

Course 090245001

Industrial Research Methodology

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

Section 1: General Information

1.	Course code and o	course title					
	090245001	Industrial Re	search Methodo	ology			
2.	Total credits						
	3 credits	□ (2-2-5)	☑ (3-0-6)	□ (3-0-9)	□ (2-3-7)		
3.	Curriculum and co	urse categor	y:				
	Curriculum:	Master of Er	ngineering in Ele	ectrical and Comput	ter Engineering		
	Course catego	ry: Requ	ired Courses				
		☑ Co	ore Course		☐ Specific Cor	e Course	
		□ Inc	dustrial Internsh	☐ Master Thesis			
J			Elective Courses				
		□ Ge	eneral Elective	☐ Specific Elective	ve □ Oth	er Elective	
4. Course coordinator/ Instructors							
Course Coordinator: Rachata Ausa			nata Ausavarun	gnirun			
	Instructor(s):	Racl	nata Ausavarun	gnirun			
5.	Semester/ year of	study					
	☐ Semester 1	(Aug. to Dec.)	☑Semester	2 (Jan. to May)	Academic Year	r: 2021	
6.	Pre-requisite (if an	y)					
	☑ No	□ Y	es, please provi	de:			
7.	Co-requisites (if ar	ny)					
	☑ No	□ Y	es, please provi	de:			
8.	Venue of study						
	Lecture Day/Ti	me: Mon	day at 13.00-16	5.00			
	☑ On-site:	Lecture Roo	m No.:11	Floor:1102			
		☑ TGGS, K	MUTNB 🔲 I	Faculty of Engineer	ing, CU	□ RWTH	
	☑ On-line*:	Teaching Me	edia: ☑ I	Microsoft Teams	☐ Google Mee	et	
				Zoom	□ Webex		
				Other (specify)			

Remark: * During COVID-19, the teaching can be on-site and/or on-line according to TGGS Policy.



9. Information for quality assurance in education

This course shows evidence of:

- Integration of research or creative activities with instruction; use of research-based learning management; knowledge management practices for learning improvement
- Integration of academic services and course implementation

10. Date of latest revision:

July 2021

Section 2: Course Description and Implementation

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

Research methodology for industrial application. Technical writing and presentation. Literature reviews. Technical seminar.

2. Number of hours per semester

Lecture		Pı	actice		Self-study
45 hours/ semester		30 hours			75 hours/ semester
(3 hours/week*)		(2 hours/week*)		*)	(5 hours/week*)
Remark: * Based on 15 weeks of	lecture				
Course Category:	☑ Le	ecture		□ Praction	ce 🗆 Laboratory
Course Evaluation:	☑ A-	F		□ S/U	□Р
3. Number of hours per w□ 1. Giving academic ad		_			
☑ 1 □ 2		3	□ 4	□ 5	
The student can a	range th	e time via	email for	the meetin	ng date/time.
☐ 2. Adopting information	n techno	logy-based	academ	ic advising	g
☑ Email:		rachata.a@tggs.kmutnb.ac.th			
☐ Phone:					
☐ Communication	Line ID:				
	(Please notify the lecturer when adding the line.)				
☐ Meeting Online:	The platform will be informed to students upon the request.				
☐ Other (specify)					
□ 3					

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



- CLO 1. To demonstrate ability to develop specifications, implement novel research hypothesis and identify key contributions.
- CLO 2. To demonstrate ability to perform literature surveys and derive key findings from previous works.
- CLO 3. To generate novel research goal and analyze and identify and exploit opportunities for new design.
- CLO 4. To analyze tradeoffs of state-of-the-art works that have been published before.
- CLO 5. To understand concepts and components of engineering research
- CLO 6. To be able to communicate key research findings to others depending on the audience types and methods of communications.
- 5. The mapping between Expected Learning Outcomes (ELOs) from the curriculum and Course Learning Outcomes (CLOs)

Table 5.1 ELOs-CLOs Consistency (for a subject-specific course/ a specific curriculum)

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

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

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

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



Consistency between desirable characteristics of KMUTNB Graduates- CLOs	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	CLO 6
3. Innovative and	✓		✓			
technopreneur mindset						
4. Global Competence	✓	√	✓	✓	√	✓

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

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

Course Learning	Teaching Methods	Evaluation Methods
Outcomes (CLOs)	compliant with CLOs	compliant with CLOs
CLO 1	Lecture*	Assignment evaluation
	Individual assignment	• Exam****
CLO 2	Lecture*	Assignment evaluation
	Individual assignment	• Exam****
CLO 3	Lecture*	Assignment evaluation
	Individual assignment	• Exam****
CLO 4	Lecture*	Assignment evaluation
	Individual assignment	• Exam****
CLO 5	Lecture*	Assignment evaluation
	Individual assignment	• Exam****
CLO 6	Lecture*	Assignment evaluation
	Individual assignment	• Exam****

Remark: * Lecture on the concept of the topic is introduced with basic or fundamental definitions, visualization and correlations. For the complicated equation, the derivation from the basic laws can be shown to students. So, the students do not memorize the equations but understand the basic concept and basic equation. The lecturer will introduce the advanced and new concepts, technologies, and findings to students from publications such as journals and websites and from the research and industrial experiences.

^{**} Active learning by asking questions related to the topic in the lecture and encouraging the students to response to the questions. If the students cannot response with answers, then the lecturer will give some guidance until the students can response.

^{***} Quiz in the closed-book format on the basic concepts and equations with simple problem solving to evaluate their learning. The solution will be given to students after grading, so they can identify their mistakes and weakness.

^{****} Exam on the basic concepts and equations with simple problem solving in the closed-book format as a review, whereas the complicated/integrated problem solving will be worked in the open-book format.



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

Section 4: Lesson Plan and Evaluation

1. Lesson Plan

Week	Topics/Details	CLOs	Hours	Learning and teaching activities; teaching media (if any)	Lecturer
1	Introduction to Scientific	CLO 1	3.0	Lecture presentation slides	Rachata
	Research	CLO 2		• Q&A	
		CLO 3		 Assignment 	
		CLO 4			
		CLO 5			
2	-Literature review	CLO 1	3.0	Lecture presentation slides	Rachata
		CLO 2		• Q&A	
		CLO 3		 Assignment 	
		CLO 4			
		CLO 5			
3	-How to do scientific	CLO 1	3.0	Lecture presentation slides	Rachata
	research	CLO 2		• Q&A	
		CLO 3		 Assignment 	
		CLO 4			
		CLO 5			
4	-Research Ethic	CLO 1	3.0	Lecture presentation slides	Rachata
		CLO 2		• Q&A	
		CLO 3		 Assignment 	
		CLO 4			
		CLO 5			
5	-How to give a good	CLO 6	3.0	Lecture presentation slides	Suramate
	talk			• Q&A	
				 Assignment 	
6-7	-Project proposal	CLO 1	6.0	Lecture presentation slides	All Lecturers
		CLO 2		• Q&A	
		CLO 3		 Assignment 	
		CLO 4			
		CLO 5			
		CLO 6			



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

Week	Topics/Details	CLOs	Hours	Learning and teaching	Lecturer
				activities; teaching media	
				(if any)	
8	LaTeX and TGGS	CLO 1	3.0	Lecture presentation slides	Yodsawalai
	Thesis Template	CLO 2		• Q&A	
		CLO 3		Assignment	
		CLO 4			
		CLO 5			
		CLO 6			
9	Resume and Elevator	CLO 1	3.0	Lecture presentation slides	Rachata
	Pitch	CLO 2		• Q&A	
		CLO 3		Assignment	
		CLO 4			
		CLO 5			
		CLO 6			
10	-Seminar	CLO 1	3.0	Lecture presentation slides	External
		CLO 2		• Q&A	Speaker
		CLO 3		Assignment	
		CLO 4			
		CLO 5			
		CLO 6			
11	Seminar	CLO 1	3.0	Lecture presentation slides	External
		CLO 2		• Q&A	Speaker
		CLO 3		Assignment	
		CLO 4			
		CLO 5			
		CLO 6			
12	Technical writing	CLO 6	3.0	Lecture presentation slides	Rachata
				• Q&A	
				Assignment	
13	Copyrights and Patents	CLO 1	3.0	Lecture presentation slides	Sansiri
				• Q&A	
				Assignment	
14	-Seminar	CLO 1	3.0	Lecture presentation slides	External
		CLO 2		• Q&A	Speaker
		CLO 3		Assignment	
		CLO 4			



Week Topics/Details CLOs Hours Learning and teaching Lecturer activities; teaching media (if any) CLO 5 CLO₆ 15 -Project presentation CLO 1 3.0 Lecture presentation slides Rachata CLO₂ Q&A CLO₃ CLO 4 CLO₅ CLO₆ 45.0 Total

2. Evaluation Plan (in accordance with OBE 2 mapping framework)

Course Learning	Evaluation Methods	Week of Evaluation	Percentage of
Outcomes (CLOs)			Evaluation
CLO 1, 2, 3, 4, 5, 6	Assignments	1, 2, 3, 4, 5	50%
CLO 1, 2, 3, 4, 5, 6	Project	6, 7, 16	50%

Section 5 Teaching/Learning Resources

Textbooks and materials

- Palsberg, Jens. "Efficient inference of object types." Information and computation 123.2 (1995): 198-209.
- Muchnick, Steven. Advanced compiler design implementation. Morgan kaufmann, 1997.
- Cooper, Keith, and Linda Torczon. Engineering a compiler. Elsevier, 2011.
- Kasami, Tadao. "An efficient recognition and syntax-analysis algorithm for context-free languages." Coordinated Science Laboratory Report no. R-257 (1966).
- Hanks, Patrick. Lexical analysis: Norms and exploitations. Mit Press, 2013.

Section 6 Course Evaluation and Improvement



Program: ECE
Degree Level: Master

Faculty/College: TGGS

1. Course evaluation by students

The students will have an opportunity to evaluate the effectiveness of the course in a form of paper survey and group interview at the end of each semester. The results of survey and interview including the grading will be reviewed by the curriculum meeting to evaluate the course's effectiveness.

2. Strategies for assessing learning management

The students will have an opportunity to evaluate the teaching of the course in a form of paper survey and group interview at the end of each semester. The results of survey and interview including the grading will be reviewed by the curriculum meeting to evaluate the teaching as well as returning to the lecturer for further improvement.

3. Improvement schemes of course implementation

The evaluation from the students including the grading will be submitted to the curriculum meeting for reviewing and brainstorming to improve teaching of each course. Comments and suggestions given by the curriculum meeting will be informed to the responsible lecturer of each course.

4. Verification of students' learning outcomes, referred to OBE 2 and 3

The grading of this course will be evaluated and reviewed by the Department meeting and the TGGS executive board meeting in order to verify its appropriateness before the final approval.

5. Course review and improvement plans

The results of the grading evaluation and student evaluation will be submitted to the curriculum meeting for reviewing and brainstorming to improve the effectiveness of the offered courses. Comments and suggestions will be informed to the responsible lecturer of each course.

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