project Defense Examination

d. Submit the complete master project including the manuscript and abstract in an electronic version to the TGGs within the period specified by the KMUTNB Academic Calendar and the Dean has approved.

e. Publish the entire or part(s) of the master project in any form that can be searched.

f. Pass English Proficiency Examination with score according to the TGGs Regulation and Announcement

(4) Comply with other requirements as stated in the curriculum

(5) In case of taking additional courses or other academic activities without earning any credits, the achievement must be according to the set forth in the course.

Item 62

The degree will be approved by the university council. To be eligible for a degree, a student must fulfill the following qualifications:

(1) The student must meet requirements as stated in Item 61.

(2) The student must follow the TGGs regulations and procedure.

(3) The student must be cleared of any outstanding academic debts in relation to his/her studies to the university.

(4) The student must be free from any disciplinary actions imposed upon his/her out of disciplinary punishment, except in the case of petty offences according to the university disciplinary regulation.

(5) The student must have appropriate behavior.

## Section 12

### Quality Accreditation and Assessment of the Curriculum

- Item 63 All Master degree programs of TGGs are under the quality accreditation according to the Ministry of Education's Qualifications Framework for Higher Education. The assessment for revision must be conducted at least every 5 years.

### Temporary Provision

- Item 64 While regulations and procedures conferring to this regulation have not been announced, regulations and procedures conferring to "the Regulation of King Mongkut's University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGs) 2017" signed on 27 September 2017 can be applied. However, they must be announced within 90 days as of REM 2020 is announced.
- Item 65 TGGs students who are pursuing their degree and enrolled at the university prior semester 1/ 2017 and have not graduated, the students must follow "the Regulation of The Sirindhorn International Thai-German Graduate School of Engineering (TGGs) 2011" signed on 16 June 2011 and its regulations and procedures until graduated.
- TGGs students who are pursuing their degree and enrolled at the university starting semester 1/ 2017 to 2/2019 and have not graduated, the students must follow "the Regulation of King Mongkut's University of Technology North Bangkok Concerning Master Degree Education (REM) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGs) 2017" and its regulations and procedures until graduated.

Announced on 19 August 2020.

(Prof. Dr. Teravuti Boonyasopon)

Chairman of KMUTNB University Council

## **Regulations for Examination in the Joint-Degree Master of Engineering Program in Railway Vehicles and Infrastructure Engineering (REM-RVIE) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) and Chulalongkorn University (For Student ID 62 onward who enrolled in the academic year of 2019 onward)**

It is deemed necessary to announce the regulation of the master degree in Railway Vehicles and Infrastructure Engineering (International Program) of The Sirindhorn International Thai-German Graduate School of Engineering 2019 (B.E. 2562) for the joint academic collaboration between King Mongkut's University of Technology North Bangkok and Chulalongkorn University following the memorandum of understanding between The Sirindhorn International Thai-German Graduate School of Engineering (TGGS), King Mongkut's University of Technology North Bangkok and Faculty of Engineering, Chulalongkorn University signed on 6 March 2018 (B.E. 2561) and the academic collaboration with RWTH Aachen University following the memorandum of understanding between King Mongkut's University of Technology North Bangkok (KMUTNB) and RWTH Aachen University signed on 22 October 2004 (B.E. 2547), 20 September 2011 (B.E. 2554) and 7 October 2015 (B.E. 2558).

By virtue of Articles 22(2) and (13) of the King Mongkut's University of Technology North Bangkok Act 2007 (B.E. 2550) and the University Council on its 11/2019 meeting on 18 December 2019 thus established this regulation.

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|--------|--|
| Item 1 | This regulation is hereby entitled “the Regulation of King Mongkut’s University of Technology North Bangkok Concerning Joint-Master Degree in Railway Vehicles and Infrastructure Engineering International Program (REM-RVIE) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS) 2019”   |
| Item 2 | This regulation is applied to all new students enrolled in semester 2/2019 onwards.  |
| Item 3 | <p>In this regulation,</p> <p><b>“University”</b> means King Mongkut’s University of Technology North Bangkok.</p> <p><b>“University Council”</b> means the Council of King Mongkut’s University of Technology North Bangkok.</p> <p><b>“Academic Council”</b> means the Academic Council of King Mongkut’s University of Technology North Bangkok.</p> <p><b>“President”</b> means the President of King Mongkut’s University of Technology North Bangkok.</p> <p><b>“TGGS”</b> means The Sirindhorn International Thai-German Graduate School of Engineering.</p> <p><b>“Dean”</b> means the Dean of The Sirindhorn International Thai-German Graduate School of Engineering.</p> <p><b>“Curriculum”</b> means the Joint-Master Degree Curriculum in Railway Vehicles and Infrastructure Engineering (International Program) in which the teaching and learning are conducted at The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut’s University of Technology North Bangkok; Faculty of Engineering, Chulalongkorn University; and RWTH Aachen University.</p> |

**“Curriculum Chairman”** means the head of responsible curriculum lecturers for the curriculum teaching and learning in Railway Vehicles and Infrastructure Engineering (International Program).

**“Permanent Lecturer”** means a permanent and full-time lecturer at The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut’s University of Technology North Bangkok.

**“TGGS Committee”** means a committee appointed to manage The Sirindhorn International Thai-German Graduate School of Engineering.

**“Curriculum Management Committee”** means a committee consists of representatives of program lecturers from The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut’s University of Technology North Bangkok and Faculty of Engineering, Chulalongkorn University.

**“Program Coordinator”** means the head of field of study at The Sirindhorn International Thai-German Graduate School of Engineering appointed by Dean with the approval from TGGS Committee of The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut’s University of Technology North Bangkok; Faculty of Engineering, Chulalongkorn University; and RWTH Aachen University.

**“External Expert”** means an individual outside The Sirindhorn International Thai-German Graduate School of Engineering who has a high professional standing and has been approved as qualified to give a lecture or be an examiner according to The Sirindhorn International Thai-German Graduate School of Engineering’s rules/regulations.

**“Examination Committee”** means a committee appointed by Dean with the approval from the Dean of The Sirindhorn International Thai-German Graduate School of Engineering.

**“Student”** means a student in the master degree program at The Sirindhorn International Thai-German Graduate School of Engineering, King Mongkut’s University of Technology North Bangkok.

**“Master thesis”** means a written document reporting on a research project aiming to develop and construct the body of knowledge in a field of study, which is supervised by the thesis advisor. The student will use several methods for managing and solving engineering and scientific problems including techniques in that field of study. The student will submit the thesis to summarize the thesis work content, deliverables and confirmed outcomes as a part of the degree requirements.

Item 4      This regulation has been drafted in Thai and English versions. In case of any discrepancies in the interpretation, the version of the regulation in Thai language shall prevail.

Item 5      This regulation is overseen by the President of King Mongkut’s University of Technology North Bangkok and the President has the authority to issue related regulations or announcements.

In case of any diagnostics or discrepancies in the interpretation, the President has the sole authority in the interpretation and the decision.

Any procedures related to joint-master degree in Railway Vehicles and Infrastructure Engineering (International Program), but remain unstated, must be proposed to the University's Academic Council for further consideration and then the University Council for the final approval.

## **Section 1**

### **Educational System**

**Item 6**                      Educational system

The educational system of the master degree program of the TGGs is an international program using English language as a medium of instruction.

**Item 7**                      Educational management

The program is a two-semester system. The academic calendar consists of two regular semesters. Each regular semester is not less than 15 weeks, but not more than 18 weeks.

**Item 8**                      Duration of Study

(1) The duration of study has a maximum of 8 semesters.

(2) The duration of study is counted from the semester in which a student once registers in the program.

**Item 9**                      Program Structure

The program structure is the master degree curriculum with Study Plan A Type A2 that focuses on research in which a student must have the master thesis with a minimum of 12 credits for graduation, and the coursework for additional 49 credits.

## **Section 2**

### **Student Admission**

**Item 10**                    Qualification of an applicant

(1) An applicant must hold a Bachelor's degree or an equivalent qualification by which the educational background in the field of the Master course is proven.

In the case that the field of study graduated is not according to the program, it must be approved by the Curriculum Management Committee on a case by case basis.

(2) The degree must be awarded with a minimum GPA of 2.75 from 4.00 scale or an equivalent GPA.

An individual lacking a minimum GPA of 2.75 must have the work experience in related field and may apply under the consent of the Curriculum Management Committee.

(3) An applicant must have English language proficiency according to the consent of the Curriculum Management Committee.

(4) An applicant must have other qualifications as stated in the curriculum or announced by the TGGS.

Item 11      Criteria for admission

(1) An applicant must pass entrance examinations as announced by the TGGS, or

(2) In exceptional circumstances, an applicant is selected with the consent of the Curriculum Management Committee and the TGGS Committee.

Item 12      Enrollment

(1) An applicant who accepted to study must enroll for credits in order to hold a student status.

(2) An applicant who accepted to study must enroll according the procedure announced by the TGGS.

(3) An applicant who accepted to study is not permitted to enroll in more than one program at the same time.

### **Section 3**

#### **Program Management**

Item 13      Study plan

Study plan means the coursework, the industrial internship and the master thesis or the master project that a student must study or complete in each semester as assigned by the program.

Item 14      Registration

(1) Registration must follow the university academic calendar. A student who has not completed the registration process within 15 days after the beginning of the semester will no longer be considered as a student.

(2) A student is allowed to register for a minimum of 3 credits and a maximum of 15 credits in each regular semester, except a student has less than 3 credits to complete the study program or only has the thesis work to be completed.

(3) A student is allowed to register for the master thesis work with a maximum of 6 credits in the summer semester.

(4) Any registration with less than the allowed minimum credits or the allowed maximum credits as stated in (2) must receive the consent from the Curriculum Chairman and approval from the Dean.

(5) Registration for Maintain Student Status:

a. A student can register to maintain the student status in a regular semester if already pass the master thesis defense examination and submit the complete master thesis manuscript.

b. A student can register to maintain the student status in the summer semester if only has the thesis work to be completed for the last semester in order to fulfill the graduation requirement.

(6) Registration for Audit Course

a. Registration for Audit Course means that the audit course is a special and/or additional course which will not be counted toward the graduation requirement for the study program.

b. The course evaluation results will be recorded as "Pass" on the transcript if the student's attendance is more than 80% of the entire lecture time.

c. The course evaluation results from the courses that are not listed in the curriculum will be recorded as "Pass" on the transcript if the student passes the examination.

(7) Maintaining student status

a. A student who has completed his/her course requirements and is working on other degree requirements that do not require enrollment in courses must register with zero credit and pay the tuition fee, the registration fee and other fees according to the university announcement every semester until graduation.

b. To retain a student status, a student must complete the registration process and pay the maintain student status fee and other fees within 15 days after the semester begins. Failure to comply with this regulation will result in termination of student status.

Item 15

Add or Withdraw Courses

(1) Add courses can be accomplished within 3 weeks after the semester begins or within the first week of the summer semester.

(2) Withdraw courses can be accomplished within 12 weeks after the semester begins or within the first two weeks of the summer semester.

(3) Add and withdraw courses stated in (1) and (2) must not violate the registration regulations and procedures stated in Item 14 (2) to (5).

(4) Any add and withdraw courses not according to Item 15 (1), (2) and (3) must receive the consent from the Curriculum Chairman and approval from the Dean.



Item 16

Leave of absence

A leave of absence is a temporary interruption of one's studies for a period of one or more semesters. A student wishing to make a leave of absence needs to maintain the student status and must be qualified according to the following criteria:

(1) A student may personally request for absence from the advisor and the Curriculum Chairman and receive the approval from the Dean within the period specified for withdraw courses in the university announcement. It can be requested under the following conditions:

a. A leave of absence for military service for the duration of military service obligation will be granted according to the conditions and the requirements of the military.

b. A leave of absence due to study or conduct the research abroad with exchange scholarship or other scholarship which can be beneficial to the program and with the support from the university will be granted according to the conditions and the requirements of the scholarship funding agencies.

c. Illness with absence for more than 20 percent of class attendance; a medical certificate is required.

d. Other personal reasons can be considered if a student has studied for at least one semester.

(2) For the leave of absence due to the illness or personal reasons, a student must submit the request for leave of absence and each time will be granted for no longer than two consecutive semesters. If necessary, only one more semester of leave is granted with the submission of another request.

(3) When the leave of absence is granted, the duration of absence is counted as part of the study duration except absence in item (1)a.

(4) During the period of approved leave of absence, a student must retain student status by paying the fees according to the university's regulations within 15 days after the semester begins. The student must retain status when the leave is granted. Failure to comply with this regulation will result in termination of student status, except the absence in Item (1)a.

(5) A student who received the approved leave of absence can resume studies by submitting the request to the Curriculum Chairman and with approval by the Dean at least one week prior the registration period begins.

(6) Special circumstances other than (1)-(5) shall be subjected to the consideration of the President.

Item 17

Termination of student status

A student status is terminated according to the following reasons:

(1) Death

(2) Approved resignation from the program

(3) Disqualifications for admission mentioned in Item 10

(4) As approved by the Dean, a student status can be terminated under any of the following reasons:

a. A student does not complete the program within the maximum period mentioned in Item 8.

b. A student does not register or does not pay the tuition fees within the deadlines.

c. A student does not follow the conditions specified for leave of absence.

d. A student does not follow the rules and guidelines mentioned in Section 8 Measurement and Evaluation, Section 7.

(5) Breach of discipline mentioned in Item 38.

TGGS must announce the list of students who are terminated according to the reasons stated in (3) – (5) and inform those students.

**Item 18**                      Reinstatement of student status

(1) A student who is terminated from reasons stated in Item 17(4)b can resume a student status within 15 days after being terminated, however it must be done within that respective semester.

(2) Reinstatement of student status must be approved by the Dean with the consent of the Curriculum Chairman.

(3) A student must pay the reinstatement fee, the maintenance fee and the tuition fees according to the university's regulations in order to resume studies.

(4) Once reinstatement of student status is approved, a student officially regains status and resumes studies. However, the duration of study must be according to Item 8.

**Item 19**                      Resignation

A student requesting a resignation from the program must submit the request to the Dean through the Program Coordinator or the main advisor and the Curriculum Chairman. The resignation becomes effective with the Dean's approval.

**Item 20**                      Change of minor

(1) A student may request to change the minor within the period for add, change section and withdraw of course stated in the university academic calendar with the consent of Curriculum Chairman and the approval from the Dean.

(2) A student must pay the fee according to the university announcement to change the minor.

## Section 4

### Faculty Members in Master Degree Program

#### Item 21 Faculty members in the master degree program

(1) A program lecturer must hold a minimum of doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The program lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.

(2) At least 3 program lecturers appointed to be responsible curriculum lecturers and they must hold a minimum of doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The responsible curriculum lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.

Responsible Curriculum Lecturer is selected from the program lecturer and appointed by TGGS Committee. It is not permitted to be a responsible curriculum lecturer for more than one curriculum at the same, except it is the multidisciplinary or interdisciplinary curriculum that he/she can be a responsible curriculum lecturer for one more curriculum. Responsible curriculum lecturers for one curriculum can be the same at most two responsible curriculum lecturers. Same responsible curriculum lecturers are permitted for the master degree curriculum and the doctoral degree curriculum the same discipline.

In the case that the program does not have at least 3 responsible curriculum lecturers or the program has less than 10 students, TGGS can request for a special consideration and approval for the current number of responsible curriculum lecturers and their the qualifications to the university council and the Commission of Ministry of Higher Education, Science, Research and Innovation to consider on the case by case basis.

(3) Master thesis advisor is classified into 2 categories as follows:

a. A master thesis main advisor must be a program lecturer who holds a doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The thesis main advisor must have at least 3 papers in the past 5 years and with that at least one research paper.

b. A master thesis co-advisor (if any) must have the qualifications as follows:

A master thesis co-advisor must be a permanent lecturer with the same qualifications as the master thesis main advisor.

For an external expert as the master thesis co-advisor, he/she must hold a doctoral degree or equivalent and must have papers (publications) published in journals which are in the nationally recognized database. The external expert must have at least 10 papers related to the master thesis topic.

In the case that an external expert does not have number of papers according to the requirement, he/she must specialize in the field of research and have experience in conducting research with recognition. The program can request for a special consideration and approval to the university council and then inform the Commission of Ministry of Higher Education, Science, Research and Innovation.

(4) A master thesis examination committee consists of a program lecturer and an external expert for at least 3 members. However, the chairman cannot be a master thesis advisor or co-advisor. The master thesis examination committee member must have the following qualifications:

a. A program lecturer as the examination committee member must hold a doctoral degree or equivalent and must have papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The program lecturer must have at least 3 papers in the past 5 years and with that at least one research paper.

b. For an external expert as the examination committee member, he/she must hold a doctoral degree or equivalent and must have papers (publications) published in journals which are in the nationally recognized database. An external expert must have at least 10 papers related to the master thesis topic.

In the case that an external expert does not have number of papers according to the requirement, he/she must specialize in the field of research and have experience in conducting research with recognition. The program can request for a special consideration and approval to the university council and then inform the Commission of Ministry of Higher Education, Science, Research and Innovation.

(5) A course instructor must be a permanent lecturer or external lecturer who holds a doctoral degree or equivalent in the study program or related study program or in the study program which the course being taught. The course instructor must have experience in teaching and papers (publications) that are not part of the education to earn a degree. The papers must be published in the recognized database announced by the Commission of Higher Education for Appointment of Academic Title. The course instructor must have at least 1 paper in the past 5 years.

However, the external lecturer can give the lecture no more than 50% of the course content together with the permanent program lecturer responsible for that course.

## Item 22

### Workload of Faculty Members in Master Degree Program

(1) One program lecturer can advise and supervise the thesis of master and doctoral students according to the following regulations:

a. A program lecturer with a doctoral degree or equivalent and have publications according to the regulation allows to be a thesis advisor up to 5 master and doctoral students each semester.

b. A program lecturer with a doctoral degree or equivalent and the academic title of assistant professor or higher and have publications according to the regulation allows to be a thesis advisor up to 10 master and doctoral students each semester.

c. In the case that a program lecturer with a doctoral degree or equivalent and the academic title of professor is needed to supervise more than 10 master and doctoral students, the program lecturer can request for a special consideration and approval to the university council to be a thesis advisor up to 15 master and doctoral students each semester. For more than 15 master and doctoral students each semester, the program lecturer must request for a special consideration and approval to the university council and the consent from the Commission of Ministry of Higher Education, Science, Research and Innovation.

(2) A responsible curriculum lecturer has the following responsibilities:

a. obligate with curriculum management and development and teaching from planning, quality control, monitoring and evaluating the results, and curriculum development.

b. remain at the program during the duration of the study

c. must be a master thesis and/or a master thesis examination committee member and/or a course instructor in the study program as well.

The revision on responsible curriculum lecturers must receive the consent from the curriculum management committee and approval from the TGGS Committee and inform the university council.

(3) A master thesis main advisor has the following responsibilities:

a. Provide the consulting on the preparation of a thesis for the student and ensure that the student would present the thesis topic during the master thesis proposal examination within the specified time.

b. Responsible for and supervising the student on the master thesis in accordance with the topic of the thesis that has passed the exam and approved by the TGGS Committee.

c. Advise and mentor the student on theoretical content, concepts and research methodology including solving problems that may arise.

d. Provide advice and counsel to the student on thesis writing and use of language.

e. Follow up the research work to be in accordance with the plan and be responsible for evaluating the results of the thesis. The progress of the student's thesis must also be reported to the Curriculum Management Committee every semester until the thesis is complete.

f. Consider and approve on the student's request for the master thesis examinations.

g. Be a master thesis examination committee member and attend the examination.

h. Provide guidance and advice on the publication of the master thesis to comply with this regulation and in accordance with the criteria set by the University Academic Policy Committee.

(4) A master thesis co-advisor has the following responsibilities:

a. Co-responsible for and supervising the student on the master thesis in accordance with the topic of the thesis that has passed the exam and approved by the TGGs Committee.

b. Participate in giving advice and mentoring the student on theoretical content, concepts and research methodology including solving problems that may arise.

c. Participate in giving advice and counselling to the student on thesis writing and use of language.

d. Jointly follow up the research work to be in accordance with the plan and be responsible for evaluating the results of the thesis. The progress of the student's thesis must also be reported to the Curriculum Management Committee every semester until the thesis is complete.

e. Be a master thesis examination committee member and attend the examination.

Item 23 Appointment of a master thesis and a master thesis examination committee member

Appointment of a master thesis and a master thesis examination committee member will be nominated by the Curriculum Management Committee with the consent of the TGGs committee.

## Section 5

### Examination Process and Procedure for the Master Degree

Item 24 Scope and Format of Examination for the Master Degree

(1) Examination process includes the followings:

- a. Examination by course subjects
- b. Industrial internship for 18 weeks or more
- c. Master Thesis as stated in Section 6

The examination must be taken on the examination date specified in the respective semester according to the university academic calendar.

(2) The examinations in program specific subjects consist of either a written test or an oral examination in the subjects or courses indicated in the master program (curriculum).

(3) The topics of the examinations are determined by the contents of the courses assigned to the subjects.

(4) Two formats of the examination are a written examination as stated in Item 27 and an oral examination as stated in Item 28 which informed in each subject at the beginning of the registration period (Item 14) and announced during the lectures by the course instructor.

Item 25 Admission to the examination process for the Master Degree

Only persons can be admitted to master examinations who are enrolled in the program.

Item 26 Admission to the examination procedure for the Master Degree

(1) Chairman of examination committee can approve the admission to the Master examinations.

(2) Admission will be refused if:

- a. the qualifications listed in Item 25 are not fulfilled, or
- b. the required documents are not completed.

Item 27 Written Examinations

(1) In the test papers, the examinee has to prove that he/she is able to understand a problem posed and find a way to solve it, using the common methods of the subject, within a time limit and with limited auxiliary material.

(2) The examinee must be given the opportunity to inspect the marked test paper within, at the most, four weeks after the test results are published.

(3) The time limit for completing written test papers is not less than 1.5 hours but no more than 3 hours according to the nature of that course either the lecture or laboratory with 3 hours per week.

Item 28 Oral Examinations

(1) In the oral examinations, the examinee has to prove that he/she sees the larger context of the tested subject and that he/she is able to deal with specific problems within this larger technical context. Additionally, the oral examinations are intended to find out whether the examinee has a broad basic knowledge.

(2) Oral examinations are held in the presence of at least one examiner and one competent assistant in the form of an examination of a group or an individual.

a. In group examinations, a maximum of four examinees can be questioned at the same time.

b. In an individual examination, an examinee is questioned by the examiner.

(3) Prior approving the exam results, the examiner must consider the evaluation from other examiners or the assistant.

(4) The essential topics, questions, and results of the examination in the individual subjects must be written down/recorded in examination notes.

(5) The examination notes consist of questions, answers, and other essential topics during the examination.

(6) The duration of an oral examination is generally 20-30 minutes per examinee.

## **Section 6**

### **Master Thesis Preparation and Examination**

Item 29            The process of master thesis preparation and examination are as follows:

                    (1) Appointment of Master Thesis Advisory Committee

                    (2) Master Thesis Evaluation

                            a. Master Thesis Proposal Examination

                            b. Master Thesis Defense Examination

Item 30            Appointment and Change of Master Thesis Main Advisor

A student must have two main advisors, one from each university. The co-advisor is optional.

The student can submit a request form to change master thesis main advisors, if there is a reason and necessity, with the consent of both the current and proposed advisor. The student has to ensure that the new advisor will undertake their work before getting approval. The student requesting the change of master thesis main advisors must submit the request to the Dean through the Curriculum Chairman and must be approved by the TGGS committee.

Item 31            Master Thesis Proposal Examination. The purpose of this examination is to evaluate students' knowledge and understanding of the content. It assesses the organizational, research methodology, methods and techniques, and conceptual skills of the students necessary to solve problems in the research. The procedure is as follows:

                    (1) Request Submission and Approval

                            a. A student could submit the request form for the Master Thesis Proposal Examination to the TGGS through the main advisor and the Curriculum Chairman. The submission process conforms to the announcement of TGGS.

                            b. A student who wishes to change the topic after the initial one has been approved must submit a request for Thesis Proposal Examination and



the thesis starting time would be counted from the new date of approval for the thesis title as well as the time to submit the request form for the Master Thesis Defense Examination.

c. A student must receive the approval for the thesis topic within two academic years starting the first semester that enrolled. Failure to comply with this regulation will result in termination of student status. The student can submit a special request form to the TGGs Committee, if there is a reason and necessity, for the extension of one more semester.

#### (2) Appointment of Master Thesis Proposal Examination Committee

The main thesis advisor will nominate the committee members to the Dean for further official appointment. The Master Thesis Proposal Examination Committee comprises of the following members:

- a. Chairman with the qualification as stated in Item 21 (4)
- b. Main advisor as a member
- c. External expert outside the university with the qualification as stated in Item 21 (4)

Up to 2 names with the qualification as stated in Item 21 may be nominated as committee member(s).

#### (3) Master Thesis Proposal Examination Procedure and Report of Examination Results

a. A student must submit the request form for Master Thesis Proposal Examination to TGGs through the main advisor and Curriculum Chairman.

b. After the examination, the advisor will report the result to the TGGs through the Curriculum Chairman and announce the result within one week from the examination date.

The student who fails the first proposal examination must submit a request form for retaking of the Master Thesis Proposal Examination within the duration specified by the Master Thesis Proposal Examination Committee.

(4) The process and procedure of the Master Thesis Proposal Examination will comply with TGGs rules and announcements.

### Item 32

#### Master Thesis Defense Examination:

The thesis defense examination is an opportunity for students to demonstrate the knowledge of their research area and overall process undertaken. The committee will evaluate the student's performance and overall understanding of their academic knowledge to graduate.

(1) Submission of Request Form for Master Thesis Defense Examination must meet the following criteria:

a. Prior the defense examination, a student must submit the request form for Master Thesis Defense Examination to the TGGs through the

main advisor and the Curriculum Chairman after the master thesis topic has been approved no less than 60 days.

b. A student must complete all courses as specified in the program, except the industrial internship.

c. A student must submit the proof of evidence that the publication on the entire or part(s) of the master thesis been submitted to the publisher according to the TGGs Regulation and Announcement.

d. Pass English Proficiency Examination with score according to the TGGs Regulation and Announcement

e. Pass on other qualifications as specified by TGGs Committee.

## (2) Appointment of Master Thesis Defense Examination Committee

The main thesis advisor will nominate the committee members to the Dean for further official appointment. The Master Thesis Defense Examination Committee comprises of the following members:

a. Chairman with the qualification as stated in Item 21 (4) who should not be the main advisor or a co-advisor.

b. Main advisor as a member.

c. External expert outside the university as member with the qualification as stated in Item 22 (4).

Additional 1-2 names with the qualification as stated in Item 21 may be nominated as committee member(s) but should not be a co-advisor.

The student can submit a request form to change master thesis defense examination committee, if there is a reason and necessity, to the Curriculum Chairman and must be approved by the TGGs committee.

## (3) Master Thesis Defense Examination Procedure and Report of Examination Results

a. A student must submit the request form for the Master Thesis Defense Examination to TGGs through the main advisor and the curriculum chairman.

b. After the examination, the advisor will report the result to the TGGs through the Curriculum Chairman and announce the result within one week from the examination date.

The student who fails the first defense examination must submit a request form for retaking of the Master Thesis Defense Examination within the duration specified by the Master Thesis Defense Examination Committee.

(4) The process and procedure of the Master Thesis Defense Examination will comply with TGGs rules and announcements.

## Item33

### Master Thesis Format

1. The master thesis must be written in English.

2. The manuscript format will be according to the TGGs Announcement.

## Section 7

### Measurement and Evaluation

- Item 34 Grading system used for educational evaluation based on defined accomplishment at the end of each semester is presented as follows

Letter Grade	Grade Score	Performance's Quality
A	4.0	Excellent
B+	3.5	Very Good
B	3.0	Good
C+	2.5	Above Average
C	2.0	Average
D+	1.5	Below Average
D	1.0	Poor
F	0	Fail
Fa	0	Fail, Insufficient Attendance
Fe	0	Fail, Absent from Examination
S		Pass/Satisfactory
U		Fail/Unsatisfactory
I		Incomplete
Ip		In-progress
W		Withdrawal
AUD		Audit

- Item 35 Cumulative Credits and Grade Point Average (GPA) Calculations

(1) Cumulative credits and GPA must be calculated at the end of each semester.

(2) Cumulative credits are registered coursework credits which earns the score according to Item 34.

(3) Two categories of GPA: Semester GPA and Cumulative GPA in which can be calculated as follows:

a. Semester GPA is calculated from the academic performance of the student in the respective semester by summing the product of credits and grade score for each course, then dividing by total of credits in the respective semester.

b. Cumulative GPA is calculated from the academic performance of the student in the first semester to the latest one by summing

the product of credits and grade score for each course, then dividing by total of credits.

Item 36

Transfer of Credits

(1) Credits of the graduate course can be transferred with the consent of the Curriculum Management Committee and the Dean only for the course with the grade of at least 3.0. The eligible course to be transferred must be taken when he/she was the student at the university or another university. The undergraduate courses taken at Chulalongkorn University or King Mongkut's University of Technology North Bangkok can be transferred to the graduate master degree study, however, those courses must be addition to courses listed in the study plan of the undergraduate curriculum.

(2) The eligible course to be transferred as stated in (1) must be no more than 5 academic years from the year that the course registered.

(3) Total of credits to be transferred cannot exceed 1/3 of all courses except thesis in the study program that the student enrolled at TGGs. And in the event that the number of credits is divided into no match, round off the decimal point unless in any of the following cases, the following shall be done without an unlimited number of credits.

(4) The transferred course and its credits will be recorded with the course name, number of credits and the grade on the transcript without calculating toward the GPA. The name of university, besides KMUTNB, will be recorded on the transcript as well.

Item 37

Student Status and Repetition

(1) A student who has the Cumulative GPA less than 2.50 will be automatically retired from the study program.

(2) A student who has the Cumulative GPA of at least 2.50 but still lower than 3.00 will be on the "probation" status.

(3) A student who has completed the coursework according to the study program and received the Cumulative GPA of at least 2.50 but still lower than 3.00 can register for additional course(s) that have not been previously taken with the consent of an advisor and the Curriculum Chairman to achieve the Cumulative GPA of at least 3.00 within the next semester. Otherwise, the student will be automatically retired from the study program.

(4) A student is not allowed to register for the course(s) that have been previously taken, except for the repetition according to Item 37 (3).

(5) A student who fails the Master Thesis Defense Examination twice will be automatically retired from the study program.

(6) A student who fails to take the Master Thesis Proposal Examination within the specified time as stated in Item 31 will be automatically retired from the study program.

Item 38

Penalty for academic dishonesty (cheating) on course examinations and plagiarism on other theses or publications.

(1) In the case that the incidents have been found or have reasonable doubts to believe that the student has been cheating on the course examination, the dean will form the investigation committee and the outcomes of this investigation will be report to TGGs Committee for consideration. If the student is found guilty, the student will get one of following penalties:

- a. Fail that examination that the student has cheated.
- b. Fail that course that the student has cheated and the student will be ordered to take a leave of absence in the next regular semester for at least one semester.
- c. Fail that course that the student has cheated including not to consider all courses in that respective semester and the student will be ordered to take the leave of absence in the next regular semester for at least one semester.
- d. Terminate the student status

(2) In the case that the incidents have been found or have reasonable doubts to believe that the student has been plagiarized on other thesis or publications or have someone write the thesis or publication, the dean will form the investigation committee and the outcomes of this investigation will be report to TGGs committee for consideration. If the student is found guilty, the TGGs Committee will proceed the followings:

- a. If the student is not completed with the study, the committee will consider not to approve or to withdraw the thesis and the student will get one of following penalties:
  1. The student will be ordered to take a leave of absence for a maximum of one academic year.
  2. The student status will be terminated.
- b. If the degree is already granted, the committee will report to the university council for degree revocation.

## **Section 8**

### **Measurement and Evaluation of Master Thesis**

#### **Item 39 Master Thesis Submission**

A student is required to submit two (2) copies of the manuscript with signatures of all committee members including two (2) sets of the manuscript and abstract in an electronic version to the TGGs within the period specified by the KMUTNB Academic Calendar for the Dean approval.

Failure to comply as stated in Paragraph 1, the student will not be able to graduate.

- Item 40 Measurement of Master thesis is considered from progress and success of research work assign in each semester together with outcomes of the proposal and defense examinations.
- Item 41 Grading system used for educational evaluation based on defined accomplishment is presented as follows:

Assessment	Performance's Quality
S	Pass proficiency exam / Satisfactory
U	Fail with inadequate achievement / Unsatisfactory
Ip	Incomplete thesis work / In-progress

<p><b>The Sirindhorn International Thai-German</b></p> <p><b>Graduate School of Engineering</b></p> <p><b>King Mongkut's University of Technology North Bangkok</b></p>	<p><b>Faculty of Engineering</b></p> <p><b>Chulalongkorn University</b></p>
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Letter Grade	Grade Score	Performance's Quality	Performance's Quality
A	4.0	Excellent	Very Good
B+	3.5	Very Good	Good
B	3.0	Good	Pass
C+	2.5	Above Average	-
C	2.0	Average	-
D+	1.5	Below Average	-
D	1.0	Poor	-
F	0	Fail	Fail
Fa	0	Fail, Insufficient Attendance	-
Fe		Fail, Absent from Examination	-
S		Pass/Satisfactory	-
U		Fail/Unsatisfactory	-
I		Incomplete	-
Ip		In-progress	-
W		Withdrawal	-
AUD		Audit	-

- Item 42 Evaluation of Master Thesis Proposal Examination

(1) "**Pass**" refers that the student has outstanding knowledge to conduct the research in their academic area together with the ability to analyze and apply their knowledge in a wider context. The student is allowed to propose the thesis topic and the student is expected to answer questions in the manner indicates his/her comprehensive knowledge in the field of research.

(2) “Fail” refers that the student does not have sufficient knowledge and competence in research work. His/her abilities do not meet minimum requirements. Therefore, the student is not allowed to submit a request for the examinations. It means that the student does not have sufficient understanding of the research he/she has studied so the student has to prepare more to retake the exam and make an effective presentation.

- Item 43      Evaluation of Master Thesis Defense Examination must include the result and record on the student’s transcript when he/she graduates.
- Item 44      The master thesis approved by the Dean is considered to be official and complete master thesis.

## **Section 9**

### **Graduation and Degree Approval**

- Item 45      A student who is eligible to graduate must complete the following requirements.
- (1) Pass the Master Thesis Defense Examination
  - (2) Submit the complete master thesis to the TGGs within the period specified in Item 39 and the Dean has approved.
  - (3) Complete the coursework according to the study program with a minimum GPA of 3.00
  - (4) Pass English Proficiency Examination with score according to the TGGs Regulation and Announcement
  - (5) Publish (or acceptance to be publish) the entire or part(s) of the master thesis in the international conference proceeding (paper) with full paper or an international academic journal or other accepted academic publications. The publication must be written in English and according to the TGGs Regulation and Announcement.
- Item 46      The degree will be approved by the university council. To be eligible for a degree, a student must fulfill the following qualifications:
- (1) The student must meet requirements as stated in Item 45.
  - (2) The student must be cleared of any outstanding academic debts in relation to his/her studies to the university.
  - (3) The student must be free from any disciplinary actions imposed upon his/her out of disciplinary punishment, except in the case of petty offences according to the university disciplinary regulation.
  - (4) The student must follow the TGGs regulations and procedure.

## **Section 12**

### **Quality Accreditation and Assessment of the Curriculum**

- Item 47      The Master degree program must have a quality assurance system according to the Ministry of Higher Education, Science, Research and Innovation's Announcement. The assessment for revision must be conducted at least every 5 years.

Announced on 18 December 2019.

(Prof. Dr. Teravuti Boonyasopon)

Chairman of KMUTNB University Council



## Regulations for Examination in the Doctor of Engineering Programs (RED) of The Sirindhorn International Thai-German Graduate School of Engineering (TGGS)

It is deemed necessary to outline the regulation of the doctoral degree education of The Sirindhorn International Thai-German Graduate School of Engineering in accordance with an announcement of the Ministry of Education entitled “Graduate Studies Program Standard Criteria 2005” along with the academic philosophy following the memorandum of understanding between RWTH Aachen University and King Mongkut’s University of Technology North Bangkok signed on 22 October 2004 (B.E. 2547) and 20 September 2011 (B.E. 2554).

By virtue of Articles 22(2) and (9) of the King Mongkut’s University of Technology North Bangkok Act 2007 (B.E. 2550) and the Academic Council’s resolution on its 2/2013 meeting on 11 February 2013, the University Council on its 7/2013 meeting on 14 August 2013 thus established this regulation.

- Item 1      This regulation is hereby entitled “the Regulation of King Mongkut’s University of Technology North Bangkok Concerning Doctoral Degree Education of The Sirindhorn International Thai-German Graduate School of Engineering 2013”
- Item 2      This regulation is applied to all new students enrolled in semester 1/2013 onwards.
- Item 3      This regulation has been drafted in Thai and English versions. In case of any discrepancies in the interpretation, the version of the regulation in Thai language shall prevail.
- Item 4      All existing regulations, notices and orders that are found inconsistent with the provisions of this regulation shall be annulled and henceforth will be replaced by this regulation.
- Item 5      This regulation is overseen by the President of King Mongkut’s University of Technology North Bangkok. Any procedures related to doctoral degree education, but remain unstated, must be proposed to the University’s Academic Council for further consideration.
- Item 6      In this regulation,
  - “**University**” means King Mongkut’s University of Technology North Bangkok.
  - “**University Council**” means the Council of King Mongkut’s University of Technology North Bangkok.
  - “**Academic Council**” means the Academic Council of King Mongkut’s University of Technology North Bangkok.
  - “**President**” means the President of King Mongkut’s University of Technology North Bangkok.
  - “**TGGS**” means The Sirindhorn International Thai-German Graduate School of Engineering.
  - “**Dean**” means the Dean of the TGGS.
  - “**Program**” means all curricular graduate programs offered for the doctoral degree programs in the TGGS.
  - “**Department**” means department or other equivalent sector which offers doctoral degree program in the TGGS.
  - “**Head of Department**” means head of department or head of other equivalent sector in the TGGS.
  - “**TGGS Committee**” means a committee appointed to manage the TGGS.
  - “**Program Coordinator**” means the head of field of study in the TGGS.
  - “**Lecturer**” means a lecturer in the TGGS.
  - “**Student**” means the student in doctoral degree program in the TGGS.
  - “**Doctoral dissertation**” means a written document reporting an independent study or a research project aiming to develop and construct the body of knowledge in a field of study, which is supervised by the dissertation advisor and is a part of the degree requirements.

## **Section 1**

### **Educational System**

- Item 7      Educational system
- The educational system of the doctoral degree program of the TGGS is an international program using English language as a medium of instruction according to the TGGS's Announcement.
- Item 8      Educational management
- The program is a two-semester system. The academic calendar consists of two semesters. Each semester is not less than 15 weeks.
- Item 9      Regular duration of study
- (1)    The study load has a minimum of 6 semesters and a maximum of 12 semesters.
  - (2)    Length of the program is counted from the semester in which a student once registers in the program.
- Item 10     The program structure focuses on research in order to develop academic and professional individual. Degree completion must conform to the requirements stipulated by the program. The dissertation module normally has a minimum of 54 credits.

## **Section 2**

### **Student Admission**

- Item 11     Qualifications of an applicant
- (1)    An applicant must hold a Master's degree or an equivalent qualification in research studies program (plan A) and obtained a minimum GPA of 3.50 or equivalent.
- An individual lacking a minimum GPA of 3.50 must have work experience in related field and may apply under the consent of the TGGS committee.
- (2)    An applicant must have English language proficiency according to the rules of the TGGS.
  - (3)    An applicant must have other qualifications as noted by the program or the TGGS.
- Item 12     Criteria for admission
- (1)    An applicant must pass entrance examinations by any means requested and announced by the TGGS, or
  - (2)    In exceptional circumstances, an applicant is selected in special cases for study under the consent of the department committee and the TGGS committee.
- Item 13     Enrollment
- (1)    A student accepted to study must enroll for credits in order to hold a student status.
  - (2)    A student accepted to study must enroll according the procedure announced by the TGGS.
  - (3)    A student is not permitted to enroll in more than one program at the same time.

### Section 3

#### Program Management

- Item 14      Study plan
- Study plan means plan and activities that a student must complete in each semester as assigned by the program.
- Item 15      Registration
- (1)      Registration must follow the academic calendar. A student who has not completed the registration process within 15 days after the beginning of the semester will no longer be considered as a student.
  - (2)      A student is allowed to register for a minimum of 9 credits and a maximum of 15 credits in each regular semester.
  - (3)      Maintaining student status
    - a. A student who has completed his/her course requirements and is working on other degree requirements that do not require enrollment in courses must nevertheless maintain his/her active student status for continued advising services until graduation, or terminated from their academic program.
    - b. To retain a student status, a student must complete the registration process and pay the fees within 15 days after the semester begins. Failure to comply with this regulation will result in termination of student status.
- Item 16      Leave of absence
- A leave of absence is a temporary interruption of one's studies for a period of one or two semesters. A student wishing to make a leave of absence needs to maintain the student status.
- (1)      A student may personally request for absence from the dissertation advisor and the head of department, and receive approval from the Dean within the period specified in the university announcement. It can be requested under the following conditions:
    - a. A leave of absence for military service for the duration of military service obligation.
    - b. A leave of absence due to study or conduct the research abroad with exchange scholarship or other scholarship.
    - c. Illness with absence for more than 20 percent of class attendance; a medical certificate is required.
    - d. Other personal reasons can be considered if a student has studied for at least two semesters.
  - (2)      Leave in item (1)a. is granted according to the conditions and the requirements of the military. Leave in item (1)b. is granted according to the conditions and the requirements of the scholarship funding resources. Leaves in items (1)c. and (1)d. are granted for no longer than two consecutive semesters. If necessary, only one more semester of leave is granted.
  - (3)      When the leave of absence is granted, the duration of absence is counted as part of the maximum length of study except absence in item (1)a.
  - (4)      Before the period of approved leave of absence, a student must retain student status by paying the fees within 15 days after the semester begins. The student must retain status when the leave is granted. Failure to comply with this regulation will result in termination of student status, except the absence in item (1)a.

- (5) After a period of approved leave, a student can resume studies by submitting the request to the head of department and with approval by the Dean at least one week prior the registration period begins.
  - (6) Special circumstances other than (1)-(5) shall be subjected to the consideration of the President.
- Item 17**      **End of student status**
- A student status is ended according to the following reasons:
- (1) Death
  - (2) Approved resignation from the program
  - (3) Completion of the graduation requirements of the program
  - (4) As approved by the Dean, a student status can be terminated under any of the following reasons:
    - a. A student does not complete the program within the maximum period mentioned in Item 9.
    - b. A student does not register or does not pay the tuition fees within the deadlines.
    - c. A student does not follow the conditions specified for leave of absence.
    - d. A student does not follow the rules and guidelines mentioned in section 5, dissertation and defense examination.
  - (5) Breach of discipline mentioned in Item 36.
- Item 18**      **Resumption (Reinstatement) of student status**
- (1) A student who is terminated from reasons in Items 16(4) and 17(4)b. can resume a student status within 15 days after being terminated.
  - (2) A student must pay the resumption fee and the tuition fees in order to resume studies.
  - (3) Resumption of student status must be approved by the Dean with the consent of the Head of Department.
  - (4) Once resumption of status is approved, a student officially regains status and resumes studies.
- Item 19**      **Resignation**
- A student requesting a resignation from the program must submit the request to the Dean through main advisor and the Head of Department.
- The resignation became effective with the Dean's approval.

## **Section 4**

### **Faculty Members**

- Item 20**      **Faculty members in the doctoral degree program**
- (1) A regular lecturer is a person employed in the TGGS (TGGS) as a lecturer, assistant professor, associate professor, or professor. Regular lecturer is in charge of a full-time teaching in the program.
  - (2) A guest lecturer is a person invited to teach in the TGGS. The guest lecturer must hold a doctoral degree with or without an academic title; and must have experience in teaching and conducting research not considered as a part of the degree program.

- Item 21      A dissertation advisor and defense examiners
- (1)      A dissertation main advisor must be a regular lecturer who holds a doctoral degree and specializes in a field of research; or must be a foreign specialist/professor as announced by the TGGS. The main advisor is in charge of giving advice and supervising the dissertation.
  - (2)      A dissertation co-advisor must be a lecturer, assistant professor, associate professor, or professor who holds a doctoral degree and specializes in the field of research; or must be an associate professor or a professor in related field. The co-advisor must have experience in teaching and conducting research apart from one's own graduation. The co-advisor cooperates with the main advisor in giving advice and supervising the dissertation.
  - (3)      A dissertation defense examiner must be a lecturer, assistant professor, associate professor, or professor or an external specialist who holds a doctoral degree and specializes in the field of research.
- Item 22      Appointment of a dissertation advisor and defense examiner
- The Dean will approve the appointment of an advisor and examiner. The appointment will be confirmed by the TGGS committee.

## **Section 5**

### **Thesis Preparation and Thesis Examination**

- Item 23      The process of thesis (dissertation) preparation and thesis examination
- (1)      Appointment of Thesis Advisory Committee
  - (2)      Dissertation Evaluation
    - a.      Doctoral Qualifying Examination
    - b.      Thesis Proposal Examination
    - c.      Thesis Progress Examination
    - d.      Thesis Defense Examination
    - e.      Other evaluation apart from ((2)a. -d.) depends on the main supervisor's consideration
- Item 24      Appointment and Change of a main dissertation advisor
- A graduate student must have at least one main advisor at the beginning of enrollment. The co-advisor is optional.
- The student can submit a request form to change a main dissertation advisor with the consent of both the current and proposed advisors. The student has to ensure that the new advisor will undertake their work before getting approval. The change of a main dissertation advisor must be approved by the TGGS committee.
- Item 25      Thesis (Dissertation) Examination
- (1)      Doctoral Qualifying Examination
- The qualifying examination is best viewed as an opportunity for students to demonstrate their knowledge and in- depth understanding of research they have. The purpose of the qualifying examination is to ensure that the student has sufficient background knowledge needed for their thesis topic.
- a.      Submission of Request Form for Doctoral Qualifying Examination form
 

Prior to the qualifying examination, the student must submit the request form to the TGGS within the first 3 semesters. Failure to comply with this regulation will result in termination of student status.
  - b.      Appointment of Doctoral Qualifying Examination Committee

The Doctoral Qualifying Examination Committee normally comprises of the following members:

1. The chairman who has the qualification as stated in the item 21 (3), who should not be the main advisor or a co-advisor.
2. The other members of the committee must have the qualification as stated in the item 20 or 21. However, at least one of the qualifying examination committee members has to be the main advisor.

The outcome of the qualifying examination is decided by the number of votes from the members of the qualifying examination committee. If the main thesis advisor and co-advisor participate in the committee, their vote must be consolidated as one.

The main thesis advisor will propose 3 names as members to the Dean for further appointment.

c. Qualifying Examination Procedure:

1. A student must submit the request form for Doctoral Qualifying Examination to the TGGS through the advisor and the Head of Department.
2. After the examination, the advisor will report the result to the TGGS through the Head of Department and announce the result within one week from the examination date. The student will hold the doctoral candidate status.

The process and procedure of the Qualifying Examination will comply with TGGS rules and announcements.

d. Failing the first qualifying examination:

The student who fails the first qualifying examination must submit a request form for retaking of the qualifying examination within one month after the announcement of outcome. The student must take the second qualifying examination within 3 months after the approval.

e. Failure of this qualifying examination will result in termination of student status.

The student who could not pass his/her first qualifying examination and do not submit the request form to retake it; as in 25(1)d., and those who fail the second qualifying examination will fail the qualifying examination and his/her student status is terminated.

(2) Thesis Proposal Examination:

A student who passes the qualifying exam could submit the request form for the Doctoral Thesis Proposal Examination to the TGGS through their main advisor and Head of Department. The submission process conforms to the announcement of TGGS.

A student who wishes to change the topic after the initial one has been approved must submit a request for Thesis Proposal Examination. The thesis starting time would be counted from the new date of approval for the thesis (dissertation) title.

(3) Thesis Progress Examination:

The purpose of this examination is to evaluate students' thesis progress including their understanding of the content. It assesses the organizational and conceptual skills of the students necessary for their defense.

A student could submit a request for the Thesis Progress Examination after 3 months of the approval date for the thesis title (Thesis Proposal Examination).

a. Submission of Request Form for Doctoral Thesis Progress Examination

Prior to the progress examination, a student must submit the request form for Doctoral Thesis Progress Examination form to the TGGS through his/her main advisor.

b. Appointment of Doctoral Thesis Progress Examination Committee

The Doctoral Qualifying Examination Committee normally comprises of the following members:

1. The chairman who has the qualification as stated in the item 21 (3), who should not be the main advisor or a co-advisor.
2. The other members of the committee must have the qualification as stated in the item 20 or 21. However, at least one of the thesis progress examination committee members has to be the main advisor.

The main thesis advisor will propose 3 or 5 names as members to the Dean for further official appointment.

c. Progress Examination Procedure

1. A student must submit the request form for the Thesis Progress Examination to TGGs through the main advisor and Head of Department.
2. After the examination, the advisor will report the result to the TGGs through the Head of Department and announce the result within one week from the examination date.

The process and procedure of the Thesis Progress Examination will comply with TGGs rules and announcements.

d. Failing the first progress examination:

The student who fails the first progress examination must submit a request form for retaking of the Thesis Progress Examination within the duration specified by the Thesis Progress Examination Committee.

- e. A student who passes the progress examination could submit a request form for the Thesis Defense Examination after 1 month of the approval date for the result of Thesis Progress Examination.

(4) Thesis Defense Examination:

The thesis (dissertation) defense examination is an opportunity for students to demonstrate the knowledge of their research area and overall process undertaken. The committee will evaluate the student's performance and overall understanding of their academic knowledge to graduate.

a. Submission of Request Form for Doctoral Thesis Defense Examination

After one month of acknowledgement of the progress examination result, a student can submit the request form for the Doctoral Thesis Defense Examination to TGGs through his/her main advisor.

b. Appointment of the Doctoral Thesis Defense Examination Committee

The Doctoral Thesis Defense Examination Committee normally comprises of the following members:

1. The chairman who has the qualification as stated in the item 21 (3), who should not be the main advisor or a co-advisor.
2. The other members of the committee must have the qualification as stated in the item 20 or 21. This includes the thesis main advisor and other members. At least one external examiner from outside university is required for the committee.

The main thesis advisor will propose 5 or 7 names as members to the Dean for further official appointment.

c. Defense Examination Procedure:

1. A student must submit the request form for the Thesis Defense Examination to TGGs through the main advisor and Head of Department.

2. After the examination, the advisor will report the result to the TGGs through the Head of Department and announce the result within one week from the examination date.

The process and procedure of the Thesis Defense Examination will comply with TGGs rules and announcements.

d. Failing the first defense examination:

The student who fails the first defense examination must submit a request form for retaking of the Thesis Defense Examination within the duration specified by the Thesis Defense Examination Committee. This will be considered as the last attempt.

Item 26 Dissertation Format

1. The dissertation must be written in English.
2. The manuscript format will be according to the TGGs Announcement.

Item 27 Dissertation Submission

A student is required to submit two copies of the manuscript with signatures of all committee members including an electronic version and abstract to the TGGs within the period specified by the KMUTNB Academic Calendar for the Dean approval.

Item 28 Fail Submission of Dissertation

Failure to comply with Item 27, the student will not be able to graduate. The student must register in order to maintain his/her student status until submit the dissertation, or until his/her student status is terminated.

Item 29 The dissertation approved by the Dean of TGGs is considered to be official and complete dissertation.

## Section 6

### Measurement and Evaluation

Item 30 Measurement

Measurement of the study is considered from progress and success of research work assign in each semester together with outcomes of the qualifying, progress and defense examinations.

Item 31 Evaluation

Grading system used for educational evaluation based on defined accomplishment is presented as follows:

Assessment	Performance's Quality
S	Pass proficiency exam / Satisfactory
U	Fail with inadequate achievement / Unsatisfactory
Ip	Incomplete thesis work / In-progress

Item 32 Evaluation of Doctoral Qualifying Examination, Doctoral Thesis Progress Examination and Doctoral Thesis Defense Examination

**"Pass"** refers that the student has outstanding knowledge to conduct the research in their academic area together with the ability to analyze and apply their knowledge in a wider context. The student is allowed to take the proposal, progress and defense examinations. The student is expected to answer questions in the manner indicates his/her comprehensive knowledge in the field of research.

**"Fail"** refers that the student does not have sufficient knowledge and competence in research work. His/her abilities do not meet minimum requirements. Therefore, the student is not allowed to submit a request for the proposal, progress and defense examinations. It means that the student does not have sufficient understanding of the



- research he/she has studied so the student has to prepare more to retake the exam and make an effective presentation.
- Item 33 The result of defense examination will be recorded on the student's transcript when he/she graduates. The quality of the dissertation is defined as follows:
- Excellent (Summa Cum Laude)
- Very good (Magna Cum Laude)
- Good (Cum Laude)
- Satisfactory (Rite)

## Section 7

### Graduation and Degree Approval

- Item 34 A student who is eligible to graduate must complete the following requirements.
1. Pass the Doctoral Thesis Defense Examination
  2. Complete dissertation, in compliance with submission guidelines in item 27, and approved by the TGGs Dean
  3. Pass English Proficiency Examination with score according to the TGGs Regulation and Announcement
  4. Publish (or acceptance to be publish) the entire or part(s) of the dissertation in an international academic journal or other accepted academic publications as stated in the TGGs Regulation and Announcement
- Item 35 Degree Approval
- To be qualified for a degree, a student must meet the requirements as stated in the item 34. The student must be cleared of any outstanding academic debts in relation to his/her studies. Besides, the student must be free from any disciplinary actions imposed upon his/her out of disciplinary punishment, except in the case of petty offences according to the university disciplinary regulation.
- Item 36 The incidents of academic dishonesty and plagiarism will be submitted by the advisor and the head of department to the dean. The dean will form the investigation committee and the outcomes of this investigation will be report to TGGs committee for consideration. If the student is found guilty, the student will get the penalties as follows:
1. If the student is not completed with the study, his/her student status will be terminated.
  2. If the degree is granted, the committee will report to the university council for degree revocation.

## Section 8

### Quality Accreditation and Assessment of the Curriculum

- Item 37 All current doctoral degree programs of TGGs are under the quality accreditation according to the Ministry of Education's Qualifications Framework for Higher Education 2009 (B.E. 2552). The assessment for revision must be conducted at least every 5 years.

**Section 9**  
**Temporary Provision**

- Item 38      This regulation will apply to TGGs students who are pursuing their degree and enrolled at the university prior semester 1/ 2013 and have not graduated, except that the former issues are more advantageous still remains effective.

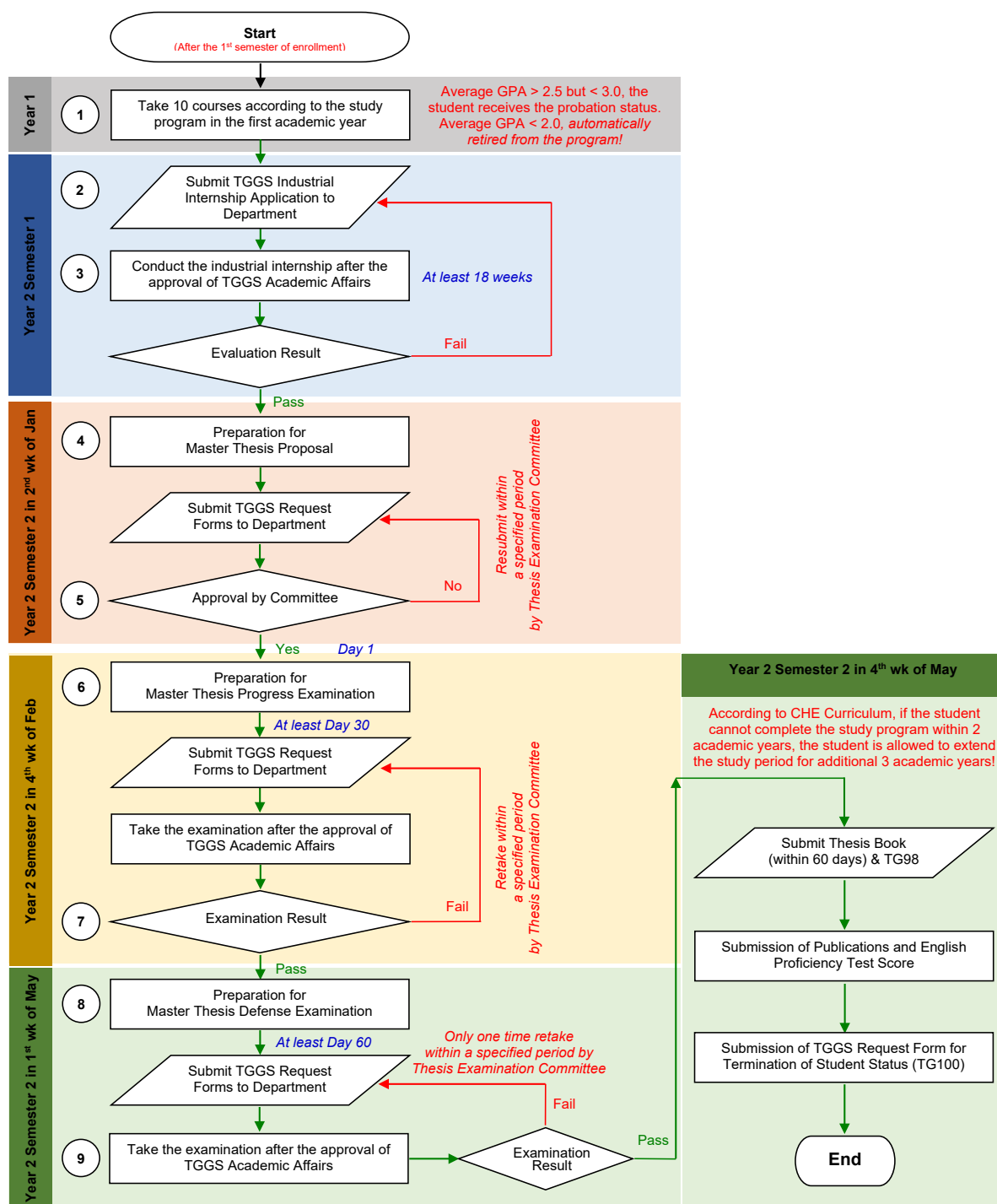
Announced on August 14, 2013.

Prof. Dr. Kasem Suwannagul  
Chairman, KMUTNB Council

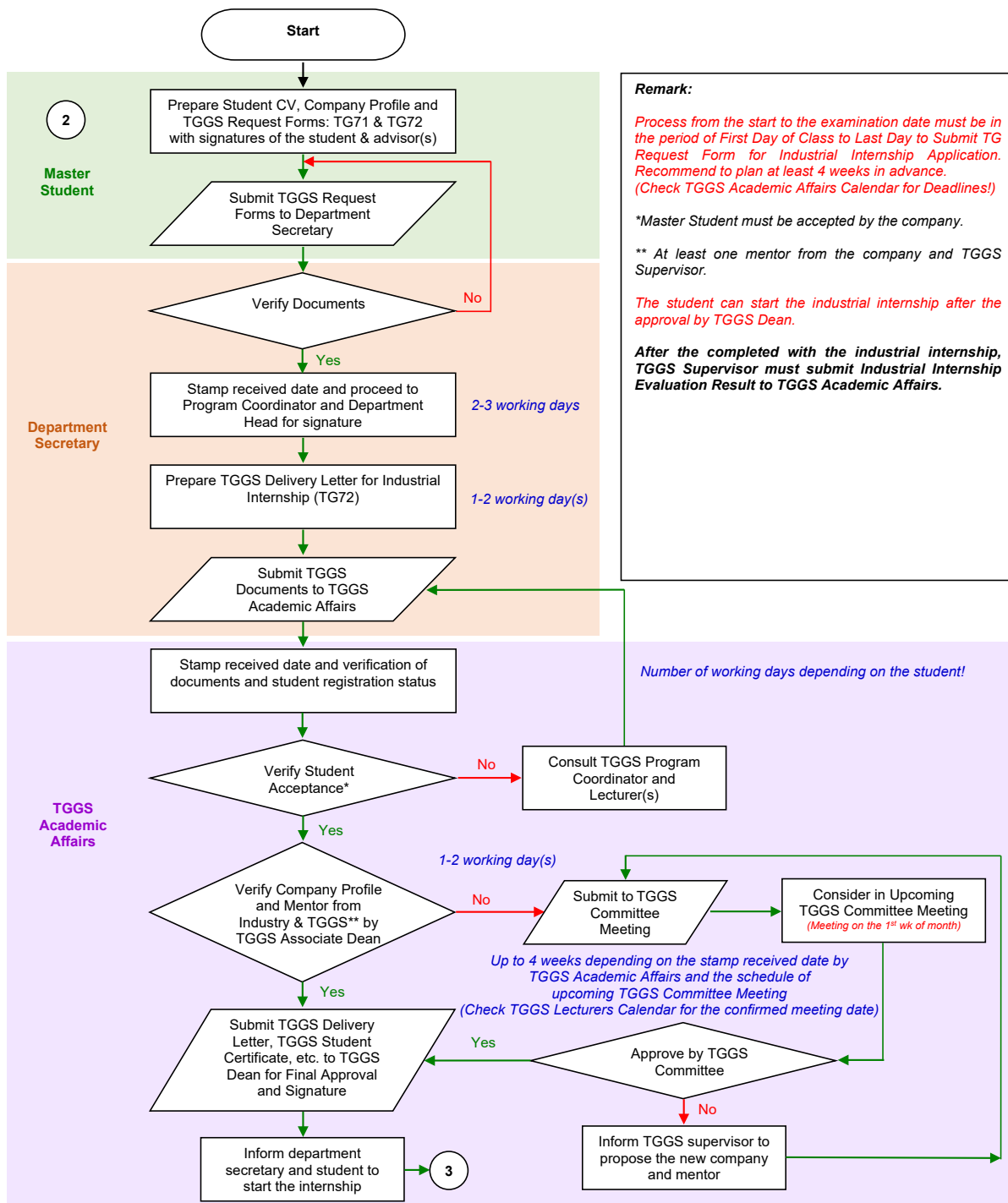
# MASTER STUDY OVERALL PROCESS FLOW PLAN

## Study Plan A2 with Coursework, Industrial Internship & Master Thesis for 2-Year Program (Student ID 59-62)

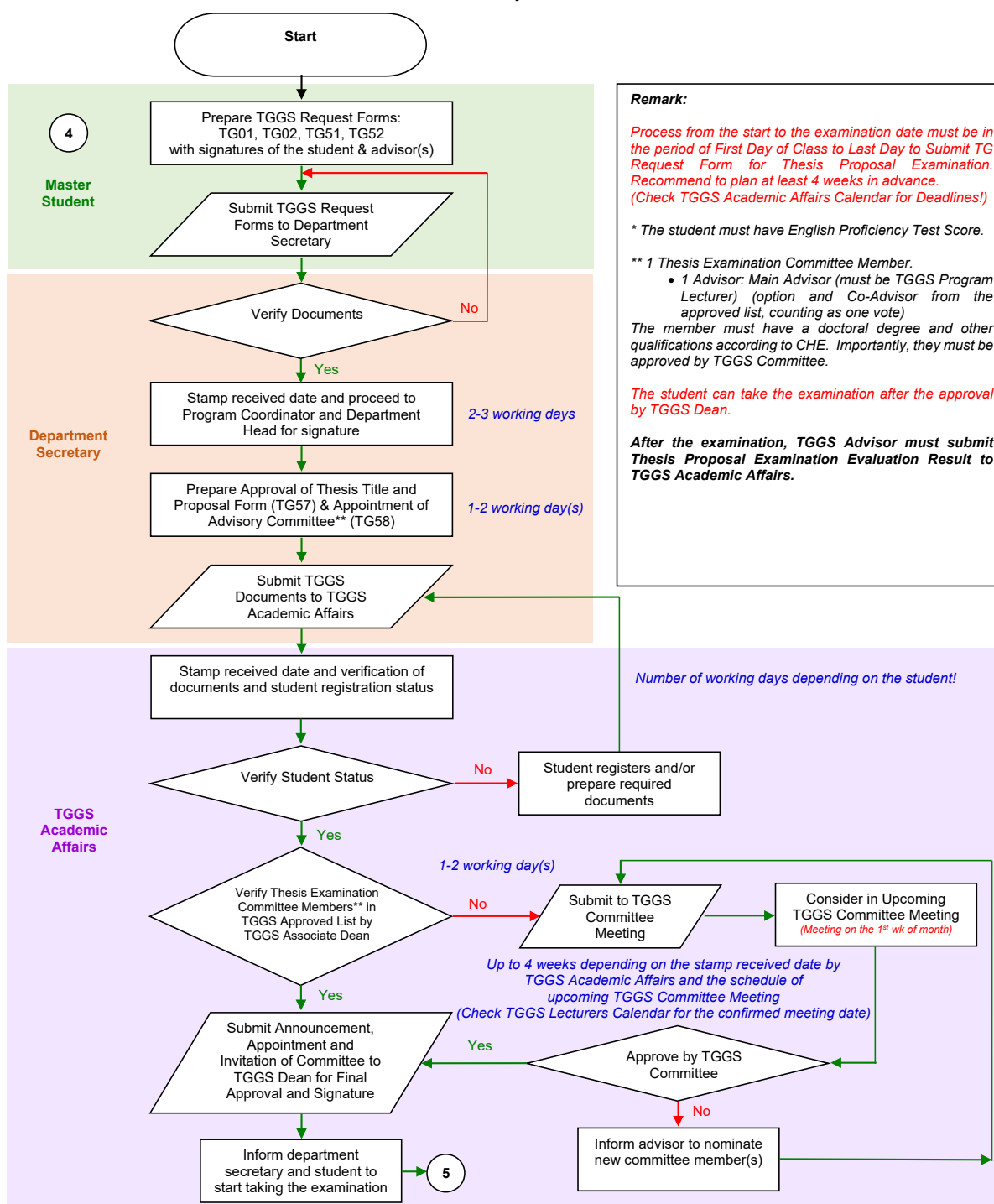
### MASTER STUDY OVERALL PROCESS FLOW



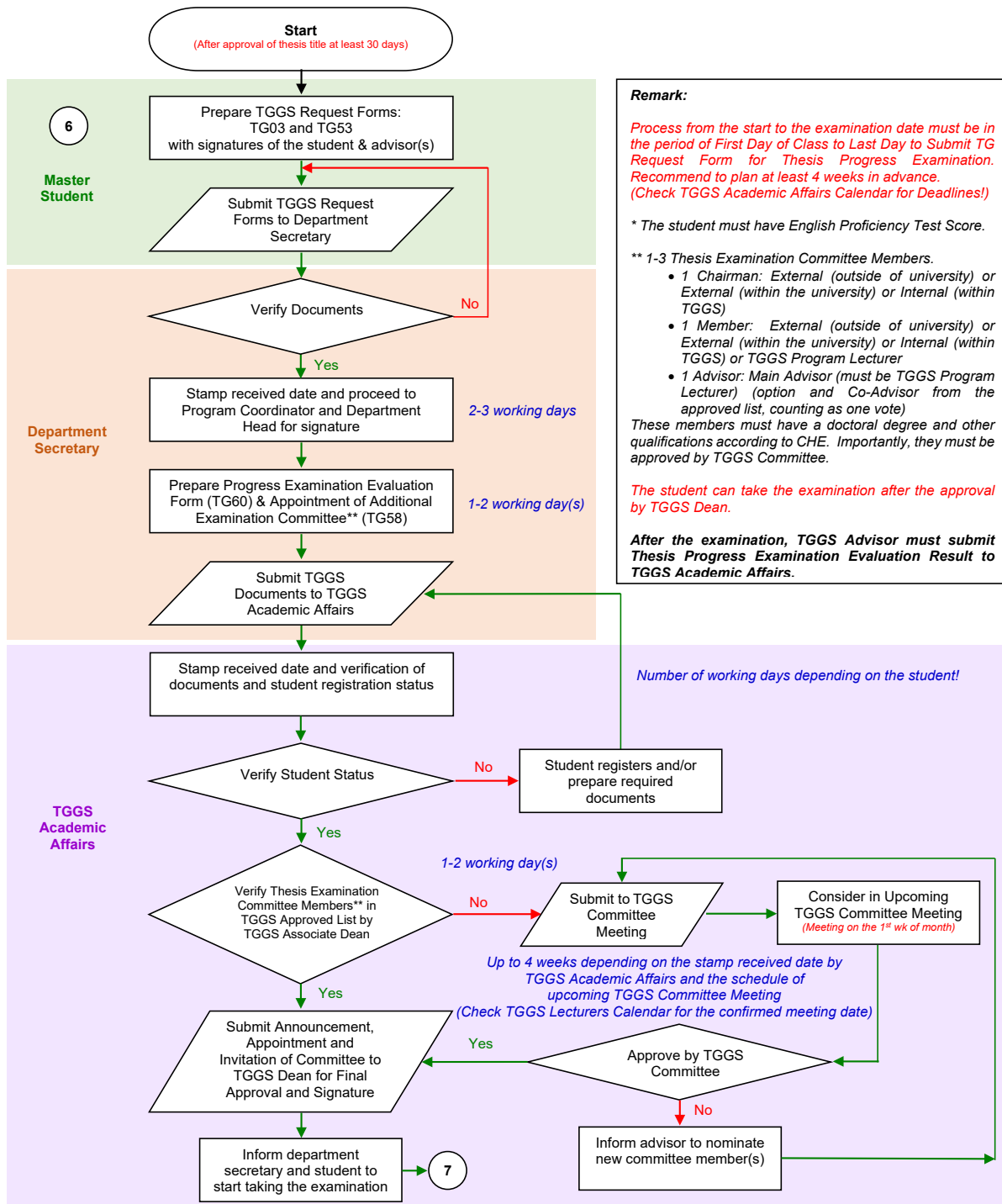
## TGGs Industrial Internship



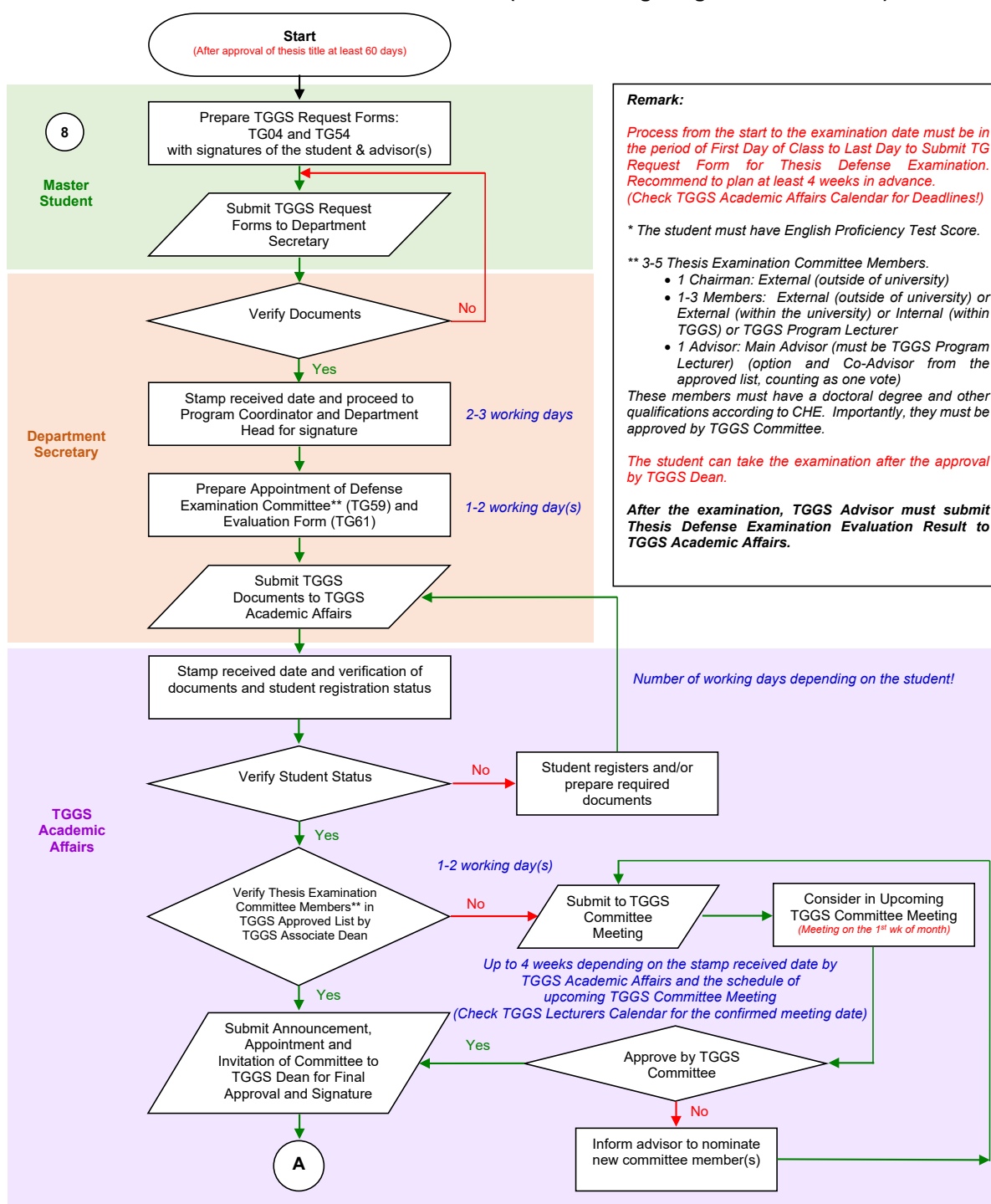
## Master Thesis Proposal Examination



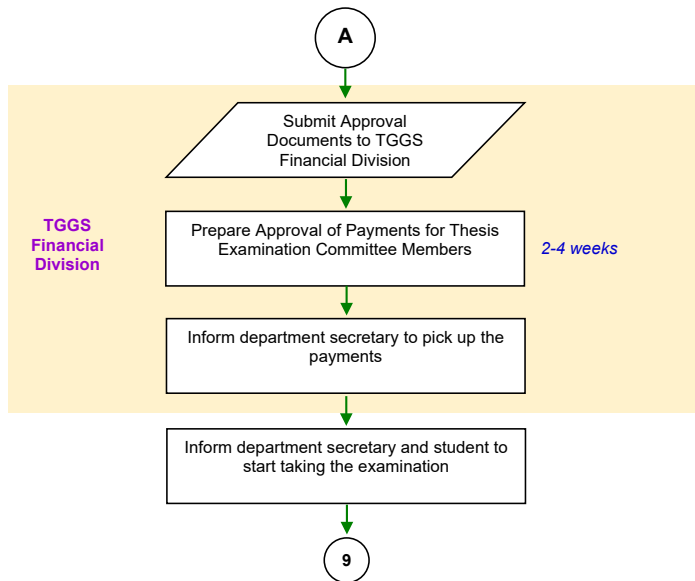
## Master Thesis Progress Examination (after approval of thesis title)



## Master Thesis Defense Examination (After Passing Progress Examination)



## Master Thesis Defense Examination (After Passing Progress Examination)



### Remark:

*TGGS and KMUTNB Financial System will be closed during September to December. Therefore, the documents must be process within August if requesting to take the examination between September to December.*

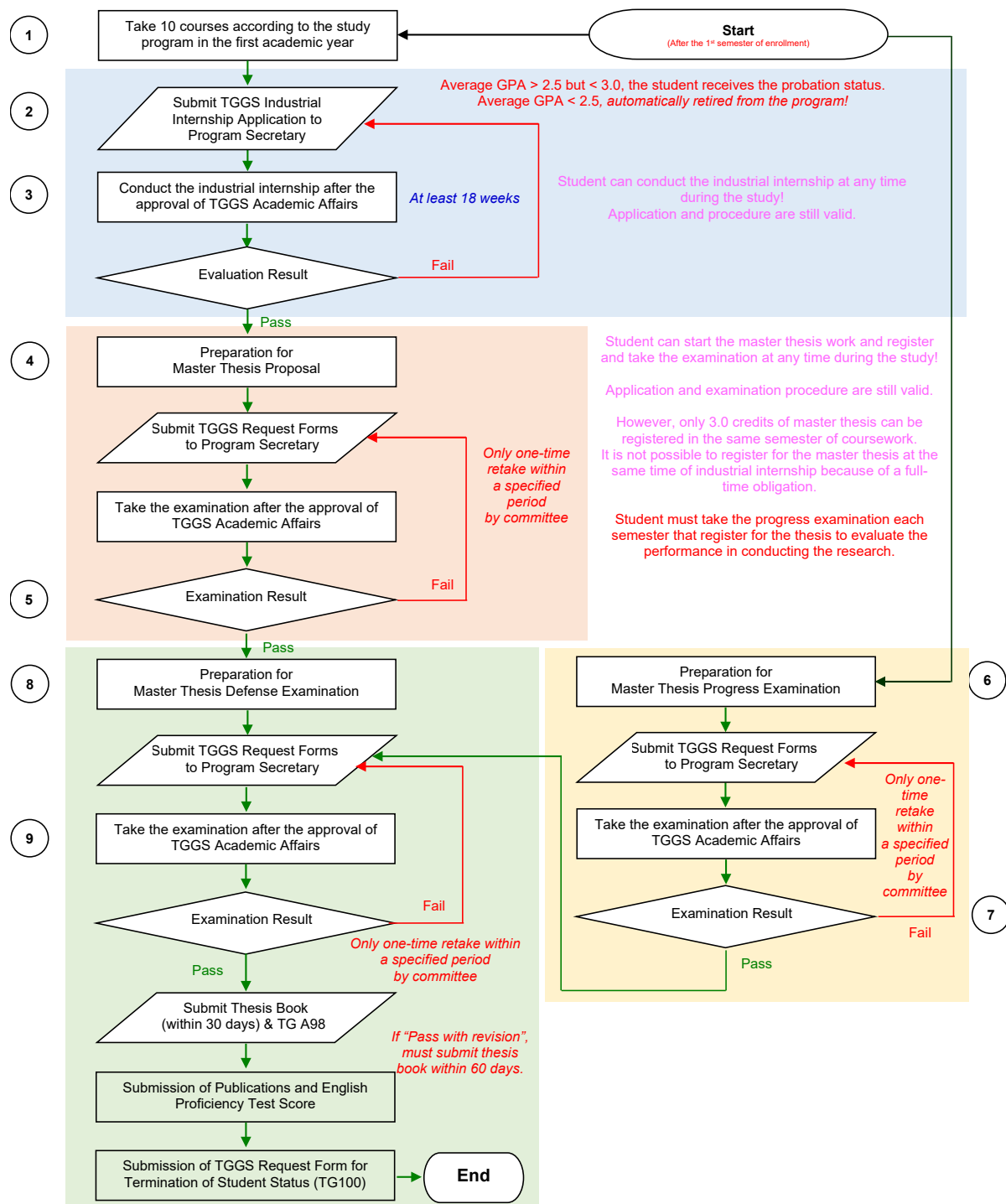
*If cannot process the documents by August, expecting the delay in payments and advisor and/or student must advance the payments to the examination committee and TGGS will pay as soon as payments have been approved.*

The complete document is available at <https://tggs.kmutnb.ac.th/wp-content/uploads/2019/04/04-Master-Thesis-Process.pdf>.

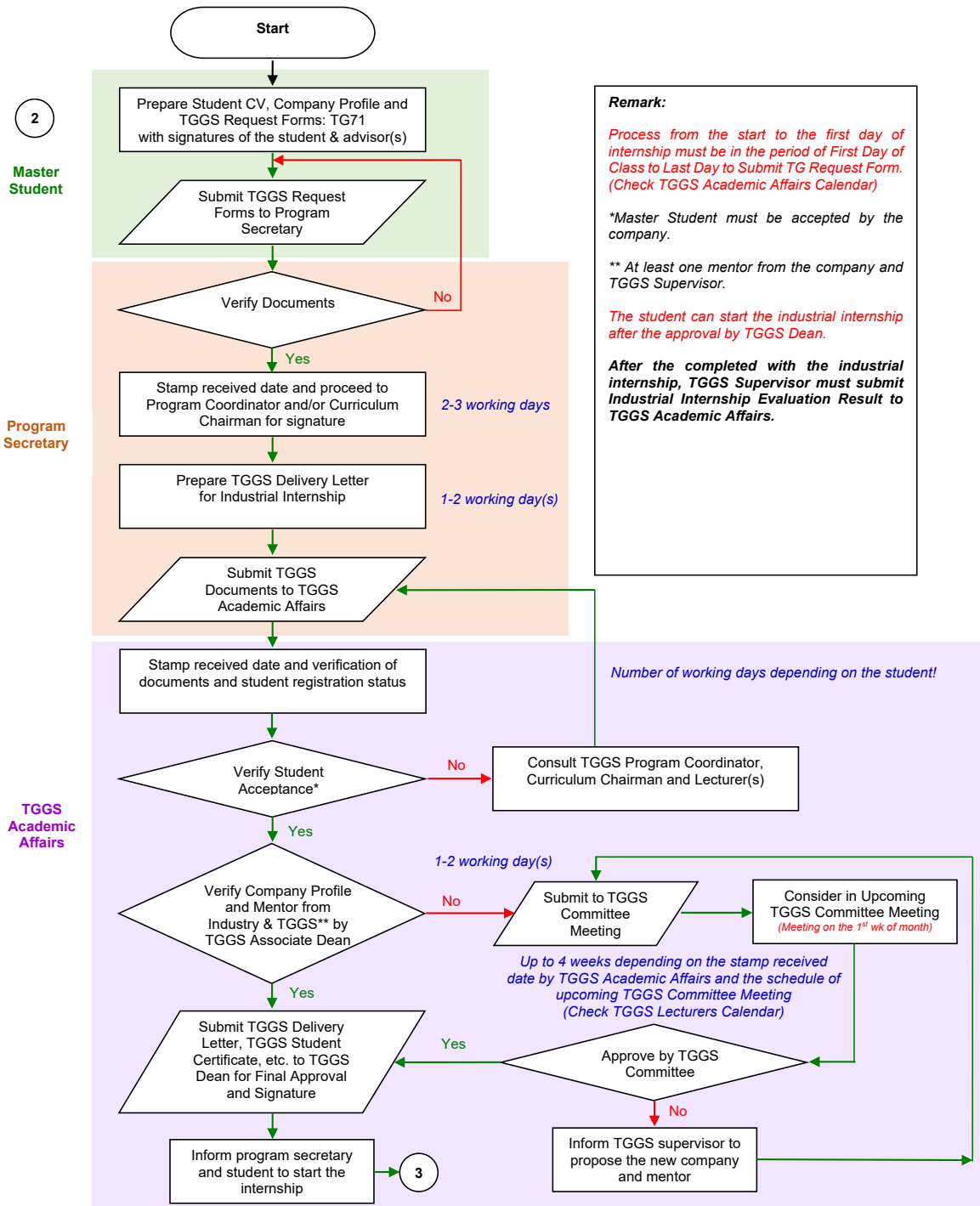


## Study Plan A2 with Coursework, Industrial Internship & Master Thesis for 2-Year Program (Student ID 63 onward)

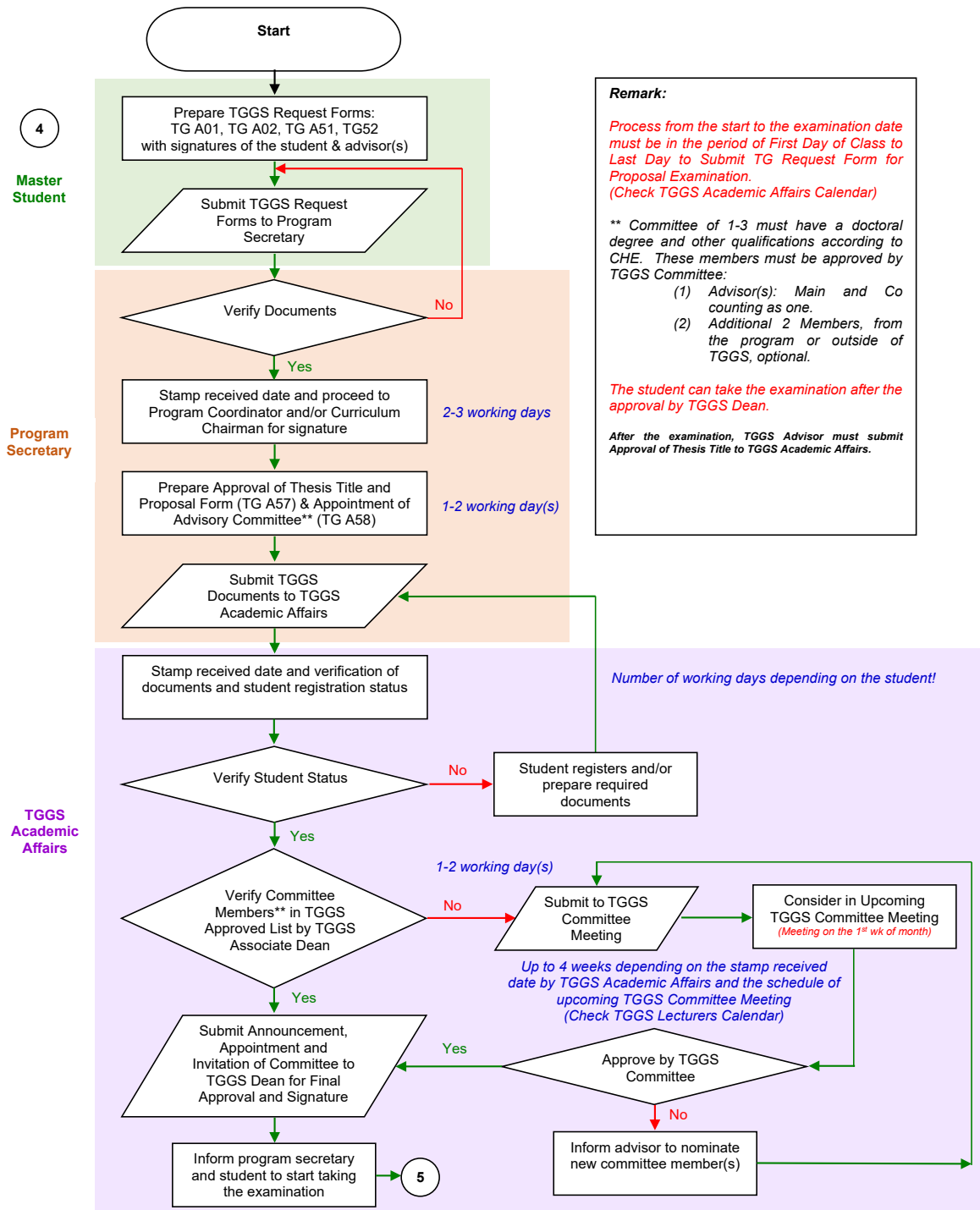
### MASTER STUDY PROCESS FLOW (Plan A2 Starting 2020)



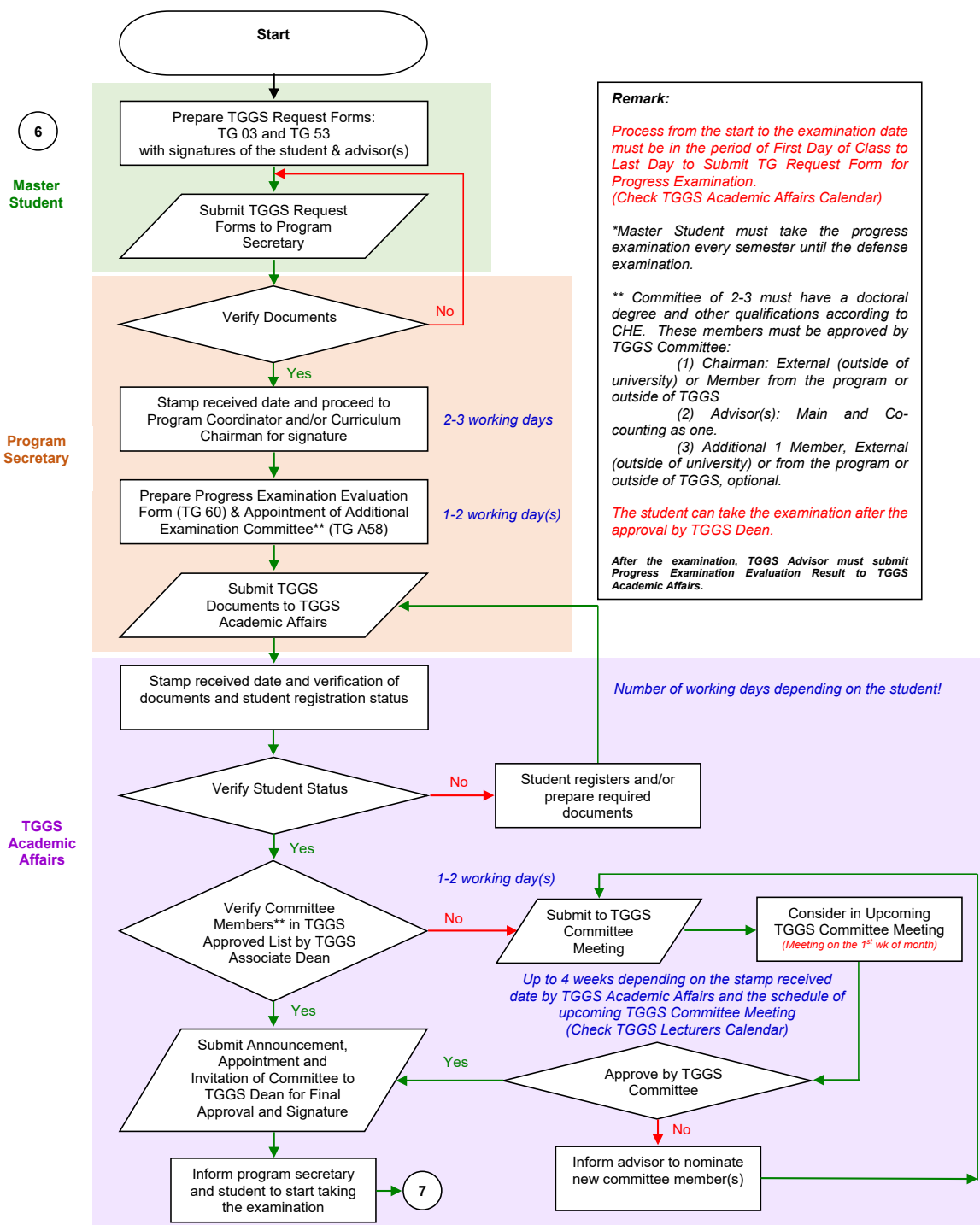
## TGGS Industrial Internship



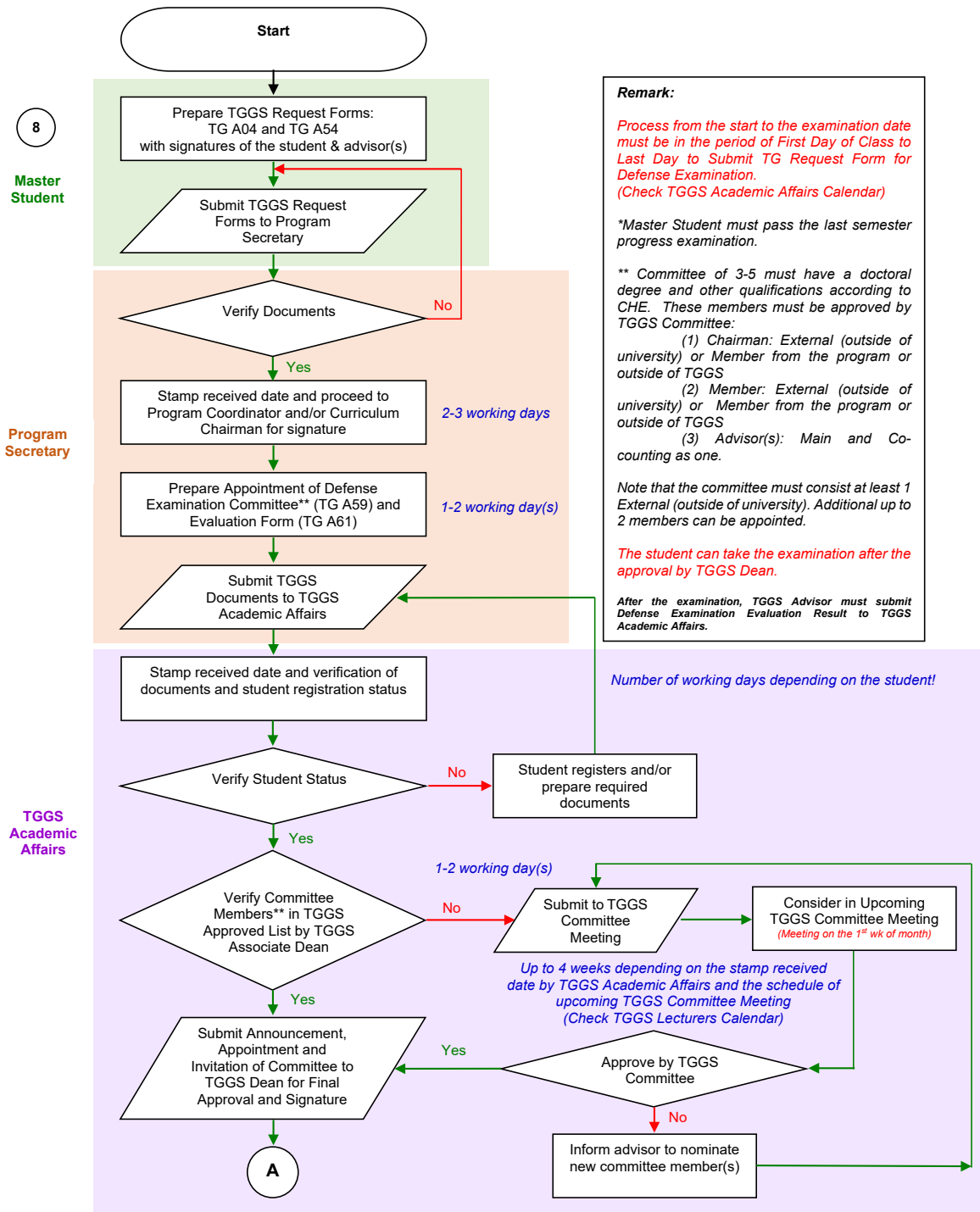
## Master Thesis Proposal Examination



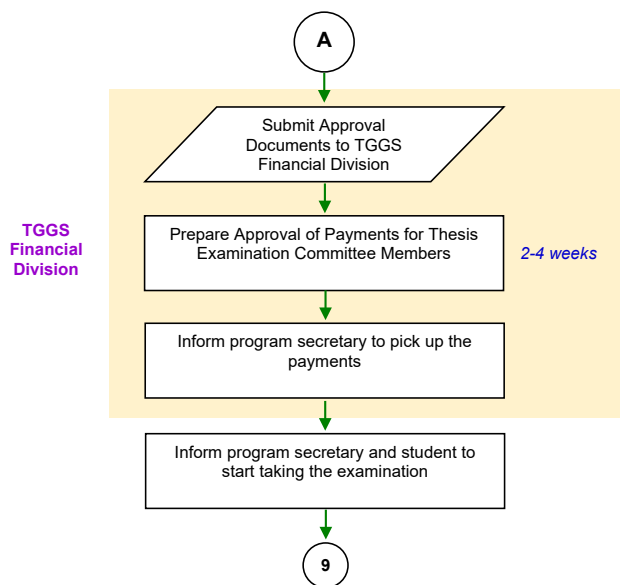
## Master Thesis Progress Examination (every semester that student register for thesis)



## Master Thesis Defense Examination (after passing the last semester Progress Examination)



## Master Thesis Defense Examination (after passing the last semester Progress Examination)



### Remark:

*TGGS and KMUTNB Financial System will be closed during September to December. Therefore, the documents must be process within August if requesting to take the examination between September to December.*

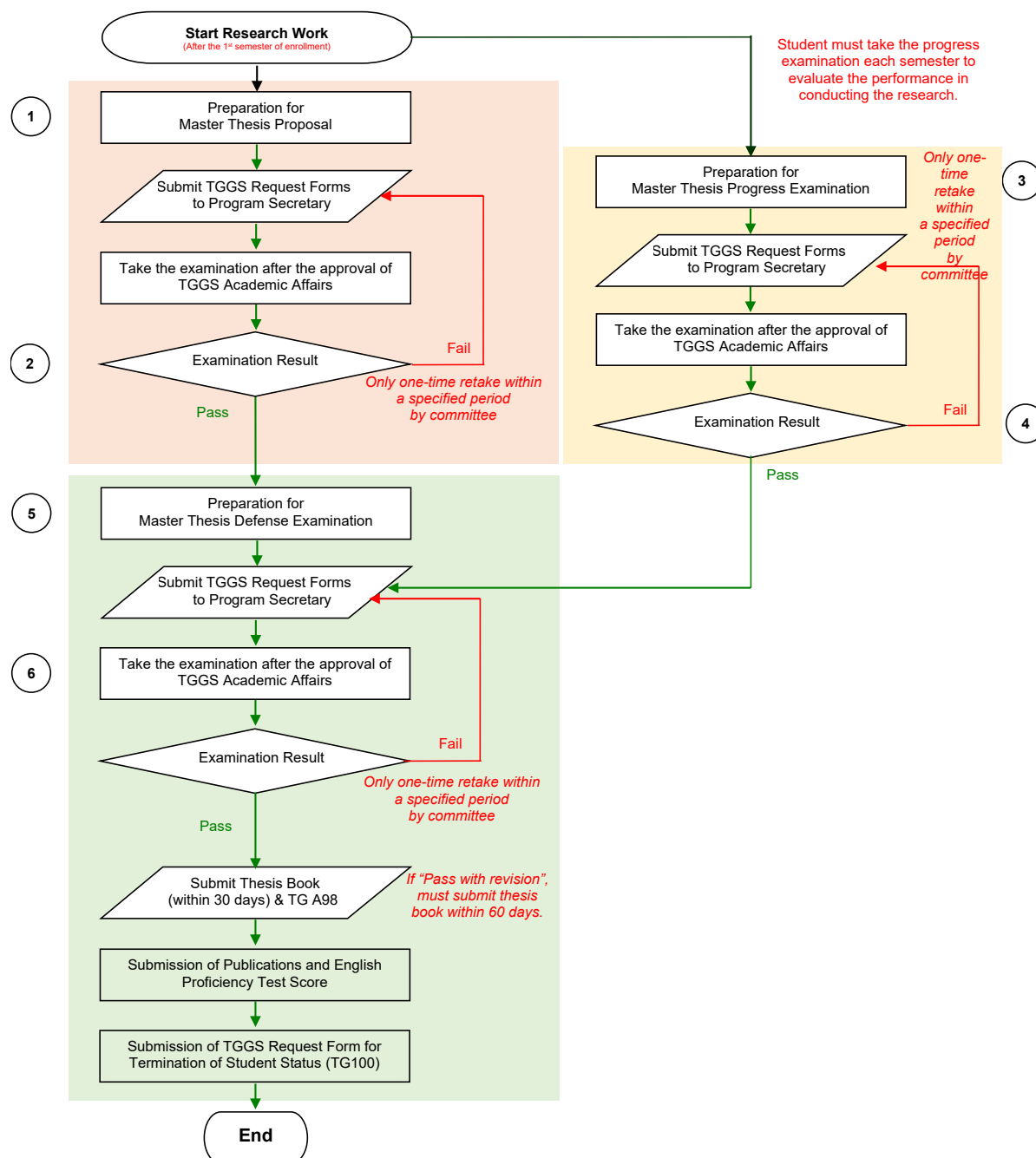
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The complete document is available at <https://tggs.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process-Plan-A2-20201026.pdf>.

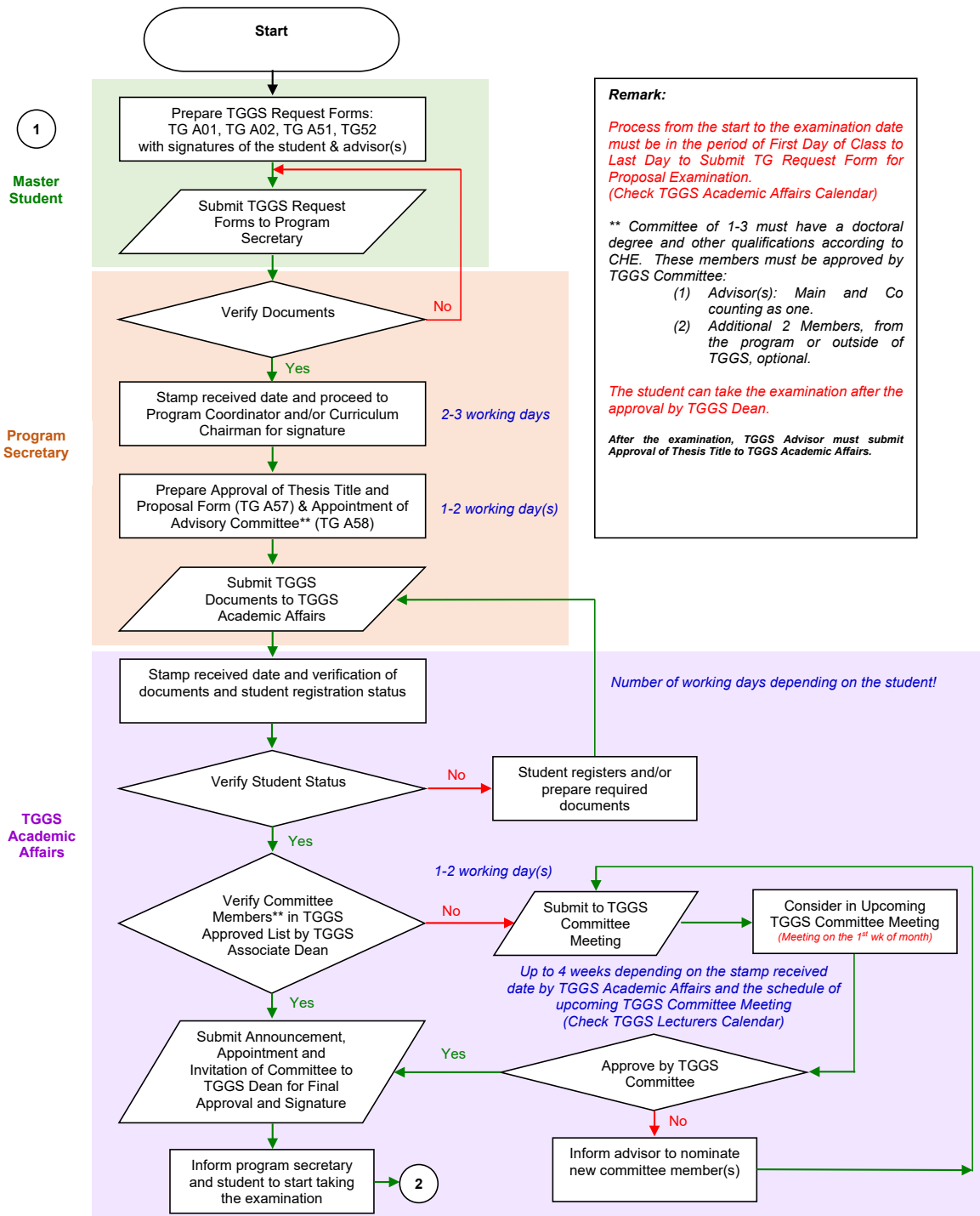
## Study Plan A1 Only Master Thesis, No Coursework and Industrial Internship for 2-Year Program (Student ID 63 onward)

### MASTER STUDY PROCESS FLOW (Plan A1 Starting 2020)

Student register for the master thesis every semester, however, the student can take the examination at any time during the study! Application and examination procedure are still valid.

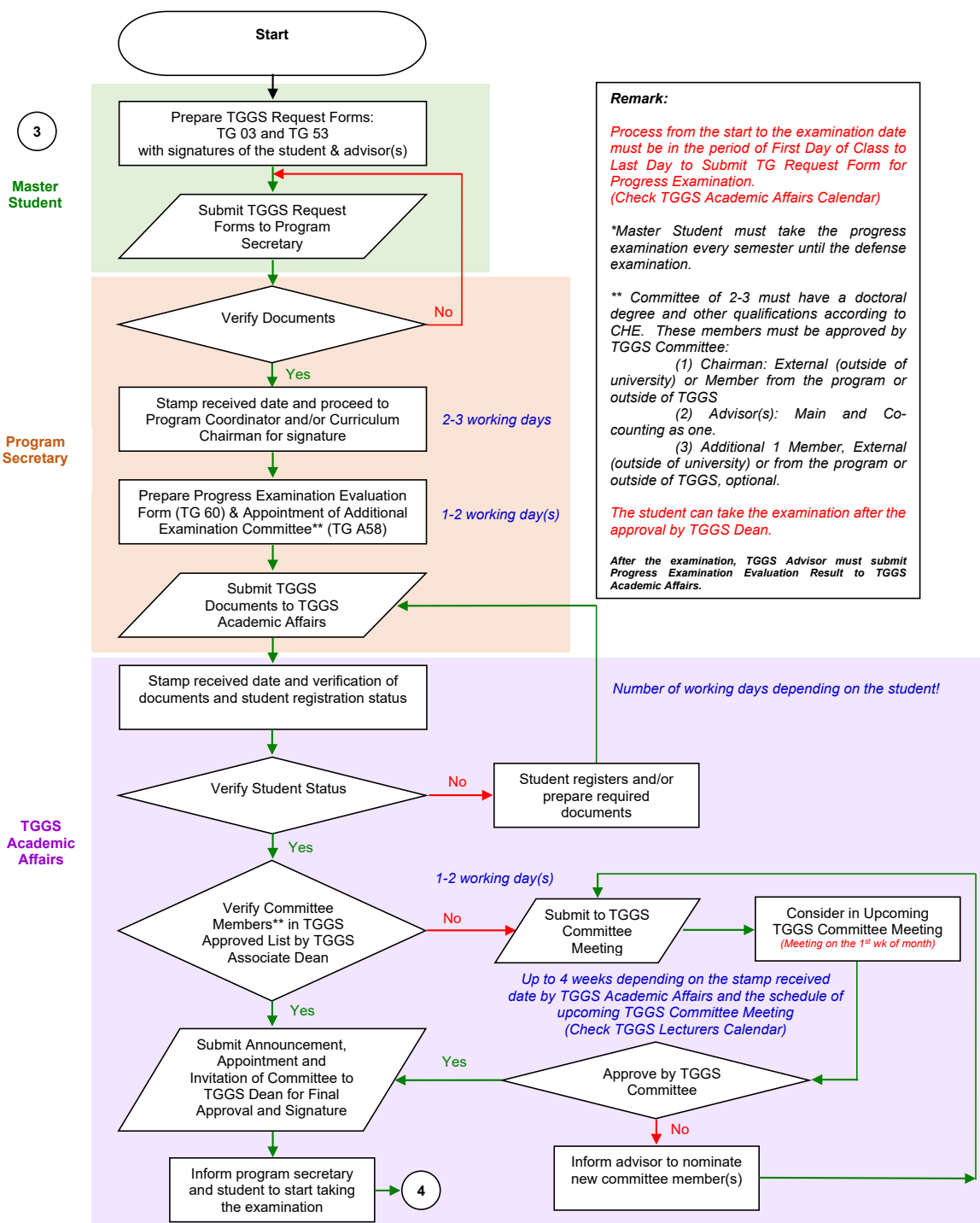


## Master Thesis Proposal Examination

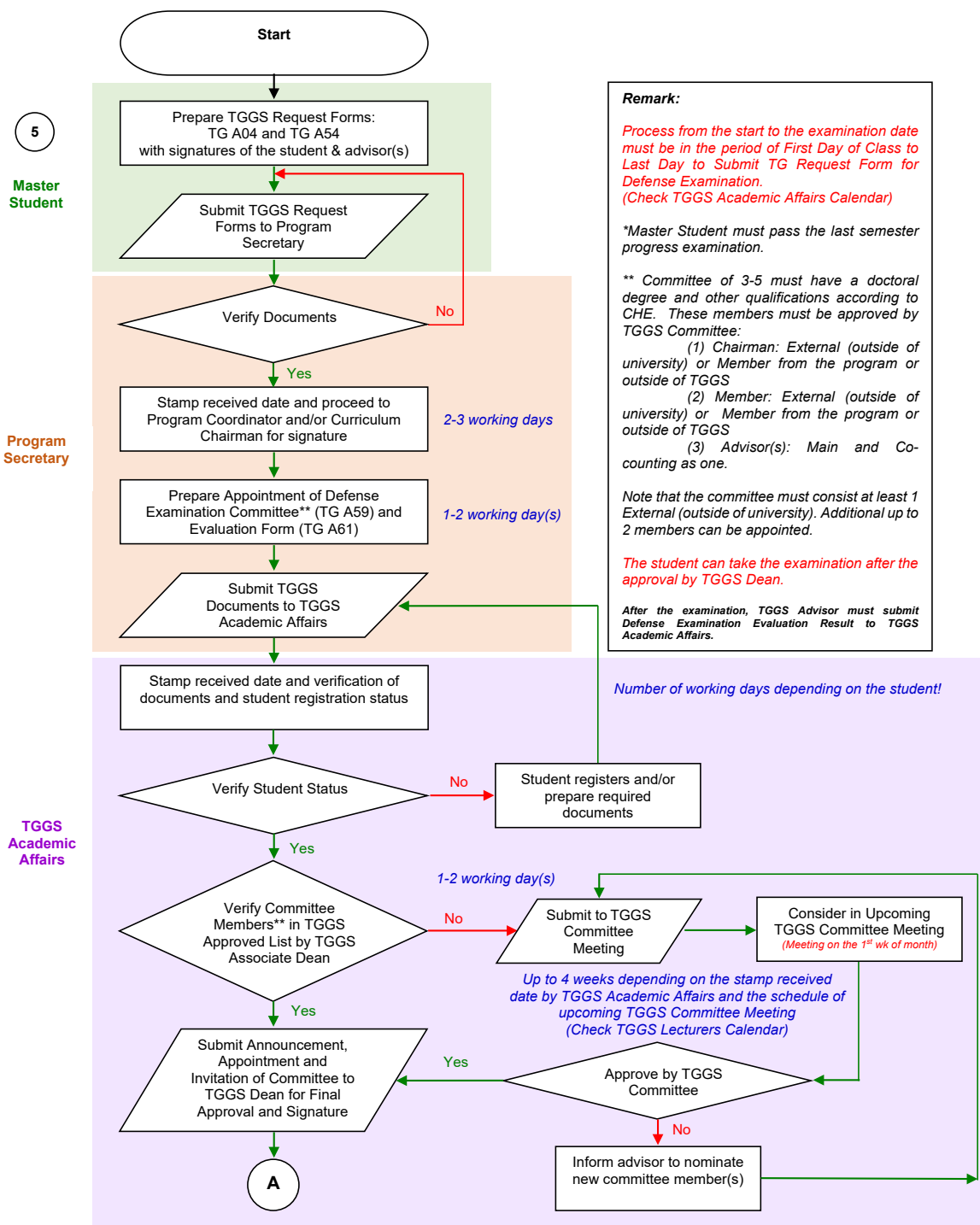




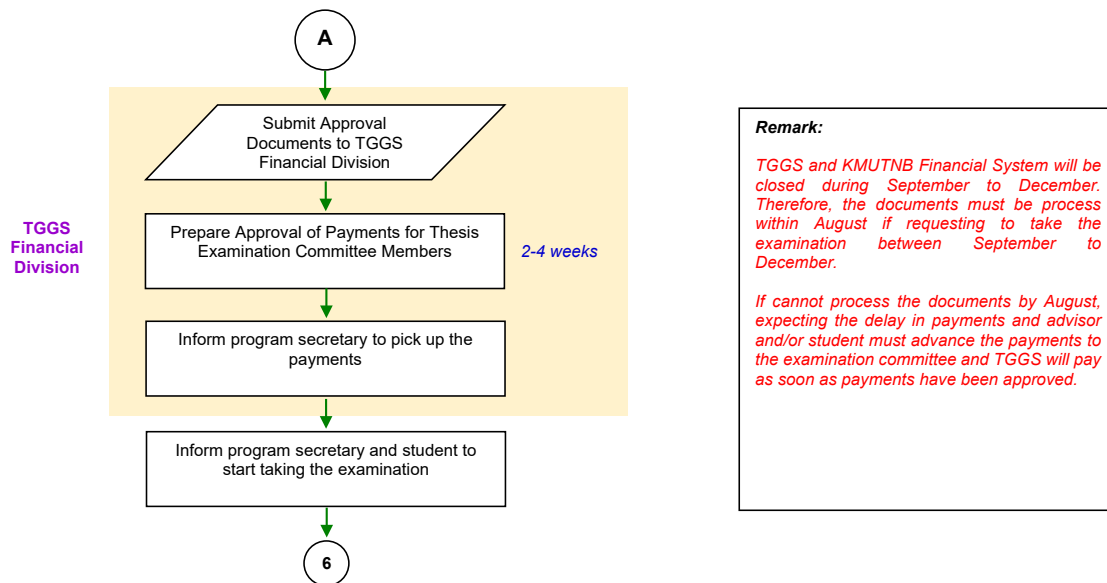
## Master Thesis Progress Examination (every semester that student register for thesis)



## Master Thesis Defense Examination (after passing the last semester Progress Examination)



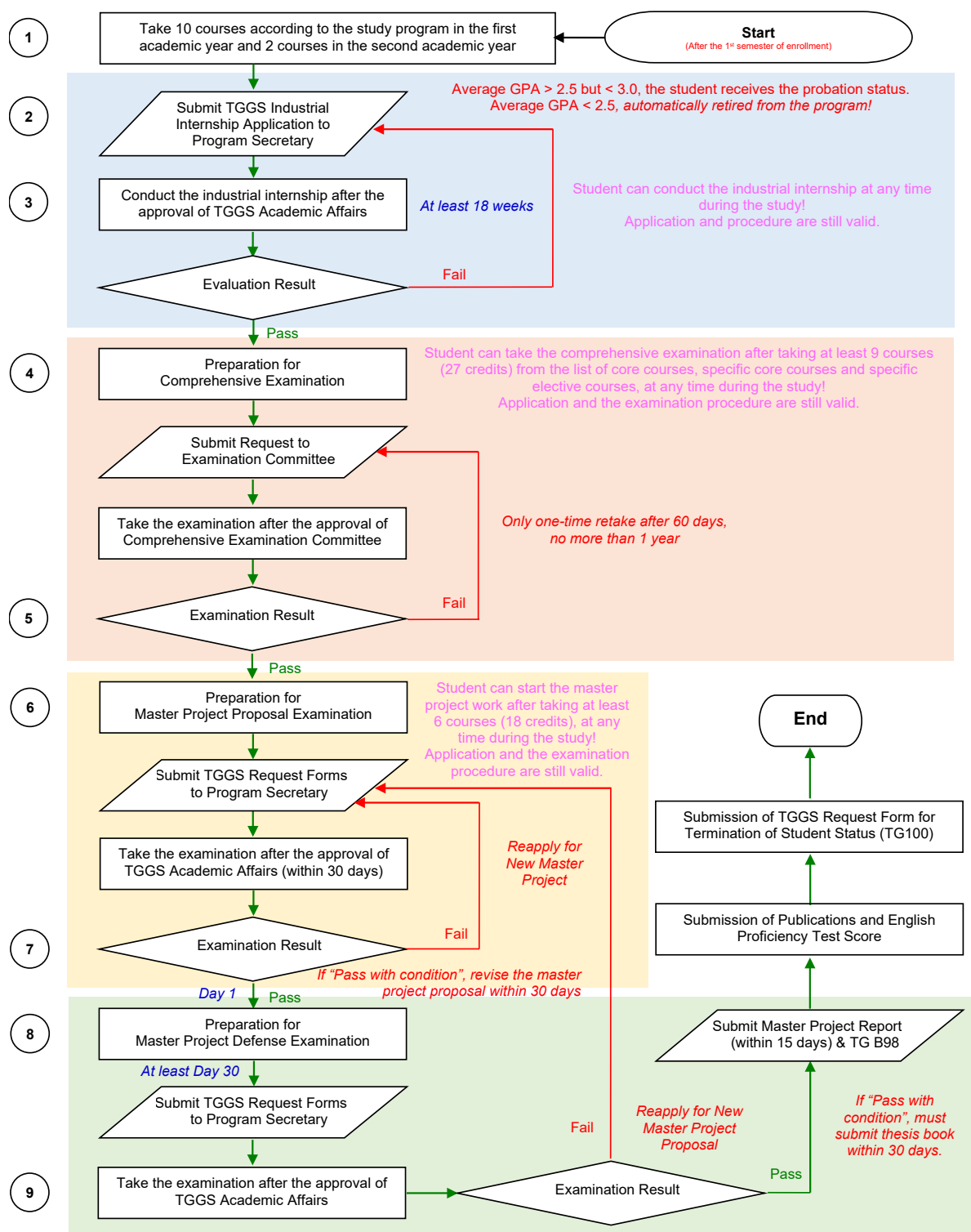
## Master Thesis Defense Examination (after passing the last semester Progress Examination)



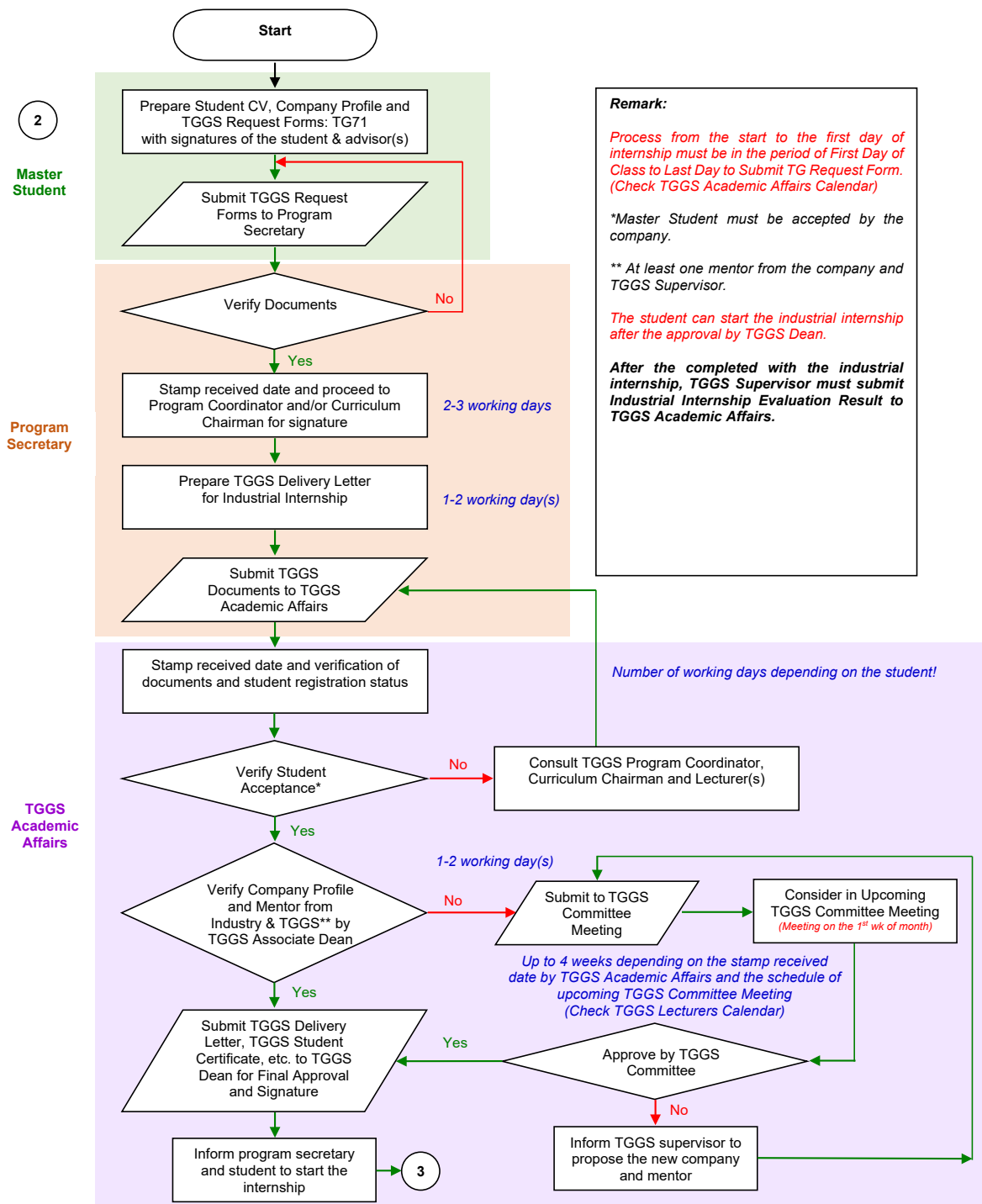
The complete document is available at <https://tggs.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process Plan-A1 20201026.pdf>.

## Study Plan B with More Coursework, Industrial Internship & Master Project for 2-Year Program (Student ID 63 onward)

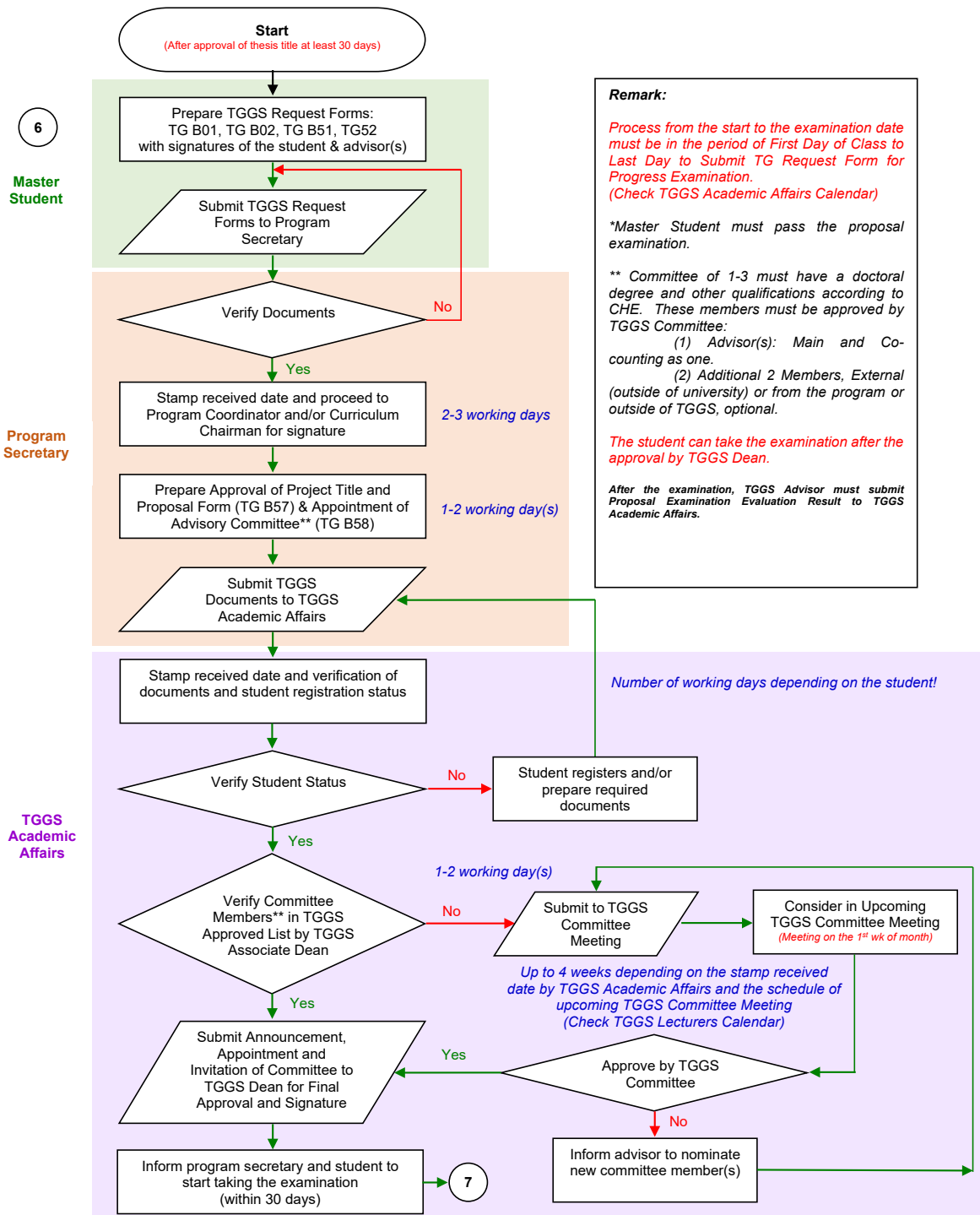
### MASTER STUDY PROCESS FLOW (Plan B Starting 2020)



## TGGGS Industrial Internship



## Master Project Proposal Examination



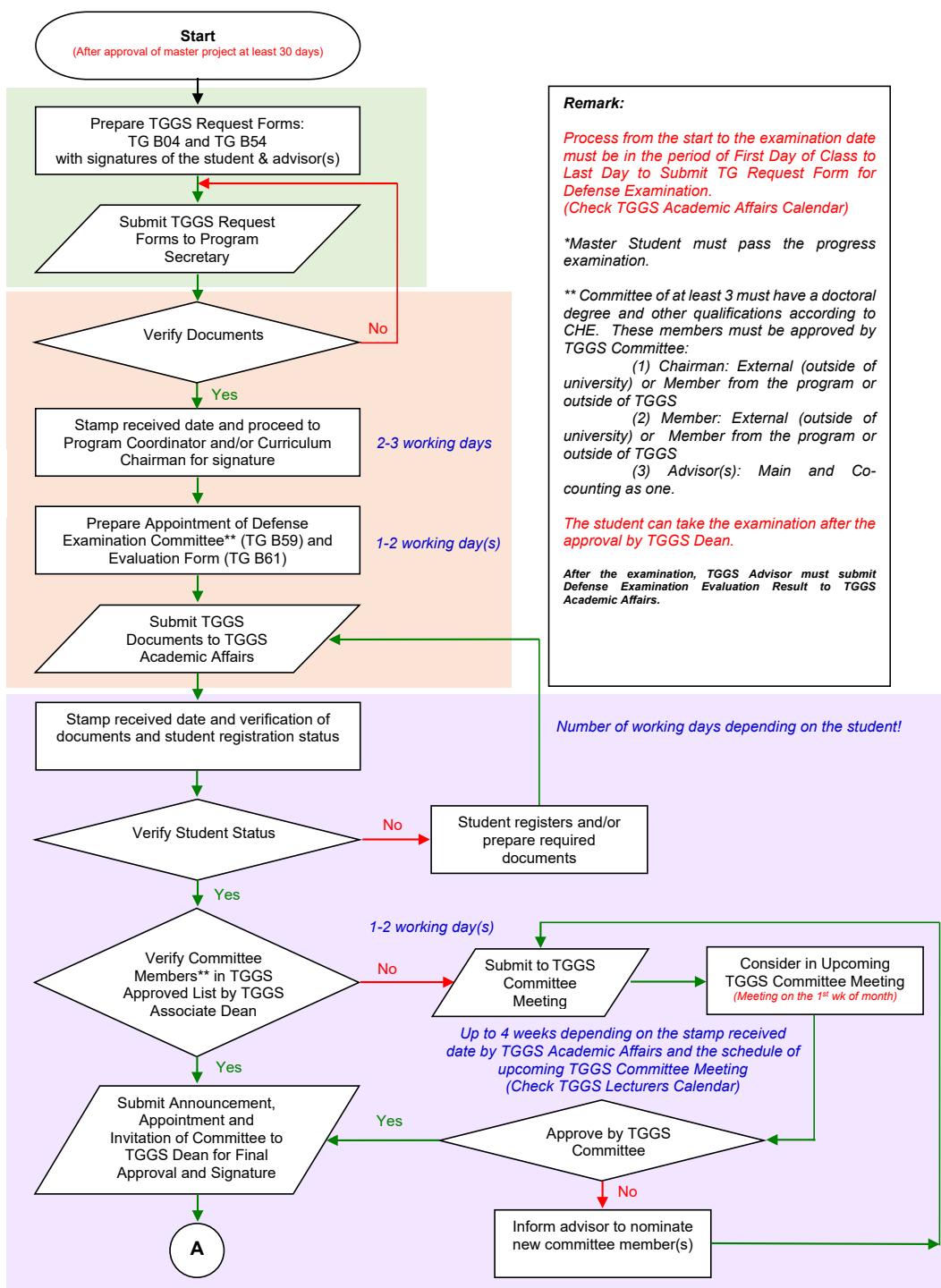
## Master Project Defense Examination (after passing Proposal Examination)

8

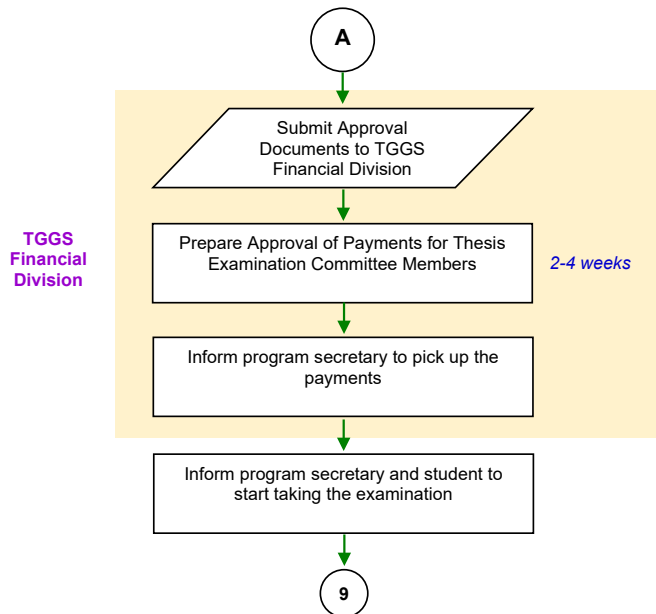
Master Student

Program Secretary

TGGS Academic Affairs



## Master Thesis Defense Examination (after passing Progress Examination)



### Remark:

*TGGS and KMUTNB Financial System will be closed during September to December. Therefore, the documents must be process within August if requesting to take the examination between September to December.*

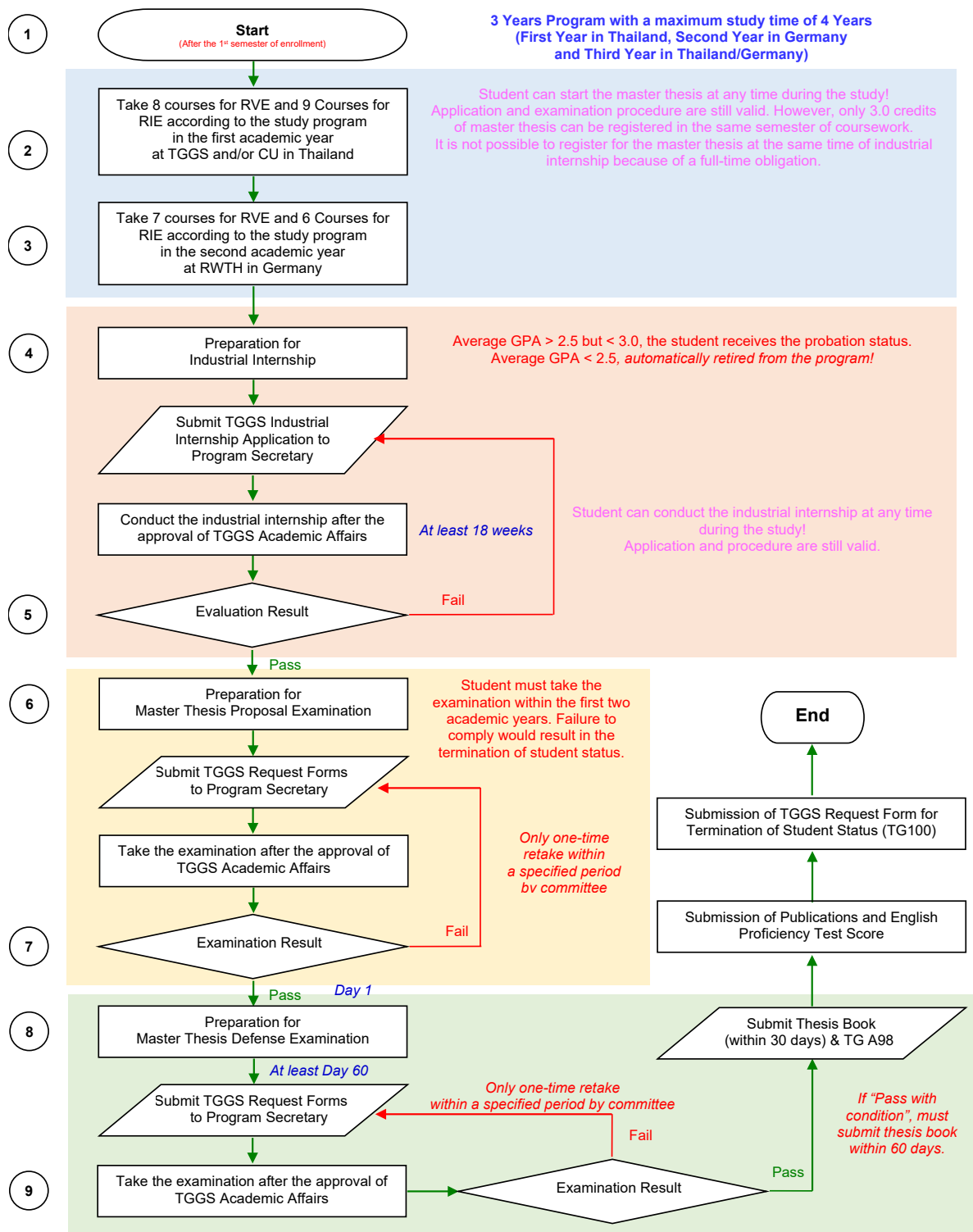
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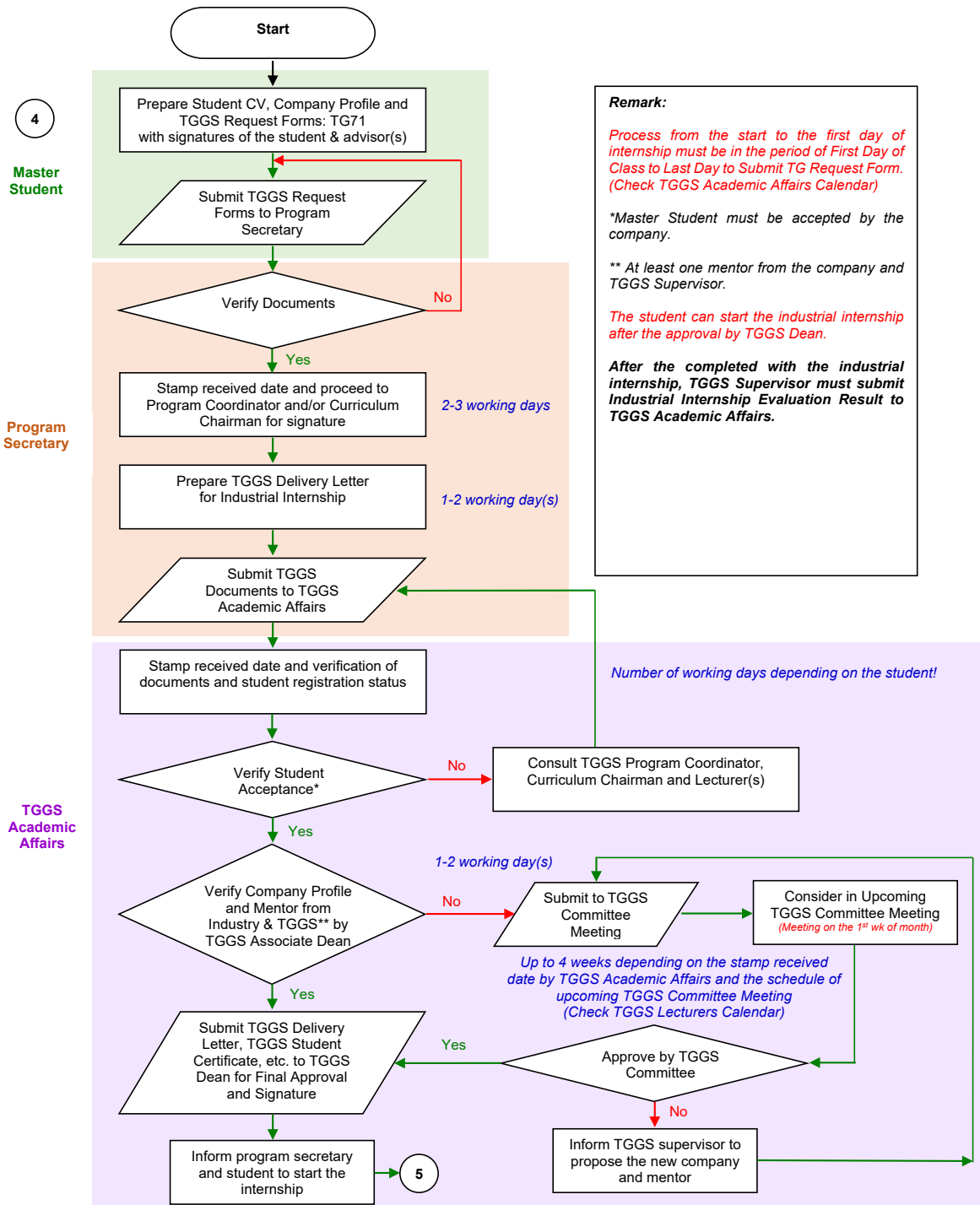


## Study Plan A2 in RVIE with Coursework, Industrial Internship & Master Thesis for 3-Year Program (Student ID 62 onward)

### MASTER STUDY PROCESS FLOW (RVIE Program Plan A2)



## TGGs Industrial Internship



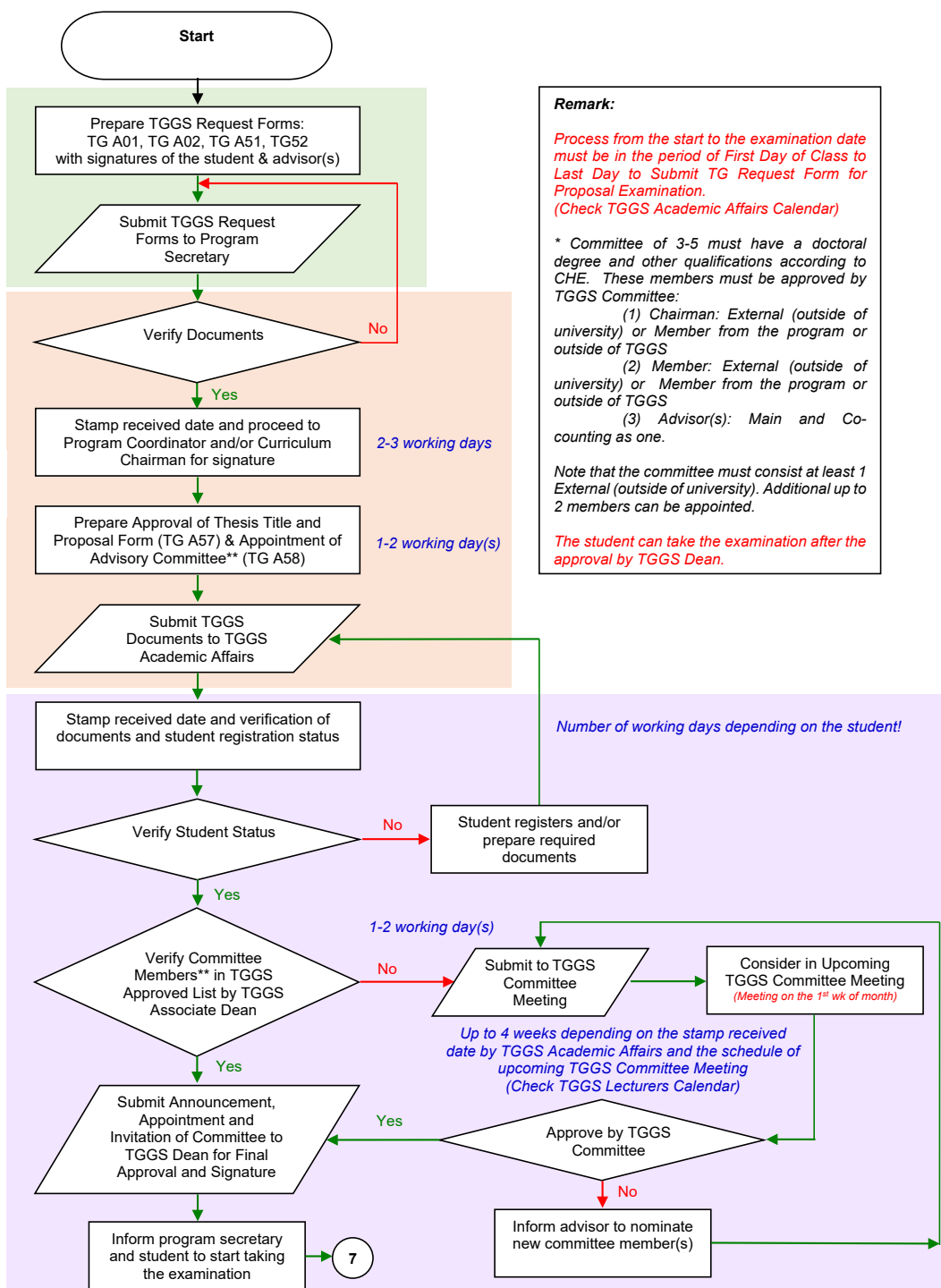
## Master Thesis Proposal Examination

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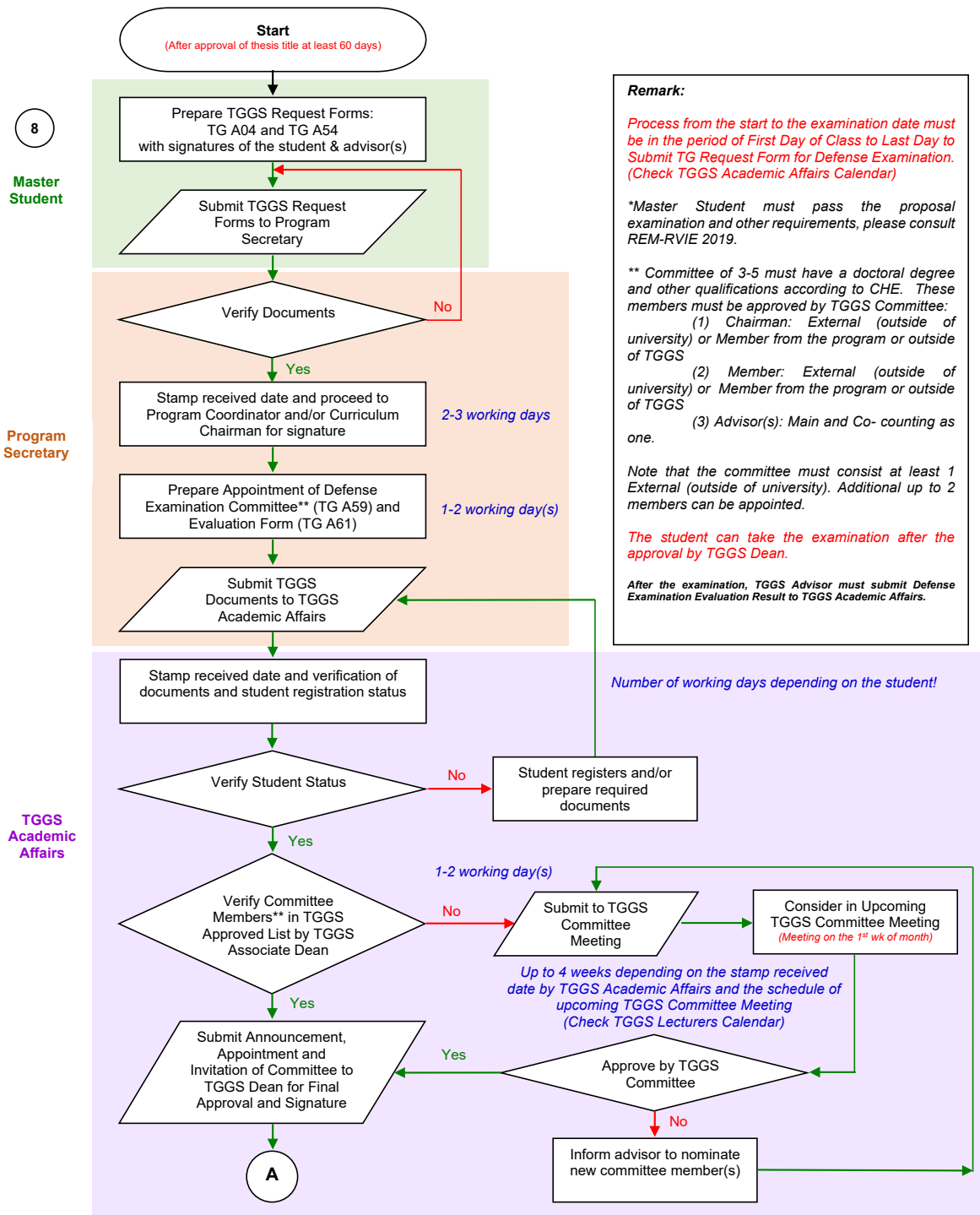
Master Student

Program Secretary

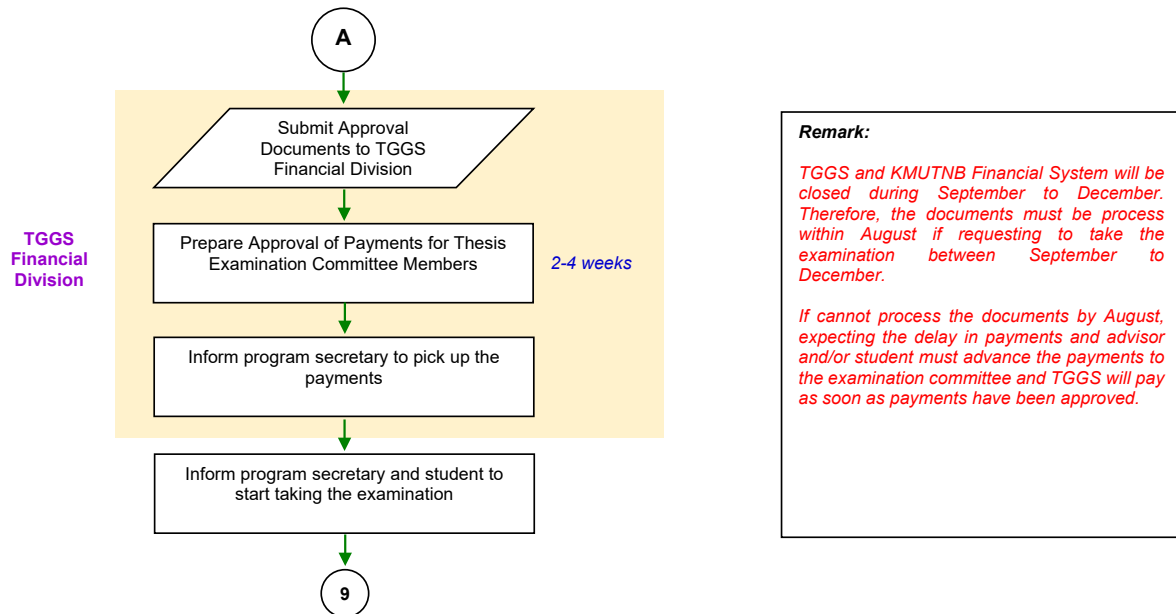
TGGS Academic Affairs



## Master Thesis Defense Examination (after passing Proposal Examination)



## Master Thesis Defense Examination (after passing Progress Examination)

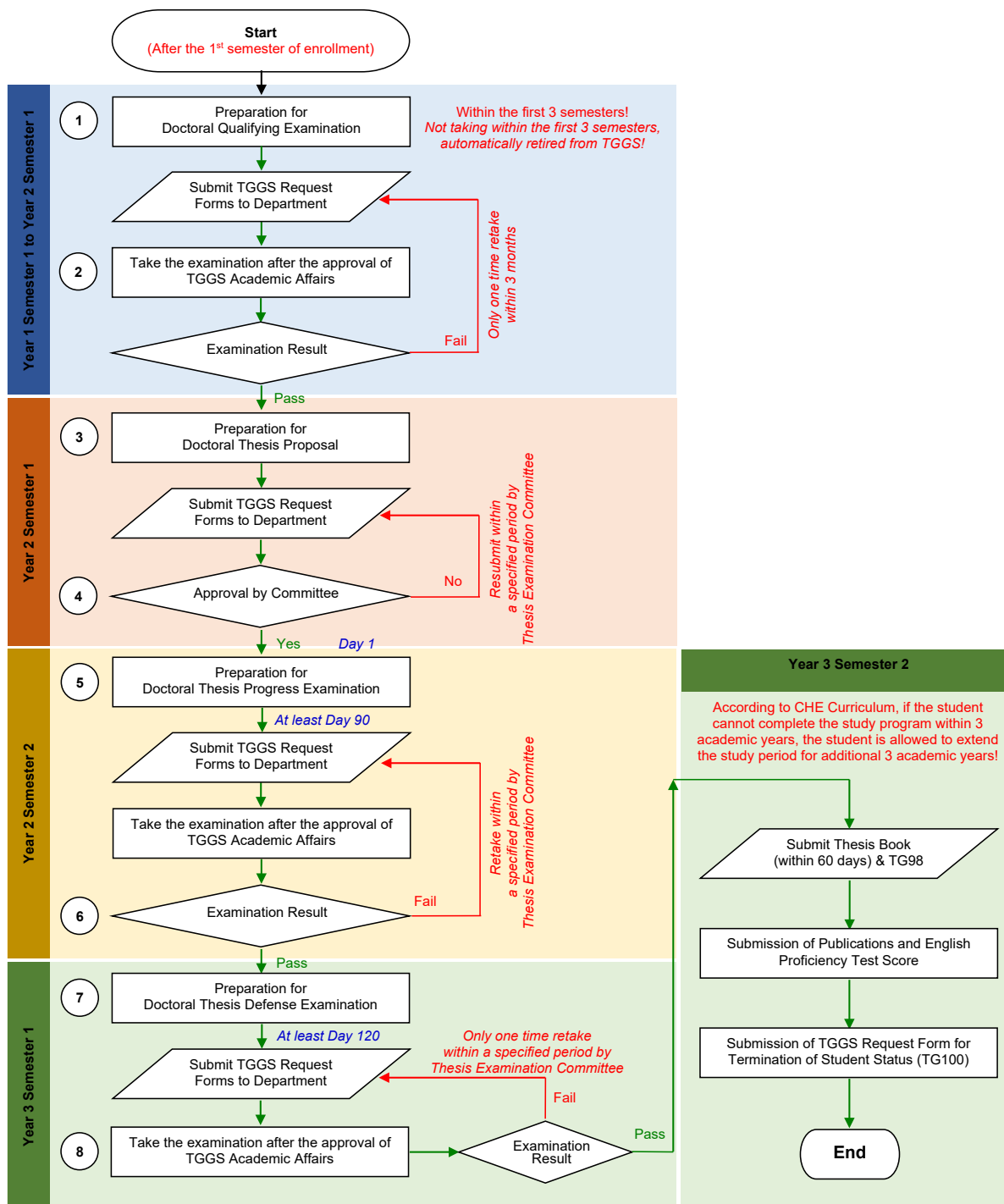


The complete document is available at <https://tggs.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process RVIE Plan-A2 Final 20201015.pdf>.

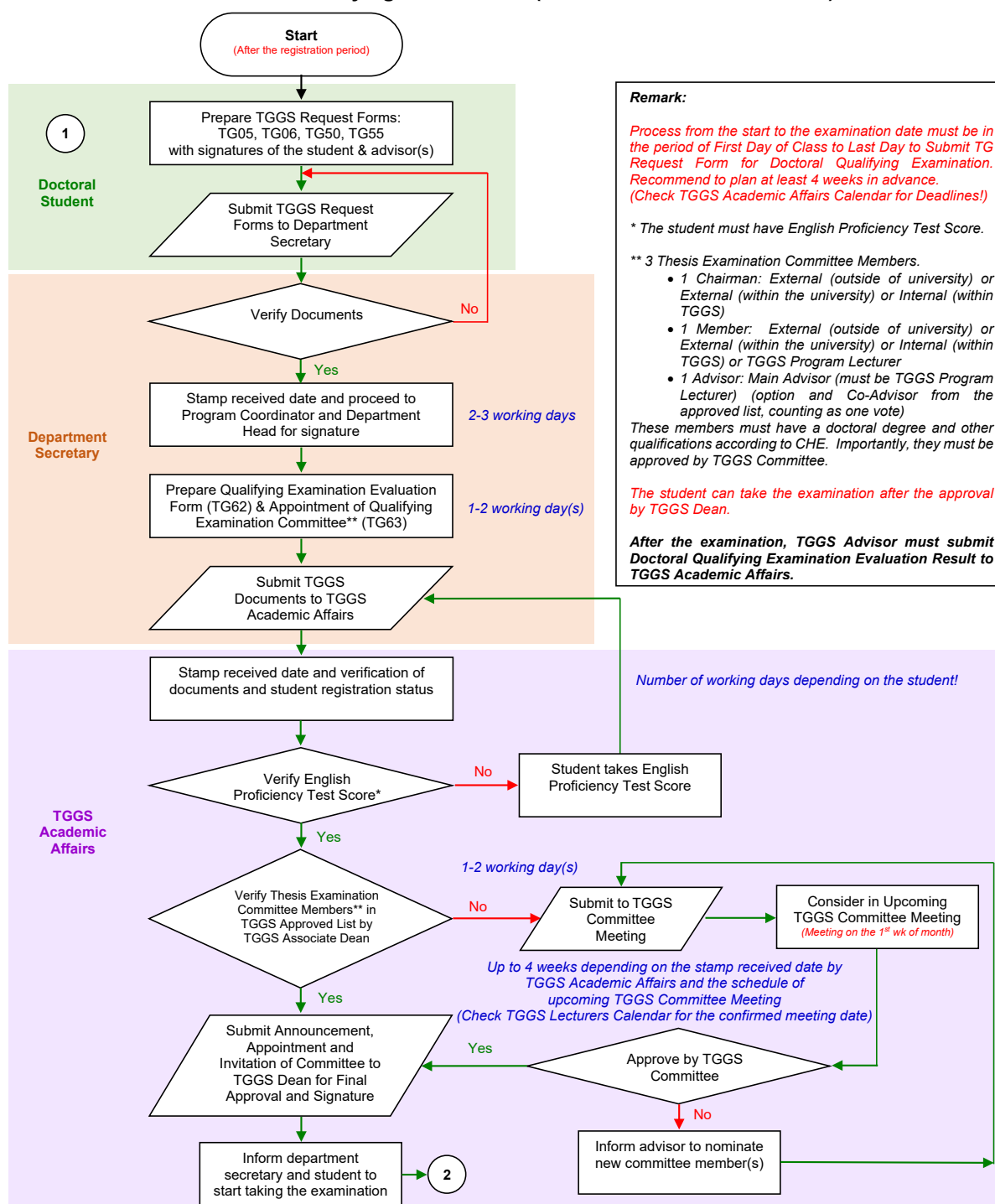
# DOCTORAL STUDY OVERALL PROCESS FLOW PLAN

## Study Plan 1.1 Only Research for Student with Master Degree Background

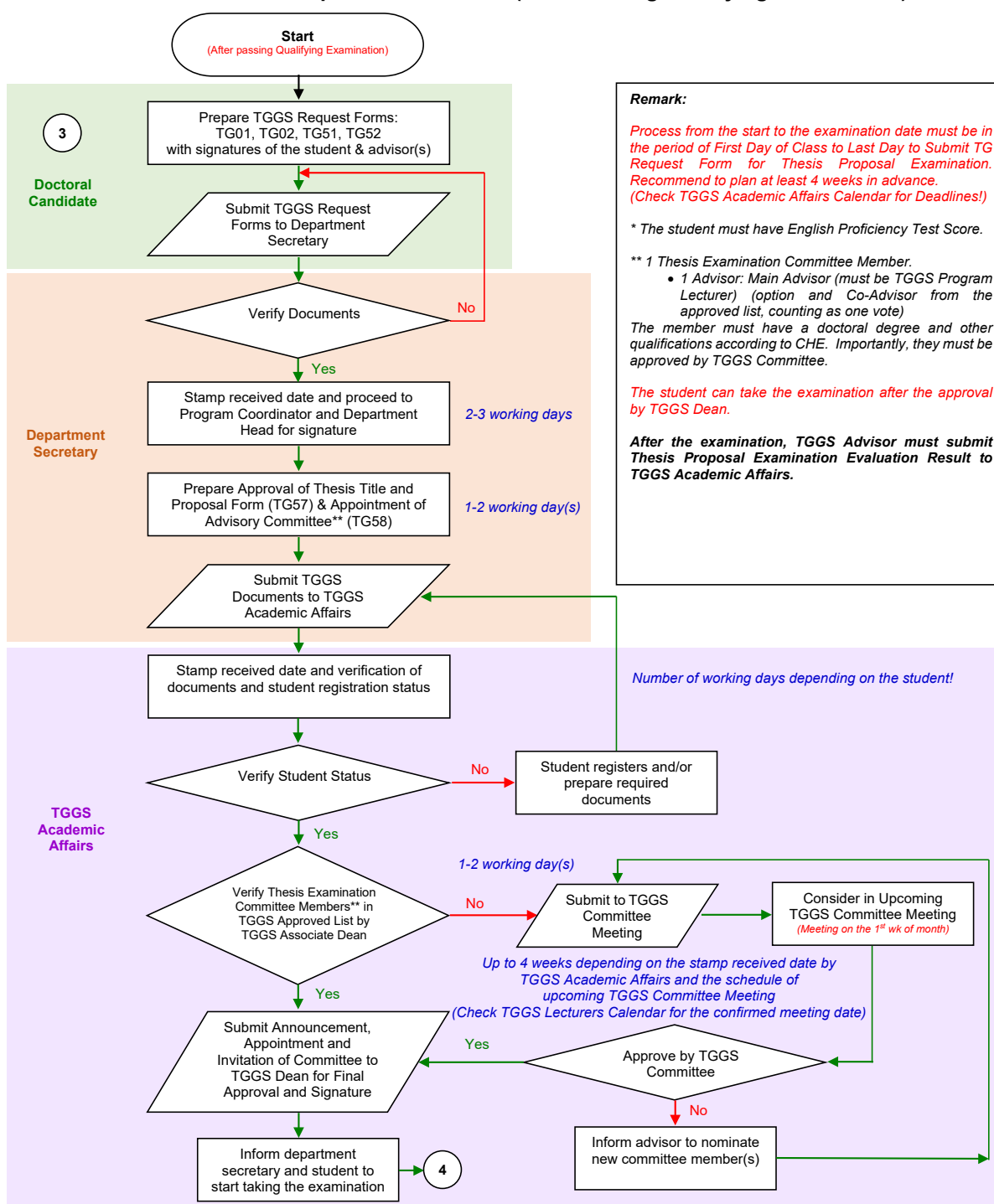
### DOCTORAL STUDY OVERALL PROCESS FLOW



## Doctoral Qualifying Examination (Within the First 3 Semesters)

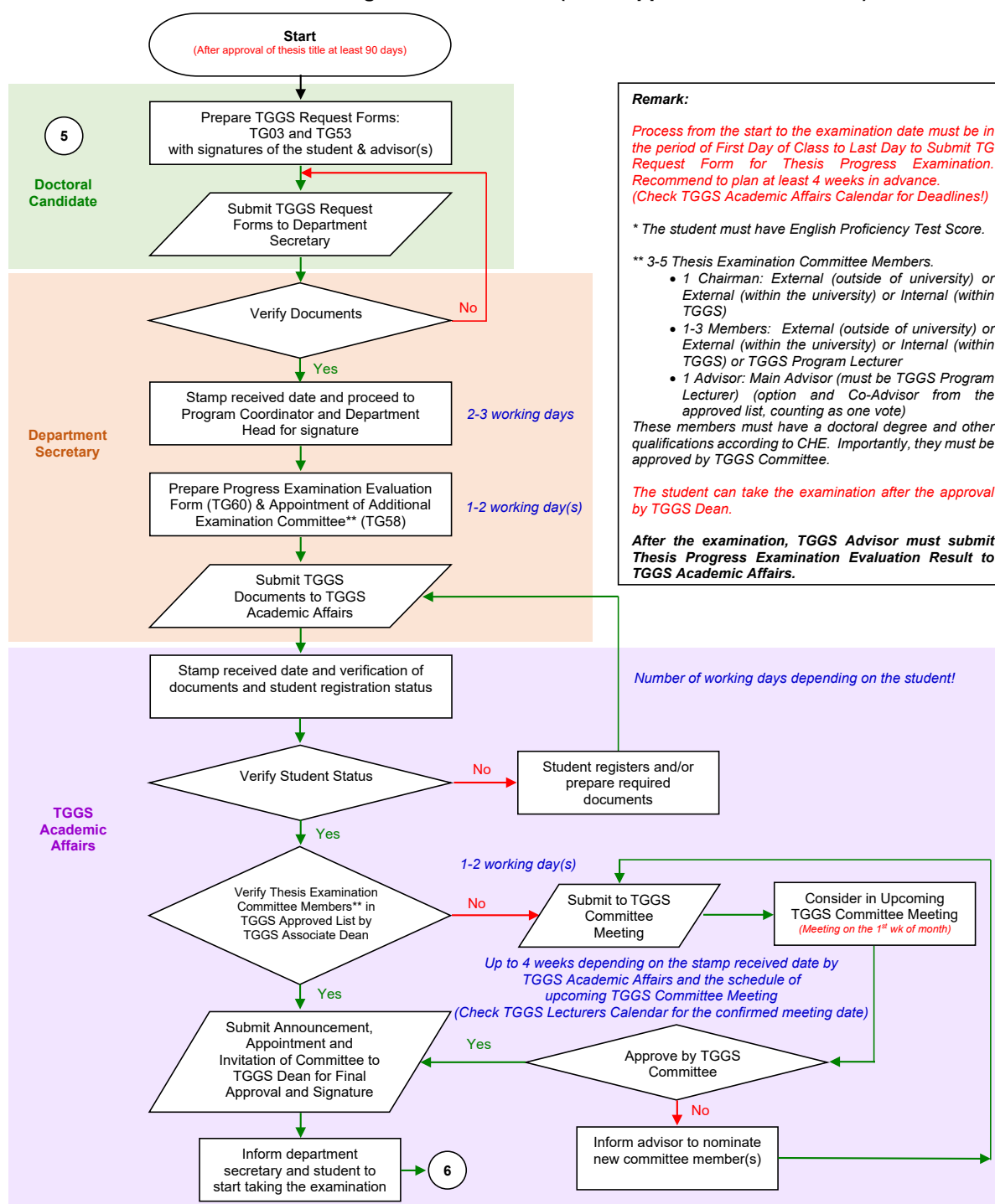


## Doctoral Thesis Proposal Examination (After Passing Qualifying Examination)

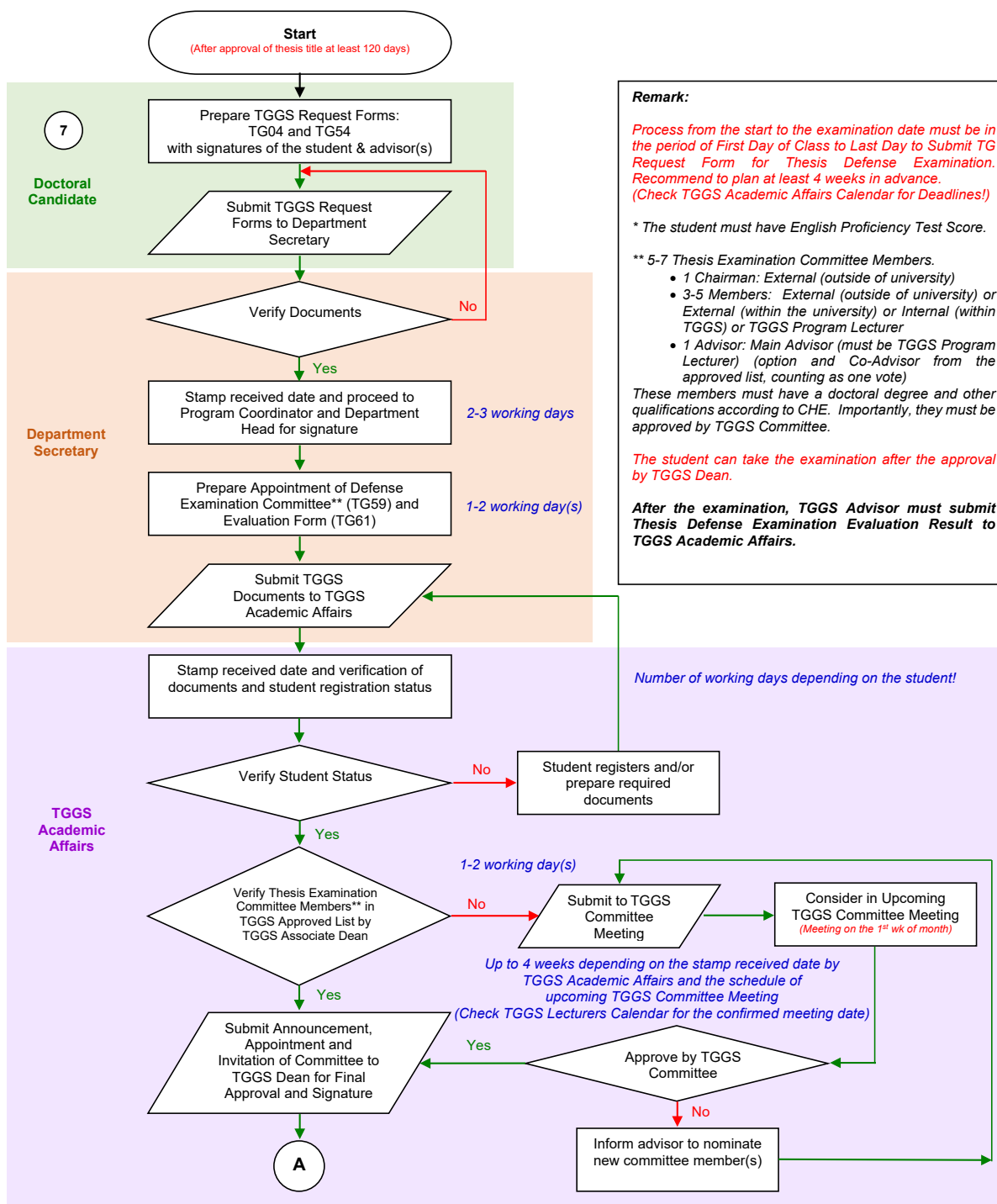




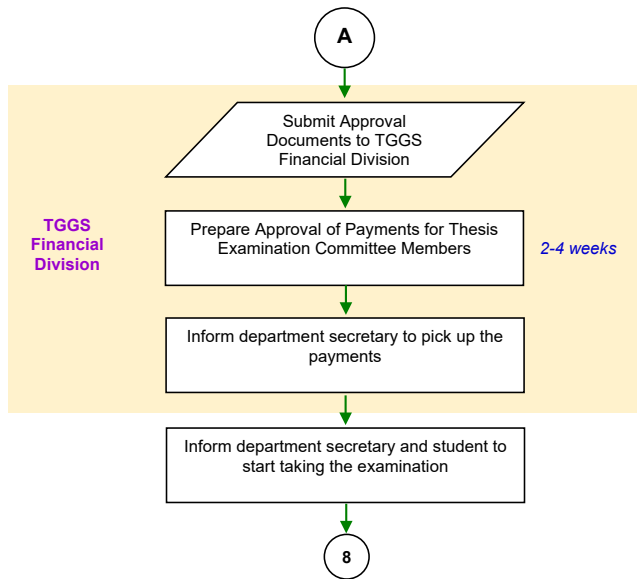
## Doctoral Thesis Progress Examination (After Approval of Thesis Title)



## Doctoral Thesis Defense Examination (After Passing Progress Examination)



## Doctoral Thesis Defense Examination (After Passing Progress Examination)



### Remark:

*TGGs and KMUTNB Financial System will be closed during September to December. Therefore, the documents must be process within August if requesting to take the examination between September to December.*

*If cannot process the documents by August, expecting the delay in payments and advisor and/or student must advance the payments to the examination committee and TGGs will pay as soon as payments have been approved.*

The complete document is available at <https://tgg.kmutnb.ac.th/wp-content/uploads/2019/04/03-Doctoral-Thesis-Process.pdf>.

# GUIDELINES FOR INTERNSHIP

## Internship Guidelines and Procedures for the TGGS International M.Eng. Courses in Engineering following the RWTH Aachen Model

The following guidelines are based on the common set of rules for engineering internships on the graduate level in the leading German Technical Universities (TU 9 Group) and approved by the standing conference of the Faculties of Engineering in the German system (Technical Universities).

- First Revision: August 2005, R.H. Jansen –
- Second Revision: March 2014, TGGS Committee –
- Third Revision: July 2019, TGGS Committee –

**Please note: All documentation for the internship file has to be prepared in English.**

### Introduction

In the context of developing industry-oriented engineering education on the Master's level in Thailand, the internship has to be an integral part of the course of study in the respective field of engineering. With the main focus on engineering innovation, science driven technology development and learning towards engineering leadership, engineering students have to be educated to come along with enhanced problem solving capability. In general, this kind of internship is aimed to widen the subject-related theoretical knowledge of the student through its practical application in a company, to achieve this by contributing to the solution of engineering problems in the workplace environment and to learn to understand the timing, economic and organizational boundary conditions for such work in a company. Because of this orientation of the internship and because of the benefits which participating companies should obtain from this, it is placed into the final year of the education just before the master thesis. In order to achieve the outlined objectives, the Master's level internship must build on an undergraduate internship or individual professional experience by which the student has obtained already a first industrial training. Further, in this graduate level internship, the student will be backed-up by his university supervisor (and his RWTH Aachen counterpart, if necessary) regarding technical know-how in the respective engineering field, by which mechanism, university – industry links in Thailand will be strengthened as a side effect.

In detail, the students have to conduct technical work with duration of at least 18 weeks under supervision of suitable engineering staff (industry mentors) in the hosting company in order

- 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
- 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,
- to learn to contribute to the development, production and quality assurance of goods, components and systems in the field of study,
- to become acquainted with 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 and 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.

## **Content**

In contrast to the basic internship during undergraduate studies, the graduate level internship during the last part of the Master's study serves to make the student familiar with career-specific and advanced engineering activities in an enterprise.

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 supervisor, if activities shall be covered which are not listed as standard topics. Such non-standard topics have to be approved in writing by the TGGs course coordinator

## **Supervision**

The internship should be supervised carefully in order to be as effective as possible. For this purpose, the university (the course coordinator) as well as the company nominate a supervising staff member/mentor responsible for the student's guidance and performance.

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 a 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.

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 judgement of the student's performance. The TGGs Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department 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 judgement), 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.

## **Enterprises**

Because of its important role in cooperative education on the master's level, the enterprise for an internship should be chosen carefully. 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.

Trade companies, computer shops are not suited and do not qualify for the prevailing internships. Enterprises owned or managed by a student's family member do not fulfill the requirements either, unless exceptionally approved by the TGGs Committee.

Government research centers and research labs at university aboard (MoU university with TGGs) are possible if the internship project is a part of or related to the industrial project. However, it must be approved by TGGs Committee prior starting the industrial internship. Only the internship at RWTH-Aachen University is accepted without the approval from TGGs Committee.

## **Reporting**

During the internship, two reports have to be prepared: A technical report (TGGs Industrial Internship Report) and a daily list of activities as work record (TGGs Internship Weekly Report).

The technical report (like a mini thesis with introduction, technical content, results and summary) has to be written by the student him/herself to document the engineering work, problem solving and development results of the internship in order to learn to present technical facts. It can describe processes, facilities, tools, etc. and include notes about his experiences and activities. Sketches, workshop drawings and circuit diagrams are often more descriptive than a longer text. The use of photocopies and company brochures as well as other imported material should be avoided. If necessary and unavoidable, such material should be included into a separate appendix of the technical report. The text (maximum of 30 pages) should mainly refer to the activities that the author has carried out by him/herself.

In addition to the technical report, a list of the daily activities carried out (e.g. summarized each month day by day in an excel table) and the time used to conduct them has to be filed and is a necessity for the evaluation of the internship. The total work record should be comprehensive, precise and clear.

At completion of the internship, the industry mentor in the respective company should sign the technical report and complete list of daily activities, then issue and sign the final company internship reference and judgement letter (ca. 1 page length). When later looking for qualified employment, the company reference letter also will be a useful document for the student's job applications.

## **Internship Reference Letter and Final Approval**

As outlined already, in order to recognize the internship activity of the student as part of his master studies, a reference from the enterprise (the responsible industry mentor) is required. This reference letter must contain

- personal information of the student (first name, family name, date and place of birth)
- name of the company, the department and the company location
- time and overall duration of the internship and the number of days absent
- short description and duration of the student's internship tasks
- a brief evaluation and judgement of the student's work and of the content of the technical report.

The internship as an integral part of the TGGs Master's course will only be accepted and approved if the following requirements are fulfilled:

- it is related to the engineering field of study and can be related to the specific list of topics relevant for the course
- it is performed as full time work (part-time internships are not accepted)
- the company fulfils the minimum requirements as defined in these guidelines
- the number of days absent are less than 3% of the internship duration (even caused by illness of the student), otherwise the internship has to be extended to compensate for the time absent
- the technical report, daily activities list as work record, and the company reference letter have been checked and countersigned by the university supervisor
- the student has given a 20 min. presentation on his internship activities, time and location to be agreed with his supervisor (e. g. in the frame of a seminar in the respective TGGs technical group to promote soft skills)
- the TGGs Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department has made the final check for completeness and formal correctness of the internship documents.

## **Contract**

TGGs and the companies participating in the Co-operative Engineering Education program will usually confirm their mutual responsibilities in a brief letter of agreement, unless the enterprise is a proven TGGs partner anyway (who is already familiar with this internship system).

Alternatively or additionally, the relations between the company and the student during the internship may be regulated by a specific internship employment contract, which determines all rights and duties of the student and the company.

On the demand of the enterprise, confidentiality regarding sensitive company issues like Intellectual Property should be agreed upon in a separate Nondisclosure Agreement (NDA) to be signed by the company, the university supervisor and the internship student.

## **Insurance**

With respect to insurance, the legal status of the student may be of importance. Since the practical activity during the internship in a company is a firm part of the Master's level curriculum, he/she maintains the legal status of a student for which a medical insurance, accident insurance and third-party liability insurance is part of the university registration.

Additional health and/or accident insurance during internship may be provided by the enterprise as part of the employment situation (or specific contract) into which the internship student enters.

## **Miscellaneous**

As some of the Master's students may have passed a phase of professional engineering employment already following their Bachelor's degree, the recognition of this professional experience-instead of conducting the Master's level internship as outlined here – can be considered as an exception. In such case it is the responsibility of the university supervisor to check the equivalency and consistency of this previous professional experience with the guidelines. In order to approve such an exception, the supervisor has to evaluate in detail the company references (profile of the company, employment references of the student, etc.) forwarded by the student, have an interview on this with the student and justify the exception in a detailed written statement to the TGGGS Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office. In order to develop or improve soft skills, the student should give an oral presentation about his/her work experience in a TGGGS seminar to his/her supervisor and the other students in his/her Master course. This statement of equivalency will become part of the student's study file to serve as a substitute for the usual internship documentation.

The TGGGS Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office continually updates and keeps a list of companies qualifying for internships as defined in these guidelines. Based upon this and upon consultation with his prospective university supervisor, the student is responsible him/herself to choose and find an adequate company, enter into the internship and fulfill the internship regulations and requirement as outlined here. The university staff engaged in the TGGGS Master courses will provide their support for this, if necessary. In case the student proposes to his supervisor a company of his own choice willing to accept him/her, he has to provide the necessary company profile and information material, which allows the TGGGS Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office in consultation with the supervisor to decide whether the chosen company is qualified as an internship partner and will be listed as such by the TGGGS Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office.

## **Internship Timing Schedule**

- In order to acquire additional theoretical background on the Master's level, the student must have completed the lectures (have passed the examinations) of the first and second semester, before entering into the internship.
- Generally, internships can be conducted in the August term or in the January term, depending on the start term of the respective TGGGS Master's course and on the student's progress.
- Before the end of the semester preceding the internship semester (i.e. ca. 2 months before the start of the internship), the student should make him/herself familiar with the internship guidelines at the TGGGS Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office, should select his favorite field(s) of technical activity and consult on this with one of the TGGGS university supervisors.
- The university supervisor recommends one or more suitable qualified companies and, if necessary, supports the student's internship application(s) to these companies. However, it is finally the student's responsibility to choose and find a qualified company.
- One month before the start of the internship, the firm approval of the respective company should have been obtained and an industry mentor should have been nominated by that company in accordance with the guidelines.
- During this month, the university supervisor and the industry mentor will meet (preferably in the company) or at least communicate to discuss and define in more detail the internship activity (Internship Project), write down a brief note on this to be kept in the student's internship file and hand out a copy of this to the student.
- During the 18 weeks internship itself, technical progress is reported and the daily list of activities is filed as outlined in the guidelines. Ca. 2 – 4 weeks after the start of the internship, the student has to see his university supervisor to give him/her a feedback on how his technical work picked-

up is moving on and if there are any problems seen. Later, closer to the end of the internship, the university supervisor will at least make one visit to the company and consult with the industry mentor on the status and finalization of the internship activities. This is the time also to discuss a possible follow-up Master's thesis project. At the end of the student's 18 weeks stay, the industry mentor provides his company reference and judgement letter after having checked and initialed the internship technical report and list of activities (work record).

- Close to the end of the internship, the student fixes with his university supervisor the date/location for his internship presentation to be given in the frame of a seminar in his TGGs Master's course. Immediately after the internship, the student delivers his technical report, list of daily activities and company reference letter to the university supervisor.
- Within two weeks after the end of the internship, the supervisor provides his judgement and approval statement (or disapproval) and passes on the internship file to the TGGs Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office which will check the file and issue the final approval sheet, if all conditions are met.
- Successful completion of the internship is a prerequisite for starting the Master's thesis project. The topic and task description for the Master's thesis project will not be handed out to the student (and thus the thesis work cannot be started) before the internship file has been closed (final approval sheet) by the TGGs Academic Affairs for Industrial Internship in conjunction with Program Coordinator and Department Office.

Note that the Brief TGGs Internship Outline for Industry Mentors for the TGGs International M.Eng. Courses in Engineering following the RWTH Aachen Model will be sent to industry mentors directly.



## Summary of Internship Procedure

- Step 1: The student prepares his/her CV.
- Step 2: The student consults with a TGGs lecturer to find an interest internship company. Note that the qualification of company according to the guideline procedure of TGGs must be satisfied. The student sends an application for the internship to the company. If the company accepts the student, the student and the lecturer discuss the scope and description of the internship project with the company's supervisor. When the company and the student have met an agreement, the internship can be started.
- Step 3: Before starting the internship, the student must submit the TGGs Request Form for Internship Application and Delivery Letter (TG71) to Program Secretary. Then, the student takes the delivery letter issued by TGGs Academic Affairs to the company.  
(See the TGGs Request Form for Internship Application and Delivery Letter (TG71). The request form basically consists of TGGs application letter and CVs, more documents can be attached if needed. The signature of the TGGs advisor is considered as a confirmation that the company has offered the internship place. If the student needs a letter for applying VISA to do the internship aboard, please tick the option in the form.)
- Step 4: The student performs the internship at the assigned company for a given period and follows the internship guideline. Along to the internship, the student prepares the weekly task report to be attached with the final report. During the internship, additional process, e.g. progress report, can be implemented depending on the TGGs lecturer.
- Step 5: The student must submit the TGGs Request Form for Internship Report Submission and Access Restriction (TG73) and the internship report (hard copy along with soft copy) including other required documents as stated in the form when returning back to Program Secretary within two months.  
(See the TGGs Request Form for Internship Report Submission and Access Restriction (TG73), TGGs issues an appreciation letter and sends it to the company.)

**\*\* Note that internship in research center and university aboard must be approved by TGGs Committee prior starting the industrial internship. Only the internship at RWTH-Aachen University is accepted without the approval from TGGs Committee.**

### ***Related documents for internship***

1. TGGs internship guidelines
2. CVs (prepared by student)
3. Internship application and delivery form → Application letter (TGGs)  
→ Delivery letter and VISA application letter (TGGs)
4. Internship report template
5. Internship report submission form → Appreciation letter (TGGs)
6. Internship report including weekly work record and evaluation sheet

### ***Important Remark:***

The student must complete at least 18 weeks of industrial internship with 4 KMUTNB credits or 30 ECTS. The evaluation/assessment result of the industrial internship is in the form of Letter Grade as S or U. If the student cannot submit the report within two months after the ending date of industrial internship work, the student will receive Ip.

Assessment	Performance's Quality
S	Pass / Satisfactory
U	Fail with inadequate achievement / Unsatisfactory
Ip	Incomplete / In-progress

The student must submit the internship report (hard copy along with soft copy) after the ending date of industrial internship work within two months. Therefore, the student must submit TGGs Request Form for Internship Report Submission (TG73) along with the following documents:

- (1) Internship Report; (2) Weekly Report; (3) Evaluation Form; and (4) Internship Reference Letter.

## Guideline for Internship Exception

According to Internship Guidelines and Procedures for the TGGs International M.Eng. Courses in Engineering following the RWTH Aachen Model (2014),

The Master's students who have passed a phase of professional engineering employment already following their Bachelor's degree, the recognition of this professional experience-instead of conducting the Master's level internship can be considered as an exception.

The exception qualifications are reviewed by the TGGs Academic Affairs and the TGGs Internship Committee and approved by TGGs Committee in the following aspects:

1. Professional Engineering Employment:
  - 1.1. Following the Bachelor's degree
  - 1.2. Minimum of 2 years at the same enterprise
2. Qualified Enterprises:
  - 2.1. Engineering and Technology-related industry with a sufficient number of engineers (minimum of 5).
  - 2.2. 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.
3. Area of Work Experience:
  - 3.1. Development and industry-oriented research, simulation and design (in particular CAD, Computer-aided Design), conceptual planning, construction, production, assembly, machine operation, maintenance and testing.
  - 3.2. Related to the program study at TGGs

The students must submit the request to TGGs Academic Affairs Office and provide all supporting documents to TGGs Academic Affairs Office in conjunction with Program Coordinator and Department Office. Summary procedure is as follows:

- Step 1: The student prepares his/her CV including the company references (profile of the company, employment references of the student, etc.).
- Step 2: The student must submit the TGGs Request Form for Internship Exception (TG74) to Program Secretary with the consent of the program coordinator two months in advance by the beginning of the second semester of the first academic year.  
(See the TGGs Request Form for Internship Exception (TG74). The request basically consists of CVs, the company references, more documents can be attached if needed.)
- Step 3: After the documents have been reviewed by the TGGs Internship Committee who consists of Associate Dean for Academic Affairs, Associate Dean for Industrial Collaborations, Department Head, Program Coordinator and Program Lecturers, see the Appointment of TGGs Internship Committee (TG75), the date for the oral presentation about his/her work experience will be scheduled.
- Step 4: One month prior the presentation date, the student must submit the presentation handouts along with the internship report to the TGGs Internship Committee to review.
- Step 5: The student can give the oral presentation about his/her work experience in a TGGs seminar to his/her supervisor and the other students in his/her Master course on the date scheduled by TGGs Internship Committee. TGGs Internship Committee will evaluate the student performance according to the internship guidelines and procedure; see TGGs Internship Exception Evaluation Form (TG76)
- Step 6: After the student passes the oral presentation and the internship report has been approved by the TGGs Internship Committee, the student must submit the TGGs Request Form for Internship Report Submission and Access Restriction (TG73) and the internship report (hard copy along with soft copy) within two weeks.  
(See the TGGs Request Form for Internship Report Submission and Access Restriction (TG73), TGGs issues a TGGs Internship Exception Letter (TG77).)

# GUIDELINES FOR MASTER PROJECT

## Summary of Master Project Process Procedure (Plan B for Student ID 63 onward)

Step 1: The student prepares the following TGGs Request Forms:

1. Application for Master Project Proposal Examination (TGB01)
2. Application for Appointment of Master Project Advisory Committee (TGB02)
3. A Proposal for a Master Project Presented to TGGs (TGB51)
4. Advisor's Professional Qualification (TG52)

The student and advisor(s) must sign all forms.

Step 2: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Proposal Examination Evaluation form (TGB56), the Approval of Master Project Title and Proposal form (TGB57) and the Appointment of Advisory Committee (TGB58).

Step 4: The student can take the Master Project Proposal Examination as dated in the TGB57 form and the Master Project Period starts counting as Day 1. The student will have 30 days to complete the Master Project work according to the REM 2020.

Step 5: The Master Project Defense Examination must be taken at least 30 days after passing Master Project Proposal Examination.

1. Application for Thesis Defense Examination (TGB04)
2. Thesis Defense Examination (TGB54)

The student and advisor(s) must sign all forms.

Step 6: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 7: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Appointment of Defense Examination Committee (TGB59) and the Defense Examination Evaluation form (TGB61).

Step 8: The student can take the Master Project Defense Examination as dated in the TGB04, TGB54 and TGB59 forms.

Step 9: The student must submit the Master Project Manuscript (1 Manuscript) and the Approval Form for Master Project Manuscript (TGB99) after the Master Project Defense Examination date to the Program Secretary by the following deadlines:

1. No more than 15 days\*: Pass the Master Defense Examination without revision
2. No more than 30 days\*: Pass the Master Defense Examination with revision

The student who wishes to restrict access to thesis, please complete and submit the Application for Master Project Access Restriction (TGB98) on the same day that submit the thesis. Afterward, this application will not be considered.

### Remarks:

\* Master Project Defense Examination Committee have the right to state different deadlines but not more than those stated number of days.

\*\* Note: If the student fails the Master Project Defense Examination, the student must follow the instruction written in the REM. For further information, please consult the REM 2020.

\*\*\* For further information, please consult the REM 2020 at <https://tgg.kmutnb.ac.th/exam-regulation-master-2020> and Master Study Overall Process Flow Plan B [ID 63 onward] at [https://tgg.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process\\_Plan-B\\_Final\\_20201015.pdf](https://tgg.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process_Plan-B_Final_20201015.pdf).

## GUIDELINES FOR MASTER THESIS

### Summary of Master Thesis Process Procedure (Plan A2 for Student ID 59-62)

Step 1: The student prepares the following TGGs Request Forms:

1. Application for Thesis Proposal Examination (TGA01)
2. Application for Appointment of Thesis Advisory Committee (TGA02)
3. A Proposal for a Thesis Presented to TGGs (TGA51)
4. Advisor's Professional Qualification (TG52)

The student and advisor(s) must sign all forms.

Step 2: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Proposal Examination Evaluation form (TGA56), the Approval of Thesis Title and Proposal form (TGA57) and the Appointment of Advisory Committee (TGA58).

Step 4: The student can take the Master Thesis Proposal Examination as dated in the TGA57 form and the Master Thesis Period starts counting as Day 1. The student will have 6 months to complete the Master Thesis work according to the REM 2017.

Step 5: The Master Thesis Progress Examination must be taken at least 30 days after the approval of Master Thesis Title. The student prepares the following TGGs Request Forms:

1. Application for Thesis Progress Examination (TG03)
2. Thesis Progress Examination (TG53)

The student and advisor(s) must sign all forms.

Step 6: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 7: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Progress Examination Evaluation form (TG60).

Step 8: The student can take the Master Thesis Progress Examination as dated in the TG03 and TG53 forms.

Step 9: The Master Thesis Defense Examination must be taken at least 60 days after the approval of Master Thesis Title.

3. Application for Thesis Defense Examination (TGA04)
4. Thesis Defense Examination (TGA54)

The student and advisor(s) must sign all forms.

Step 10: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 11: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Appointment of Defense Examination Committee (TGA59) and the Defense Examination Evaluation form (TGA61).

Step 12: The student can take the Master Thesis Defense Examination as dated in the TGA04, TGA54 and TGA59 forms.

Step 13: The student must submit the Master Thesis Book (2 Books (hard copy) and 2 CDs) and the Approval Form for Thesis Book (TGA99) after the Master Thesis Defense Examination date to the Program Secretary by the following deadlines:

3. No more than 30 days\*: Pass the Master Defense Examination without revision
4. No more than 60 days\*: Pass the Master Defense Examination with revision

The student who wishes to restrict access to thesis, please complete and submit the Application for Thesis Access Restriction (TGA98) on the same day that submit the thesis. Afterward, this application will not be considered.

## **Summary of Master Thesis Process Procedure (Plan A1 and A2 for Student ID 63 onward and Plan A2 in RVIE)**

Step 1: The student prepares the following TGGs Request Forms:

1. Application for Thesis Proposal Examination (TGA01)
2. Application for Appointment of Thesis Advisory Committee (TGA02)
3. A Proposal for a Thesis Presented to TGGs (TGA51)
4. Advisor's Professional Qualification (TG52)

The student and advisor(s) must sign all forms.

Step 2: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Proposal Examination Evaluation form (TGA56), the Approval of Thesis Title and Proposal form (TGA57) and the Appointment of Advisory Committee (TGA58).

Step 4: The student can take the Master Thesis Proposal Examination as dated in the TGA57 form and the Master Thesis Period starts counting as Day 1.

Step 5: The Master Thesis Progress Examination must be taken after the approval of Master Thesis Title every semester that student has registered for the thesis except in the semester that the thesis defense examination has been scheduled. The student prepares the following TGGs Request Forms:

1. Application for Thesis Progress Examination (TG03)
2. Thesis Progress Examination (TG53)

The student and advisor(s) must sign all forms.

Step 6: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 7: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Progress Examination Evaluation form (TG60).

Step 8: The student can take the Master Thesis Progress Examination as dated in the TG03 and TG53 forms.

Step 9: The Master Thesis Defense Examination must be taken after passing the last semester Master Thesis Progress Examination.

1. Application for Thesis Defense Examination (TGA04)
2. Thesis Defense Examination (TGA54)

The student and advisor(s) must sign all forms.

Step 10: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 11: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Appointment of Defense Examination Committee (TGA59) and the Defense Examination Evaluation form (TGA61).

Step 12: The student can take the Master Thesis Defense Examination as dated in the TGA04, TGA54 and TGA59 forms.

Step 13: The student must submit the Master Thesis Book (1 Book (hard copy) and 1 CD) and the Approval Form for Thesis Book (TGA99) after the Master Thesis Defense Examination date to the Program Secretary by the following deadlines:

1. No more than 30 days\*: Pass the Master Defense Examination without revision
2. No more than 60 days\*: Pass the Master Defense Examination with revision

The student who wishes to restrict access to thesis, please complete and submit the Application for Thesis Access Restriction (TGA98) on the same day that submit the thesis. Afterward, this application will not be considered.

*Remarks:*

*\* Thesis Defense Examination Committee have the right to state different deadlines but not more than those stated number of days.*

*\*\*Note: If the student fails the Master Thesis Defense Examination, the student must follow the instruction written in the REM. For further information, please consult the REM 2020.*

*\*\*\*For further information, please consult the REM 2020 at <https://tggs.kmutnb.ac.th/exam-regulation-master-2020> and Master Study Overall Process Flow: Plan A1 [ID 63 onward] at <https://tggs.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process-Plan-A1-20201026.pdf> and Plan A2 [ID 63 onward] at <https://tggs.kmutnb.ac.th/wp-content/uploads/2020/10/Master-Thesis-Process-Plan-A2-20201026.pdf>.*

*Remarks:*

*\* Master Thesis Defense Examination Committee have the right to state different deadlines but not more than those stated number of days.*

*\*\* Note: If the student fails the Master Thesis Defense Examination, the student must follow the instruction written in the REM. For further information, please consult the REM 2017.*

*\*\*\* For further information, please consult the REM 2017 at <https://tggs.kmutnb.ac.th/exam-regulation-master-2017> and Master Study Overall Process Flow Plan A2 [ID 59-62] at <https://tggs.kmutnb.ac.th/wp-content/uploads/2019/04/04-Master-Thesis-Process.pdf>.*

## **Summary of Master Thesis Process Procedure (Thesis work at RWTH Aachen University and other universities abroad)**

Step 1: The student prepares the following documents:

1. International Registration Form from the thesis work university, for example, RWTH Form
2. TGGs Financial Agreement Form
3. Invitation Letter from advisor at Universities Aboard
4. Advisor's Professional Qualification (TGA52) for Universities Aboard

The student, thesis advisors (from TGGs and Universities Aboard) and the program coordinator must sign all forms.

Step 2: The student must submit the documents (stated in Step 1) to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary.

Step 4: The student must process the Application for Visa, Accommodation and etc. himself/herself.

Step 5: After the student has completed the Master Thesis and returned to Thailand, the student must submit the following documents to the Program Secretary:

1. Thesis Registration document from Universities Aboard
2. Thesis Evaluation document from Universities Aboard
3. Thesis Certificate

The grading report must be on either the Thesis Evaluation document or Thesis Certificate.

Step 6: The student must submit the Master Thesis Book (1 Books (hard copy) and 1 CDs) and the Approval Form for Thesis Book (TGA99) to the Program Secretary.

The student who wishes to restrict access to thesis, please complete and submit the Application for Thesis Access Restriction (TGA98) on the same day that submit the thesis. Afterward, this application will not be considered.

According to TGGs Regulations, it is the responsibility of TGGs students to submit the hard-copy of their thesis to TGGs along with the following documents (not scanned but actual signature):

1. Thesis Registration
2. Thesis Evaluation
3. Thesis Certificate

This is not the obligation of RWTH or other universities professor or institute's personal. However, having the electronic of thesis content and these three documents being sent to TGGs supervisor directly from RWTH is recommended procedure additional to the hard copy.

# GUIDELINES FOR DOCTORAL THESIS

## Summary of Doctoral Qualifying Examination

Step 1: The student prepares the following TGGs Request Forms:

1. Application for Doctoral Qualifying Examination (TG05)
2. Application for Appointment of Doctoral Qualifying Examination Committee (TG06)
3. A Proposal for a Research Presented to TGGs (TG50)
4. Doctoral Qualifying Examination Committee Member's Professional Qualification (TG55)

The student and advisor(s) must sign all forms. This should be done within the first three semesters at TGGs.

Step 2: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Qualifying Examination Evaluation form (TG62) and the Appointment of Qualifying Examination Committee (TG63).

Step 4: The student who has passed the qualifying examination will be announced by the TGGs Academic Affairs and he/she can take the Doctoral Thesis Proposal Examination afterward.

**Note:** If the student fails the Doctoral Qualifying Examination, the student must follow the instruction written in the RED. For further information, please consult the RED.

## Summary of Doctoral Thesis Process Procedure

Step 1: The student prepares the following TGGs Request Forms:

1. Application for Thesis Proposal Examination (TGA01)
2. Application for Appointment of Thesis Advisory Committee (TGA02)
3. A Proposal for a Thesis Presented to TGGs (TGA51)
4. Advisor's Professional Qualification (TG52)

The student and advisor(s) must sign all forms.

Step 2: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Proposal Examination Evaluation form (TGA56), the Approval of Thesis Title and Proposal form (TGA57) and the Appointment of Advisory Committee (TGA58).

Step 4: The student can take the Doctoral Thesis Proposal Examination as dated in the TGA57 form and the Doctoral Thesis Period starts counting as Day 1.

Step 5: The Doctoral Thesis Progress Examination must be taken at least 90 days after the approval of Doctoral Thesis Title. The student prepares the following TGGs Request Forms:

1. Application for Thesis Progress Examination (TG03)
2. Thesis Progress Examination (TG53)

The student and advisor(s) must sign all forms.

Step 6: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 7: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Progress Examination Evaluation form (TG60).

Step 8: The student can take the Doctoral Thesis Progress Examination as dated in the TG03 and TG53 forms.



Step 9: The Doctoral Thesis Defense Examination must be taken after passing the Doctoral Thesis Progress Examination for at least 30 days.

1. Application for Thesis Defense Examination (TGA04)
2. Thesis Defense Examination (TGA54)

The student and advisor(s) must sign all forms.

Step 10: The student must submit the TGGs Request Forms to the Program Secretary 5 working days in advance.

Step 11: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary along with the Appointment of Defense Examination Committee (TGA59) and the Defense Examination Evaluation form (TGA61).

Step 12: The student can take the Doctoral Thesis Defense Examination as dated in the TGA04, TGA54 and TGA59 forms.

Step 13: The student must submit the Doctoral Thesis Book (2 Books (hard copy) and 2 CDs) and the Approval Form for Thesis Book (TGA99) after the Doctoral Thesis Defense Examination date to the Program Secretary by the following deadlines:

1. No more than 30 days\*: Pass the Doctoral Defense Examination without revision
2. No more than 60 days\*: Pass the Doctoral Defense Examination with revision

The student who wishes to restrict access to thesis, please complete and submit the Application for Thesis Access Restriction (TGA98) on the same day that submit the thesis. Afterward, this application will not be considered.

Remarks:

\* Doctoral Thesis Defense Examination Committee have the right to state different deadlines but not more than those stated number of days.

\*\*Note: If the student fails the Doctoral Thesis Defense Examination, the student must follow the instruction written in the RED. For further information, please consult the RED.

\*\*\*For further information, please consult the RED at <https://tggs.kmutnb.ac.th/exam-regulation-doctor> and Doctoral Study Overall Process Flow at <https://tggs.kmutnb.ac.th/wp-content/uploads/2019/04/03-Doctoral-Thesis-Process.pdf>.

## **Summary of Doctoral Thesis Process Procedure (Thesis work at RWTH Aachen University and other universities abroad)**

Step 1: The student prepares the following documents:

1. International Registration Form from the thesis work university, for example, RWTH Form
2. TGGs Financial Agreement Form
3. Invitation Letter from advisor at Universities Aboard
4. Advisor's Professional Qualification (TG52) for Universities Aboard

The student, thesis advisors (from TGGs and Universities Aboard) and the program coordinator must sign all forms. This should be done within the first academic year at TGGs.

Step 2: The student must submit the documents (stated in Step 1) to the Program Secretary 5 working days in advance.

Step 3: After the documents have been approved by the TGGs Academic Affairs, the student will be informed by the Program Secretary.

Step 4: The student must process the Application for Visa, Accommodation and etc. himself/herself.

Step 5: After the student has completed the Doctoral Thesis and returned to Thailand, the student must submit the following documents to the Program Secretary:

1. Thesis Registration document from Universities Aboard
2. Thesis Evaluation document from Universities Aboard
3. Thesis Certificate

The grading report must be on either the Thesis Evaluation document or Thesis Certificate.

Step 6: The student must submit the Doctoral Thesis Book (2 Books (hard copy) and 2 CDs) to the Program Secretary.

The student who wishes to restrict access to thesis, please complete and submit the Application for Thesis Access Restriction (TGA98) on the same day that submit the thesis to the TGGS Academic Affairs. Afterward, this application will not be considered.

According to TGGS Regulations, it is the responsibility of TGGS students to submit the hard-copy of their thesis to TGGS along with the following documents (not scanned but actual signature):

1. Thesis Registration
2. Thesis Evaluation
3. Thesis Certificate

This is not the obligation of RWTH or other universities professor or institute's personal. However, having the electronic of thesis content and these three documents being sent to TGGS supervisor directly from RWTH is recommended procedure additional to the hard copy.

# MASTER DEGREE PROGRAMS AND DESCRIPTION OF COURSES

## Chemical and Process Engineering Program (CPE 2019)

Website: <https://cpe.tggs.kmutnb.ac.th/>

Asst. Prof. Dr. Suksun Amornraksa	<i>CPE Master &amp; Doctoral Curriculum Chairman/ Lecturer and Researcher</i>
Asst. Prof. Dr. Atthasit Ta-wai	<i>CPE Coordinator/Lecturer and Researcher</i>
Assoc. Prof. Dr. Tawiwat Kangsadan	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr. Unalome Wetwatana Hartley	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr. Malinee Sriariyanun	<i>Lecturer and Researcher</i>
	<i>Lecturer and Researcher</i>
Ms. Notsawan Swadchaipong	<i>Research Assistant</i>
Ms. Sukunya Arreeya	<i>Engineer</i>

The curriculum of this program is designed along the same principles as the RWTH Aachen University German version, at the same time adapted to support the industrial development in Thailand. It is meant to create Master level engineers not only with abilities in knowledge application, but also skills in research and development. This distinctive academic program is fully supported by one of the leading chemical engineering schools in Europe, the RWTH Department of Chemical Engineering (Verfahrenstechnik), in which nine research institutes are included, namely;

- 1) Chair of Chemical Process Engineering
- 2) Chair of Mechanical Process Engineering
- 3) Chair of Thermal Process Engineering
- 4) Chair of Process Systems Engineering
- 5) Chair of Biochemical Engineering
- 6) Enzyme Process Technology
- 7) Chair of Process Systems Engineering
- 8) Molecular Simulations and Transformation
- 9) Computational Systems Biotechnology.

These institutes have close research links to companies in the areas of petroleum, chemical pharmaceutical, food processing, and environment technologies.

### Plan of Study: Plan A1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Master Thesis					30	12	090115196
					<b>30</b>	<b>12</b>	
<b>Semester II</b>							
Master Thesis					30	12	090115196
					<b>30</b>	<b>12</b>	
<b>Semester III</b>							
Master Thesis					30	12	090115196
					<b>30</b>	<b>12</b>	
<b>Semester IV</b>							
Master Thesis					30	10	090115196
					<b>30</b>	<b>10</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

### Plan of Study: Plan A2 (Coursework, Internship and Thesis)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Heterogeneous Kinetics	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115102
Molecular Thermodynamics and Interfacial Properties	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115103
Chemical Product Design	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115105
Elective	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090xx5xxx
Elective	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090xx5xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Molecular and Interfacial Transport Phenomena	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115101
Chemical Process Design	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115104
Seminar on Modern Aspects of Chemical and Process Engineering	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115106
Elective	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090xx5xxx
Elective	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090xx5xxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship (18 weeks)					30	4	090115199
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090115198
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Electives of TGGs/CPE as approved by the TGGs Curriculum Chairmen and/or Coordinators:</b>							
Advanced Separation Technology	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115201
Multiphase Flow	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115202
Advanced Process Heat Integration	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115203
Biochemical Engineering	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115204
Membrane Technology	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115205
Energy Technology for Chemical Engineer	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115206
Catalytic Reaction Engineering	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115207
Industrial Enzymology	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115208
Selected Topics in Chemical and Process Engineering I	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115209
Selected Topics in Chemical and Process Engineering II	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115210
Biorefinery	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115211
Process Modeling and Simulation	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090115212

## Description of Courses: Plan A1 (Research Only)

090115196	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Research on an interesting topic in chemical and process engineering.	46
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## Description of Courses: Plan A2 (Coursework, Internship and Thesis)

090115101	<b>Molecular Interfacial Transport Phenomena</b> <i>Prerequisite: Department Permission</i> Transport problems involving momentum, heat, and mass transfer in chemical engineering and process engineering application. Conservation of momentum, heat, and mass transfer in laminar and turbulent flow in microscopic approach. Equations of change for multi-component systems including charge. Moving boundary systems. Steady and transient simultaneous heat and mass transfer. Interfacial stability. Determination of transport properties. Macroscopic and Microscopic transport theories.	3(2-2-5)
090115102	<b>Heterogeneous Kinetics</b> <i>Prerequisite: Department Permission</i> Learning from Top to Bottom, from Applications down to Fundamentals. Project-based including heterogeneous reaction laboratory experiments (focus on simple/modern gas-solid reactions), catalyst preparation/characterization and results interpretation. Experiment with reactor design, concepts and ideas where the design being out-of-the-box and challenging. Result interpretation process allowing to analyze if the design being scientifically sensible in term of kinetics, reactor characteristics and scaling up. Prediction of reaction mechanism using models like Eley-Rideal and Langmuir Hinshelwood Mechanism, Surface reactions, Inter-particle and intra-particle diffusions.	3(2-2-5)
090115103	<b>Molecular Thermodynamics and Interfacial Properties</b> <i>Prerequisite: None</i> Application of thermodynamics in chemical industries. Chemical and phase equilibrium of heterogeneous closed and open systems. Statistical Mechanics and background of equations of state and GE models. Application of equations of state to industrial uses. Experimental determination of thermodynamic properties. Modeling of thermodynamics properties. Thermodynamic and electrostatic properties of interfaces. Interactions between interfaces.	3(2-2-5)
090115104	<b>Chemical Process Design</b> <i>Prerequisite: Department Permission</i> Process invention heuristics and analysis including process synthesis, process simulation, process optimization, cost analysis and estimation, controllability analysis, environmental protection and safety considerations.	3(2-2-5)
090115105	<b>Chemical Product Design</b> <i>Prerequisite: Department Permission</i> Categories of products in chemical engineering. Principle and procedure of product design. Steps in designing industrial and consumer products. Technology and economic concerns. Product design report and presentation.	3(2-2-5)
090115106	<b>Seminar on Modern Aspects of Chemical and Process Engineering</b> <i>Prerequisite: Department Permission</i> Public presentation and report submission of research and development or new technology in the field of chemical and process engineering.	3(2-2-5)
090115198	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Research on an interesting topic in chemical and process engineering.	12

090115199	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> 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.	4
090115201	<b>Advanced Separation Technology</b> <i>Prerequisite: Department Permission</i> Advanced design strategies for separation processes with the following topics: Advantage of integrating unit operation, Reactive distillation, Reactive extraction, Liquid-membrane extraction, Bioseparation, Chromatography, Simulated moving bed chromatography.	3(2-2-5)
090115202	<b>Multiphase Flow</b> <i>Prerequisite: Department Permission</i> Gas-Liquid systems, fluid-solid systems, and solid-liquid-gas systems. Design criteria for two-phase and three-phase flow systems. Application of two-phase flow in pollution treatments. Application of two-phase flow in separation technology. Application of three-phase flow in fluidized bed, petrochemical process, and petroleum engineering.	3(2-2-5)
090115203	<b>Advanced Process Heat Integration</b> <i>Prerequisite: Department Permission</i> Advanced topics in process heat and power integration including: pinch analysis for maximum energy recovery, heat exchanger network design with a minimum number of units, superstructures for minimization of annual costs, heat integrated distillation trains, positioning heat engines and heat pumps, heat integration of batch process.	3(2-2-5)
090115204	<b>Biochemical Engineering</b> <i>Prerequisite: Department Permission</i> Introduction to microbiology. Enzyme kinetics and deactivation. Transport phenomena in bioprocess. Interfacial mass transfer in cellular system. Growth kinetics. Fermentation and applications. Product recovery. Bioreactor design and scale-up.	3(2-2-5)
090115205	<b>Membrane Technology</b> <i>Prerequisite: Department Permission</i> Principle of membrane processes. Membrane characterization and preparation. Dialysis and electrodialysis process. Reverse Osmosis. Microfiltration. Ultrafiltration and nanofiltration. Pervaporation. Application of Membrane technology in separation processes.	3(2-2-5)
090115206	<b>Energy Technology for Chemical Engineer</b> <i>Prerequisite: Department Permission</i> Overview of energy situation and trends. Fundamentals of thermal energy systems. Energy conversion processes and energy efficiency improvement in chemical industry. Principles of main energy technologies: fossil energy, solar energy, wind energy, biomass and biofuel energy, and fuel cell.	3(2-2-5)
090115207	<b>Catalytic Reaction Engineering</b> <i>Prerequisite: Department Permission</i> A study of catalysis theory, application, preparation and analysis. Understanding towards scientific problems arising behind catalysis processes and systems with fashionable catalytic equipment and techniques. Principle of heterogeneous catalysis, for instance, selectivity of catalysts, definition of catalytic activity, procedure of catalytic adsorption and desorption, kinetics of surface reactions, characterizations of catalysts and their surfaces including gas-phased probe reactions and temperature programmed reactions, the significant of pore structure and surface area in heterogeneous catalysis, the solid-state and surface chemistry of catalysis and classic catalytic reactions.	3(2-2-5)

090115208	<b>Industrial Enzymology</b> <i>Prerequisite: Department Permission</i> Introduction to microbiology. Enzyme kinetics and deactivation. Transport phenomena in bioprocess. Interfacial mass transfer in cellular system. Growth kinetics. Fermentation and applications. Product recovery. Bioreactor design and scale-up.	3(2-2-5)
090115209	<b>Selected Topics in Chemical and Process Engineering I</b> <i>Prerequisite: Department Permission</i> Lecture by experts, studies, seminar and/or individual investigations in selected or specific areas of chemical and process engineering, including the topics concerning the new or advanced knowledge in chemical and process engineering.	3(2-2-5)
090115210	<b>Selected Topics in Chemical and Process Engineering II</b> <i>Prerequisite: Department Permission</i> Lecture by experts, studies, seminar and/or individual investigations in selected or specific areas of chemical and process engineering, including the topics concerning the new or advanced knowledge in chemical and process engineering.	3(2-2-5)
090115211	<b>Biorefinery</b> <i>Prerequisite: Department Permission</i> Introduction of the integrated approach required in modern biorefinery. Demonstration of the concepts biological and chemical knowledge to be applied in biorefining process. Use of conversion technologies of various types of biomass as a renewable resource to produce high value bioenergy and biochemicals. Also, the environmental, safety, health, quality and sustainability aspects, as well as the economical feasibility and reliability, and related technology development.	3(2-2-5)
090115212	<b>Process Modeling and Simulation</b> <i>Prerequisite: Department Permission</i> Introduces the methods and techniques of dynamic model building skills for chemical and biochemical processes with the following topics: uses and benefits of system modelling, model development, models of heat transfer equipment, separation processes and reactors, steady state and dynamic models, time domain solutions, block diagram representation, modelling of control loop elements, and application of computer simulation for solutions of models.	3(2-2-5)



## Mechanical and Automotive Engineering Program (MAE 2020)

Mechanical and Automotive Engineering consists of Mechanical Engineering Simulation and Design (MESD) and Automotive Safety and Assessment Engineering (ASAE). MESD is based on the corresponding Master program of RWTH Aachen University and takes into account the growing use of simulation tools in Mechanical Engineering. The course combines technical theory and application, giving a sound basis for model validation for the purposes of problem solving and design solutions. ASAE focuses on fundamentals of vehicle modules and systems, structure design and manufacturing process. Global vehicle testing standards for vehicle safety, performances and emission are introduced together with regulations for vehicle and component evaluation.

Website: <https://tggs.kmutnb.ac.th/academics/mae-master>

Assoc. Prof. Dr. Ekachai Juntasaro	<i>MAE Doctoral Curriculum Chairman / MESD Lecturer and Researcher</i>
Assoc. Prof. Dr. Saiprasit Koetninyom	<i>MAE Master Curriculum Chairman / ASAE Lecturer and Researcher</i>

### **Minor: Mechanical Engineering Simulation and Design (MESD):**

Website: <https://mesd.tggs.kmutnb.ac.th/>

Assoc. Prof. Dr. Ekachai Juntasaro	<i>MESD Coordinator/ Lecturer and Researcher</i>
Asst. Prof. Dr. Karuna Tuchinda	<i>Lecturer and Researcher</i>
Dr.-Ing. Alexander Brezing	<i>Lecturer and Researcher</i>
Dr. Ampol Likitchatchawankun	<i>Lecturer and Researcher</i>
-	<i>Research Assistant</i>
Mr. Chinnawit Glunrawd	<i>Engineer</i>

### Plan of Study: Plan A1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Master Thesis					30	12	090115196
					<b>30</b>	<b>12</b>	
<b>Semester II</b>							
Master Thesis					30	12	090115196
					<b>30</b>	<b>12</b>	
<b>Semester III</b>							
Master Thesis					30	12	090115196
					<b>30</b>	<b>12</b>	
<b>Semester IV</b>							
Master Thesis					30	10	090115196
					<b>30</b>	<b>10</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

### Plan of Study: Plan A2 (Coursework, Internship and Thesis)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Finite Element Methods	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125101
Computer Aided Engineering Tools I	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125102
Fluid Mechanics for Simulation and Design	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125103
Machine Design Process	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125104
Research Fundamentals in Mechanical and Structure Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125119
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Industrial Design Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125111
Specific Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125xxx
Specific Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125xxx
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090125199
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090125198
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

## Plan of Study: Plan B (Coursework, Internship and Master Project)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Finite Element Methods	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125101
Computer Aided Engineering Tools I	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125102
Fluid Mechanics for Simulation and Design	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125103
Machine Design Process	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125104
Research Fundamentals in Mechanical and Structure Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125119
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Industrial Design Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125111
Specific Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125xxx
Specific Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125xxx
Specific Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125xxx
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090125199
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
Master Project					18	6(6-0-12)	090125195
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of General Electives of TGGs/MESD/ASAE as approved by the TGGs Coordinators:</b>							
Special Topic in Mechanical and Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125205
Seminar in Mechanical and Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125206
Industrial Quality System for Mechanical and Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125207
Special Problems in Automotive safety and Assessment Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125215
Data Management and Analysis	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245405
Battery Storage Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245224
Electric vehicles	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245226
Machine Learning	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245337
Optimization	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245348
Engineering Economics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135227
Strategic Management	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135228

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Specific Electives of TGGs/MESD/ASAE as approved by the TGGs Coordinators:</b>							
Turbulence Modelling for CFD	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125201
Special Topic in Mechanical Engineering Simulation and Design	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125203
Computational Fluid Dynamics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125208
Computer Aided Engineering Tools II	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125209
Mechanical Behaviors and Degradations	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125210

## Description of Courses: Plan A1 (Research Only)

090125196	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> 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.	46
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## Description of Courses: Plan A2 (Coursework, Internship and Thesis) and Plan B (Coursework, Internship and Master Project)

090125101	<b>Finite Element Methods</b> <i>Prerequisite: None</i> Overview of numerical methods; Finite elements for 2D trusses, beams, 2D and 3D continua; Matrix methods (force and displacement method); Stiffness matrix for springs, rods, 2D trusses, bending of beams, 2D elastic continua; Mass matrices for dynamic analysis; Triangle element, higher order (quadratic and cubic) displacement functions; Quadrilateral elements (Lagrange and serendipity elements); Isoperimetric elements; Elements for 3D analysis (tetrahedron, cube). The course will include the use of non-commercial and/or commercial software.	3(3-0-6)
090125102	<b>Computer Aided Engineering Tools I</b> <i>Prerequisite: Program Permission</i> A series of examined modules to give students the necessary CAE tool technical skills needed for practical use in other courses, research and thesis work, and in preparation of industrial application. The software could be either commercial or non-commercial packages, more than one package, and selected according to the overall program needs and balanced between current industry and research market requirements.	3(3-0-6)
090125103	<b>Fluid Mechanics for Simulation and Design</b> <i>Prerequisite: None</i> Fluid kinematics; Continuity equation; Bernoulli equation; Energy equation; Momentum analysis of flow systems; Dimensional analysis and modeling; Internal flow; Differential analysis of fluid flow; Approximate solution of the Navier-Stokes equation; External flow; Compressible flow; Turbo machinery; Interaction between fluid flow, heat transfer and thermodynamics. Students will also take part in a research seminar.	3(3-0-6)
090125104	<b>Machine Design Process</b> <i>Prerequisite: None</i> <i>Co-requisites: Computer Aided Engineering Tools I</i> The course is split into two main parts: Part 1: Review of drawing fundamentals; Drawing standards; Bolted and welded connections; Shaft-and-hub connections; Geometric irregularities and tolerances; Shaft bearings; Power transmission types, drives and gears. Part 2: Systematic design process and methodology; Engineering design process; Requirements list; Conceptual design; Evaluation and selection solutions; Design rules.	3(3-0-6)
090125111	<b>Industrial Design Engineering</b> <i>Prerequisite: None</i> Application of fundamentals of Machine Elements and Engineering Design focusing on the specific aspects of the industrialization of mass-produced consumer goods. The content covers the theory and methods of Industrial Design and Engineering collaborations, the most relevant production technologies for mass-produced consumer goods and applicable design restrictions and strategies and the relevant Skills, i.e. CAD-modelling of Class-A freeform surfaces, injection molding and sheet-metal parts. The scope covers the complete value chain from the initial design brief into a tooling-ready design of the product. A project with a partner from industry will accompany the lectures.	3(3-0-6)

090125119	<b>Research Fundamentals in Mechanical and Structure Engineering</b> <i>Prerequisite: None</i> Research Fundamentals such as basic knowledge and skills required for research including research design and management in topics related to Mechanical and Structural Engineering at the master's degree level by conducting a small research project. Topics are subjected to change each semester depending on current situation.	3(3-0-6)
090125195	<b>Master Project</b> <i>Prerequisite: Program Permission</i> The student is expected to complete 6 credit hours of study before submitting a master project proposal with approval from instructors of advisors. This special study must be related with the subject or knowledge, which students have learned from the courses. The study should also integrate principles of mechanical and automotive engineering as well as contribute to potential applications or implementation in the real world.	6(6-0-12)
090125198	<b>Master Thesis</b> <i>Prerequisite: Program Permission</i> 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.	12
090125199	<b>Industrial Internship</b> <i>Prerequisite: Program Permission</i> Apply the knowledge for solution or analysis of engineering problem in industry through internship in industrial environment. The student will submit the report to summarize the internship work content, deliverables and confirmed outcomes.	4
090125201	<b>Turbulence Modelling for CFD</b> <i>Prerequisite: Advanced Fluid Mechanics, Computer Aided Engineering Tools I</i> <i>Co-requisites: Computer Aided Engineering Tools II</i> Governing equations of fluid dynamics; Statistical description of turbulence; Mean flow equations; Free shear flows; Scales of turbulent motion; Wall shear flows; Turbulence modeling; Eddy viscosity model; Zero-equation model; One-equation model; Two-equation model; Reynolds stress model; Transition modeling.	3(3-0-6)
090125203	<b>Special Topic in Mechanical Engineering Simulation and Design</b> <i>Prerequisite: Program Permission</i> This course will be provided on special request for special topic and for flexibility.	3(3-0-6)
090125205	<b>Special Topics in Mechanical and Automotive Engineering</b> <i>Prerequisite: Program Permission</i> This course will be provided on special request for special topic and for flexibility.	3(3-0-6)
090125206	<b>Seminar in Mechanical and Automotive Engineering</b> <i>Prerequisite: Program Permission</i> The subject deals with current topics in Mechanical and Automotive Engineering related technology, often linked to ongoing research activities. The content is based on presentations from the participants and invited guests, and will vary depending on who is included and current industrial oriented situation.	3(3-0-6)
090125207	<b>Industrial Quality System for Mechanical and Automotive Engineering</b> <i>Prerequisite: Program Permission</i> Quality management theory and industrial applications. Statistical quality control. Stabilizing and improving process. Quality cost. Variable control chart. Attribute control charts. Process capability. Quality inspection. Acceptance sampling plans. Six sigma management.	3(3-0-6)

090125208	<b>Computational Fluid Dynamics</b> <i>Prerequisite: Advanced Fluid Mechanics</i> Governing equations of fluid dynamics; Finite volume method for structured and unstructured meshes; Solution of diffusion problem; Solution of convection-diffusion problem; Solution of fluid-flow problem; Solution methods.	3(3-0-6)
090125209	<b>Computer Aided Engineering Tools II</b> <i>Prerequisite: Computer Aided Engineering Tools I</i> Continues from Computer Aided Engineering Tools I, by deepening skills and/or using different packages. A series of examined modules to give students the necessary CAE tool technical skills needed for practical use in other courses, research and thesis work, and in preparation of industrial application. The software could be either commercial or non-commercial packages, more than one package, and selected according to the overall program needs and balanced between current industry and research market requirements.	3(3-0-6)
090125210	<b>Mechanical Behaviors and Degradations</b> <i>Prerequisite: None</i> Stress and Strain; Elastic Properties; Yielding; Material Behavior with Plastic Deformation; Fracture; Crack Growth; Fatigue; Creep; Wear; Failure Analysis; Life Assessment for Engineering Components.	3(3-0-6)

**Minor: Automotive Safety and Assessment Engineering (ASAE):**Website: <https://ae.tggs.kmutnb.ac.th/>

Assoc. Prof. Dr. Julaluk Carmai

ASAE Coordinator/Lecturer and Researcher

Assoc. Prof. Dr. Saiprasit Koetnuyom

Lecturer and Researcher

Dr. Saharat Chanthanumataporn

Lecturer and Researcher

Mr. Chen Chin Chun

Engineer and Software Specialist

Mr. Isara Rojana

Research Assistant

Mr. Manus Dangchat

Engineer

**Plan of Study: Plan A1 (Research Only)**

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Master Thesis					30	12	090125196
					<b>30</b>	<b>12</b>	
<b>Semester II</b>							
Master Thesis					30	12	090125196
					<b>30</b>	<b>12</b>	
<b>Semester III</b>							
Master Thesis					30	12	090125196
					<b>30</b>	<b>12</b>	
<b>Semester IV</b>							
Master Thesis					30	10	090125196
					<b>30</b>	<b>10</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

**Plan of Study: Plan A2 (Coursework, Internship and Thesis)**

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Finite Element Methods	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125101
Machine Design Process	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125104
Research Fundamentals in Mechanical and Structure Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125119
Introduction to Vehicle Safety	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125114
Automotive Systems Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125118
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Standards and Regulations for Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125115
Fundamentals of Vehicle and Component Assessments	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125212
Application of Simulation in Vehicle Safety and Biomechanics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125213
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
					<b>30</b>	<b>15</b>	



Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester III</b>							
Industrial Internship					30	4	090125199
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090125198
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

### Plan of Study: Plan B (Coursework, Internship and Master Project)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Finite Element Methods	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125101
Machine Design Process	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125104
Research Fundamentals in Mechanical and Structure Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125119
Introduction to Vehicle Safety	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125114
Automotive Systems Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125118
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Standards and Regulations for Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125115
Special Topic in Automotive Safety and Assessment Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125211
Fundamentals of Vehicle and Component Assessments	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125212
Application of Simulation in Vehicle Safety and Biomechanics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125213
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090125199
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
General Elective	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xxxxxx
Master Project					18	6(6-0-12)	090125195
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of General Electives of TGGS/MESD/ASAE as approved by the TGGS Coordinators:</b>							
Special Topic in Mechanical and Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125205
Seminar in Mechanical and Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125206
Industrial Quality System for Mechanical and Automotive Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125207
Special Problems in Automotive safety and Assessment Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125215
Data Management and Analysis	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245405
Battery Storage Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245224
Electric vehicles	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245226
Machine Learning	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245337
Optimization	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245348
Engineering Economics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135227
Strategic Management	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135228
<b>List of Specific Electives of TGGS/MESD/ASAE as approved by the TGGS Coordinators:</b>							
Turbulence Modelling for CFD	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125201
Special Topic in Mechanical Engineering Simulation and Design	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125203
Computational Fluid Dynamics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125208
Computer Aided Engineering Tools II	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125209
Mechanical Behaviors and Degradations	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090125210

## Description of Courses: Plan A1 (Research Only)

090125196	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> 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.	46
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## Description of Courses: Plan A2 (Coursework, Internship and Thesis) and Plan B (Coursework, Internship and Master Project)

090125101	<b>Finite Element Methods</b> <i>Prerequisite: None</i> Overview of numerical methods; Finite elements for 2D trusses, beams, 2D and 3D continua; Matrix methods (force and displacement method); Stiffness matrix for springs, rods, 2D trusses, bending of beams, 2D elastic continua; Mass matrices for dynamic analysis; Triangle element, higher order (quadratic and cubic) displacement functions; Quadrilateral elements (Lagrange and serendipity elements); Isoperimetric elements; Elements for 3D analysis (tetrahedron, cube). The course will include the use of non-commercial and/or commercial software.	3(3-0-6)
090125104	<b>Machine Design Process</b> <i>Prerequisite: None</i> <i>Co-requisites: Computer Aided Engineering Tools I</i> The course is split into two main parts: Part 1: Review of drawing fundamentals; Drawing standards; Bolted and welded connections; Shaft-and-hub connections; Geometric irregularities and tolerances; Shaft bearings; Power transmission types, drives and gears. Part 2: Systematic design process and methodology; Engineering design process; Requirements list; Conceptual design; Evaluation and selection solutions; Design rules.	3(3-0-6)
090125114	<b>Introduction to Vehicle Safety</b> <i>Prerequisite: None</i> Active safety for accident prevention; Passive safety for crashworthiness; Accident survey and statistics; Dummy technology; Injury mechanism and criteria; Occupant protection systems for seat, steering, belt and air bag.	3(3-0-6)
090125115	<b>Standards and Regulations for Automotive Engineering</b> <i>Prerequisite: None</i> Testing standards of vehicles for front, side, rear and rollover impacts; New Car Assessment Program (NCAP); Fuel consumption testing standards; Emission Regulation for fuel losses from vehicles; Emission control regulations for internal combustion engine.	3(3-0-6)
090125118	<b>Automotive Systems Engineering</b> <i>Prerequisite: None</i> Power and energy requirements; Functional description of driveline components such as clutch, gearbox, differential and brake units; Power units of vehicle; Driving performance of motor vehicle; Suspension system; Steering system.	3(3-0-6)
090125119	<b>Research Fundamentals in Mechanical and Structure Engineering</b> <i>Prerequisite: None</i> Research Fundamentals such as basic knowledge and skills required for research including research design and management in topics related to Mechanical and Structural Engineering at the master's degree level by conducting a small research project. Topics are subjected to change each semester depending on current situation.	3(3-0-6)

090125195	<b>Master Project</b> <i>Prerequisite: Program Permission</i> The student is expected to complete 6 credit hours of study before submitting a master project proposal with approval from instructors of advisors. This special study must be related with the subject or knowledge, which students have learned from the courses. The study should also integrate principles of mechanical and automotive engineering as well as contribute to potential applications or implementation in the real world.	6(6-0-12)
090125198	<b>Master Thesis</b> <i>Prerequisite: Program Permission</i> 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.	12
090125199	<b>Industrial Internship</b> <i>Prerequisite: Program Permission</i> Apply the knowledge for solution or analysis of engineering problem in industry through internship in industrial environment. The student will submit the report to summarize the internship work content, deliverables and confirmed outcomes.	4
090125205	<b>Special Topics in Mechanical and Automotive Engineering</b> <i>Prerequisite: Program Permission</i> This course will be provided on special request for special topic and for flexibility.	3(3-0-6)
090125206	<b>Seminar in Mechanical and Automotive Engineering</b> <i>Prerequisite: Program Permission</i> The subject deals with current topics in Mechanical and Automotive Engineering related technology, often linked to ongoing research activities. The content is based on presentations from the participants and invited guests, and will vary depending on who is included and current industrial oriented situation.	3(3-0-6)
090125207	<b>Industrial Quality System for Mechanical and Automotive Engineering</b> <i>Prerequisite: Program Permission</i> Quality management theory and industrial applications. Statistical quality control. Stabilizing and improving process. Quality cost. Variable control chart. Attribute control charts. Process capability. Quality inspection. Acceptance sampling plans. Six sigma management.	3(3-0-6)
090125211	<b>Special Topics in Automotive Safety and Assessment Engineering</b> <i>Prerequisite: None</i> This course will be provided on special topic in automotive safety and assessment engineering.	3(3-0-6)
090125212	<b>Fundamental of vehicle and component Assessments</b> <i>Prerequisite: None</i> Vehicle structure testing; Chassis and engine dynamometers; Vehicle module and component test benches; Technique and facilities for dynamics crash tests of vehicle or components.	3(3-0-6)
090125213	<b>Application of Simulation in Vehicle Safety and Biomechanics</b> <i>Prerequisite: None</i> Numerical simulation methods available in the field of vehicle safety including accident reconstruction. Kinematics of vehicle impact; Simulation of side impact and frontal collision; Principle of human body simulation; analysis of occupant and pedestrian post-crash kinematics and injury mechanisms.	3(3-0-6)

090125215

**Special Problems in Automotive safety and Assessment Engineering**

3(3-0-6)

*Prerequisite: None*

Problem solving for topics in the field of Automotive safety and Assessment Engineering. Problem-based learning concept. Progress presentation. Review and checking of project status. Application of suggestions and comments from supervising lecturers and classmates. Writing of technical report.

## Materials and Production Engineering Program (MPE 2020)

Website: <http://mpe.tggs.kmutnb.ac.th/index.php/en/>

Asst. Prof. Dr.-Ing. Pruet Kowitwarangkul	<i>MPE Doctoral Curriculum Chairman / MPE Coordinator/ Lecturer and Researcher</i>
Assoc. Prof. Dr. Srisawat Supsomboon	<i>MPE Master Curriculum Chairman / Lecturer and Researcher</i>
Prof. Dr.-Ing. Suchart Siengchin	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr. Yingyot Aueulan	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr.-Ing. Piyada Suwanpinij	<i>Lecturer and Researcher</i>
Asst. Prof. Dr.-Ing. Kumpanat Sirivedin	<i>Lecturer and Researcher</i>
Asst. Prof. Dr. Rungsima Yeetsorn	<i>Lecturer and Researcher</i>
Dr. Jyotishkumar Parameswaranpillai	<i>Researcher</i>
Mr. Maitri Kamonrattanasud	<i>Research Assistant</i>
Ms. Rapeeporn Srisuk	<i>Research Assistant</i>
Mr. Thitinun Ungtrakul	<i>Engineer</i>
Mr. Piyapat Chuchuy	<i>Engineer</i>

The two-year of Engineering in Materials and Production Engineering (MPE) has been developed to meet the industrial needs through practical training in industry or manufacturing enterprises, which is one of the main educational philosophies. The curriculum has a structure similar to the RWTH-Aachen Master Program in Materials and Production Engineering. This program will cover into 3 major disciplines;

1. Process and Manufacturing Technology
2. Metallurgical and Material Processing Technology
3. Design and Production Management.

The overall courses are designed to encompass students with in-depth knowledge in all three disciplines. In addition, the solving of management related problems, the skill of leading and functioning in project teams, and the ability to communicate effectively will be enhanced and strengthened. An integral part of the program exposes students to industry-related activities. This includes a mandatory four-month internship in industry and an opportunity to take part in applied or advanced research projects.

Outstanding students will have an opportunity to conduct their internship and Master thesis in well-known industries and institutes in Germany, European countries or the United States of America.

### Plan of Study: Plan A1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Master Thesis					30	12	090135196
					<b>30</b>	<b>12</b>	
<b>Semester II</b>							
Master Thesis					30	12	090135196
					<b>30</b>	<b>12</b>	
<b>Semester III</b>							
Master Thesis					30	12	090135196
					<b>30</b>	<b>12</b>	
<b>Semester IV</b>							
Master Thesis					30	10	090135196
					<b>30</b>	<b>10</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

### Plan of Study: Plan A2 (Coursework, Internship and Thesis)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Production Management	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135104
Manufacturing Technology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135110
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	0901352xx
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	0901352xx
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xx5xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Materials Testing	3h x 15w	5h x 15w	30	150	6	3(2-2-5)	090135108
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	0901352xx
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	0901352xx
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	0901352xx
Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090xx5xxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090135199
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090135198
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Electives of TGGGS/MPE as approved by the TGGGS Coordinators:</b>							
Polymer and Composite Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135203
Industrial Logistics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135204
Applications of Manufacturing Technology for Industries	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135207
Corrosion Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135208
Casting Processes and Casting Alloys	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135209
Fundamentals and Solving Methods in Metal Forming	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135210
Chemical Metallurgy for Ferrous Metal	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135211
Chemical Metallurgy for Non-Ferrous Metals	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135212
Transport Phenomena in Materials Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135213
Mechanical Metallurgy	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135214
Steel Designs	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135215
Materials Science of Steel	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135216
Polymer Processing	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135217
Composites Processing	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135218
Polymer Recycling and Biodegradable Polymer	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135219
Rubber Technology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135220
Plastic Designs	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135221
Machine Tools	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135222
Quality Systems Management	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135223
Finite Element Method Simulation Techniques	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135224
Materials Selection and Design	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135225
Materials Characterization	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135226
Engineering Economics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135227
Strategic Management	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135228
Engineering Management Science	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135229
Seminar	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135230
Selected Topic in Production Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135231
Selected Topic in Materials Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135232
Selected Topic in Industrial Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135233
Materials Science for Engineers	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135234
Computer Simulation Technique	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090135235



## Description of Courses: Plan A1 (Research Only)

090135196	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Research in topic of mechanical engineering, material engineering, production engineering; Development of Research and Development; Analysis and solving skill in R&D environment; Development of presentation and writing skill.	46
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## Description of Courses: Plan A2 (Coursework, Internship and Thesis)

090135104	<b>Production Management</b> <i>Prerequisite: Department Permission</i> Production management. Using operation to complete. Develop process strategy. Analyzing processes. Managing Quality. Total quality control. Planning capacity. Managing process constraints. Designing Lean system. Managing inventories. Designing effective supply chains. Locating Facility. Planning and scheduling operations. Managing demand.	3(3-0-6)
090135108	<b>Materials Testing</b> <i>Prerequisite: Department Permission</i> Basic of materials testing, tensile testing, compression testing, long period creep testing, bending testing, torsion testing, hardness testing, Charpy testing, fracture mechanic testing, fatigue testing, safety analysis, non-destructive testing, finite Element Method, statistical process control, polymer identification polymer compounding and polymer processing.	3(2-2-5)
090135110	<b>Manufacturing Technology</b> <i>Prerequisite : Department Permission</i> Mechanical properties of materials, Techniques used to determine those properties as well as basic polymer engineering rheological properties The second part will overview a principle of manufacturing technologies, including forming (sheet and bulk) processes, casting process and powder metallurgy process as well as polymer processing Some specific in forming technologies such as sheet and bulk forming using case studies to the emphasis in the ongoing research in those processes.	3(3-0-6)
090135198	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Research in topic of mechanical engineering, material engineering, production engineering; Development of Research and Development; Analysis and solving skill in R&D environment; Development of presentation and writing skill.	12
090135199	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Development of engineering skill in real industrial environment, team work, Analysis and solving real industrial problem; Development of presentation and writing skill.	4
090135203	<b>Polymer and Composite Engineering</b> <i>Prerequisite: Department Permission</i> Processing and engineering properties of polymer materials, the effects of crystalline on the mechanical/thermal properties of polymers; Common measurement, testing and comparison techniques to aid in selection of polymer materials will be discussed; Testing methods include compressive, dynamic mechanic thermo analysis, tensile strength and different morphology testing, the effects of combining certain materials in a composite to improve overall mechanical properties.	3(3-0-6)
090135204	<b>Industrial Logistics</b> <i>Prerequisite: Department Permission</i> Logistics management; Role of logistics in industry and organization; Total cost concept; Key logistics activities, customer service, logistics information systems, inventory management, managing materials flow, transportation, warehousing, materials handling and packaging; Global logistics; Logistics performance.	3(3-0-6)

090135207	<b>Applications of Manufacturing Technology for Industries</b> <i>Prerequisite: Department Permission</i> Advanced calculation techniques such as slip line and upper bound theories in metal forming technology to approximate the suitable process parameters will be covered. Classical plasticity theories will be introduced to analysis the metal forming processes.	3(3-0-6)
090135208	<b>Corrosion Engineering</b> <i>Prerequisite: Department Permission</i> Principle of Corrosion, Forms of Corrosion and Prevention, High Temperature Corrosion, Anodic Protection, Cathodic Protection, Coatings and Inhibitors, Materials Selection and Design.	3(3-0-6)
090135209	<b>Casting Processes and Casting Alloys</b> <i>Prerequisite: Department Permission</i> Principle of Solidification, Patterns, Molding and Casting Processes, Foundry Equipment and Processing, Design Considerations, Ferrous Casting Alloys, Nonferrous Casting Alloys, the Ten Casting Rules.	3(3-0-6)
090135210	<b>Fundamentals and Solving Methods in Metal Forming</b> <i>Prerequisite: Department Permission</i> Basic of plastomechanics, stress and deformation states, yield law, differential equations for elementary theory, boundary conditions, elementary theory for basic metal forming processes, similarity theorem and modeling techniques, basic of Finite Element Method.	3(3-0-6)
090135211	<b>Chemical Metallurgy for Ferrous Metal</b> <i>Prerequisite: Department Permission</i> Thermodynamics and reaction kinetics of iron and steelmaking. Preparation of raw material: sintering, pelletizing and coke-making. Reduction of iron oxides. Blast furnace and alternative ironmaking processes. Basic oxygen steelmaking. Scrap recycling and electric arc furnace steelmaking. Secondary steelmaking. Slag chemistry. Solidification of steel ingots and continuous casting of steel products.	3(3-0-6)
090135212	<b>Chemical Metallurgy for Non-Ferrous Metals</b> <i>Prerequisite: Department Permission</i> Extraction and recycling of non-ferrous metals; e.g. copper, aluminum, zinc, tin, lead, titanium and precious metals. Primary and secondary raw material. Thermodynamics and reaction kinetics. pyrometallurgy: roasting, smelting, converting and refining. Hydrometallurgy: leaching, solution purification and the precipitation of metals and compounds. Electrowinning and electrorefining in aqueous and molten salt media.	3(3-0-6)
090135213	<b>Transport Phenomena in Materials Engineering</b> <i>Prerequisite: Department Permission</i> Fundamentals of heat transfer, mass transfer and fluid flow (momentum transport) in metallurgical and materials processing. Thermal conductivity, Fourier's law, heat conduction, convection, radiation, system boundaries, one dimensional steady state heat conduction, transient heat conduction, numerical methods for heat conduction, mass diffusion, Fick's law, viscous behavior of fluids, conservation laws, fluid statics, laminar and turbulent flow.	3(3-0-6)
090135214	<b>Mechanical Metallurgy</b> <i>Prerequisite: Department Permission</i> Stress-strain diagram, flow curve and anisotropy, strengthening mechanisms in metals, toughness and fracture behavior, damage and toughness analysis, cyclic load, high temperature materials behavior, cold forming properties.	3(3-0-6)
090135215	<b>Steel Designs</b> <i>Prerequisite: Department Permission</i> Fundamental of materials modeling and phase transformation control, production of pipe and tube, boiler tube for power plant, steel for offshore and sub-zero applications, advanced high strength steels, car body steel, rail steel.	3(3-0-6)

090135216	<b>Materials Science of Steel</b> <i>Prerequisite: Department Permission</i> Technical and economic importance of iron and steel, physical properties of iron and steel, substitutional and interstitial solid solution, selected binary and ternary systems, stainless steel, segregation and inclusions, continuous casting, precipitation and aging, pearlite formation, bainite formation, martensite formation, heat treatment of steels, adjustment of microstructure.	3(3-0-6)
090135217	<b>Polymer Processing</b> <i>Prerequisite: Department Permission</i> Principle and application of polymer processing. Practical detail of conventional process such as extrusion, injection, blow molding, compression, thermo forming, and rotational molding.	3(3-0-6)
090135218	<b>Composites Processing</b> <i>Prerequisite: Department Permission</i> Overview of polymer processing. Polymer blend. Polymer composites. Polymer composites processing. Mixing. Testing. Improvement properties of polymer.	3(3-0-6)
090135219	<b>Polymer Recycling and Biodegradable Polymer</b> <i>Prerequisite: Department Permission</i> Principle and application of recycling technology of plastic waste. Design and characterization recyclable polymer product. Method of separation and recycling. Properties of biodegradable polymer. Standard and industrial application of biodegradable polymer.	3(3-0-6)
090135220	<b>Rubber Technology</b> <i>Prerequisite: Department Permission</i> Natural rubber and synthetic rubber. Type and application of rubber. Rubber processing. Rubber chemistry and rubber formulation. Rubber compounding. Processing technology of rubber products.	3(3-0-6)
090135221	<b>Plastic Designs</b> <i>Prerequisite: Department Permission</i> A simplified and practical approach in designing with plastic that is fundamentally related to the load, temperature, time, and environment subjected to a product. It will provide the basic behaviors in what to consider when designing plastic products to meet performance and cost requirements. Important aspects are presented such as understanding the advantages of different shapes and how they influence designs. Information is concise, comprehensive, and practical. Examples are provided of designing different plastic products and relating them to critical factors that range from meeting performance requirements in different environments to reducing costs and targeting for zero defects.	3(3-0-6)
090135222	<b>Machine Tools</b> <i>Prerequisite: Department Permission</i> Introduction to various machine tools. Design of machine components. Optimization of machine components. Evaluation of machine tools. Measuring instruments for machine tools evaluation, Automation technology for machine tools. Control systems, Numerical control. Communication technology and command control, Integrated manufacturing systems, Machine tool monitoring and diagnosis, Artificial intelligence in machine tool monitoring.	3(3-0-6)
090135223	<b>Quality System Management</b> <i>Prerequisite: Department Permission</i> Quality management theory and industrial applications. Statistical quality control. Stabilizing and improving process. Quality cost and Loss function. Quality consciousness and types of control chart. Variable control charts. Attribute control charts. Operating characteristic functions. Process capability and statistical tolerance. Inspection policy. Acceptance sampling plans.	3(3-0-6)

090135224	<b>Finite Element Method Simulation Techniques</b> <i>Prerequisite: Department Permission</i> Fundamentals in Finite Element Method, Concept of stiffness analysis, Stiffness matrix for assembly of springs, Solution procedure, Application to frameworks and several networks; Finite Element Methods to model in metal forming processes, Forging process, Sheet forming process, Blanking process.	3(3-0-6)
090135225	<b>Materials Selection and Design</b> <i>Prerequisite: Department Permission</i> Materials selection, especially together with other components fabricated by other materials. Ashby chart. Consideration criteria for materials selection: price, strength, density, thermal conductivity, thermal expansion, electrical conductivity, corrosion resistance, galvanic series, ability to recycle, alternative materials, green materials.	3(3-0-6)
090135226	<b>Materials Characterization</b> <i>Prerequisite: Department permission</i> The course is for both metal and polymer materials. Thermal methods, light optical microscope, etching method and reagents, electron microscopy, elemental analysis, atom probe, scanning probe microscopy, microstructure-crystallographic technique, X-ray and neutron spectroscopy, synchrotron technology, techniques for determination of polymer molecular weight, identification of polymer, mechanical analysis technique for polymer.	3(3-0-6)
090135227	<b>Engineering Economics</b> <i>Prerequisite: Department Permission</i> Apply a systematic process to making economic decisions. Financial accounting principles and cost systems, interpretation and use of accounting reports and supplemental information for engineering economic analyses, consideration of cost-volume-profit analyses, use of discounted cash flow techniques, flexible budgeting, transfer pricing, and capital budgeting. Formulate, and analyze cash flow models and conduct engineering alternatives based on use of interest computations, valuations, depreciation, and cost estimates.	3(3-0-6)
090135228	<b>Strategic Management</b> <i>Prerequisite: Department Permission</i> Understand competitive forces and how organizations strive to build sustainable competitive advantages through business- and corporate-level strategies. Develop strategic thinking skills for balancing opportunities and risks of business competition to generate superior value for stakeholders. Perform in-depth analyses of industries and competitors, predicts competitive behavior, and explores how firms develop and sustain competitive advantage over time. Learn strategic considerations and implementations that affect the success of technology-based products in the marketplace through a systematic exposure to key concepts in analysis, formulation and execution of strategic options.	3(3-0-6)
090135229	<b>Engineering Management Science</b> <i>Prerequisite: Department Permission</i> The course covers fundamental theories, concepts, and practices in optimization, simulation, and decision theory models to support management decision making. Emphasis on modeling and interpreting results for managerial applications of linear and integer programming models, network problems, simulation models, and decision analysis. Use software to accomplish the mathematical manipulations.	3(3-0-6)
090135230	<b>Seminar</b> <i>Prerequisite: Department Permission</i> Related to a given technical topic out of the program's research area,. The students have to search for literature and material by their own. In cooperation with the supervisor, the students have to prepare a presentation about a special problem and defend their opinion in a discussion with the other students.	3(3-0-6)
090135231	<b>Selected Topic in Production Engineering</b> <i>Prerequisite: Department Permission</i> Lectures, seminar, and independent investigations or studies in selected areas of manufacturing processes, emphasizing in advanced metal forming technologies and polymer and composites technologies.	3(3-0-6)

090135232	<b>Selected Topic in Materials Engineering</b> <i>Prerequisite: Department Permission</i> Lectures, seminar, and independent investigations or studies in selected areas of material engineering, emphasizing in advanced applications and processing of materials.	3(3-0-6)
090135233	<b>Selected Topic in Industrial Management</b> <i>Prerequisite: Department Permission</i> Advanced topics in production relevant to Industrial Engineering Study of industrial management concepts concerning these following topics; fundamental of management and business; strategic management; production strategy and competitiveness; product design and process selection; project management; supply chain management; total quality management and statistical quality control; just in time system and lean manufacturing; forecasting, capacity planning and facility location; facility layout and work system design; aggregate planning management, inventory and material requirements planning; production scheduling; engineering economics; financial and accounting for engineers; industrial cost analysis; project feasibility study; engineering decision analysis; engineering management science; discrete simulation.	3(3-0-6)
090135234	<b>Materials Science for Engineers</b> <i>Prerequisite: Department Permission</i> Atomic Structure and Interatomic Bonding, Structures of Metals and Ceramics, Polymer Structures, Imperfections in Solids, Diffusion, Properties of Materials, Deformation and Strengthening Mechanisms, Phase Diagrams, Phase Transformations, Failure, Applications and Processing of Materials.	3(3-0-6)
090135235	<b>Computer Simulation Technique</b> <i>Prerequisite: Department Permission</i> Introduction to computer simulation, random number generation techniques, Monte-Carlo technique of simulation, computer simulation languages, Simulation modeling using simulation software, applications of simulation in industrial problems, case studies on queuing, inventory, and scheduling systems.	3(3-0-6)

## Electrical and Software Systems Engineering Program (ESSE)

The master of engineering program in Electrical and Software Systems Engineering at TGGs offers the research and education opportunities in the field of communication systems, power electronics, energy conversion, software systems and smart grids:

Communications Engineering focuses on in-depth theoretical and practical knowledge in modern communication technologies both from hardware oriented aspects (fronted technology, microwave and high speed digital circuits, embedded system for communication) and from the protocol and software oriented side (e.g. signal processing, coding).

Electrical Power and Energy Engineering focus on high voltage equipment and asset management of electrical asset, power system protection and simulation and reliability aspects as well as electric vehicle, battery testing and renewable energy.

Software Systems Engineering focuses on the study of modern industrial software that is usually a part of complex systems with connections to application specific environments and special hardware.

Smart Grids Engineering focuses on dynamic optimization of grid operations and resources, with full cyber-security; distributed resources and generation; demand response, demand-side resources, and energy efficiency resources; technologies that optimize the operation for metering, communications concerning grid operations, and distribution automation; advanced electricity storage and peak-shaving technologies; and communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.

Website: <https://tggs.kmutnb.ac.th/academics/esse-master>

Assoc. Prof. Dr. Soamsiri Chantaraskul

*ESSE Master & Doctoral Curriculum Chairmen/  
CSE Coordinator/CSE Lecturer and Researcher*

**Minor: Communication and Smart System Engineering (CSE):**

Website:

Assoc. Prof. Dr. Soamsiri Chantaraskul

CSE Coordinator/Lecturer and Researcher

Assoc. Prof. Dr. Chaeyod Pirak

Lecturer and Researcher

Asst. Prof. Dr.-Ing. Suramate Chalermwisutkul

Lecturer and Researcher

Mr. Somchai Theppang

Research Assistant

Mr. Varunyou Nontaboot

Research Assistant

Mr. Tanayoot Sangsuwan

Engineer

**Plan of Study: Plan A2 (Coursework, Internship and Thesis)**

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Design Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245004
Microwave Components & Circuit Design	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245100
Communication Protocols	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245101
Broadband Wireless Communication Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245103
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Industrial Research Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245001
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090245099
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090245098
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Specific Electives of TGGs/CSE as approved by the TGGs Coordinators:</b>							
Information Theory and Source Coding	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245121
Mobile Radio Networks	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245122
Antenna Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245124
DSP Design Methodologies and Tools	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245125
Multimedia Communications	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245126
VLSI Architecture	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245127
Algorithm Design of Digital Receivers	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245128
Cryptography	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245129
System and Processor Architectures for Mobile Devices	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245130
Estimation and Detection Theory	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245131
Special Problems in Communication Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245132
Software-Defined Radio and Cognitive Radio Network	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245133
Advanced Topics in Communications	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245134
Electromagnetic Field Theory for Smart Sensing Applications	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245135



## Description of Courses: Plan A2 (Coursework, Internship and Thesis)

090245001	<b>Industrial Research Methodology</b> <i>Prerequisite: None</i> Research methodology for industrial application. Technical writing and presentation. Literature reviews. Technical seminar.	3(3-0-6)
090245004	<b>Design Methodology</b> <i>Prerequisite: None</i> Design processes for mechatronic systems (VDI 2221, VDI 2206), methods for conceptual design. Introduction to the development of consumer goods: Theoretical Approaches, Practical Methods, Introduction to Styling and Visualization Techniques. Project: Briefing, Design Review, Final Presentation	3(3-0-6)
090245098	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Students are required to conduct a research on a current topic in software systems engineering.	12
090245099	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Students are required to utilize their knowledge to solve or analyze engineering problems that occur in a factory, as well as to work in an industrial environment and write a working report that summarizes their jobs and outcomes.	4
090245100	<b>Microwave Component and Circuit Design</b> <i>Prerequisite: Department Permission</i> Electromagnetic field theory. Network theory generalization. S-parameters. Signal flow graph. Smith chart. Design of planar circuits. Filters. Dividers. Couplers. Matching networks. Microwave electronic devices including diodes; BJTs; MESFETs and HEMTs. Low noise amplifier design. Power amplifier design. Transmitter design. Receiver design.	3(3-0-6)
090245101	<b>Communication Protocols</b> <i>Prerequisite: Department Permission</i> Fundamental concept of telecommunications and computer networks. Concept of layers composing the networking framework. Network topology and standards. The ISO/OST reference model. Local Area Network (LAN). Internet and connecting networks. Basic concepts and design aspect of communication protocols. Model and operations of the TCP/IP protocol suit. Error handling methods. Routing algorithms and IP. Working principle of TCP and UDP. TCP congestion control. Application layer protocols.	3(3-0-6)
090245103	<b>Broadband Wireless Communication Systems</b> <i>Prerequisite: Department Permission</i> Introduction to digital communications. Discrete channel models. principles of orthogonal frequency division multiplexing OFDM. Fourier representation. Multicarrier transmission, implementation by fast Fourier transform (FFT). Cyclic prefix. Timing and frequency offset. Timing and frequency synchronization. Channel estimation. Probability of error analysis. OFDM systems examples. Principles of code division multiple access (CDMA). CDMA transmission channel models. Receiver structures. Performance analysis of CDMA receivers. 5th Generation Mobile Communication Systems.	3(3-0-6)
090245121	<b>Information Theory and Source Coding</b> <i>Prerequisite: Department Permission</i> Discrete memoryless sources. Entropy. Entropy coding and performance limits, continuous sources with memory. Speech quantization, differential encoding and linear prediction. Rate distortion theory. Standards of speech coding.	3(3-0-6)

090245122	<b>Mobile Radio Networks</b> <i>Prerequisite: Department Permission</i> Introduction of mobile radio networks and hysterical review. The cellular systems. System architecture and evolution from GSM towards UMTS and 4G systems. The spread spectrum technique and their usage in CDMA-based networks. The WCDMA/UMTS networks including its architecture, the used entities, and the system design choices and principles behind. The 4G network and core technology. Introduction to technologies for the next generation networks such as Software Defined Radio (SDR), Cognitive Radio network, and Heterogeneous Networks (HetNets). WLANs based on the IEEE 802.11 standard. Basic aspects of the physical layer as well as the medium access and issues of whole networks. Introduction to Bluetooth (802.15.1). ZigBee (802.15.4) as the short range communications. Wireless Sensor Network: applications and network management.	3(3-0-6)
090245124	<b>Antenna Engineering</b> <i>Prerequisite: Department Permission</i> Antenna types and parameters. Antenna analysis: wire antennas, aperture antennas, reflectors, microstrip antennas and broadband antennas. Concept of antenna arrays. Antenna systems and measurement techniques.	3(3-0-6)
090245125	<b>DSP Design Methodologies and Tools</b> <i>Prerequisite: Department Permission</i> Introduction to digital signal processing and processors. Design languages: VHDL, C/C++, and Matlab. Implementation technologies. ASICs, FPGAs, and processors High level design: code generation and hardware synthesis.	3(3-0-6)
090245126	<b>Multimedia Communications</b> <i>Prerequisite: Department Permission</i> Signal types: images, video and audio. Quantization and coding. Compression. Transmission and signal modeling. composition and synthesis of multimedia signals, JPEG, MPEG-xx, H.26x and DVD standards.	3(3-0-6)
090245127	<b>VLSI Architecture</b> <i>Prerequisite: Department Permission</i> Introduction to very large scale integrated circuits (VLSI). Moore's law and Joy's law. Basics of CMOS and digital CMOS design. MOS transistors. CMOS circuit techniques. Basics of optimization for circuit design. Mapping and implementation techniques.	3(3-0-6)
090245128	<b>Algorithm Design of Digital Receivers</b> <i>Prerequisite: Department Permission</i> Algorithm design of digital receivers, Modulation. General digital transceiver model. Digital receiver principles. Bandpass sampling Optimum ML receiver for constant synchronization parameters, systematic synthesis of synchronization algorithms based on the ML criteria. Digital algorithm for timing recovery. Timing adjustment by interpolation., Rate adaptation and modulation. Phase synchronization. Frequency estimation. Synchronizer performance analysis. Fading channel models. Optimum receiver for time varying channels.	3(3-0-6)
090245129	<b>Cryptography</b> <i>Prerequisite: Department Permission</i> Classical cryptography, entropy and perfect secrecy. Fast block ciphers. Number theoretic reference problems. Public-key encryption. Digital signature schemes.	3(3-0-6)
090245130	<b>System and Processor Architectures for Mobile Devices</b> <i>Prerequisite: Department Permission</i> Processing requirements in mobile devices. Flexible radio concepts. Silicon technology issues. Fundamental processor architectures. Execution speed-up and parallelism in processors. Application specific instruction set processors (ASIPs). Reconfigurable ASIPs (rASIP). Multi-processor systems-on-chip (MPSoC) architectures. MPSoC design.	3(3-0-6)
090245131	<b>Estimation and Detection Theory</b> <i>Prerequisite: Department Permission</i> Fundamentals of estimation and detection theory. Binary decisions: single and multiple observations. Composite decision theory. ML and MAP estimations. passband transmission over time invariant channels. receiver structure for PAM signals.	3(3-0-6)

090245132	<b>Special Problem in Communication Engineering</b> <i>Prerequisite: Department Permission</i> Problem solving for topics in the field of communications engineering. Problem-based learning concept. Progress presentation. Review and checking of project status. Application of suggestions and comments from supervising lecturers and classmates. Writing of technical report.	3(3-0-6)
090245133	<b>Software-Defined Radio and Cognitive Radio Network</b> <i>Prerequisite: Department Permission</i> Spectrum usage and regulation. Software-defined radios. Spectrum sensing. Cognitive radio network and architectures. Dynamic spectrum access technologies and algorithms. Cognitive radio protocol architectures. Cognitive networking. Standard for cognitive radios. Cognitive radio network security.	3(3-0-6)
090245134	<b>Advanced Topics in Communication</b> <i>Prerequisite: Department Permission</i> Advanced topics in Communications. Selected topics in Wireless Communications, Networking, RF frontend technology, Microwave Technology.	3(3-0-6)
090245135	<b>Electromagnetic Field Theory for Smart Sensing Applications</b> <i>Prerequisite: Department Permission</i> Maxwell's equations. Time-dependent fields. Planewave propagation; characteristics and power flow. Solution of boundary-value problems for time-harmonic fields. Relation between field theory and circuit theory: lump elements and transmission lines. Applications of electromagnetic field theory for smart industrial and medical sensing.	3(3-0-6)

**Minor: Electrical Power and Energy Engineering (EPE):****Website:**

Assoc. Prof. Dr. Wijarn Wangdee

*EPE Coordinator/Lecturer and Researcher*

Prof. Dr.-Ing. Nisai Fuengwarodsakul

*Lecturer and Researcher*

Assoc. Prof. Dr.-Ing. Thanapong Suwanasri

*Lecturer and Researcher*

Mr. Bundit Tanboonjit

*Research Assistant*

Mr. Sayan Ruankon

*Engineer***Plan of Study: Plan A2 (Coursework, Internship and Thesis)**

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Design Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245004
Electric Drive System	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245203
Testing and Condition Diagnostic of High Voltage Equipment	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245204
Electric Power Generation Control and Protection	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245205
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Industrial Research Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245001
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090245099
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090245098
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Specific Electives of TGGS/EPE as approved by the TGGS Coordinators:</b>							
Power System Reliability	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245222
Electrical Transients in Electrical Power Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245223
Battery Storage Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245224
Electric Vehicles	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245226
Selected Topics in Electrical Power Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245227
Asset Management of Electrical Power System	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245229
Power System Monitoring, Control and Protection	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245230
Distributed Generation Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245231
Renewable Energies for Electrical Power Generation	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245233
Advanced Topics in Smart Grid Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245426
Special Problems in Smart Grid Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245427

## Description of Courses: Plan A2 (Coursework, Internship and Thesis)

090245001	<b>Industrial Research Methodology</b> <i>Prerequisite: None</i> Research methodology for industrial application. Technical writing and presentation. Literature reviews. Technical seminar.	3(3-0-6)
090245004	<b>Design Methodology</b> <i>Prerequisite: None</i> Design processes for mechatronic systems (VDI 2221, VDI 2206), methods for conceptual design. Introduction to the development of consumer goods: Theoretical Approaches, Practical Methods, Introduction to Styling and Visualization Techniques. Project: Briefing, Design Review, Final Presentation	3(3-0-6)
090245098	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Students are required to conduct a research on a current topic in software systems engineering.	12
090245099	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Students are required to utilize their knowledge to solve or analyze engineering problems that occur in a factory, as well as to work in an industrial environment and write a working report that summarizes their jobs and outcomes.	4
090245203	<b>Electrical Drive System</b> <i>Prerequisite: None</i> Introduction to electrical drive systems. Fundamental theory of mechanical motion. Power electronics converters for electrical drives. DC drive system and its control. Synchronous drive system and its control. Induction drive system and its control. Switched reluctance system and its control.	3(3-0-6)
090245204	<b>Testing and Condition Diagnostic of High Voltage Equipment</b> <i>Prerequisite: None</i> Generation and measurement of high voltage in laboratory. Withstand voltage test of high voltage equipment by AC, DC and impulse voltages. Electric field calculation and insulation design technique. Partial discharge in high voltage insulation and measurement technique. Condition monitoring and diagnostic of high voltage equipment. Partial discharge measurement in underground cable system. Testing and maintenance of power transformer by electrical and insulating oil tests.	3(3-0-6)
090245205	<b>Electric Power Generation Control and Protection</b> <i>Prerequisite: None</i> Electric power generation technologies. Grid integration for conventional generation, variable renewable energy and distributed energy resources (i.e. solar photovoltaic, wind turbine, battery energy storage, electric vehicle). Principles of generator operation. Overview of power grid dynamics and stability. Frequency and voltage control principles. Generator synchronization. Generator parallel operation and load sharing. Governor control systems. Excitation control systems. Power system stabilizer and power oscillation damping. Modelling of conventional synchronous generators and inverter-based generation resources. Generator fault and protection principles. Generator abnormal operation protection. Grid-connected and islanded operation considerations.	3(3-0-6)
090245222	<b>Power System Reliability</b> <i>Prerequisite: None</i> Basic probability theory and reliability concepts. Generating capacity reliability evaluation. Operating reserve assessment. Composite system reliability evaluation. Substation reliability evaluation. Distribution system reliability assessment. Reliability worth assessment.	3(3-0-6)

090245223	<b>Electrical Transients in Electrical Power Systems</b> <i>Prerequisite: None</i> Fundamental of electrical transients, Switching transients, Damping of transient oscillation, Abnormal switching transients, Transients in three-phase circuits, Transients on transmission lines, Behavior of equipment under transient conditions, Lightning, Protection of systems and equipment against transient over voltages.	3(3-0-6)
090245224	<b>Battery Storage Systems</b> <i>Prerequisite: None</i> Fundamentals of battery. Basics of electrochemistry. Secondary battery. battery management system. Battery model. application of battery.	3(3-0-6)
090245226	<b>Electric Vehicles</b> <i>Prerequisite: None</i> Principle and structure of electric vehicles and hybrid electric vehicles, propulsion system, energy storage system, generating system, different technologies of electric vehicles.	3(3-0-6)
090245227	<b>Selected Topics in Electrical Power Engineering</b> <i>Prerequisite: None</i> The course will cover topics of interest selected by the lecturer in the field of electrical power engineering.	3(3-0-6)
090245229	<b>Asset Management of Electrical Power System</b> <i>Prerequisite: None</i> Introduction to high voltage equipment and substation, Aging and degradation of high voltage equipment, Maintenance strategies applied to high voltage equipment, Inspection and maintenance of power transformer, Inspection and maintenance of power circuit breaker, Useful lifetime assessment of high voltage equipment, Preventive and condition-based maintenance of high voltage equipment, Condition assessment of high voltage equipment, Risk management of utilization and maintenance of high voltage equipment, Inventory control of spare part, Economic analysis of high voltage equipment utilization.	3(3-0-6)
090245230	<b>Power System Monitoring, Control and Protection</b> <i>Prerequisite: None</i> Introduction to synchrophasors, Standards on synchrophasors (PMU) and phasor data concentrators (PDC), Optimal placement of synchrophasors, Wide-area measurement systems (WAMS), Requirements for monitoring, control and operation, Framework for power system operation, Power system dynamic phenomena, Monitoring and visualization technologies, Preventive and emergency control technologies, Protection technologies against blackouts, Online dynamic security assessment applications.	3(3-0-6)
090245231	<b>Distributed Generation Systems</b> <i>Prerequisite: None</i> Introduction to distributed generation (DG), Technologies of DG: conventional and renewable technologies, Grid interconnection, Active distribution networks, Technical impacts of distributed generation on distribution systems: loss, voltage profile, reliability, protection, power flow, Smart grids with DG, Economics aspects.	3(3-0-6)
090245233	<b>Renewable Energies for Electrical Power Generation</b> <i>Prerequisite: None</i> Potentials, technologies. opportunities and threats of using renewable energies for electrical power generation. technologies and sources for renewable energy conversion into electrical power. Photovoltaic. wind power. hydro power and solar thermal power. biomass and biogas. geothermal power and ocean power; electrical energy storage. integration of electrical power generation by renewable energies into grids and independent power systems.	3(3-0-6)
090245426	<b>Advanced Topics in Smart Grid Engineering</b> <i>Prerequisite: Department Permission</i> Selected topics in smart grids engineering.	3(3-0-6)

090245427

**Special Problems in Smart Grid Engineering**

3(3-0-6)

*Prerequisite: Department Permission*

Problem solving for topics in the field of smart grids engineering, Problem-based learning concept, Progress presentation, Review and checking of project status, Application of suggestions and comments from supervising lecturers and classmates, Writing of technical report.



**Minor: Software Systems Engineering (SSE):**Website: <https://sse.tggs.kmutnb.ac.th/>

Dr. Sansiri Tanachutiwat

SSE Coordinator/Lecturer and Researcher

Asst. Prof. Dr. Wannida Sae-Tang

Lecturer and Researcher

Asst. Prof Dr.-Ing. Chayakorn Netramai

Lecturer and Researcher

Dr. Yodsawalai Chodpathumwan

Lecturer and Researcher

Asst. Prof. Dr. Rachata Ausavarungnirun

Lecturer and Researcher

Dr. rer. nat. Ekkapot Charoenwanit

Lecturer and Researcher

Dipl.-Ing. Nuchchada Kohpeisansukwattana

Research Assistant

-

Engineer

**Plan of Study: Plan A2 (Coursework, Internship and Thesis)**

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Design Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245004
Efficient Algorithm	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245300
Hardware and System Software Architectures	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245303
Advanced Software Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245304
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Industrial Research Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245001
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090245099
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090245098
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Specific Electives of TGGs/SSE as approved by the TGGs Coordinators:</b>							
Computer Graphics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245322
Selected Topics in Practical Computer Science	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245323
Selected Topics in Software Systems Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245325
Network Security	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245331
Machine Vision	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245332
Digital Image Processing	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245334
Embedded Software	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245336
Machine Learning	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245337
High Performance Computing using Graphics Processing Units	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245338
Advanced Computer Architecture	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245339
Principles of Data Mining	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245340
Information Retrieval	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245341
Algorithmic Differentiation	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245342
Parallel Computing	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245343
High Performance Scientific Computing	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245344
Big Data Analytics	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245345
Human-Computer Interaction	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245346
Database and Data Warehouse	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245347
Optimization	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245348
Applications of Digital Image Processing	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245349

## Course Description: Plan A2 (Coursework, Internship and Thesis)

090245001	<b>Industrial Research Methodology</b> <i>Prerequisite: None</i> Research methodology for industrial application. Technical writing and presentation. Literature reviews. Technical seminar.	3(3-0-6)
090245004	<b>Design Methodology</b> <i>Prerequisite: None</i> Design processes for mechatronic systems (VDI 2221, VDI 2206), methods for conceptual design. Introduction to the development of consumer goods: Theoretical Approaches, Practical Methods, Introduction to Styling and Visualization Techniques. Project: Briefing, Design Review, Final Presentation	3(3-0-6)
090245098	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Students are required to conduct a research on a current topic in software systems engineering.	12
090245099	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Students are required to utilize their knowledge to solve or analyze engineering problems that occur in a factory, as well as to work in an industrial environment and write a working report that summarizes their jobs and outcomes.	4
090245300	<b>Efficient Algorithms</b> <i>Prerequisite: Department Permission</i> Sorting: Bubble sort, Selection sort, Insertion sort, Heap sort, Merge sort, Quick sort. Graph search: Linear search, Binary search, Breadth-first search, Depth-first search. Bellman-Ford algorithm. Dijkstra's algorithm. A* algorithm. Data structures: Lists, Arrays, Stacks, Queues, Hash tables, Heaps, Binary trees. Algorithm paradigms: Recursion, Divide and conquer, Greedy algorithm, Dynamic programming. Optimization: Maximum-flow, Linear programming, Simplex algorithm. Computational complexity theory: big-O notation, NP. Applications: Data compression, Security, Math.	3(3-0-6)
090245303	<b>Hardware and System Software Architectures</b> <i>Prerequisite: Department Permission</i> Translation from a high-level language to hardware operations. Processor design. Pipelining. Out-of-order processing. Branch prediction. Caching. Memory subsystem. Concurrency. Locality. Virtual memory. Software subsystems. System software. The design of software systems. Programming paradigms. Hardware-software co-optimizations.	3(3-0-6)
090245304	<b>Advanced Software Engineering</b> <i>Prerequisite: Department Permission</i> Modern software development process. Techniques for specifying software requirements and coding robust programs. Automated software testing. Software project management techniques.	3(3-0-6)
090245322	<b>Computer Graphics</b> <i>Prerequisite: None</i> An introduction to computer graphics, understanding of the background and concepts of 2D and 3D computer graphics technologies, and using standard 2D and 3D graphics libraries for efficient graphics content generation.	3(3-0-6)
090245323	<b>Selected Topics in Practical Computer Science</b> <i>Prerequisite: Department Permission</i> Advanced topics in practical perspective related to the computer technology in the field of software systems engineering.	3(3-0-6)
090245325	<b>Selected Topics in Software Systems Engineering</b> <i>Prerequisite: Department Permission</i> Advanced topics in software systems relevant to software systems engineering.	3(3-0-6)

090245331	<b>Network Security</b> <i>Prerequisite: None</i> The fundamental of network monitoring, the knowledge and practice of network security, Internet security from the packet flow aspect, abnormalities within the network, security Policies, security Audits, cyber Terrorism.	3(3-0-6)
090245332	<b>Machine Vision</b> <i>Prerequisite: None</i> Introduction about the machine vision technology, basic components in machine vision systems, application of machine vision in the fields such as engineering and related industries.	3(3-0-6)
090245334	<b>Digital Image Processing</b> <i>Prerequisite: None</i> Fundamentals of digital image processing. Color conversion. Thresholding. Image enhancement. Noise reduction and image restoration. Pixel sampling. Image quantization. Image filtering. Edge detection. Image watermarking. Image encryption. Image compression. Image segmentation. Morphological image processing. Image registration. Image recognition and classification. High dynamic range images.	3(3-0-6)
090245336	<b>Embedded Software</b> <i>Prerequisite: None</i> Introduction to embedded systems and its current research issues. introduction to microcontroller. Structure and component of a microcontroller. Digital I/O. Analog I/O. Timer and counter. Interrupt. Serial and parallel communications. Peripheral device interface. PWM and close-loop control. Real-time design consideration. Microcontroller software testing and debugging.	3(3-0-6)
090245337	<b>Machine Learning</b> <i>Prerequisite: None</i> Introduction of machine learning. Mathematics and statistics for machine learning. Data processing. Various machine learning models both supervise and unsupervised learning e.g. Regression, Classification, Clustering, Reinforcement learning models.	3(3-0-6)
090245338	<b>High Performance Computing using Graphics Processing Units</b> <i>Prerequisite: None</i> GPU architecture. Graphics pipeline. Single-instruction-multiple-thread (SIMT). limitation of GPU programming. General purpose applications on Graphics Processing Units (GPGPU). Accelerating applications' performance with CUDA and OpenCL. Heterogeneous CPU-GPU architecture. GPU on a cloud.	3(3-0-6)
090245339	<b>Advanced Computer Architecture</b> <i>Prerequisite: None</i> Parallel architecture. Cache coherence. Memory consistency. Transactional memory. Non-volatile memory. Hardware reliability. Hardware security. Reconfigurable architecture. Graphics architecture. Software-hardware codesigns that enable new models of computation.	3(3-0-6)
090245340	<b>Principles of Data Mining</b> <i>Prerequisite: None</i> Principles and algorithms of data mining. Data cleaning and integration. Descriptive and predictive mining. Frequent, sequential and structured pattern mining. Clustering. Outlier analysis and fraud detection. Other research topics in data mining.	3(3-0-6)
090245341	<b>Information Retrieval</b> <i>Prerequisite: None</i> Concepts, Models and algorithms in information retrieval including evaluation methodology. Vector space retrieval models. Probabilistic retrieval models. Learning-to-rank algorithms. Topic modeling. Text analytics and other research topics in information retrieval.	3(3-0-6)
090245342	<b>Algorithmic Differentiation</b> <i>Prerequisite: None</i> Finite difference method. Steepest descent algorithm. Newton's algorithm. Derivative code. Tangent and Adjoint modes of AD. High-order derivatives. Checkpointing strategies for adjoint mode of AD. Vertex elimination. Edge elimination. Face elimination. Parallelization strategies.	3(3-0-6)

090245343	<b>Parallel Computing</b> <i>Prerequisite: None</i> Parallel computer architectures. Parallel performance analysis. Shared-memory programming paradigm. Processes and threads. Inter-process communication (IPC). Synchronization primitives. Multithreaded programming with Pthreads and OpenMP. Distributed-memory programming paradigm. Message-passing programming with Message Passing Interface (MPI). Point-to-point communication. Collective communication. Synchronous and asynchronous operations. Parallel algorithms.	3(3-0-6)
090245344	<b>High-Performance Scientific Computing</b> <i>Prerequisite: None</i> Asymptotic notation. Complexity analysis. Parallel performance analysis. Parallel computer architectures. Numerical linear algebra. PageRank algorithm. Numerical methods for linear differential equations. Least-square regression. Algorithmic differentiation.	3(3-0-6)
090245345	<b>Big Data Analytics</b> <i>Prerequisite: None</i> Fundamental platforms and storages for big data: Hadoop, Spark and other tools. Statistics and Exploratory Data Analysis. Linked Big Data and Graph Analysis. Big Data Analytics Algorithms. Big Data Visualization.	3(3-0-6)
090245346	<b>Human-Computer Interaction</b> <i>Prerequisite: None</i> Designing the human-computer interaction. Human-computer interaction using graphics and text. Human-computer interaction using natural body gesture. augmented technology for human-computer interaction.	3(3-0-6)
090245347	<b>Database and Data Warehouse</b> <i>Prerequisite: Department Permission</i> Modern database models and systems, yet scientifically based level. Relational models and database using SQL. Semi-structured models and database using XML. Database transaction management. Concepts for performance tuning and safety in database implementation.	3(3-0-6)
090245348	<b>Optimization</b> <i>Prerequisite: None</i> Linear programming. Graphical method. Simplex method. Duality. Non-linear programming. Unconstrained optimization. Direct search. Gradient Descent. Steepest Descent. Newton's method. Constrained optimization. Lagrange's method.	3(3-0-6)
090245349	<b>Applications of Digital Image Processing</b> <i>Prerequisite: None</i> Applications of digital image processing such as face recognition, character recognition, copyright- and privacy-protected image trading systems. compression of high dynamic range images, biomedical image processing, and other applications.	3(3-0-6)

**Minor: Smart Grids Engineering (SGE):**

Website: <https://www.facebook.com/SGE.TGGS.KMUTNB/>

Assoc. Prof. Dr. Chaigyod Pirak	<i>SGE Coordinator</i>
Prof. Dr.-Ing. Nisai Fuengwarodsakul	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr.-Ing. Thanapong Suwanasri	<i>Lecturer and Researcher</i>
Asst. Prof. Dr.-Ing. Suramate Chalermwisutkul	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr. Soamsiri Chantaraskul	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr. Wijarn Wangdee	<i>Lecturer and Researcher</i>
Dr. Sansiri Tanachutiwat	<i>Lecturer and Researcher</i>
Asst. Prof. Dr.-Ing. Chayakorn Netramai	<i>Lecturer and Researcher</i>
Asst. Prof. Dr. Wannida Sae-Tang	<i>Lecturer and Researcher</i>
Dr. Yodsawalai Chodpathumwan	<i>Lecturer and Researcher</i>
Asst. Prof. Dr. Rachata Ausavarungnirun	<i>Lecturer and Researcher</i>
Dr. rer. nat. Ekkapot Charoenwanit	<i>Lecturer and Researcher</i>

## Plan of Study: Plan A2 (Coursework, Internship and Thesis)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Design Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245004
Modern Power Grid Operation and Control	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245403
Advanced Wireless Communications and Metering Infrastructure	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245404
Data Management and Analysis	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245405
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Industrial Research Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245001
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
General Elective / Specific Elective / Other Elective / Other Specific Course*	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245xxx
					<b>30</b>	<b>15</b>	
<b>Semester III</b>							
Industrial Internship					30	4	090245099
					<b>30</b>	<b>4</b>	
<b>Semester IV</b>							
Master Thesis					30	12	090245098
					<b>30</b>	<b>12</b>	
<b>Total</b>					<b>120</b>	<b>46</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of Specific Electives of TGGS/SGE as approved by the TGGS Coordinators:</b>							
Communication Systems for Smart Grids	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245423
Internet of Things	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245424
Cyber Security for Smart Grids	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245425
Advanced Topics in Smart Grid Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245426
Special Problems in Smart Grid Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-6)	090245427

## Course Description: Plan A2 (Coursework, Internship and Thesis)

090245001	<b>Industrial Research Methodology</b> <i>Prerequisite: None</i> Research methodology for industrial application. Technical writing and presentation. Literature reviews. Technical seminar.	3(3-0-6)
090245004	<b>Design Methodology</b> <i>Prerequisite: None</i> Design processes for mechatronic systems (VDI 2221, VDI 2206), methods for conceptual design. Introduction to the development of consumer goods: Theoretical Approaches, Practical Methods, Introduction to Styling and Visualization Techniques. Project: Briefing, Design Review, Final Presentation	3(3-0-6)
090245098	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Students are required to conduct a research on a current topic in software systems engineering.	12
090245099	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Students are required to utilize their knowledge to solve or analyze engineering problems that occur in a factory, as well as to work in an industrial environment and write a working report that summarizes their jobs and outcomes.	4
090245403	<b>Modern Power Grid Operation and Control</b> <i>Prerequisite: Department Permission</i> Introduction to electric power supply structure. Power grid evolution. Integration of large-scale renewable energy and distributed generation resources. Effect of power electronic interfaced equipment penetration. Power grid reliability containing variable renewable energy. Economic operation of power grid. Principles of power grid stability and security. Power grid standards (grid codes). Active power and frequency control. Reactive power and voltage control. Microgrid operation and control. Energy management systems for smart grids.	3(3-0-6)
090245404	<b>Advanced Wireless Communications and Metering Infrastructure</b> <i>Prerequisite: Department Permission</i> Introduction to Wireless Communications. Probability Theory. Random Variables. Random Processes. Matrix definitions. Operations. and Properties. Path Loss. Shadowing. Statistical Multipath Channel Models. Digital Modulation and Detection. Performance of Digital Modulation over Wireless Channels. Multiple Access Techniques. Signal to Noise Power Ratio. Detection Error Probability. Smart Meters. Advanced Metering Infrastructure (AMI). Communication Network Architecture for Smart Grids. Meter Data Acquisition System. Meter Data Management System (MDMS). Anti-tampering Methodology. Smart Grid System Integration.	3(3-0-6)
090245405	<b>Data Management and Analysis</b> <i>Prerequisite: Department Permission</i> Data storage, data management, and data processing. Database models including Relational model and Semi-Structured model. Statistics and exploratory data analysis. Analytics tools for big data. Data visualization.	3(3-0-6)
090245423	<b>Communication Systems for Smart Grids</b> <i>Prerequisite: Department Permission</i> Hardware components for wireless communications in smart grids, Reflection and transmission, RF cables and transmission line theory in communications systems, RF passive and active components, Antenna basics, Maintenance of RF and microwave systems and basic measurement techniques, Principles of wireless power transfer, RF mesh networks, Power Line Communications (PLC), Cellular Networks.	3(3-0-6)
090245424	<b>Internet of Things</b> <i>Prerequisite: Department Permission</i> Components and architecture of IoT, Embedded system, Embedded software, Communication interfaces for embedded systems, Machine to machine communication, IoT applications and case studies, Design and development of IoT application.	3(3-0-6)



090245425	<b>Cyber Security for Smart Grids</b> <i>Prerequisite: Department Permission</i> Security architecture, Security services, System security, Network security, Cyber security, Protocol failure analysis, Cyber attacks, Introduction to cryptography, Encryption, Data integrity, Authentication, Wireless network security, Security of RF mesh, Wi-Fi systems, Security of cellular networks, Security of PLC, Security of DLMS/COSEM.	3(3-0-6)
090245426	<b>Advanced Topics in Smart Grid Engineering</b> <i>Prerequisite: Department Permission</i> Selected topics in smart grids engineering.	3(3-0-6)
090245427	<b>Special Problems in Smart Grid Engineering</b> <i>Prerequisite: Department Permission</i> Problem solving for topics in the field of smart grids engineering, Problem-based learning concept, Progress presentation, Review and checking of project status, Application of suggestions and comments from supervising lecturers and classmates, Writing of technical report.	3(3-0-6)

# CU-TGGS JOINT-MASTER DEGREE PROGRAM AND DESCRIPTION OF COURSES

The Master Program in Railway Vehicles and Infrastructure Engineering (RVIE) focuses on the engineering aspects, design, and research and development of the complete rail systems including the rail vehicles and rail infrastructure. All classes in the program are taught by experienced lectures from KMUTNB, CU as well as world renowned professors in the area of railway from RWTH Aachen University, Germany--a world leading country in railway technology. RVIE combines the best know-how into the three-year program that includes one full year of studies in Germany.

RVIE is a true multidiscipline program that cross combine multiple engineering topics such as civil, mechanical, electrical and power electrical, communications, mechatronics, design methodology, software, materials and production, logistics, management, just to name a few.

RVIE consists of two majors which are (1) Rail Vehicles Engineering (RVE) which directed primarily at students with a background in Mechanical and Electrical Power Engineering and (2) Railway Infrastructure Engineering (RIE) which directed primarily at students with a background in Civil Engineering.

RVIE cooperates research problems from rail related industry into the learning process. Students will be seamlessly integrated into research projects under the guidance of their lecturers and experts from industry from which they will acquire technical knowledge and teamwork skills.

Through this learning scheme, companies and students can get to know each other's potential which may result in career opportunities. Graduates from RVIE program will enjoy the vast opportunities as thousands of job positions in rail industry in Thailand and SEA are in urge to be filled in the coming decades.

RVIE is part of the German Thai Railway Partnership (GTRP) where one of the key targets is to addresses the human resource development, engineering R&D, and knowledge transfer. GTRP is an active group with members from universities, rail related government organizations and industries from Thailand and abroad. GTRP is under direct support from the Ministry of Transport and the German Embassy in Thailand.

Website: <https://rvie.tggs.kmutnb.ac.th/>

Univ.-Prof. Dr.-Ing. Christian Schindler	<i>RWTH-RVIE Coordinator / Professor Chair of Institute for Rail Vehicles and Transport Systems (IFS)</i>
Asst. Prof. Dr.-Ing. Chayakorn Netramai	<i>TGGS-RVIE Curriculum Chairman</i>
Assoc. Prof. Dr. Boonchai Sangpetngam	<i>CU-RVIE Coordinator / RIE Lecturer</i>
Asst. Prof. Dr. Kittichai Sojiphan	<i>TGGS-RVIE Coordinator/ RVE Lecturer &amp; Researcher</i>

## **Minor: Railway Vehicles Engineering (RVE):**

Asst. Prof. Dr. Kittichai Sojiphan	<i>TGGS-RVE Coordinator / Lecturer and Researcher</i>
Assoc. Prof. Dr.-Ing. Thanapong Suwanasri	<i>Lecturer and Researcher</i>
Asst. Prof. Dr.-Ing. Kumpanat Sirivedin	<i>Lecturer and Researcher</i>
Asst. Prof. Dr. Karuna Tuchinda	<i>Lecturer and Researcher</i>
Dr.-Ing. Alex Brezing	<i>Lecturer and Researcher</i>
Assoc. Prof. Dr. Thavatchai Tayjasanant	<i>CU Electrical Engineering Lecturer</i>
Asst. Prof. Dr. Nuksit Noomwongs	<i>CU Mechanical Engineering Lecturer</i>
Univ.-Prof. Dr.-Ing. Christian Schindler	<i>RWTH-RVIE Coordinator / Professor /Chair of IFS</i>
Univ.-Prof. Dr.-Ing. Jörg Feldhusen	<i>RWTH Professor</i>

## Plan of Study: Plan A2 (Coursework, Internship and Thesis)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
RAMS in Railway Applications	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155101
Fundamentals of Rail Vehicle Dynamics	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155102
Rail Vehicle Vibration Dynamics	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155113
Specific Core Course / General Elective Course / Specific Elective / Other Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155xxx
					<b>24</b>	<b>12</b>	
<b>Semester II</b>							
Electric Drive Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155111
Structural Design Methodology	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155112
Hydraulics and Pneumatics	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155114
Specific Core Course / General Elective Course / Specific Elective / Other Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155xxx
					<b>24</b>	<b>12</b>	
<b>Semester III (at RWTH Aachen University in Germany)</b>							
Track Guiding Technology	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155104
Rail Vehicles Components	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155123
Specific Core Course / General Elective Course / Specific Elective / Other Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155xxx
					<b>18</b>	<b>9</b>	
<b>Semester IV (at RWTH Aachen University in Germany)</b>							
Principles of Rail Vehicle Technology	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155103
Mechatronic Systems in Vehicle Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155121
Internal Combustion Engines I	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155122
Electric Rail Vehicles, Linear Drives and Magnetic Levitation	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155124
					<b>24</b>	<b>12</b>	
<b>Semester V</b>							
Master Thesis					30	12	090155198
					<b>30</b>	<b>12</b>	
<b>Semester VI</b>							
Industrial Internship					30	4	090155199
					<b>30</b>	<b>4</b>	
<b>Total</b>					<b>150</b>	<b>61</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of General Electives of TGGs/RVE as approved by the TGGs Coordinators:</b>							
Vehicle Acoustics	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155201
Dynamics and Vibrations	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155202
Fundamentals of Internal Combustion Engines	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155203
Fundamentals of Electrical Power Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155204
Environmental Sustainability in Transport Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155205
Quality Engineering for Railway Engineers	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155206
<b>List of Specific Electives of TGGs/RVE as approved by the TGGs Coordinators:</b>							
Advanced Special Topics in Rolling Stock Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155208
Computer-Aided Engineering Tools I	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155211
Computer-Aided Engineering Tools II	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155212
Finite Element Method	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155213
Mechanical Behaviour and Degradation	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155214
Vehicle Crash and Human Body Simulation Techniques	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155215

## Description of Courses: Plan A2 (Coursework, Internship and Thesis)

090155101	<p><b>RAMS in Railway Applications</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Reliability, Availability, Maintainability, Safety: RAMS-management as a product-lifecycle-oriented component of a holistic management process that addresses all aspects of complete rail-systems; RAMS-process and related approaches, lifecycle engineering principles, systems approach, design methodology, FMEA/ FMECA; RAMS standards (EN 50126). RAMS-impacting factors: rail-system conditions, operating conditions, maintenance; human factors; specification of RAMS requirements; risk management: risk concept, risk analysis, hazard analysis, deterministic vs. probabilistic approaches, risk-reduction approaches, risk-acceptable criteria (ALARP GAMAP MEM); functional analysis; failure mode identification (functional and piece part failures) and effect analysis, criticality analysis; safety integrity, design for safety (fail-safe concepts and others), design for maintainability; RAMS documentation.</p>	3(3-0-9)
090155102	<p><b>Fundamentals of Rail Vehicle Dynamics</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Concepts of forces and accelerations of a moving mass; applied on longitudinal, vertical and lateral dynamics of a rail vehicle; Concepts of driving resistance: rolling resistance, drag, vehicle acceleration, inclines and declines; Concepts of propulsion power demand calculations; Overview of rail propulsion systems: combustion (diesel), electrical, alternative; Overview of rail transmission systems; Overview of rail brake systems (regulations, safety by redundant systems, technical concepts: mechanical, hydraulics, pneumatics electric brakes), concepts of braking performance calculations; Concepts of vibrations of single mass oscillators, resonance frequencies, damping; Concepts of vibrations of double mass oscillators; Suspension systems; vertical dynamics, vibration excitations from the track; Vibration excitations from propulsion systems; Vertical dynamics and driving comfort: the effect of vibrations on the human body, seating systems; Introduction to Multi-Body Models and Simulation of rail suspensions; Introduction to Multi-Body Models and Simulations of complete vehicles; Lateral dynamics, derailing, cross-influences of longitudinal and lateral vehicle dynamics; Introduction to wheel/rail interactions</p>	3(3-0-9)
090155103	<p><b>Principles of Rail Vehicle Technology</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Categorization of railway transport within the context of other transport systems; Railway subsystems with a focus on vehicles; rail-guided vehicle systems in comparison with road vehicles; socio-economic challenges, contribution of railway to overall transport systems; overview of the rail industry. Laws and standards, mass transit and main line railway: technical specifications, layouts, vehicle and train configurations, principles of carrying, guiding and driving / braking; basic components of vehicle: track, wheel; wheel-track interactions: load transfer, traction and brake forces; driving resistance, traction force, energy demand and energy saving potential; transmission systems and elements; brake systems and components, braking principles and methods.</p>	3(3-0-9)
090155104	<p><b>Track Guiding Technology</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Tasks and elements of track guiding system: wheel/rail and wheelset/track in established configurations; derivation of conditions for geometrically ideal track guiding, detailed discussion of wheel to rail interface, resulting forces and moments effective on the wheel-pair; estimation of wheel/rail wear, established proof of derailment safety in twisting track sections with quasi-static cornering; Kinematic explanation of hunting oscillation of the wheelset according to Klingel, detailed calculations of contact surface and -pressure between wheel and rail according to the theory of Hertz, determination of the wheel/rail contact point, analytical calculation of the so-called "visible" or "effective" wheel profile according to Borgeaud; equations of motion for the kinetic analysis of the movements of the wheelset and independently rotating wheel pairs; introduction to the numerical calculation of the vehicle run: multi-body simulations; modeling of the track condition as independent excitations of the wheelset; introduction to vibration analogy models for track, wheelset, undercarriage and entire rail vehicles.</p>	3(3-0-9)

090155198	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Research in an interesting topic in Automotive Engineering. The student will submit the thesis to summarize the thesis work content, deliverables and confirmed outcomes.	12
090155199	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Apply the knowledge for solution or analysis of engineering problem in industry through internship in industrial environment. The student will submit the report to summarize the internship work content, deliverables and confirmed outcomes.	4
090155111	<b>Electric Drive Systems</b> <i>Prerequisite: Department Permission</i> Introduction to electrical drive systems, fundamental theory of mechanical motion, power electronics converters for electrical drives, DC drive system and its control, synchronous drive system and its control, induction drive system and its control, switched reluctance drive system and its control.	3(3-0-9)
090155112	<b>Structural Design Methodology</b> <i>Prerequisite: Department Permission</i> The course embeds quantitative methods of structural mechanics into the context of design methodology, thereby combining these with qualitative approaches to structural design. First part, design methodology: General design process acc. to VDI2221, methods for technical specification, functional decomposition, requirement engineering, conceptual design, evaluation and selection of technical concepts; taxonomy of design rules and principles according to Pahl and Beitz, selected examples thereof: force transmission, division of tasks, self-help, bistability, fault-free design and others; introduction to computer-based topology optimization. Second part, advanced concepts of structural mechanics for lightweight structures: energy principles, deformation of elastic systems, statically indeterminate structures (force method, method of consistent deformations), force introduction and transmission, stability behavior of lightweight structures, buckling of trusses with and without plastic material behavior, Ritz-method for solving stability problems, stability of other structural elements; sandwich design, failure modes of sandwich materials, core and face materials.	3(3-0-9)
090155113	<b>Rail Vehicle Vibration Dynamics</b> <i>Prerequisite: Department Permission</i> General introduction to vibrations in rail vehicles, narrowed down to vertical and longitudinal dynamics; methods of vibration analysis; modelling of vibration systems, notation, examples; determining equations for single mass oscillators with base point displacement excitation; modelling of track irregularities in the displacement and frequency domain, response spectrums as functions of vehicle velocity and transfer path; assessment of the effects of vehicle vibrations.; application examples of multiple –mass oscillator models; measures to improve vibration behavior of railway vehicles; railway trains as a chain of longitudinally oscillating masses.	3(3-0-9)
090155114	<b>Hydraulics and Pneumatics</b> <i>Prerequisite: Department Permission</i> Introduction to hydraulics & pneumatics; development of hydraulic machines and applications; hydraulics systems and components; principles of hydraulic systems calculations; hydraulic fluids; pumps, valve types and their selection; design of hydraulic circuit diagrams, dimensioning calculation of hydraulic components, calculations of hydraulics system, examples. Fundamentals of pneumatics systems, pneumatic pumps and supply systems, pneumatic piping design, pneumatic components, calculation of pneumatic systems, design of pneumatics circuits, example of such.	3(3-0-9)

090155121	<b>Mechatronic Systems in Vehicle Engineering</b> <i>Prerequisite: Department Permission</i> Concept of structural testing and evaluation; destructive and non-destructive testing; structural models and components for testing; full scale testing; testing standards; equipment and measurement techniques; data analysis and evaluation of structural performance.	3(3-0-9)
090155122	<b>Internal Combustion Engines I</b> <i>Prerequisite: Department Permission</i> Classification, manufacturing processes, chemical structure and physical properties of fuels based on mineral oil; energy reserves, consumption and the energy industry; alternative fuels based on coal, natural gas and non-fossil sources of energy; energy flow in the combustion engine process: open cycle simulations, energy balance and definition of losses; heat flow in combustion engines: heat transfer mechanisms, calculation methods of heat transfer coefficients in the combustion chamber, conduction and heat transfer to the coolant; temperatures and thermal stresses of engine components, layout of combustion engines, rules of geometrical, mechanical and thermal similarity, indices and mechanical power limits; engine base data; typical plan of an engine development process; forces and moments in engines: gas forces and inertia forces, excitation by forces in crank drive mechanism; Engine balancing; torsional vibration of crankshafts; engine components: requirements on crankshaft, connecting rod, piston, crankcase, cylinder head and liner; materials, concepts and specific design features; cooling and lubrication systems	3(3-0-9)
090155123	<b>Rail Vehicles Components</b> <i>Prerequisite: Department Permission</i> Introduction to the design of rail vehicles and main design restrictions, transportation tasks of different vehicle categories; discussion of the most important subsystems and functional groups: car bodies and their build types; undercarriage types including drive/ transmission configurations; drives and brakes; coupling elements such as springs, dampers, handlebars or guide elements; doors and footboards; joint transitions and vehicle couplings; windows and interior lighting; heating, air conditioning and ventilation systems; sanitary systems.	3(3-0-9)
090155124	<b>Electric Rail Vehicles, Linear Drives and Magnetic Levitation</b> <i>Prerequisite: Department Permission</i> Railways history, main propulsion systems of electric railways; system overview; drives: power converters, traction motors, transmissions; drive control; transformers; high voltage equipment; suspension systems; brakes; characteristics railway vehicles; light rail, metro; commuter rail, high speed trains; magnetic levitation systems / linear drives: overview and principles; Transrapid, Maglev; system design.	3(3-0-9)
090155131	<b>Railway Electrification</b> <i>Prerequisite: Department Permission</i> Electrical Railway Power Supply Systems, Electric Motor Drive for Electric Railway, Energy management in Railway System, Electromagnetic Compatibility in Railway System, Case Studies from Thailand and abroad	3(3-0-9)
090155132	<b>Material Characterization</b> <i>Prerequisite: Department Permission</i> Non destructive testing, Mechanical property, Hardness, Computed Tomography, Ultrasonic, SEM/EM, Failure analysis, Chemical Composition Analysis.	3(3-0-9)

090155133	<b>Infrastructure planning and management</b> <i>Prerequisite: Department Permission</i> An integrated approach to the planning, construction, operation, and maintenance of infrastructure through an understanding of the performance of infrastructure and life-cycle cost evaluation; approaches to management, available technologies, and decision supporting tools in infrastructure and facility planning and management; economic framework for identifying and analyzing investment and operations options; relevant issues such as environment, laws, and regulations.	3(3-0-9)
090155134	<b>Railway Track Engineering</b> <i>Prerequisite: Department Permission</i> Principles of railway track alignment and track structures; general knowledge of rolling stocks and locomotives; structural gauge and loading gauge; cross sections of track structures; horizontal and vertical alignment for intercity train, commuter train and metro; components of railway track and track structures; track structures design; track layouts in yards; signalling concept; various types of stations: container yard, industry yard; track inspection and maintenance.	3(3-0-9)
090155135	<b>Rail Transport System</b> <i>Prerequisite: Department Permission</i> History of Rail Transport Development, Fundamental and Characteristics of Rail Operation, Rules of Safety, Composition of Rail System: Infrastructure, Rolling Stocks, Signaling and Communication, Case Studies of Rail Transport Development in Thailand and Neighboring Countries.	3(3-0-9)
090155141	<b>Railway Timetabling and Operations</b> <i>Prerequisite: Department Permission</i> Timetable construction; time/distance/track-occupancy diagrams and minimum headway times; capacity assessment with probabilistic methods; capacity assessment with simulation methods; railway control systems (railway operation centers, conflict solving, deadlock-avoiding); infrastructure modeling.	2(2-0-6)
090155142	<b>Railway Control Systems</b> <i>Prerequisite: Department Permission</i> Risk analysis and risk acceptance models; train control systems; European Train Control System (ETCS); train protection and train control, radio systems; safety technology in railway crossings.	1(1-0-3)
090155143	<b>Mobility Research and Transport Modelling</b> <i>Prerequisite: Department Permission</i> Mobility – definitions and patterns: passenger transportation, freight traffic; impacts and trends; traffic management, transportation demand management, mobility management, ICT; empirical mobility research: methods and interpretation, fundamentals of empirical social research; theory of planned behavior; interaction of land use and mobility: land use patterns and modeling, types of transportation models, prognosis and scenario; macroscopic transportation modeling (4 step algorithm); microscopic transportation modeling; modeling of freight traffic, modeling and management of urban freight traffic.	3(3-0-9)
090155144	<b>Railway Systems</b> <i>Prerequisite: Department Permission</i> Comparison of railway vehicles and automotive engineering; elements and dimensioning of superstructures; dimensioning of alignment elements; construction of alignment in ground plan and elevation; design of railway stations; safety engineering; dimensioning of nodes/switches; minimum headway times; calculation of running times, introduction to timetable construction.	3(3-0-9)



090155201	<b>Vehicle Acoustics</b> <i>Prerequisite: Department Permission</i> Introduction to technical acoustics; audiology, measuring of ( airborne) sound; measuring of ( structure- borne) sound and vibrations; legislative issues, accelerated pass-by noise measurement procedure (ISO 362); engine noise; noise and vibrations of drivetrain components; vibrations of vehicle drivetrains; road/tyre noise; noise and vibrations of brake systems; power steering noise; vehicle body noise and vibration; psychoacoustics, sound engineering.	3(3-0-9)
090155202	<b>Dynamics and Vibrations</b> <i>Prerequisite: Department Permission</i> Dynamic system modeling; equation of motion; analysis of systems with single and multi degree of freedom; free and forced vibration; determination of natural frequencies of structures; distributed mass system; response spectrum method; dynamic analysis using numerical techniques; basic principles of non- linear system.	3(3-0-9)
090155203	<b>Fundamentals of Internal Combustion Engines</b> <i>Prerequisite: Department Permission</i> Classification and characteristics of internal combustion engines, Kinematics and forces of the internal combustion engine, Mass forces of the displacement motor, Thermodynamic fundamentals, Characteristic parameters, Process in gasoline/Otto engines, Process in diesel engines, Pollutant formation and exhaust after treatment	3(3-0-9)
090155204	<b>Fundamentals of Electrical Power Engineering</b> <i>Prerequisite: Department Permission</i> Introduction to power systems, sources of electric energy, load characteristics, electric power plants, basic power system calculation, electric power transmission, transmission line parameters, electric power distribution, power transformers, power system equipment	3(3-0-9)
090155205	<b>Environmental Sustainability in Transport Engineering</b> <i>Prerequisite: Department Permission</i> Pollutants and pollutant sources: road vehicle emissions, railway train emissions, naval emissions, aircraft emissions; measurements and data analysis: concentration measurement of gases and particles, analysis of an air-quality data set; dry and wet deposition; mitigation and effects of air pollution: the role of vegetation, effects on humans and animals, plants, soil and groundwater, effects on material properties; control of emissions, legislation in EU, UK, US and Asia; noise: introduction to acoustics, environmental noise. noise sources: emissions from motor vehicles, railway and aircraft; measurement, prediction, propagation and control of noise in the contexts of road traffic, railway and airports; effects of noise on humans and animals; environmental assessment.	3(3-0-9)
090155206	<b>Quality Engineering for Railway Engineers</b> <i>Prerequisite: Department Permission</i> The course provides the understand of quality infrastructure ( QI) and quality engineering ( QE) in railway industry and their tools such as Metrology, Standard, Testing and Quality assurance (MSTQ). Theory of the MSTQ and hand-on practices in railway cases. Case study in implementing of MSTQ in railway industrial for trouble shooting and development. Necessary skills in quality engineering and management for professional career.	3(3-0-9)
090155207	<b>Advanced Special Topics in Railway Track Engineering</b> <i>Prerequisite: Department Permission</i> The course focuses on current interest and approaches in railway track research and development. Study and investigate special problems assigned by the instructors. Analyze and determine possible solutions to the problems in written report and presentation. The topic selected can be extended for master degree thesis.	3(3-0-9)

090155208	<b>Advanced Special Topics in Rolling Stock Engineering</b> <i>Prerequisite: Department Permission</i> The course focuses on current interest and approaches in research and development of rolling stock engineering. Study and investigate special problems assigned by the instructors. Analyze and determine possible solutions to the problems in written report and presentation. The topic selected can be extended for master degree thesis.	3(3-0-9)
090155211	<b>Computer Aided Engineering Tools I</b> <i>Prerequisite: Department Permission</i> A series of examined modules to give students the necessary CAE tool technical skills needed for practical use in other courses, research and thesis work, and in preparation of industrial application. The software could be either commercial or non-commercial packages, more than one package, and selected according to the overall program needs and balanced between current industry and research market requirements.	3(3-0-9)
090155212	<b>Computer Aided Engineering Tools II</b> <i>Prerequisite: Department Permission</i> Continues from Computer Aided Engineering Tools I, by deepening skills and/or using different packages. A series of examined modules to give students the necessary CAE tool technical skills needed for practical use in other courses, research and thesis work, and in preparation of industrial application. The software could be either commercial or non-commercial packages, more than one package, and selected according to the overall program needs and balanced between current industry and research market requirements.	3(3-0-9)
090155213	<b>Finite Element Method</b> <i>Prerequisite: Department Permission</i> Overview of numerical methods; Finite elements for 2D trusses, beams, 2D and 3D continua; Matrix methods (force and displacement method); Stiffness matrix for springs, rods, 2D trusses, bending of beams, 2D elastic continua; Mass matrices for dynamic analysis; Triangle element, higher order (quadratic and cubic) displacement functions; Quadrilateral elements (Lagrange and serendipity elements); Isoparametric elements; Elements for 3D analysis (tetrahedron, cube). The course will include the use of non-commercial and/or commercial software.	3(3-0-9)
090155214	<b>Mechanical Behaviour and Degradation</b> <i>Prerequisite: Department Permission</i> Stress and Strain; Elastic Properties; Yielding; Material Behavior with Plastic Deformation; Fracture; Crack Growth; Fatigue; Creep; Wear; Failure Analysis; Life Assessment for Engineering Components.	
090155215	<b>Vehicle Crash and Human Body Simulation Techniques</b> <i>Prerequisite: Department Permission</i> Accidental reconstruction and analysis; Kinematics of vehicle impact; Simulation of side impact and frontal collision; Principle of human body simulation; Pedestrian and occupant simulation.	3(3-0-9)
090155231	<b>Probability Statistics and Decision for Civil Engineering</b> <i>Prerequisite: Department Permission</i> Elements of probability theory; common probability models; probabilistic models and observed data; elementary Bayesian decision theory; analysis of independent random process.	3(3-0-9)

090155232	<b>Computer Programming and Computer Tools for Graduate Research</b> <i>Prerequisite: Department Permission</i> Object-oriented programming using C++, event driven and GUI programming, data flow programming for data acquisition and automatic control in laboratory; use of MATLAB and Mathematica, numerical algorithm for linear system, numerical algorithm for non-linear system.	3(3-0-9)
090155233	<b>Finite Element Method for Civil Engineers</b> <i>Prerequisite: Department Permission</i> Basic concepts of interpolation; finite element interpolation; introduction to the finite element techniques in mechanics; development of elements from various principles and application of the method to static continuum problems; convergence and compatibility requirements; assemblage of elements and boundary conditions; structure of a typical finite element computer program; introduction to the treatment of dynamics and stability and extension of the method to generalized field problem; application in civil engineering problems.	3(3-0-9)
090155234	<b>Structural Testing and Evaluation</b> <i>Prerequisite: Department Permission</i> Concept of structural testing and evaluation; destructive and non-destructive testing; structural models and components for testing; full scale testing; testing standards; equipment and measurement techniques; data analysis and evaluation of structural performance.	3(2-3-7)

**Minor: Railway Infrastructure Engineering (RIE):**

Assoc. Prof. Dr. Boonchai Sangpetngam

CU-RIE Coordinator / Civil Engineering Lecturer

Assoc. Prof. Dr. Terdsak Rongveriyapanich

KMUTNB Civil Engineering Lecturer

Univ.-Prof. Dr.-Ing. Nils Nießen

RWTH Professor

Chair of Institute of Transport Science (VIA)

**Plan of Study: Plan A2 (Coursework, Internship and Thesis)**

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
RAMS in Railway Applications	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155101
Fundamentals of Rail Vehicle Dynamics	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155102
Infrastructure Planning and Management	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155133
Rail Transport Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155135
Specific Core Course / General Elective Course / Specific Elective / Other Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155xxx
					<b>30</b>	<b>15</b>	
<b>Semester II</b>							
Railway Electrification	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155131
Material Characterization	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155132
Railway Track Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155134
Specific Core Course / General Elective Course / Specific Elective / Other Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155xxx
					<b>24</b>	<b>12</b>	
<b>Semester III (at RWTH Aachen University in Germany)</b>							
Track Guiding Technology	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155104
Railway Timetabling and Operations	3h x 15w	5h x 15w	30	150	6	2(2-0-6)	090155141
Railway Systems	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155144
Specific Core Course / General Elective Course / Specific Elective / Other Elective Course	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155xxx
					<b>24</b>	<b>11</b>	
<b>Semester IV (at RWTH Aachen University in Germany)</b>							
Principles of Rail Vehicle Technology	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155103
Railway Control Systems	3h x 15w	5h x 15w	30	150	6	1(1-0-3)	090155142
Mobility Research and Transport Modelling	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155143
					<b>18</b>	<b>7</b>	
<b>Semester V</b>							
Master Thesis					30	12	090155198
					<b>30</b>	<b>12</b>	
<b>Semester VI</b>							
Industrial Internship					30	4	090155199
					<b>30</b>	<b>4</b>	
<b>Total</b>					<b>150</b>	<b>61</b>	

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>List of General Electives of TGGS/RVE/RIE as approved by the TGGS Coordinators:</b>							
Vehicle Acoustics	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155201
Dynamics and Vibrations	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155202
Fundamentals of Internal Combustion Engines	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155203
Fundamentals of Electrical Power Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155204
Environmental Sustainability in Transport Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155205
Quality Engineering for Railway Engineers	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155206
<b>List of Specific Electives of TGGS/RIE as approved by the TGGS Coordinators:</b>							
Advanced Special Topics in Railway Track Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155207
Probability Statistics and Decision for Civil Engineering	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155231
Computer Programming and Computer Tools for Graduate Research	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155232
Finite Element Method for Civil Engineers	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155233
Structural Testing and Evaluation	3h x 15w	5h x 15w	30	150	6	3(3-0-9)	090155234

## Description of Courses: Plan A2 (Coursework, Internship and Thesis)

090155101	<p><b>RAMS in Railway Applications</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Reliability, Availability, Maintainability, Safety: RAMS-management as a product-lifecycle-oriented component of a holistic management process that addresses all aspects of complete rail-systems; RAMS-process and related approaches, lifecycle engineering principles, systems approach, design methodology, FMEA/ FMECA; RAMS standards (EN 50126). RAMS-impacting factors: rail-system conditions, operating conditions, maintenance; human factors; specification of RAMS requirements; risk management: risk concept, risk analysis, hazard analysis, deterministic vs. probabilistic approaches, risk-reduction approaches, risk-acceptable criteria (ALARP GAMAP MEM); functional analysis; failure mode identification (functional and piece part failures) and effect analysis, criticality analysis; safety integrity, design for safety (fail-safe concepts and others), design for maintainability; RAMS documentation.</p>	3(3-0-9)
090155102	<p><b>Fundamentals of Rail Vehicle Dynamics</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Concepts of forces and accelerations of a moving mass; applied on longitudinal, vertical and lateral dynamics of a rail vehicle; Concepts of driving resistance: rolling resistance, drag, vehicle acceleration, inclines and declines; Concepts of propulsion power demand calculations; Overview of rail propulsion systems: combustion (diesel), electrical, alternative; Overview of rail transmission systems; Overview of rail brake systems (regulations, safety by redundant systems, technical concepts: mechanical, hydraulics, pneumatics electric brakes), concepts of braking performance calculations; Concepts of vibrations of single mass oscillators, resonance frequencies, damping; Concepts of vibrations of double mass oscillators; Suspension systems; vertical dynamics, vibration excitations from the track; Vibration excitations from propulsion systems; Vertical dynamics and driving comfort: the effect of vibrations on the human body, seating systems; Introduction to Multi-Body Models and Simulation of rail suspensions; Introduction to Multi-Body Models and Simulations of complete vehicles; Lateral dynamics, derailling, cross-influences of longitudinal and lateral vehicle dynamics; Introduction to wheel/rail interactions</p>	3(3-0-9)
090155103	<p><b>Principles of Rail Vehicle Technology</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Categorization of railway transport within the context of other transport systems; Railway subsystems with a focus on vehicles; rail-guided vehicle systems in comparison with road vehicles; socio-economic challenges, contribution of railway to overall transport systems; overview of the rail industry. Laws and standards, mass transit and main line railway: technical specifications, layouts, vehicle and train configurations, principles of carrying, guiding and driving / braking; basic components of vehicle: track, wheel; wheel-track interactions: load transfer, traction and brake forces; driving resistance, traction force, energy demand and energy saving potential; transmission systems and elements; brake systems and components, breaking principles and methods.</p>	3(3-0-9)
090155104	<p><b>Track Guiding Technology</b></p> <p><i>Prerequisite: Department Permission</i></p> <p>Tasks and elements of track guiding system: wheel/rail and wheelset/track in established configurations; derivation of conditions for geometrically ideal track guiding, detailed discussion of wheel to rail interface, resulting forces and moments effective on the wheel-pair; estimation of wheel/rail wear, established proof of derailment safety in twisting track sections with quasi-static cornering; Kinematic explanation of hunting oscillation of the wheelset according to Klingel, detailed calculations of contact surface and -pressure between wheel and rail according to the theory of Hertz, determination of the wheel/rail contact point, analytical calculation of the so-called "visible" or "effective" wheel profile according to Borgeaud; equations of motion for the kinetic analysis of the movements of the wheelset and independently rotating wheel pairs; introduction to the numerical calculation of the vehicle run: multi-body simulations; modeling of the track condition as independent excitations of the wheelset; introduction to vibration analogy models for track, wheelset, undercarriage and entire rail vehicles.</p>	3(3-0-9)

090155198	<b>Master Thesis</b> <i>Prerequisite: Department Permission</i> Research in an interesting topic in Automotive Engineering. The student will submit the thesis to summarize the thesis work content, deliverables and confirmed outcomes.	12
090155199	<b>Industrial Internship</b> <i>Prerequisite: Department Permission</i> Apply the knowledge for solution or analysis of engineering problem in industry through internship in industrial environment. The student will submit the report to summarize the internship work content, deliverables and confirmed outcomes.	4
090155111	<b>Electric Drive Systems</b> <i>Prerequisite: Department Permission</i> Introduction to electrical drive systems, fundamental theory of mechanical motion, power electronics converters for electrical drives, DC drive system and its control, synchronous drive system and its control, induction drive system and its control, switched reluctance drive system and its control.	3(3-0-9)
090155112	<b>Structural Design Methodology</b> <i>Prerequisite: Department Permission</i> The course embeds quantitative methods of structural mechanics into the context of design methodology, thereby combining these with qualitative approaches to structural design. First part, design methodology: General design process acc. to VDI2221, methods for technical specification, functional decomposition, requirement engineering, conceptual design, evaluation and selection of technical concepts; taxonomy of design rules and principles according to Pahl and Beitz, selected examples thereof: force transmission, division of tasks, self-help, bistability, fault-free-design and others; introduction to computer-based topology optimization. Second part, advanced concepts of structural mechanics for lightweight structures: energy principles, deformation of elastic systems, statically indeterminate structures (force method, method of consistent deformations), force introduction and transmission, stability behavior of lightweight structures, buckling of trusses with and without plastic material behavior, Ritz-method for solving stability problems, stability of other structural elements; sandwich design, failure modes of sandwich materials, core and face materials.	3(3-0-9)
090155113	<b>Rail Vehicle Vibration Dynamics</b> <i>Prerequisite: Department Permission</i> General introduction to vibrations in rail vehicles, narrowed down to vertical and longitudinal dynamics; methods of vibration analysis; modelling of vibration systems, notation, examples; determining equations for single mass oscillators with base point displacement excitation; modelling of track irregularities in the displacement and frequency domain, response spectrums as functions of vehicle velocity and transfer path; assessment of the effects of vehicle vibrations. ; application examples of multiple –mass oscillator models; measures to improve vibration behavior of railway vehicles; railway trains as a chain of longitudinally oscillating masses.	3(3-0-9)
090155114	<b>Hydraulics and Pneumatics</b> <i>Prerequisite: Department Permission</i> Introduction to hydraulics & pneumatics; development of hydraulic machines and applications; hydraulics systems and components; principles of hydraulic systems calculations; hydraulic fluids; pumps, valve types and their selection; design of hydraulic circuit diagrams, dimensioning calculation of hydraulic components, calculations of hydraulics system, examples. Fundamentals of pneumatics systems, pneumatic pumps and supply systems, pneumatic piping design, pneumatic components, calculation of pneumatic systems, design of pneumatics circuits, example of such.	3(3-0-9)

090155121	<b>Mechatronic Systems in Vehicle Engineering</b> <i>Prerequisite: Department Permission</i> Concept of structural testing and evaluation; destructive and non-destructive testing; structural models and components for testing; full scale testing; testing standards; equipment and measurement techniques; data analysis and evaluation of structural performance.	3(3-0-9)
090155122	<b>Internal Combustion Engines I</b> <i>Prerequisite: Department Permission</i> Classification, manufacturing processes, chemical structure and physical properties of fuels based on mineral oil; energy reserves, consumption and the energy industry; alternative fuels based on coal, natural gas and non-fossil sources of energy; energy flow in the combustion engine process: open cycle simulations, energy balance and definition of losses; heat flow in combustion engines: heat transfer mechanisms, calculation methods of heat transfer coefficients in the combustion chamber, conduction and heat transfer to the coolant; temperatures and thermal stresses of engine components, layout of combustion engines, rules of geometrical, mechanical and thermal similarity, indices and mechanical power limits; engine base data; typical plan of an engine development process; forces and moments in engines: gas forces and inertia forces, excitation by forces in crank drive mechanism; Engine balancing; torsional vibration of crankshafts; engine components: requirements on crankshaft, connecting rod, piston, crankcase, cylinder head and liner; materials, concepts and specific design features; cooling and lubrication systems	3(3-0-9)
090155123	<b>Rail Vehicles Components</b> <i>Prerequisite: Department Permission</i> Introduction to the design of rail vehicles and main design restrictions, transportation tasks of different vehicle categories; discussion of the most important subsystems and functional groups: car bodies and their build types; undercarriage types including drive/ transmission configurations; drives and brakes; coupling elements such as springs, dampers, handlebars or guide elements; doors and footboards; joint transitions and vehicle couplings; windows and interior lighting; heating, air conditioning and ventilation systems; sanitary systems.	3(3-0-9)
090155124	<b>Electric Rail Vehicles, Linear Drives and Magnetic Levitation</b> <i>Prerequisite: Department Permission</i> Railways history, main propulsion systems of electric railways; system overview; drives: power converters, traction motors, transmissions; drive control; transformers; high voltage equipment; suspension systems; brakes; characteristics railway vehicles; light rail, metro; commuter rail, high speed trains; magnetic levitation systems / linear drives: overview and principles; Transrapid, Maglev; system design.	3(3-0-9)
090155131	<b>Railway Electrification</b> <i>Prerequisite: Department Permission</i> Electrical Railway Power Supply Systems, Electric Motor Drive for Electric Railway, Energy management in Railway System, Electromagnetic Compatibility in Railway System, Case Studies from Thailand and abroad	3(3-0-9)
090155132	<b>Material Characterization</b> <i>Prerequisite: Department Permission</i> Non destructive testing, Mechanical property, Hardness, Computed Tomography, Ultrasonic, SEM/EM, Failure analysis, Chemical Composition Analysis.	3(3-0-9)



090155133	<b>Infrastructure planning and management</b> <i>Prerequisite: Department Permission</i> An integrated approach to the planning, construction, operation, and maintenance of infrastructure through an understanding of the performance of infrastructure and life-cycle cost evaluation; approaches to management, available technologies, and decision supporting tools in infrastructure and facility planning and management; economic framework for identifying and analyzing investment and operations options; relevant issues such as environment, laws, and regulations.	3(3-0-9)
090155134	<b>Railway Track Engineering</b> <i>Prerequisite: Department Permission</i> Principles of railway track alignment and track structures; general knowledge of rolling stocks and locomotives; structural gauge and loading gauge; cross sections of track structures; horizontal and vertical alignment for intercity train, commuter train and metro; components of railway track and track structures; track structures design; track layouts in yards; signalling concept;. various types of stations: container yard, industry yard; track inspection and maintenance.	3(3-0-9)
090155135	<b>Rail Transport System</b> <i>Prerequisite: Department Permission</i> History of Rail Transport Development, Fundamental and Characteristics of Rail Operation, Rules of Safety, Composition of Rail System: Infrastructure, Rolling Stocks, Signaling and Communication, Case Studies of Rail Transport Development in Thailand and Neighboring Countries.	3(3-0-9)
090155141	<b>Railway Timetabling and Operations</b> <i>Prerequisite: Department Permission</i> Timetable construction; time/ distance/ track-occupancy diagrams and minimum headway times; capacity assessment with probabilistic methods; capacity assessment with simulation methods; railway control systems (railway operation centers, conflict solving, deadlock-avoiding); infrastructure modeling.	2(2-0-6)
090155142	<b>Railway Control Systems</b> <i>Prerequisite: Department Permission</i> Risk analysis and risk acceptance models; train control systems; European Train Control System (ETCS); train protection and train control, radio systems; safety technology in railway crossings.	1(1-0-3)
090155143	<b>Mobility Research and Transport Modelling</b> <i>Prerequisite: Department Permission</i> Mobility – definitions and patterns: passenger transportation, freight traffic; impacts and trends; traffic management, transportation demand management, mobility management, ICT; empirical mobility research: methods and interpretation, fundamentals of empirical social research; theory of planned behavior; interaction of land use and mobility: land use patterns and modeling, types of transportation models, prognosis and scenario; macroscopic transportation modeling (4 step algorithm); microscopic transportation modeling; modeling of freight traffic, modeling and management of urban freight traffic.	3(3-0-9)
090155144	<b>Railway Systems</b> <i>Prerequisite: Department Permission</i> Comparison of railway vehicles and automotive engineering; elements and dimensioning of superstructures; dimensioning of alignment elements; construction of alignment in ground plan and elevation; design of railway stations; safety engineering; dimensioning of nodes/ switches; minimum headway times; calculation of running times, introduction to timetable construction.	3(3-0-9)

090155201	<b>Vehicle Acoustics</b> <i>Prerequisite: Department Permission</i> Introduction to technical acoustics; audiology, measuring of (airborne) sound; measuring of (structure-borne) sound and vibrations; legislative issues, accelerated pass-by noise measurement procedure (ISO 362); engine noise; noise and vibrations of drivetrain components; vibrations of vehicle drivetrains; road/tyre noise; noise and vibrations of brake systems; power steering noise; vehicle body noise and vibration; psychoacoustics, sound engineering.	3(3-0-9)
090155202	<b>Dynamics and Vibrations</b> <i>Prerequisite: Department Permission</i> Dynamic system modeling; equation of motion; analysis of systems with single and multi-degree of freedom; free and forced vibration; determination of natural frequencies of structures; distributed mass system; response spectrum method; dynamic analysis using numerical techniques; basic principles of non-linear system.	3(3-0-9)
090155203	<b>Fundamentals of Internal Combustion Engines</b> <i>Prerequisite: Department Permission</i> Classification and characteristics of internal combustion engines, Kinematics and forces of the internal combustion engine, Mass forces of the displacement motor, Thermodynamic fundamentals, Characteristic parameters, Process in gasoline/Otto engines, Process in diesel engines, Pollutant formation and exhaust after treatment	3(3-0-9)
090155204	<b>Fundamentals of Electrical Power Engineering</b> <i>Prerequisite: Department Permission</i> Introduction to power systems, sources of electric energy, load characteristics, electric power plants, basic power system calculation, electric power transmission, transmission line parameters, electric power distribution, power transformers, power system equipment	3(3-0-9)
090155205	<b>Environmental Sustainability in Transport Engineering</b> <i>Prerequisite: Department Permission</i> Pollutants and pollutant sources: road vehicle emissions, railway train emissions, naval emissions, aircraft emissions; measurements and data analysis: concentration measurement of gases and particles, analysis of an air-quality data set; dry and wet deposition; mitigation and effects of air pollution: the role of vegetation, effects on humans and animals, plants, soil and groundwater, effects on material properties; control of emissions, legislation in EU, UK, US and Asia; noise: introduction to acoustics, environmental noise. noise sources: emissions from motor vehicles, railway and aircraft; measurement, prediction, propagation and control of noise in the contexts of road traffic, railway and airports; effects of noise on humans and animals; environmental assessment.	3(3-0-9)
090155206	<b>Quality Engineering for Railway Engineers</b> <i>Prerequisite: Department Permission</i> The course provides the understand of quality infrastructure (QI) and quality engineering (QE) in railway industry and their tools such as Metrology, Standard, Testing and Quality assurance (MSTQ). Theory of the MSTQ and hand-on practices in railway cases. Case study in implementing of MSTQ in railway industrial for trouble shooting and development. Necessary skills in quality engineering and management for professional career.	3(3-0-9)
090155207	<b>Advanced Special Topics in Railway Track Engineering</b> <i>Prerequisite: Department Permission</i> The course focuses on current interest and approaches in railway track research and development. Study and investigate special problems assigned by the instructors. Analyze and determine possible solutions to the problems in written report and presentation. The topic selected can be extended for master degree thesis.	3(3-0-9)

090155208	<b>Advanced Special Topics in Rolling Stock Engineering</b> <i>Prerequisite: Department Permission</i> The course focuses on current interest and approaches in research and development of rolling stock engineering. Study and investigate special problems assigned by the instructors. Analyze and determine possible solutions to the problems in written report and presentation. The topic selected can be extended for master degree thesis.	3(3-0-9)
090155211	<b>Computer Aided Engineering Tools I</b> <i>Prerequisite: Department Permission</i> A series of examined modules to give students the necessary CAE tool technical skills needed for practical use in other courses, research and thesis work, and in preparation of industrial application. The software could be either commercial or non-commercial packages, more than one package, and selected according to the overall program needs and balanced between current industry and research market requirements.	3(3-0-9)
090155212	<b>Computer Aided Engineering Tools II</b> <i>Prerequisite: Department Permission</i> Continues from Computer Aided Engineering Tools I, by deepening skills and/or using different packages. A series of examined modules to give students the necessary CAE tool technical skills needed for practical use in other courses, research and thesis work, and in preparation of industrial application. The software could be either commercial or non-commercial packages, more than one package, and selected according to the overall program needs and balanced between current industry and research market requirements.	3(3-0-9)
090155213	<b>Finite Element Method</b> <i>Prerequisite: Department Permission</i> Overview of numerical methods; Finite elements for 2D trusses, beams, 2D and 3D continua; Matrix methods (force and displacement method); Stiffness matrix for springs, rods, 2D trusses, bending of beams, 2D elastic continua; Mass matrices for dynamic analysis; Triangle element, higher order (quadratic and cubic) displacement functions; Quadrilateral elements (Lagrange and serendipity elements); Isoparametric elements; Elements for 3D analysis (tetrahedron, cube). The course will include the use of non-commercial and/or commercial software.	3(3-0-9)
090155214	<b>Mechanical Behaviour and Degradation</b> <i>Prerequisite: Department Permission</i> Stress and Strain; Elastic Properties; Yielding; Material Behavior with Plastic Deformation; Fracture; Crack Growth; Fatigue; Creep; Wear; Failure Analysis; Life Assessment for Engineering Components.	
090155215	<b>Vehicle Crash and Human Body Simulation Techniques</b> <i>Prerequisite: Department Permission</i> Accidental reconstruction and analysis; Kinematics of vehicle impact; Simulation of side impact and frontal collision; Principle of human body simulation; Pedestrian and occupant simulation.	3(3-0-9)
090155231	<b>Probability Statistics and Decision for Civil Engineering</b> <i>Prerequisite: Department Permission</i> Elements of probability theory; common probability models; probabilistic models and observed data; elementary Bayesian decision theory; analysis of independent random process.	3(3-0-9)

090155232	<b>Computer Programming and Computer Tools for Graduate Research</b> <i>Prerequisite: Department Permission</i> Object-oriented programming using C++, event driven and GUI programming, data flow programming for data acquisition and automatic control in laboratory; use of MATLAB and Mathematica, numerical algorithm for linear system, numerical algorithm for non-linear system.	3(3-0-9)
090155233	<b>Finite Element Method for Civil Engineers</b> <i>Prerequisite: Department Permission</i> Basic concepts of interpolation; finite element interpolation; introduction to the finite element techniques in mechanics; development of elements from various principles and application of the method to static continuum problems; convergence and compatibility requirements; assemblage of elements and boundary conditions; structure of a typical finite element computer program; introduction to the treatment of dynamics and stability and extension of the method to generalized field problem; application in civil engineering problems.	3(3-0-9)
090155234	<b>Structural Testing and Evaluation</b> <i>Prerequisite: Department Permission</i> Concept of structural testing and evaluation; destructive and non-destructive testing; structural models and components for testing; full scale testing; testing standards; equipment and measurement techniques; data analysis and evaluation of structural performance.	3(2-3-7)

# DOCTORAL DEGREE PROGRAMS AND DESCRIPTION OF COURSES

## Chemical and Process Engineering Program (CPE)

### Plan of Study: Plan 1.1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Dissertation						9	090116198
						9	
<b>Semester II</b>							
Dissertation						9	090116198
						9	
<b>Semester III</b>							
Dissertation						9	090116198
						9	
<b>Semester IV</b>							
Dissertation						9	090116198
						9	
<b>Semester V</b>							
Dissertation						9	090116198
						9	
<b>Semester VI</b>							
Dissertation						9	090116198
						9	
<b>Total</b>						<b>54</b>	

### Description of Courses: Plan 1.1 (Research Only)

090116198

#### **Dissertation**

54

*Prerequisite: Department Permission*

Research on an interesting topic in Chemical and Process Engineering or related areas to deal with scientific demands involving theoretical or computing works, engineering design studies, and case studies or experimental works in any process-engineering laboratories. Industrial-oriented Basic or applied research with/without collaboration with the industry. Defining objectives, scope and thesis outline. Literature survey, prototype development, experimental design, data analysis, result and discussion, and conclusion with suggestions and recommendations. Qualifying examination, thesis proposal, thesis progress examination and thesis defense examination. Research paper preparation for an international journal. Well-written dissertation.

## Mechanical and Automotive Engineering Program (MAE)

### Plan of Study: Plan 1.1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Dissertation						9	090106198
						9	
<b>Semester II</b>							
Dissertation						9	090106198
						9	
<b>Semester III</b>							
Dissertation						9	090106198
						9	
<b>Semester IV</b>							
Dissertation						9	090106198
						9	
<b>Semester V</b>							
Dissertation						9	090106198
						9	
<b>Semester VI</b>							
Dissertation						9	090106198
						9	
<b>Total</b>						<b>54</b>	

### Description of Courses: Plan 1.1 (Research Only)

090106198

#### **Dissertation**

54

*Prerequisite: Department Permission*

Research procedure in interesting topics both in foundation knowledge and industrial aspects with analytical and research problem solving processes to gain fundamental knowledge and/or to originally improve related processes or with significant development or to be applied expecting significant impact. The dissertation is based on referencing related fundamentals and theories, defining the research purpose, scoping the work, literature review, model development, experimental plan and procedures, analysis of data and results, discussion of the results, drawing conclusions and outlook for further research. The candidate has to pass the qualifying exam, dissertation proposal, progress examination, and finally defense exam. The output of the dissertation must be delivered as research articles in international journals as well as dissertation.

## Materials and Production Engineering Program (MPE)

### Plan of Study: Plan 1.1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Dissertation						9	090136198
						<b>9</b>	
<b>Semester II</b>							
Dissertation						9	090136198
						<b>9</b>	
<b>Semester III</b>							
Dissertation						9	090136198
						<b>9</b>	
<b>Semester IV</b>							
Dissertation						9	090136198
						<b>9</b>	
<b>Semester V</b>							
Dissertation						9	090136198
						<b>9</b>	
<b>Semester VI</b>							
Dissertation						9	090136198
						<b>9</b>	
<b>Total</b>						<b>54</b>	

### Description of Courses: Plan 1.1 (Research Only)

090136198

#### **Dissertation**

54

*Prerequisite: Department Permission*

Research procedure in interesting topics both in foundation knowledge and industrial aspects with analytical and research problem solving processes to gain fundamental knowledge and/or to originally improve related processes or with significant development or to be applied expecting significant impact. The dissertation is based on referencing related fundamentals and theories, defining the research purpose, scoping the work, literature review, model development, experimental plan and procedures, analysis of data and results, discussion of the results, drawing conclusions and outlook for further research. The candidate has to pass the qualifying exam, dissertation proposal, progress examination, and finally defense exam. The output of the dissertation must be delivered as research articles in international journals as well as dissertation.

## Electrical and Software Systems Engineering Program (ESSE)

### Plan of Study: Plan 1.1 (Research Only)

Course	Lecture hours	Assignment and self-study	Preparation for exam	Total working hours per semester	ECTS credits	KMUTNB Credits	Code
<b>Semester I</b>							
Dissertation						9	090226198
						9	
<b>Semester II</b>							
Dissertation						9	090226198
						9	
<b>Semester III</b>							
Dissertation						9	090226198
						9	
<b>Semester IV</b>							
Dissertation						9	090226198
						9	
<b>Semester V</b>							
Dissertation						9	090226198
						9	
<b>Semester VI</b>							
Dissertation						9	090226198
						9	
<b>Total</b>						<b>54</b>	

### Description of Courses: Plan 1.1 (Research Only)

090226198

#### **Dissertation**

54

*Prerequisite: Department Permission*

Research on an interesting topic in Electrical Engineering or Software Systems or related areas.



## RULES, POLICIES AND REGULATIONS

Upon registering, ALL TGGs students agree to acknowledge and to follow King Mongkut's University of Technology North Bangkok (KMUTNB) rules, policies and regulations.

### TGGs Student's Ethics

- Responsibility:  
To himself, to the environment, to the society, by being a loyal, determined, dedicated, co-operative, honest and integrate person.
- Appropriate codes of conduct:
  1. Encourage and embed student's ethics by integrating ethics and moral values in learning and instruction.
  2. Set up environment and create events and activities to promote student's ethics inside and outside academic settings.
  3. Encourage the students to demonstrate their good deeds and morality.
  4. Recognize and admire the students who demonstrated those ethics and morals.

### Class Attendance

- Students should attend every registered class.
- Students must obtain the permission from the lecturer for attending the class late.
- Breaks during class time are given at the discretion of the lecturer.
- Students must notify the lecturer for a missing class in writing.

Additional rules, policies, and regulations will be given at the lecturer's discretion.

### Classroom and Building Policies

- Building and Student Common Room Hour  
7 A.M. to 10 P.M. Mondays to Fridays  
  
The student must submit the request to Department with the recommendation of the advisor or supervisor to access the building during the off-hour.  
  
Students must use the access card to enter the building and the common room.
- TGGs Announcement for Students  
  
It is the students' responsibility to frequently check the TGGs, Department, and Program Websites for important information such as cancellations of classes, 'make-up' classes, examination schedules and other information. In addition, there is an Announcement Board outside each program office where other notices will be posted. Students who neglect to check the websites and read any posted information on the Websites or Announcement Boards cannot request an exception or a special treatment.
- Mobile Phones  
  
Mobile phones must be switched off during classes. Additional policy on mobile phones maybe given at the lecturer's discretion.
- Smoking  
  
King Mongkut's University of Technology North Bangkok is a non-smoking campus, except in designated areas. Students caught smoking outside of the designated areas will be put on behavioral probation and reported to KMUTNB. They may also be fined according to KMUTNB policy and Thai law.
- Alcohol and Drugs  
  
Alcohol and drugs are forbidden to be brought on campus. Any student who comes to class under the influence of alcohol or drugs will be asked to leave the class immediately and may be reported to the police.

- **Weapons**

Weapons of any kind are forbidden to be brought on campus. Any student who brings a weapon to school will be asked to leave the program immediately and the case will be reported to the police.

- **Fighting/Aggression/Inappropriate Language**

A student who has a verbal disagreement with another student should seek help from a lecturer or the office staff if the problem cannot be solved alone. Any student who gets involved in a physical fight will be asked to leave the program immediately and the case will be reported to the police.

Students who are aggressive or use inappropriate language of any kind (in any language) towards lecturers, students, and/or staffs may be asked to leave the program and/or reported to the police.

- **Driving and Parking**

Students who wish to drive to the university must obtain a parking permit from KMUTNB and obey all traffic and parking rules on the KMUTNB campus. Reckless driving and speeding will not be tolerated. Failure to adhere to traffic rules on campus will incur severe penalties and/or dismissal and/or reporting to the police.

- **Courteous Behavior**

All students are expected to behave in a respectful and courteous manner toward security officers, cleaning staffs, university staffs, lecturers, and other students. Rude and aggressive behavior (including inappropriate verbal interactions) will not be tolerated. This includes racism, sexism, homophobia, social class distinction, and etc.

## **Uniform**

TGGS students are required to wear appropriate dress.

No shorts. No flip flop. No tank tops, No T-shirt. Long pants, Jeans, and Polo Shirt are acceptable. TGGS students are required to carry their Student ID card every day. TGGS students who are not properly dressed will not be permitted to enter the campus, TGGS building, and/or classrooms.

## **TGGS Access Card**

All TGGS students can access TGGS Building (only the front door) and TGGS Student Common Room 502 (on 5<sup>th</sup> Floor) with TGGS Access Card only.

This card is a property of TGGS, KMUTNB. TGGS has the right to modify or terminate the access of the card without prior notice. The use of this card by the holder constitutes acceptance of the agreement as follows: Students as holders agrees

- (1) To follow TGGS building regulations
- (2) To not allow another person to use the card to access the building
- (3) To notify TGGS immediately of loss or theft of the card

## **Student's Email Account**

All TGGS students will get an email account after they are registered to the faculty. It is encouraged that students use this email account for all matters related to TGGS, e.g. to communicate with the lecturers and staffs, to contact other parties with TGGS related issues, to register to an academic conference, journal publishers, etc.

For more information about how to obtain the Email address please contact your department office.

## **University Property**

Students are expected to maintain the university properties.

Students found intentionally damage KMUTNB and TGGS properties will be held responsible for paying for the damage properties and they may be put on behavioral probation.

## **Examination and Quiz Policies**

- Students must wear the correct uniform and show a valid Student ID card for any quiz/examination.
- Students must be on time for a quiz/examination.

Students arriving after the start of a quiz/examination will not be allowed to take that quiz/examination.

- Students are not allowed to talk during a quiz/exam.

All questions should be directed to the lecturer/proctor.

- No dictionaries (including electronic dictionaries) or other reference materials are allowed to be used during a quiz/examination.

Unless otherwise specified, any form of supporting material is explicitly forbidden.

- All mobile phones must be switched off and submitted to the lecturer/proctor before a quiz/examination begins.

Any student whose mobile phone goes off during a quiz/examination will be penalized by the loss of marks and/or may be asked to leave the quiz/examination room.

- Students who fail to take any quiz/examination on the scheduled date (without prior arrangement with TGGs staff or due to an emergency such as serious illness) will not be allowed to take a make-up quiz/examination and will receive an 'F' grade.

All excuses for non-attendance at an examination will be carefully checked for accuracy and authenticity.

## **Cheating Policy**

***Cheating is not tolerated at KMUTNB.***

It is the students' responsibility to know what constitutes cheating, and to take all necessary precautions to avoid it. Ignorance is no defense. If in doubt, students' should consult their course lecturer, project or Thesis supervisor, and/or their Program Coordinator.

If a student is discovered cheating during any quiz/examination, e.g. talking, whispering, signaling to anyone other than the lecturer/proctor, looking at another exam paper, holding an exam paper in the air, using crib notes or mobile phones, etc., that student will automatically fail the course and be put on behavioral probation. Serious cases of cheating may result in ineligibility to pass to the next level, enroll in the next semester, or ever attend TGGs or any KMUTNB affiliate.

## **Plagiarism Policy**

In any technical and academic writing, it is very important to adequately credit the source for ideas, drawings, texts, etc. in any language and any type of publication, without this it is considered plagiarism. By taking credit for anyone else's work intentionally or by accident, it is stealing and it is not acceptable in all academic and professional situations.

TGGs students must distinguish their own ideas and work from knowledge obtained from sources in all students' work at TGGs and properly site the sources.

## General Conduct

***All students are expected to behave in a way befitting adults.***

Students are expected to have a mature and professional attitude towards their studies. This includes appropriate language, dress, behavior, and participation. Sleeping in class, sexist/racist/homophobic remarks, and swearing are not allowed in any class.

At the lecturer's discretion, any students who do not conduct themselves in the aforementioned manner may be given penalties. Some actions may result in behavioral probation, dismissal, and/or reporting to the police.

## Petition Appeal

***To be used for reconsideration on a previously denied petition/request***

Students can submit the request according to individual issue according to TGGs Academic Affairs procedure/process stated in this student handbook. In the case that the request has been denied, students can submit the petition for appeal to Program Secretary. The petition for appeal form (TG31) including supporting documents will be reconsidered by TGGs Committee or KMUTNB Committee depending on the issue.

Please consult additional petition procedure and process for each individual issue as announced by TGGs Academic Affairs.

## Code of Ethics for Engineers

**All professional engineers and technicians are bound by the Code of Ethics for Engineers or Professional Ethics of their professional engineering institutions.**

As future engineers, students must acknowledge and obey the Code of Ethics for Engineers at least in the following countries:

Country	Organization	Website
Thailand	Council of Engineers Thailand (COE)	<a href="http://www.coe.or.th">http://www.coe.or.th</a>  Download Document at: <a href="http://www.coe.or.th/_coe/_legal/_caseEx/coe_codeofconduct.pdf">http://www.coe.or.th/_coe/_legal/_caseEx/coe_codeofconduct.pdf</a>
Germany	Association of German Engineers (VDI)	<a href="http://www.vdi.de">www.vdi.de</a>  Download Document at: <a href="http://www.vdi.de/fileadmin/media/.../FundamentalsOfEngineeringEthics.pdf">www.vdi.de/fileadmin/media/.../FundamentalsOfEngineeringEthics.pdf</a>
USA	National Society of Professional Engineers (NSPE)	<a href="http://www.nspe.org">http://www.nspe.org</a>  Download Document at: <a href="http://www.nspe.org/resources/ethics/code-ethics">http://www.nspe.org/resources/ethics/code-ethics</a>
UK	Engineering Council (EngC)	<a href="http://www.engc.org.uk">http://www.engc.org.uk</a>  Download Document at: <a href="http://www.engc.org.uk/professional-ethics.aspx">http://www.engc.org.uk/professional-ethics.aspx</a>

## Note

For further information on regulations, policies and penalties, students should consult the KMUTNB Student Affairs website at <http://www.studentaffairs.kmutnb.ac.th/rule-1.html>.

Additional TGGs specific regulations, policies and penalties, will be made available as appropriate.

# FAQ

## General FAQ

- Q: What are the final degrees awarded?  
A: Master of Engineering (M.Eng.) and Doctor of Engineering (D.Eng.)
- Q: What is the language of instruction?  
A: English
- Q: What is the regular duration of the program?  
A: 2 years (4 semesters)
- Q: What are the entrance requirements?  
A:
  - Bachelor degree in engineering awarded by an internationally recognized university with a minimum GPA of 3.00
  - Entrance examination/interview
  - Good reading and writing skills in English (to obtain TGGs M.Eng. degree, TOEFL 525+ or equivalent has to be passed within 2 years following registration)
- Q: What are the credit requirements?  
A: 46 credits. Please check the curriculum.
- Q: What about the TGGs curricula?  
A: International M.Eng. curricula, following the RWTH Aachen Model (Germany) which links industry-oriented teaching with collaborative research and project-oriented internship and thesis work
- Q: What about internships within studying at TGGs Bangkok?  
A: 4-6 months, mandatory industrial internship, incl. reporting and technical supervision, job reference
- Q: What about tuition fees at TGGs?  
A: M.Eng.: 60,000 THB per semester for Thai students and 85,000 THB per semester for international students from outside of Thailand  
D.Eng.: 100,000 THB per semester for all students
- Q: Which between King Mongkut's University of Technology North Bangkok and RWTH Aachen University will award the degrees? Does the degree certificate include the name of RWTH Aachen University?  
A: The degrees will be awarded by King Mongkut's University of Technology North Bangkok, but the name of RWTH Aachen University is not on the certificate.
- Q: Are there any fees or expenses which the students have to pay during the registration period in August?  
A: Yes, the registration document package costs 200 THB and a student card costs 200 THB.
- Q: Is there free internet access at TGGs and at the accommodation center?  
A: Yes, TGGs and King Mongkut's University of Technology North Bangkok provide free access to the internet for the on-campus students. And the accommodation center is also on the campus.
- Q: How much do three meals normally cost per day on average in Thailand?  
A: About 150 THB.
- Q: Are there any German courses offered by TGGs?

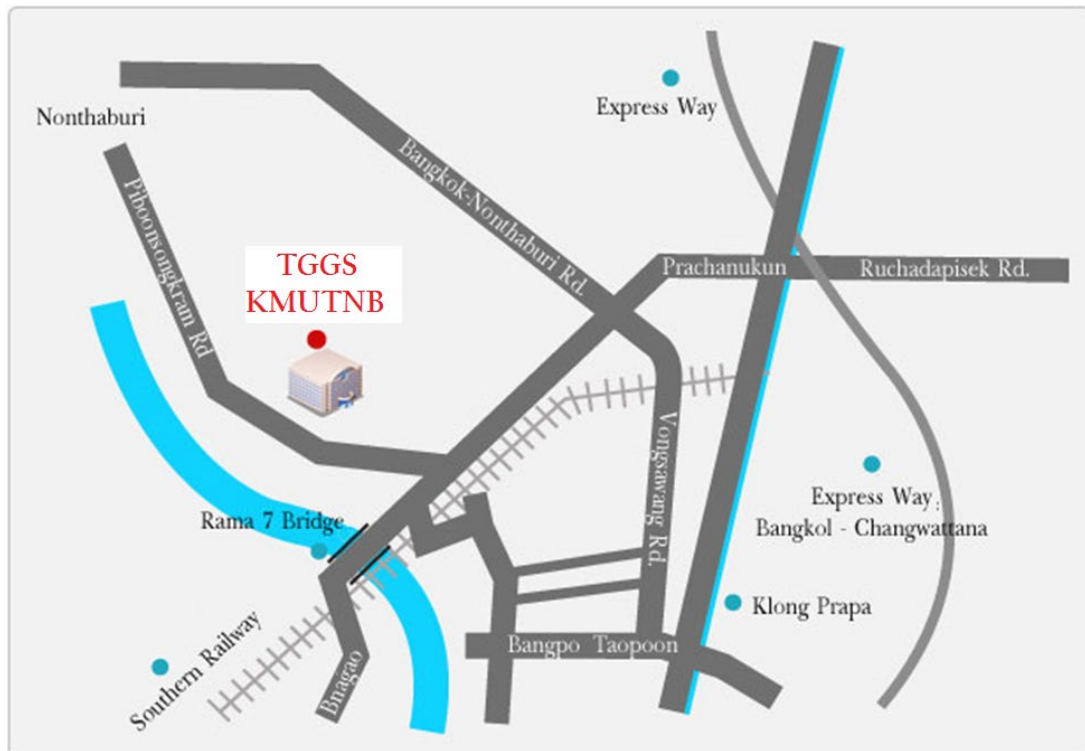
- A: No, but Goethe Institute does and is located here on the fifth floor of TGGs building.
- Q: Are there other expenses besides the tuition fee for the doctoral program at TGGs?
- A: Yes, but just in case D.Eng. candidate would like to do research at RWTH Aachen University, Germany. Please consult TGGs academic affairs for more details.

## **FAQ for DAAD Scholarship Holders**

- Q: Do DAAD scholarship holders need to apply for the student visa themselves?
- A: Yes, TGGs will issue the acceptance letter and after receiving the letter DAAD scholarship holders can apply for the visa at the Embassy/Consulate in their home country.
- Q: Who is responsible for paying visa fee?
- A: DAAD scholarship holders have to take care of all additional costs that might occur during their studies, including visa fee.
- Q: In case the flight to Bangkok, Thailand costs more than the amount provided by TGGs, i.e. approximately 100 EUR, who will be responsible for paying the remaining amount?
- A: DAAD scholarship holders receive stipends from DAAD, not TGGs. Therefore, they have to take care of all additional costs by themselves.
- Q: Is the travel allowance of approximately 750 EUR provided by DAAD exactly equal to the price of airfare from Bangkok to Germany?
- A: No. DAAD pays the so-called “flat-rate” travel allowance.
- Q: Is the monthly award of approximately 220 EUR provided by DAAD enough for a student to live in Bangkok, Thailand?
- A: Yes, 220 EUR should be sufficient. But for the first few months the student has to prepare his/her extra budget just in case of emergency.
- Q: Are DAAD scholarship holders allowed to take up part-time jobs to help pay for miscellaneous expenses related to their education in Thailand or Germany?
- A: TGGs recommends that DAAD scholarship holders do not take up part-time jobs along with their studies due to the student visa restrictions.

## VISITOR INFORMATION

### How to get to TGGs/KMUTNB?



TGGs is located inside the King Mongkut's University of Technology North Bangkok campus area. Following is the information how to reach TGGs.

#### ***By car***

KMUTNB is at 1518 Pracharat 1 Road, Bangsue, Bangkok, Thailand. It is close to Rama 7 bridge on the Eastside of the Chao Phraya River between Rama 7 Bridge and Nonthaburi province. The 11-story TGGs building is located on the left side of the KMUTNB main entrance.

#### ***By bus***

There are three different bus lines that go to KMUTNB.

Bus No. 97 from Victory Monument to KMUTNB

Bus No. 32, 33, 64, and 203 from the Grand Palace KMUTNB

Bus No. 90 from Central Plaza, Lad Phrao to KMUTNB

#### ***By boat***

By Chao Phraya Express Boat from all piers. Go up river to Nonthaburi pier. Then transfer to any of bus No. 32, 33, 64, 90, 97, 117, 175, and 203 (all inbound) and get off at KMUTNB.

#### ***By MRT train***

By MRT Subway from all stations, you may get off at the Wongsawang Station (Purple Line). You can, then, take a bus No.97 (outbound) or a taxi to KMUTNB (ask taxi driver for "Tech-No Pra-Na-Korn-Nuea").

### ***By the Airport Rail Link***

To get to KMUTNB from the BKK airport, you can take the Airport Rail Link. The Airport Rail Link is the direct sky train line that runs from the BKK airport to the city. For those coming from abroad and wishing to visit KMUTNB, the Airport Rail Link Station is located at the underground floor of the airport.

#### **Option 1:**

Get a ticket for the “SA City Line” at the underground floor of the BKK Airport, the fare ranges from 15 to about 45 THB. The SA City Line makes 6 stops on the way before arriving at its final stopping point at the Prayathai Station. The other midway Stations are, Lad Krabang Station, Thab Chang Station, Hua Mark Station, Ramkhamhaeng Station, Makkasan Station, and Ratchaprarop Station. It takes about 30 minutes.

#### **Option 2:**

Get a ticket for the “SA Express Line” at the underground floor of the BKK Airport. The SA Express Line runs directly to the Prayathai Station without any stop on the way. It takes about 17 minutes for the whole journey. The fare is a flat rate of 150 THB.

Passengers using both lines would stop at the Prayathai Station. To facilitate your trip to KMUTNB, it is advisable to take a taxi directly to KMUTNB. (or in Thai “Tech-No Pra-Na-Korn-Nuea”).

Tell the taxi driver to take you to “Tech-No Pra-Na-Korn-Nuea” because most Thais are familiar with that name. It’s close to the Rama 7 Bridge. The fare ranges from about 100-150 THB depending on the traffic condition.



## KMUTNB MAP AND BUILDING



### 1. Thai-German Graduate School of Engineering (TGGS)

- **1st floor: KMUTNB Financial Service**
- **2nd floor: KMUTNB Registrar Office**
- **3rd – 10th floors: TGGS**

### 2. President Office Building

- 1st floor: Post Office, Credit Union
- 2nd floor: President Office and KMUTNB Auditorium
- 3rd – 5th floors: Computer and IT Service
- **10th floor: International Affairs Division Project**

### 3. Entertainment Building

- **1st floor: Bank, Student Service**
- **2nd floor: Cafeteria**
- **3rd – 11th floors: Student Activities Clubs, and Gymnasiums**

### 4. Faculty of Engineering

### 5. Faculty of Technical Education

#### 5.1 Multi-Laboratory Building

### 6. Faculty of Applied Science

### 7. College of Industrial Technology

### 8. Civil Engineering Building

### 9. Thai-French Innovation Institute

### 10. Faculty of Applied Arts

- **2nd floor: Suan-Palm Cafeteria**

### 11. Institute for Technology Education Development

12. KMUTNB Staff Club, KMUTNB Health Center

- **1st floor: Convenient, Photo, and Book Stores**
- **2nd floor: Health Center and Restaurant**

**13. Sports Field**

14. Navamindra Rajini Building

- 4th – 6th floors Zone A: Faculty of Information Technology
- **2nd – 9th floors Zone B: Central Library**
- 12th floor: Graduate College

15. Buddhist Shrine

16. King Mongkut's Monument

17. Building and Vehicle Division, Document Section

18. Thai–German Dual Education and e–Learning Development Institute (TGDE)

19. Science and Technology Research Institute (STRI)

20. Official Residence

21. Substation

22. Student Dormitories

23. Gymnasium Building

24. Faculty of Architecture and Design

25. Agro-Industrial and Technology Building

## INSIDE TGGs BUILDING

- Basement:
  - Coffee Shop
- 1<sup>st</sup> floor:
  - KMUTNB Financial Service
  - Coffee Shop
- 2<sup>nd</sup> floor:
  - KMUTNB Registrar Office
- 3<sup>rd</sup> floor:
  - Dean's Office
  - Associate Dean's Office
  - TGGs Academic Affairs Office
  - TGGs Administration Office
  - TGGs Aachen (Conference Room)
  - TGGs Bonn (TGGs Staff Recreation Room)
  - TGGs Cologne and TGGs Berlin (Meeting Rooms)
  - TGGs Common Room
- 4<sup>th</sup> floors:
  - **Communication and Smart System Engineering (CSE)**
    - Mobile Communications and Embedded Systems Laboratory
    - Communication Networks Laboratory
    - RF & Microwave Laboratory
    - Smart Grid Technology Research Center
    - Research Center of Advanced Metering Infrastructure (AMI)
  - **Electrical Power Engineering (EPE)**
    - Electrical Power Conversion Laboratory
    - Power System Analysis Laboratory
- 5<sup>th</sup> floors:
  - **Communications and Smart System Engineering (CSE)**
    - Communication Networks Laboratory
  - **Electrical Power Engineering (EPE)**
    - High Voltage Engineering Laboratory I
    - Electrical Power and Energy Engineering Training Center I/II
  - National Rubber Technology Center
  - Research Center of Innovative Rubber
  - TGGs Student Common Room
  - Goethe Institute and DAAD Office
  - TGGs Student Pray Room (Women)
- 6<sup>th</sup> floors:
  - **Material and Production Engineering (MPE)**
    - Simulation Lab for Metal Forming
    - Materials Preparation Laboratory
    - Microstructure Laboratory
    - Battery Test Laboratory
    - Metallurgical Process Modeling Laboratory
    - Plant Simulation Laboratory
    - Natural Composite Research Laboratory
    - Materials Testing Laboratory
    - Polymer Processing Laboratory
- 7<sup>th</sup> floors:
  - **Mechanical and Automotive Engineering (MAE)**
    - Solid Mechanics Laboratory
    - Computational Fluid Dynamics Research Laboratory
    - Structural Dynamics Research Laboratory
    - Design and Innovation Laboratory
    - Automotive Virtual Safety Simulation Laboratory
    - Material Manufacturing and Surface Engineering Research Center (MaSE)

**Automotive Safety and Assessment Engineering Research Centre at Automotive Testing Facility KMUTNB Prachinburi Campus**

- Automotive Test Track
  - Automotive Component Impact Test Laboratory
  - Full Vehicle Crash Test Laboratory
  - Automotive Brake Performance Test Area
- 8<sup>th</sup> floors:
  - **Software Systems Engineering (SSE)**
    - Software Systems Laboratory
    - Visual Intelligence Laboratory
    - Architecture Research Group
    - Information Systems and Analytics Laboratory
    - Software and Tools for Scientific Computing Group
  - **Railway Vehicles and Infrastructure Engineering (RVIE)**
  - TGGS Student Pray Room (Men)
  - KMUTNB Academic Service Office
  - State Audit Office of the Kingdom of Thailand at KMUTNB
- 9<sup>th</sup> floors:
  - **Company Research and Development Center (CRDC)**
  - Companies under CRDC Project
  - Private space and co-working space
- 10<sup>th</sup> floors:
  - **Chemical and Process Engineering (CPE)**
    - Bioprocess Engineering Laboratory
    - Catalysis and Reaction Engineering Laboratory
    - Novel Technology Laboratory
    - System and Control Laboratory
- 11<sup>th</sup> floors:
  - Classrooms