



## Course **090245424**

### Internet of Things

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

#### Section 1: General Information

**1. Course code and course title**

090245424    Internet of Things

**2. Total credits**

3 credits     (2-2-5)     (3-0-6)     (3-0-9)     (2-3-7)

**3. Curriculum and course category:**

Curriculum:    *Master of Engineering in Electrical and Computer Engineering*

Course category:    Required Courses

Core Course     Specific Core Course

Industrial Internship     Master Thesis

Elective Courses

General Elective     Specific Elective     Other Elective

**4. Course coordinator/ Instructors**

Course Coordinator:    Chayakorn Netramai, Yodsawalai Chodpathumwan

Instructor(s):    all ECE lecturers

**5. Semester/ year of study**

Semester 1 (Aug. to Dec.)     Semester 2 (Jan. to May)    Academic Year: **2021**

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

No     Yes, please provide: .....

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

No     Yes, please provide: .....

**8. Venue of study**

Lecture Day/Time:    Monday at 13.00-16.00

On-site:    Lecture Room No.:.....    Floor:....

TGGS, KMUTNB     Faculty of Engineering, CU     RWTH

On-line\*:    Teaching Media:     Microsoft Teams     Google Meet

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)

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.

**2. Number of hours per semester**

Lecture	Practice	Self-study
45 hours/ semester (3 hours/week*)	30 hours (2 hours/week*)	75 hours/ semester (5 hours/week*)

Remark: \* Based on 15 weeks of lecture

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

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

1. Giving academic advice (minimally number hour per week) during the office hour  
 1             2             3             4             5             .....
- The student can arrange the time via email for the meeting date/time.
2. Adopting information technology-based academic advising  
 Email:                                    rachata.a@tggs.kmutnb.ac.th  
 Phone:  
 Communication Apps:    Line ID:  
(Please notify the lecturer when adding the line.)



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

Faculty/College: **TGGS**

- 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.     Explain concepts and terms in IoT
- CLO 2.     Discuss and relate the importance of IoT components and architectures
- CLO 3.     Use IoT concepts and methods to solve problems in real-world context and communicate the result effectively
- CLO 4.     Design IoT-based framework or application in real word context and situation

**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
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
1. <b>Professional credentials with critical thinking skills</b>			✓	✓



Consistency between desirable characteristics of KMUTNB Graduates- CLOs	CLO 1	CLO 2	CLO 3	CLO 4
2. <b>Integrity and social responsibility</b>				
3. <b>Innovative and technopreneur mindset</b>				✓
4. <b>Global Competence</b>				

### 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"> <li>• Lecture*</li> <li>• Group or individual project</li> </ul>	<ul style="list-style-type: none"> <li>• assignment</li> <li>• Presentation</li> </ul>
CLO 2	<ul style="list-style-type: none"> <li>• Lecture* / Tutorial</li> <li>• Group or individual project</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly assignment report</li> <li>• Presentation</li> </ul>
CLO 3	<ul style="list-style-type: none"> <li>• Case studies</li> <li>• Group or individual project</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly assignment report</li> <li>• Presentation</li> </ul>
CLO 4	<ul style="list-style-type: none"> <li>• Individual assignment</li> <li>• Case studies</li> <li>• Group or individual project</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly assignment report</li> <li>• Presentation</li> </ul>

*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	Overview of Internet of Things	CLO 1	3.0	<ul style="list-style-type: none"> <li>• Lecture presentation slides</li> <li>• Q&amp;A</li> </ul>	
2	Case Studies Project Talks	CLO 1 CLO 2	3.0	<ul style="list-style-type: none"> <li>• Lecture presentation slides</li> <li>• Q&amp;A</li> </ul>	
3-7	Tutorial on embedded devices	CLO 1 CLO 2	12.0	<ul style="list-style-type: none"> <li>• Lecture presentation slides</li> <li>• Q&amp;A</li> </ul>	
8	<i>Project Proposal</i>	CLO 3 CLO 4	3.0	<ul style="list-style-type: none"> <li>• Q&amp;A</li> <li>• Projects</li> </ul>	
9-15	Specific topics/discussion/tutorial on individual projects	CLO 1 CLO 2	21.0	<ul style="list-style-type: none"> <li>• Q&amp;A</li> <li>• Projects</li> <li>• Weekly assignment report</li> </ul>	
16	<i>Project Presentation</i>	CLO 3 CLO 4			All
		Total	48.0		

### 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	Reports	9-15	20%
CLO 3, 4	Proposal Presentation	7	30%
CLO 3, 4	Demo Presentation	16	50%



## Section 5 Teaching/Learning Resources

Textbooks and materials

## 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.