



Program: **ECE**
 Degree Level: **Master**

Faculty/College: **TGGS**

- 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 KMUTNB Graduates- CLOs	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	CLO 6
1. Professional credentials with critical thinking skills			✓	✓		
2. Integrity and social responsibility	✓					✓



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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 Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
CLO 1	<ul style="list-style-type: none"> Lecture* Individual assignment 	<ul style="list-style-type: none"> Assignment evaluation Exam****
CLO 2	<ul style="list-style-type: none"> Lecture* Individual assignment 	<ul style="list-style-type: none"> Assignment evaluation Exam****
CLO 3	<ul style="list-style-type: none"> Lecture* Individual assignment 	<ul style="list-style-type: none"> Assignment evaluation Exam****
CLO 4	<ul style="list-style-type: none"> Lecture* Individual assignment 	<ul style="list-style-type: none"> Assignment evaluation Exam****
CLO 5	<ul style="list-style-type: none"> Lecture* Individual assignment 	<ul style="list-style-type: none"> Assignment evaluation Exam****
CLO 6	<ul style="list-style-type: none"> Lecture* Individual assignment 	<ul style="list-style-type: none"> Assignment evaluation 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.*



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 Research	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Rachata
2	-Literature review	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Rachata
3	-How to do scientific research	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Rachata
4	-Research Ethic	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Rachata
5	-How to give a good talk	CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Suramate
6-7	-Project proposal	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	6.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	All Lecturers



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Week	Topics/Details	CLOs	Hours	Learning and teaching activities; teaching media (if any)	Lecturer
8	LaTeX and TGGS Thesis Template	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Yodsawalai
9	Resume and Elevator Pitch	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Rachata
10	-Seminar	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	External Speaker
11	Seminar	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	External Speaker
12	Technical writing	CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Rachata
13	Copyrights and Patents	CLO 1	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	Sansiri
14	-Seminar	CLO 1 CLO 2 CLO 3 CLO 4	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A Assignment 	External Speaker



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Week	Topics/Details	CLOs	Hours	Learning and teaching activities; teaching media (if any)	Lecturer
		CLO 5 CLO 6			
15	-Project presentation	CLO 1 CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	3.0	<ul style="list-style-type: none"> Lecture presentation slides Q&A 	Rachata
		Total	45.0		

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

Course Learning Outcomes (CLOs)	Evaluation Methods	Week of Evaluation	Percentage of 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



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.