

STUDENT HANDBOOK



Doctor of Philosophy in  
**Artificial Intelligence and  
Computer Engineering**  
Ph.D. in AiCE

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CMKL University  
1 Soi Chalongkrung 1  
Ladkrabang, Bangkok 10520  
Thailand  
+66 65 878 5000  
[www.cmkl.ac.th](http://www.cmkl.ac.th)

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# WELCOME TO ARTIFICIAL INTELLIGENCE AND COMPUTER ENGINEERING

CMKL University was established in 2017 as a collaboration between Carnegie Mellon University and King Mongkut's Institute of Technology Ladkrabang (KMUTL) for a graduate dual-degree program in Electrical and Computer Engineering. Building on the experience of this collaboration, CMKL University has established the Artificial Intelligence and Computer Engineering Program (AiCE) at CMKL University with B.S., M.S. and Ph.D. degrees.

The Ph.D. in AiCE program at CMKL equips students with the expertise to pursue new frontiers in AI, Computer Engineering, and Innovation. Our competency-based course design provides a well-rounded foundation of knowledge that can be put to immediate use to help people and organizations solve their real-world problems. Moreover, through artificial intelligence, computer engineering and an entrepreneurial perspective, AiCE graduates can assist our society in tackling challenges that will propel the future development of Thailand and Southeast Asia.

Our graduate education and research programs provide students the opportunity to experience and participate in real world engineering research and projects, collaborating with partners of CMKL and of Carnegie Mellon University in the US. Carnegie Mellon has led the world in AI education and innovation since the earliest work in AI, more than half a century ago. Its interdisciplinary research and rigorous education programs have become the touchstone for an international computing education. CMU provides a standard that our AiCE program aims to achieve.

CMKL hosts the AI Engineering Institute (AIEI) which is a collaboration among leading Thai universities to advance AI Engineering education and research. In addition, our university serves as a hub of national AI supercomputing research infrastructure. Our students will be equipped with cutting-edge engineering research and education while accessing the best facilities and AI supercomputing. Students will be guided through the best practices used for building effective AI-systems, led by our faculty who are world-class academics and experts in the field.

In this handbook, you will find more information about the AiCE M.S. program. If you have questions or concerns not covered in this handbook, please do not hesitate to reach out to us. I am looking forward to seeing our graduates making a positive impact in the field, enabling future possibilities for our economy and society.

Sincerely,



Akkarit Sangpetch, PhD  
AiCE Program Director  
CMKL University

# BRIEF OVERVIEW OF PROGRAM

Our mission is to foster the development of talented engineers and researchers who are ready for the next wave of digital disruption. Throughout the program, our students will explore how to apply AI techniques to major aspects of computing, including human-centric design and visualization, scalable and distributed computing systems, privacy and security. Students will learn through hands-on experience, working alongside our engineers and designers to solve the real-world problems of our industrial partners. Technical deep dive is also provided by working with our international teams of researchers and faculty members from leading universities.

## Mission

Nurture talent and revolutionize industries to become leaders through a synergistic approach of knowledge, technology, research, and innovation.

## Vision

Transform education to cultivate entrepreneurial professionals and revolutionize collaborative research and development.

## Value

Push boundaries, bring ideas to life, make a meaningful impact on industry and society

## Program Educational Objectives

Our program educational objectives are as follows. The objectives represent our vision for what our graduates will be doing in their careers five years after graduation.

- **Engineering Experts:** Our graduates will be able to solve problems by applying engineering fundamentals. Their solutions will reflect the depth and understanding of technology, drawing upon multiple disciplines and considerations for the problem.
- **Entrepreneurial Innovators:** Our graduates will demonstrate creativity in their engineering practice. They will be able to consider a system-oriented approach in their design. They will be able to strategically plan and execute successful engineering projects in their own businesses or organizations.
- **Ethical Leaders:** Our graduates will take initiative, demonstrating their resourcefulness and ability to collaborate in diverse and multidisciplinary teams. They will also be leaders in their organizations or professions while being aware of potential economic and societal impacts of their actions.

# **INTRODUCTION**

## **Degrees Offered**

Graduates of the Ph.D. in AiCE program will earn a degree from CMKL University. Students will be supervised by faculty advisors from CMKL University who will help them to create and define research projects to complete in pursuit of their degree. The advisors will also assist with selection of learning activities and other elements of the Ph.D.in AiCE program based on the student's background and academic goals.

## **Graduate Student Handbook**

This handbook is intended to set guidelines and expectations for new and current Doctoral students in Artificial Intelligence and Computer Engineering at CMKL University. This handbook is not exhaustive and will be subject to revision from time to time.

It is the responsibility of each student to read and understand the contents of this handbook. This handbook, along with any revisions, will be posted and announced annually on the university website.

# **CMKL UNIVERSITY STATEMENT OF EQUAL ACCESS**

CMKL University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Additionally, CMKL University adheres to non-discrimination policies set forth in Thai national laws and executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the Vice President for Campus Affairs, CMKL University,1 Soi Chalongkrung 1, Ladkrabang, Bangkok 10520, Thailand. Obtain general information about CMKL University by calling +66 65 878 5000.

## **CMKL FACULTY**

Throughout their time in the AiCE program, students will encounter a variety of faculty and staff members who will help them on their way to completing their degree. For more details about faculty backgrounds and specialties.

## **University Officers**

- President of CMKL University: Dr. Supan Tungjitkusolmun
- Vice President of CMKL University: Dr. Orathai Sangpetch
- AiCE Program Director: Dr. Akkarit Sangpetch

## Course Instructors

### **Supan Tungjithkusolmun**

Associate Professor, CMKL University

B.S., Electrical and Electronics Engineering, University of Pennsylvania, USA

M.S., Electrical Engineering, University of Wisconsin, USA

Ph.D., Electrical Engineering, University of Wisconsin, USA

### **Orathai Sangpetch**

Assistant Professor, CMKL University

B.S., Electrical and Computer Engineering, Carnegie Mellon University, USA

M.S., Electrical and Computer Engineering, Carnegie Mellon University, USA

Ph.D., Electrical and Computer Engineering, Carnegie Mellon University, USA

### **Akkarit Sangpetch**

Program Director, CMKL University

Director, AI Engineering Institute

B.S., Computer Science, Carnegie Mellon University, USA

B.S., Electrical and Computer Engineering, Carnegie Mellon University, USA

M.S., Electrical and Computer Engineering, Carnegie Mellon University, USA

Ph.D., Electrical and Computer Engineering, Carnegie Mellon University, USA

### **Charnon Pattiyanon**

Assistant Director of IT, CMKL University

Instructor, CMKL University

B.S., Computer Engineering (International Program), King Mongkut's University of Technology Thonburi, Thailand

M.S., Software Engineering, Chulalongkorn University, Thailand

Ph.D., Japan Advanced Institute of Science and Technology (JAIST), Japan

### **Irving Gómez Méndez**

Assistant Professor, CMKL University

B.Sc., Mathematical Engineering, Instituto Politecnico Nacional, Mexico

M.Sc., Probability and Statistics, Centro de Investigacion en Matematicas, Mexico

Ph.D., Probability and Statistics, Centro de Investigacion en Matematicas, Mexico

### **Pisut Wisessing**

Assistant Professor, CMKL University

B.A., Physics and Mathematics, Cornell University, USA

M.F.A., Digital Production Arts, Clemson University, USA

Ph.D., Computer Science, Trinity College Dublin, Ireland

### **Sarun Gulyanon**

Assistant Professor, CMKL University

B.Sc., Computer Science, University of Edinburgh, UK

M.S., Computer and Information Science, Purdue University, USA

Ph.D., Computer Science, Purdue University, USA

**Sally Goldin**

Assistant Professor, CMKL University  
Associate Director of Learning Innovation, CMKL University  
B.A., Cognitive Psychology, Brown University, USA  
M.A., Cognitive Psychology, Brown University, USA  
M.S., Cognitive Psychology, Carnegie Mellon University, USA  
Ph.D., Cognitive Psychology, Carnegie Mellon University, USA

**Pongsin Poosankam**

Director, Data Innovation, Krungthai Bank  
Adjunct Faculty, CMKL University  
B.S., Computer Science, Carnegie Mellon University, USA  
M.S., Compute Science, Carnegie Mellon University, USA  
Ph.D., Computer Science, Carnegie Mellon University, USA

**Sooksan Panichpapiboon**

Professor, School of Information Technology, King Mongkut's Institute of Technology Ladkrabang  
Adjunct Faculty, CMKL University  
B.S., Electrical and Computer Engineering, Carnegie Mellon University, USA  
M.S., Electrical and Computer Engineering, Carnegie Mellon University, USA  
Ph.D., Electrical and Computer Engineering, Carnegie Mellon University, USA

**Sorakrit Phruthanontachai**

Senior Vice President, Information Technology Division, Bangkok Bank  
Adjunct Faculty, CMKL University  
B.Eng., Computer Engineering, Chulalongkorn University, Thailand  
M.S., E-Commerce Technology, University of Sussex, UK  
M.S., Information Technology in E-Business Technology, School of Computer Science, Carnegie Mellon University, USA  
MBA., Sloan Fellows, MIT Sloan School of Management, Massachusetts Institute of Technology, USA

**Suporn Pongnumkul**

Senior Researcher, National Electronics and Computer Technology Center  
Adjunct Faculty, CMKL University  
B.S., Computer Science, Carnegie Mellon University, USA  
B.S., Mathematics, Carnegie Mellon University, USA  
M.S., Computer Science and Engineering, University of Washington, USA  
Ph.D., Computer Science and Engineering, University of Washington, USA

# PRE-MATRICULATION

## Admissions Policies

Admission criteria for the Ph.D. in AiCE Program are designed to reflect our core values and program outcome. We consider collaboration, perseverance, passion, advocacy for others and self-direction when making admission decisions. We are interested in students who can be successful at CMKL while fully engaging in the university community and our extended ecosystem.

For information about AiCE's admission policies, including application requirements, application deadlines, links to the application forms, please visit the university webpage: <https://www.cmkl.ac.th/academic/graduate>

## English Language Proficiency Test

All learning activities in the AiCE program are conducted in English. Therefore, all prospective students must demonstrate English proficiency. Specifically, all applicants whose native language is not English must take an English Language proficiency test. Native language is defined as a first language, or language spoken from birth. The test scores must be submitted by the application deadline for the semester in which students are applying.

CMKL accepts TOEFL, IELTS or Duolingo English Test as evidence of English language proficiency. Please refer to the admissions website for the minimum requirement for each test.

## Final Transcripts

As a condition of enrollment at CMKL university, applicants admitted to the AiCE program must submit final official transcripts, properly sealed, upon completion of their undergraduate program or master program from the institution conferring their degree as a condition of enrollment at CMKL University. Certificates of graduation and/or degree certificates or equivalent should also be submitted if provided by the institution. Failure to provide such documents that confirm the completion of graduation requirements by the end of the first semester of study at CMKL University may prevent the Ph.D. degree from being certified.

# ENROLLMENT AND REGISTRATION

## Overview

After matriculating into Ph.D. in AiCE, students should create an academic plan and register for courses. Students should actively engage in their process by reviewing degree requirements on the website, connecting with their academic advisor, and conferring with a faculty mentor.

Once a schedule is developed, it is the student's responsibility to register for courses via <https://cube.cmkl.ac.th/>. Students must be registered for every course that they plan to take for the semester, even if it is not taken for credit (e.g., audited courses). After the first semester, a student's assigned registration time is determined by the number of completed units and cannot be changed.

## **Degree Progress and Planning**

### **Student Responsibility**

It is the student's exclusive obligation to manage their program's academic development. Students are expected to take the appropriate prerequisites and courses in order to satisfy degree requirements on time. Students can add and remove courses, as well as select units for variable unit courses. It is the obligation of the students to be aware of all academic deadlines, including the add and drop dates. Academic deadline information can be obtained on each semester's academic calendar, which can be found at <https://www.cmkl.ac.th/cube/overview>.

If a student is not making the required progress, they should seek advice and counsel from their academic advisor. If a student is concerned about their ability to complete degree requirements, they should consult with their advisor for assistance.

### **Degree Requirements Timeframe**

The Ph.D. in AiCE program lasts five-year (ten full time semesters). The maximum period allowed to complete the Ph.D. degree requirements is six years, beginning with the successful completion of the Ph.D. Qualifying Examination.

At the beginning of the semester, students must be physically present and attend class. If a student is unable to attend class due to extenuating circumstances, he or she must immediately contact the academic advisor and teachers. Failure to attend class from the start of the semester will jeopardize a student's advancement in the program. AiCE will make an effort to verify all students have arrived to begin their program and will consider a student as "withdrawn from the university" if he or she is not here by the tenth day of class as defined by the academic calendar.

During the academic year, international students will require a Non-immigrant (ED) ("educational") visa, which can be extended. If international students desire to leave Thailand briefly and return, they must also have a valid re-entry permission. If they leave the country without a re-entry permit, their educational visa will be cancelled. Staff at CMKL will assist overseas students in dealing with Thailand's immigration department.

### **Full-time Requirements**

Full-time students must enroll in at least 36 units per semester (fall, spring, and summer). Furthermore, in order to preserve their immigration status, overseas students must enroll in a full course load (minimum 36 units) each semester. Enrollment less than full-time may be permitted throughout specific phases of the Ph.D. program (e.g., self-supporting in the final semester). For more information, contact your academic advisor.

## Statute of Limitations

AiCE adheres to CMKL's policy on Ph.D. completion timelines, as follows:

A student who passes the Ph.D. qualifying examination is admitted to candidacy for the Ph.D. degree for a period of no more than six calendar years. If the Ph.D. is not conferred at the end of the six-year period, the student must reapply for admission to the graduate school and will be judged competitively with other students applying at the same time.

Former AiCE students who did not finish graduation requirements and wish to return to complete a degree should refer to the University Policies

Under extraordinary circumstances, such as leave of absence, military or public service, family or parental leave, or temporary disability, a school or college may defer the lapse of All But Dissertation (ABD) status for a period commensurate with the duration of the interruption, with the written approval of the dean.

Students wishing to obtain an extension due to special circumstances must submit a formal petition at least one semester prior to his or her defense timeline expiring. The time clock will stop for students who have not taken the qualifying exam prior to the leave of absence.

## Obtaining an M.S. on the Way to the Ph.D.

Ph.D. students in the AiCE program may earn an M.S. degree en route to completing their doctorate, as a formal recognition of academic progress. Two tracks are available:

- **Professional Track** – focuses on graduate coursework and applied innovation
- **Thesis Track** – involves original research and a thesis defense
- **Entrepreneurial Track** - build and launch your own technology-based venture

For full program details, please refer to: [MS in AiCE Handbook](#)

## Change of Degree Program

Students have the option of switching to the M.S. program. The student should discuss transferring to the M.S. program with his or her advisor prior to filling out the necessary form to formalize the switch.

Please note that this switch must be done prior to or within the first 10 days of classes in the semester in which a student would like to switch to the M.S. program. After the 10th day of classes, a request to switch will not be considered until the following semester and the student will be expected to continue with Ph.D. research.

Students who switch to the M.S. program will become financially self-supporting, meaning that they will no longer receive tuition or stipend support from the department.

## Double Counting Courses

Students are required to notify the Graduate Affairs Office prior to declaring a degree outside of AiCE as this may have repercussions for your units and coursework to date. If a student takes the same course twice, the course with the higher grade will be counted towards the AiCE Ph.D. course requirements.

## Retaking Courses

If students fail a course, they should take another course to meet the requirement. Retaking a course is not advised. All grades are recorded on the transcript and count toward the cumulative QPA; however, only the best 144 units that complete degree requirements count toward the needed 3.0 graduation QPA.

## Auditing Courses

Auditing a course means attending a class but not obtaining academic credit or a letter grade. A course that has been audited will show on a student's transcript. Students who are present in a classroom but are not receiving academic credit or a letter grade must audit the class in order to continue attending on a regular basis. Students who want to audit a course must do the following:

1. Sign up for the course.
2. Obtain permission from the instructor and have him/her sign the course audit approval form.
3. Submit the form for clearance to their academic advisor.
4. If authorized, the form will be sent to the academic adviser for processing.

After submitting a course audit permission form, no letter grade ('A'-R') will be issued to the course, and the declaration cannot be overturned. The deadline for submitting this form can be found on the Academic Calendar. Students will not be allowed to request the option to audit a course after the deadline.

The course instructor must arrange and authorize the extent of the student's participation.

Auditors are typically expected to attend class as if they were normal class members. Those who do not attend class on a regular basis or prepare for class will receive a zero grade. Otherwise, the student obtains an audit grade of 'O.'

Audited course units count toward the maximum course load units but not toward degree requirements. A course may be audited by any student. An audited course is billed in the same way as ordinary courses under tuition rates.

## Pass/No Pass Courses

Students who wish to take a pass/fail course must register for it and submit a pass/no pass approval form to their academic advisor for approval. If approved, the form will be sent to the academic adviser for processing.

After submitting a Pass/Fail Audit Approval form, no letter grade ('A'-'R') will be issued to the course, and the declaration cannot be overturned. Passing work (letter grades 'A'-'B-') is recorded on the student's academic record as 'P' (passing grade) or 'S' (satisfactory), with both grades meaning the same; work with a grade of 'C' or lower will not receive credit and will be recorded as 'N' (not passing grade) on the student's academic record. No quality points will be granted to 'P'/'S' or 'N' grades, and their units will not be counted into the student's QPA.

Pass/no pass courses count toward the maximum course load units but not toward the degree requirements. The deadline for submitting this form can be found on the Academic Calendar. Students will not be allowed to request the option to pass/fail a course beyond the deadline.

## Course Transfer Request Policy and Process

Only one graduate-level course, or the equivalent of 12 units, can be transferred from another university as credit toward the Ph.D. degree. As a guideline, three-credit courses from other universities equate to 9-unit CMKL courses; a four-credit course equates to a 12-unit CMKL course.

The course being transferred must:

- Fulfill an AiCE degree course requirement and be equivalent to a CMKL course
- Be considered a graduate level course at the university where it was taken (unless requesting transfer credit for the one allowed undergraduate course)
- Not have been used to fulfill requirements for any previously earned degree

A grade of 'B' or better must be earned for the course to be transferred. The transfer credits will appear on the student's transcript and will not be factored into the QPA.

Transfer credit is not granted prior to admission and must be approved by the Graduate Studies Committee. Courses can only be requested for transfer after the student has successfully completed 36 units of coursework at CMKL. After matriculating to CMKL, AiCE students should consult with their academic advisor before taking a course at another university.

Transfer courses will be reviewed for academic rigor and alignment with courses offered in AiCE. The course description and syllabus, learning outcomes, delivery mode, and institutional accreditation will be considered when evaluating the course for transfer.

The process for requesting to transfer a course is as follows:

- Meet with academic advisor to discuss the course transfer
- Complete and collect the following mandatory documents:
- Appropriate petition form ([M.S. AiCE Petition form](#))
- Official transcript from previous institution

- Detailed course description/syllabus (should include grading scale, assignments required, mandatory books, and time required in class) of the course you wish to transfer
- Letter from the previous institution's registrar or academic advisor stating the course intended for transfer was not used towards a degree
- E-mail endorsement from the instructor of the CMKL course you believe your transfer course is most equivalent to CMKL Graduate Transfer Credit Request form
- Submit the completed packet to the academic advisor

The academic advisor will present the transfer request to the CMKL Dean's office and notify the student of the result.

Once the petition is approved, the Admission Office will work with the student to complete the transfer request.

AiCE has not entered into an articulation or transfer agreement with any specific college or university. The transfer of credits from any college or university must follow the above policy and process. Additionally, AiCE does not award credit for prior experiential learning.

## **REGISTERING FOR COURSES**

### **Course Load**

Every semester, students are responsible for completing their enrollment. Students who have not registered for classes by the tenth day of the semester will be dropped from the university.

Prior to registering each semester, it is strongly recommended that students consult with their faculty advisor in order to ensure that their course load is balanced and relevant to the student's Ph.D. research.

Due to the rigor of these programs, students are advised not to take more than 36 units of courses in their first semester and 36 units of courses each semester thereafter. However, we recognize that our student body is diverse, and that includes how each student handles their course load. While students may register for maximum units each semester, we strongly recommend students take no more than 36 units each semester. Students unsure of whether they should take 48 units should schedule an appointment with their academic advisor to discuss their reason for overloading and prepare a plan for how to handle the additional load.

### **Adding Courses**

Students have the option of adding courses to their schedule starting at their assigned registration time until the add/drop deadline through the Cube. If a student wishes to be added to a course after the add/drop deadline, the Course Add Request Form must be completed and signed by the course instructor. Then, the student must submit the form to their academic advisor for approval. If approved, the academic advisor will send the form for processing.

## Course Locations

Courses will take place at various buildings and room locations across CMKL University as assigned in each academic semester. Please refer to the schedule of classes available on your campus.

## Dropping Courses

Students can drop courses from their schedule beginning at their allocated registration time and continuing until the add/drop deadline. When you drop a course before the drop deadline, it does not appear on your transcript. As a courtesy to others, students should drop a course as soon as they decide not to take it. This allows a wait-listed student to enroll while minimizing disturbance to any team-based tasks.

## Withdrawing from Courses

Each semester, students should drop a course before the drop deadline. If a student wishes to withdraw from a course after the drop deadline, the student must do so in writing and should check with their advisor. To withdraw from a course after the drop deadline but before the end of the semester, students must complete and submit the Course Withdrawal Request form with their academic advisor. Withdrawals receive a "W" grade on their record; this "W" grade is not counted into the QPA, but the course counts against the maximum units.

## Courses with Time Conflicts

In general, students are not permitted to register for two courses that conflict in time. Registration may be possible with consent from an instructor, allowing the conflict or attendance at an alternate time. Students should forward permissions from instructors to their academic advisor to register for conflicting courses.

## Prerequisites

While the university may enable you to register for courses without having finished a listed prerequisite course, it is the duty of the student to have appropriate background knowledge to be successful in the succeeding course. This prior knowledge could be from a CMKL introductory course, your undergraduate university, or other work/research experience. You should check with the teachers because it is up to them if a prerequisite course can be waived.

## Final Exams

Any final exams or other final evaluation activities organized by individual course instructors must be attended by all AiCE students. If students fear that a final exam will cause a schedule conflict, they must speak with the course instructor about it. Attendance at the final evaluation activity is ultimately the student's responsibility. Please bear this in mind while planning final-semester travel; purchasing airline tickets is not

an acceptable reason for skipping a final exam.

## **ENROLLMENT AND DEGREE CERTIFICATION**

### **Enrollment Verifications**

The Cube (<https://www.cmkl.ac.th/cube/overview>) is the main point of contact for students and alumni who need a transcript, enrollment verification, or other information about their experience in AiCE.

AiCE may give a letter to verify some limited information, which may be appropriate for specific purposes, such as confirming skills students gained through the AiCE program. For more information, please contact your academic advisor.

### **Leave of Absence**

Students may need to take a break from their studies for a variety of reasons (financial, academic or personal). Students who wish to take a leave of absence must first consult with their adviser to discuss their goals while away and to iron out any conditions that may be required for a successful return to CMKL.

A student may depart CMKL by either withdrawing from the university (leaving with no intention of returning) or taking a leave of absence (this means leaving the university temporarily, with the firm and stated intention of returning). All students requesting a leave of absence must fill out a Leave of Absence Form. All students who are withdrawing must complete a Withdrawal Form. Notifying instructors or no longer attending classes does not complete the process.

The Cube website has forms available. Tuition will be charged to the midway of the semester or the last date the student attended an academically related activity such as an exam, tutorial, or study group, or the final day a student turned in a class assignment if the leave form is not completed.

### **Returning from a Leave of Absence**

Students on leave who want to return to CMKL to finish their degree can do so under certain conditions. A student must first receive an Application for Return form from the Cube in order to be considered for return from leave. This application needs the student to provide information about their intended semester of return, current address information, and information about their leave. This application must be sent to Cube at least one month before the semester begins. Graduate students are eligible to return to the AiCE program after two years. Students who return after two years are subject to space limits and an academic performance review.

Students on leave are not able to live in university accommodation, attend classes, or work as students at CMKL while their leave is in force, according to university policy.

It should also be noted that international students who take a leave of absence would lose their Educational Visa and will be forced to leave Thailand.

## **Degree Certification Process and Commencement**

Ph.D. degrees will be certified after students successfully defend their dissertation and submit all required paperwork, including publication permissions and contact information. In addition, students must have provided a final copy of their undergraduate transcript(s) and must have no outstanding balance in their CMKL tuition account. Students will be notified of their degree certification via email once the certification has been completed.

Before graduation, students should update their contact information, such as mailing address and email address, within the Cube system. Also, students should review a proxy of their diploma in Cube to verify the information displayed there, such as the spelling of their name.

Students who are certified in the summer or fall semesters will be invited to attend the following spring commencement ceremony. Spring graduates will be invited to the spring commencement ceremony. Students are not eligible to participate in the Doctoral Hooding Ceremony or the AiCE Diploma Ceremony unless their degree has been certified by the Graduate Affairs Office.

The title of the degree students receive is Doctor of Philosophy in Artificial Intelligence and Computer Engineering.

## **ACADEMIC STANDARDS**

### **Grades**

Below are the policies surrounding grades for students in the AiCE program.

#### **University Policy on Grades**

The university policy on grading offers details concerning university grading principles for students studying in the program and covers the specifics of assigning and changing grades, grading options, drop/withdrawals and course repeats. It also defines the undergraduate and graduate standards.

#### **Grading Policy**

AiCE follows the following letter grade scale. The letter grade scale is 'A' (highest), 'A-', 'B+', 'B', 'B-', 'C+', 'C', 'C-', 'D+', 'D', and 'R' (lowest). Grades lower than 'B-', meaning C+ or below, are considered failure in the AiCE doctoral program and will not count toward degree requirements.

Individual instructors may decide to omit some of the intermediate grade levels (plus or minus levels).

## **Incomplete Grade**

Incomplete grades will be assigned at the discretion of the course instructor, per the [university grading policy](#).

## **Process for Appealing Final Grades**

Final grades will be changed only in exceptional circumstances and only with the approval of the instructor, unit, or program. Grading is a matter of sound discretion of the instructor and final grades are rarely changed without the consent of the instructor who assigned the grade. The following circumstances are the unusual exceptions that may warrant a grade appeal: (a) the final grade assigned for a course is based on manifest error (e.g. a clear error such as arithmetic error in computing a grade or failure to grade one of the answers on an exam), or (b) the faculty or staff member who assigned the grade did so in violation of a University policy.

## **Withdrawal Grade**

Students can withdraw from a course after the add/drop deadline until the last day of classes. This will result in a 'W' on the transcript, which is not factored into the QPA. To withdraw, the course withdrawal request form must be completed and submitted to the academic advisor for approval. If approved, the academic advisor will send the form for processing.

## **Academic Performance**

### **Quality Points Average**

In order to graduate, each student must have a Quality Point Average (QPA) of at least 3.0 in the courses being used towards the required units for the Ph.D. program. Coursework or graduate project units with a grade lower than 'B-' will not be considered toward graduate degree requirements; however, they will be used in calculating into the student's cumulative QPA.

### **Academic Probation**

In the event that a student's semester or cumulative QPA falls below 3.0, that student is considered to be on academic probation and will receive a letter from the department alerting them. While on probation, students must meet with their academic advisor and comply with their recommendations. Once a student's semester and cumulative QPA increase above 3.0, the student is automatically removed from probation.

## **Academic Integrity**

Students at CMKL are engaged in preparation for professional activity of the highest standards. Each profession constrains its members with both ethical responsibilities and disciplinary limits. To assure the validity of the learning experience a university establishes clear standards for student work.

AiCE adheres to CMKL's policies on academic integrity and all students are expected to review these policies prior to their arrival at CMKL.

In any presentation, creative, artistic, or research, it is the ethical responsibility of each student to identify the conceptual sources of the work submitted. Failure to do so is dishonest and is the basis for a charge of cheating or plagiarism, which is subject to disciplinary action.

The individualized, self-paced nature of the AiCE program places even more stringent demands on students' integrity. Since much of the student's learning will be self-directed and mastery will be demonstrated largely via creation of designs, programs, and systems, the student will need to rely on external sources and information. It is critical that students identify what work is their own and what work is derived from other sources. Furthermore, students must adhere to instructors' guidelines regarding what types of external sources are permitted.

Finally, some work at CMKL will be done in teams, while other work will be individual. Students should note that an individual assignment must be solely their own work. Copying of any sort on an individual assignment is a violation of ethical standards and will be subject to severe penalties.

### **Penalties for Violating Academic Integrity**

Instructors are responsible for defining academic integrity for students in their courses including student performance expectations and attendance requirements. Students are responsible for understanding and abiding by the instructor's academic integrity policies. Policies may vary from instructor to instructor and students should seek further guidance from a faculty member if they have specific questions about a course's academic integrity policy.

Should an instructor believe that an academic integrity violation has occurred, he or she may consult with the Office of the Dean of Student Affairs, who will assist the faculty member in handling a possible academic integrity violation and, if a student is found responsible for violating academic integrity policies, determining possible sanctions. Sanctions may include being required to redo work, losing credit and/or public admissions of guilt.

If a student is found to have violated the academic integrity policy for a second time, the student will be dropped from the AiCE program at the end of the semester in which the infraction has occurred.

Students have the right to appeal an academic integrity decision.

# PH.D. AiCE DEGREE REQUIREMENTS

## Overview

AiCE students must satisfy multiple requirements before the doctoral degree is certified. These milestones addressed in this section include:

- Coursework
- Breadth Area Requirements
- Qualifying Exam
- Research
- Teaching Internships Prospectus
- Dissertation
- Dissertation Defense

Below is an example of a student’s plan of study over the duration of the AiCE Ph.D. program. Please note that this plan is an example and may vary based on whether the student has a master’s degree prior to enrolling, on conversations between the student and his or her advisor, and which AiCE Ph.D. program the student is enrolled in.

| Milestones          | F1        | S1        | F2        | S2        | F3 | S3 | F4 | S4 | F5 | S5 |
|---------------------|-----------|-----------|-----------|-----------|----|----|----|----|----|----|
| Research            | X         | X         | X         | X         | X  | X  | X  | X  | X  | X  |
| Courses & Breadth   | 2 classes | 2 classes | 2 classes | 2 classes |    |    |    |    |    |    |
| Qualifying Exam     |           |           |           | X         |    |    |    |    |    |    |
| Teaching Internship |           |           | X         |           |    | X  |    |    |    |    |
| Prospectus          |           |           |           |           |    |    |    | X  |    |    |
| Thesis and Defense  |           |           |           |           |    |    |    |    |    | X  |

## Coursework

Prior to registering each semester, students should consult with their faculty advisor to ensure that their semester course load is balanced and relevant to their Ph.D. research. To maintain full-time status as a student at CMKL, students must enroll in at least 36 units per semester. The maximum number of units permitted in a semester is 48.

## Required course total

Students in the Ph.D. program without a M.S. degree, and students in the Ph.D. program who have an AiCE M.S. degree from CMKL, must take a total of eight [8] AiCE or related courses (totaling 96 units) at CMKL. At least seven of these eight courses must be approved graduate-level courses.

Students in the Ph.D. program who have earned a M.S. degree elsewhere (outside of CMKL's AiCE department) must take a total of four [4] AiCE or related courses (totaling 48 units) at CMKL. At least three of these four courses must be approved graduate-level courses.

Students who received an M.S. in AiCE from CMKL may use their M.S. courses to count toward Ph.D. requirements.

- Students who have received an M.S. from CMKL in AiCE are strongly encouraged to schedule an appointment with the Ph.D. Academic Program Advisor to discuss their M.S. courses and which will count towards the Ph.D. degree requirement.

Students who are pursuing Ph.D. in AiCE for CMKL are also required to take 41-900 Research Entrepreneurship and Innovation in order to satisfy CMKL postgraduate program requirement.

## Course Restrictions

Certain courses from other departments or organizations are considered “restricted” and may not be used for credit toward the doctoral degree requirements.

Students are responsible for checking the syllabi for classes to ensure their courses are not restricted courses. The following course characteristics determine the restricted status of a course:

- Courses where more than 50% of the course grade is based on a group project or more than 20% is based on attendance are restricted.
- Mini-courses worth 12 units are restricted.
- No more than 12 units of professional development coursework can be applied toward the course requirement.

## Petitioning to Count a Course Not on the Pre-approved List

Students wishing to count a graduate course at CMKL not listed in the approved graduate course list, or an undergraduate course offered by another program at CMKL, must formally petition the Graduate Studies Committee.

## Breadth Area Requirement

The AiCE Program has defined four technical areas (plus an ‘Other’ area) to insure breadth of knowledge for the Ph.D. degree. These areas are:

- Artificial Intelligence
- Human-centered Design
- Scalable Systems
- Cybersecurity
- Other (by petition)

Each Ph.D. candidate must take at least one [1] graduate class from three of these areas to fulfill the breadth requirement. Students must receive a “B-” grade or better in these courses.

By petition to AiCE’s Graduate Studies Committee, students may be able to count one course that they have taken during a previous degree toward the breadth course requirement. If the petition is accepted, only two more breadth areas must be satisfied. However, students will still be held to the same course requirements.

## Qualifying Exam Requirement

Students who are working towards a Ph.D. degree are required to take the Ph.D. Qualifying Examination. The Ph.D. Qualifying Examination tests the student’s ability to think, speak, and write. Students must read and analyze three technical papers that define the examination topical area. Students then write a review paper as well as orally present this review to a faculty examining committee. This committee includes three faculty from the AiCE department whose research focus is in the area the student wants to be tested on. The student must answer detailed questions from the faculty committee. These questions can be about the review paper and presentation, the reference papers, or the obvious undergraduate-level technical background for the material in the review and reference papers.

## Timeline

Students must take the Ph.D. Qualifying Exam for the first time no later than the fourth semester after being admitted to the Ph.D. program and must pass the exam no later than the fifth semester after being admitted to the Ph.D. program. Summer semesters are not included in this qualifying exam timetable.

Each student should discuss with her or his advisor when to take the qualifying exam the first time. The time clock determining when a student must take the qualifying exam is stopped for one semester if the student is engaged in a full-time industrial internship during an academic year semester (fall or spring). This policy applies for up to one semester of internship experience. Students engaged in internships for more than one academic semester must petition to AiCE’s Graduate Studies Committee to request a deferment of the

qualifying exam time line beyond one semester. Please note that there is no guarantee that such petitions will be approved.

## Mechanics

The qualifying exam process consists of three steps: declaration, review paper, and oral examination.

### 1. Declaration, Abstract, and Technical Papers (due in September or February)

In this step, the student identifies the research area and literature on which he or she focuses. With faculty advisor input, the student must complete a qualifying exam declaration, write a presentation abstract, and submit three technical papers. The declaration will allow students to rank order between seven [7] and ten [10] AiCE faculty that the student and his or her advisor feel would be the best fit for the examination committee. The three technical papers provide context to the faculty examining committee regarding the student's area of focus.

Students can choose no more than two papers that may have authors who are currently faculty at CMKL. Students can choose no more than one paper that the student has co-authored. The total length of all three papers may not exceed 50 pages.

The Graduate Studies Committee reviews the declaration packets and recommends a three-person faculty examination committee. While every attempt is made to choose faculty from the student's declaration submission, these preferences cannot always be accommodated due to faculty availability and committee balancing. This committee is subject to approval by the student's faculty advisor.

### 2. Review paper (due in October or March)

The qualifying examination tests the student's written communication skills through a short review paper. This paper defines the focus of the qualifying examination topic. The student should explain the selected technical area; the intended future research work and the relationship between that work and the content of the student's three technical papers. This paper must not exceed four pages and must be in a 2-column format.

### 3. Oral Exam (occurs in November or April)

Prior to the start of the qualifying exam, the Graduate Affairs Office will communicate each student's exam date, time, committee, and location via email.

The qualifying examination tests a student's oral communication skills by having the student present a short, conference-style talk during the first 30 minutes. The examining faculty will typically ask the student's questions to help clarify the presentation immediately following your presentation.

Once the clarification question and answers are completed, the examining committee will ask the student questions about the student's research area, technical papers, review paper, and electrical and computer engineering fundamentals that relate to the selected research area.

## Outcome

At the conclusion of the qualifying exam, the faculty examiners will consult with each other and grade the qualifying exam. All qualifying exams will be discussed at the faculty qualifying exam review meeting, which occurs on the Friday of the second week of qualifying exams. Final outcomes will be determined by the faculty at this meeting, not by the three-person faculty examination committee. All students will be notified of their qualifying exam outcome and provided with feedback after the faculty has convened.

Students failing the qualifying exam the first time can take it a second time, no later than the fifth semester. One faculty member from the first exam committee will serve on the second committee. A student who fails the exam twice must leave the Ph.D. program at the end of the semester in which the second failure occurs.

Students who pass the qualifying exam will officially be recognized as candidates for the Ph.D. degree.

## Research

All full-time Ph.D. students are required to complete research every semester they are enrolled in the program. The completion of research is represented by the student's enrollment in 41-910 Research and Development while they are at CMKL. Expectations for research and productivity vary greatly throughout the department and should be discussed regularly with the student's faculty advisor.

## Teaching Internship Requirement

All AiCE Ph.D. students are required to complete two Teaching Internships ("TI") at CMKL – over the course of the Ph.D. program. These Teaching Internships are unpaid and students will receive a letter grade reflecting their performance. Students must receive a "B" or better in the TI course to receive credit for completing the teaching internship.

The TI program is coordinated through the Academic Services Office. All students must complete a teaching assistant application for the TI to be formally recognized by the department. The Academic Services Office will work with the student to enroll him or her in the correct course representing their work as a TI prior to the start of the semester.

Students may complete a TI for a course outside of AiCE or during the summer semester, though in this case the internship must be approved by the Associate Department Head for Academic Affairs and recorded by the Associate Director of Student and Academic Affairs prior to the student starting the TI. Students should contact the Graduate Affairs office to facilitate this process.

In their TI activities, students are expected to support the course instructor and establish mutual expectations while providing excellent academic support to students. Depending on a student's area of expertise and English proficiency, he or she may be assigned to a variety of tasks that can range from grading to leading recitations.

## Prospectus

All Ph.D. students are required to prepare a thesis prospectus (also known as a proposal) within four semesters following the successful completion of the Ph.D. qualifying examination. This time clock begins with the semester following the qualifying examination. If a student leaves for a semester to return to industry, this four-semester clock is stopped.

The Ph.D. prospectus clock stops when the student leaves and resumes at the start of the semester when the student returns. Students who have not met their Ph.D. prospectus requirement within the four-semester time limit must discuss a revised timeline with their advisor prior to the semester's Graduate Progress Review faculty meeting.

Regarding timelines, it is important to note the following:

- A calendar year has three semesters: spring, summer, and fall.
- While the prospectus clock may stop during an industry internship, the time clock for the overall Ph.D. program does not stop.

## Prospectus Description

The prospectus is both 1.) an informal written description of the problem to be investigated and the expected accomplishments of that investigation and 2.) an oral presentation to the Prospectus Committee for its review and recommendations. Both prospectus requirements must be completed at least one semester prior to the final defense.

## Prospectus Format

The Ph.D. prospectus write up should be no more than 25 double-spaced pages in length, although prospectuses that are on the order of five to ten pages are encouraged. The prospectus should include the following:

- A statement of the problem the dissertation research is intended to address;
- An explanation of the basic idea of the dissertation research activity ;
- An explanation as to why this topic is interesting;
- A statement as to what kind of results are expected, and;
- A convincing argument as to why these results are attainable in a reasonable amount of time

Furthermore, the prospectus should not be:

- A summary or abstract of the dissertation;
- The first chapter or part of the dissertation;
- A technical report;
- A survey of the field, or;
- An annotated bibliography.

Students should discuss the presentation format of their prospectus with their faculty advisor. Typically, a student is expected to provide a 45-60 minute presentation on his/her prospectus, and then participate in a question-and-answer-based discussion with his/her committee.

## Prospectus Committee

The Prospectus Committee consists of at least four members, including the student's faculty advisor at CMKL. At least two members of this committee must be AiCE faculty at CMKL and at least one member must be from outside the department. Faculty members from other departments who hold courtesy appointments in AiCE are considered to be "inside" the department. Faculty members who hold an adjunct appointment are considered to be "outside" members. All committee members must hold a doctoral degree.

All four committee members must actively participate in both the prospectus meeting and defense and at least three committee members must be physically present. It is desirable to have all committee members participate in person; however, a student is allowed to have one committee member of four participate by teleconferencing. Any deviation from this teleconferencing policy is exceptional and additional information must be provided on the Prospectus form. For students seeking dual-program, requests for teleconferencing will be approved due to the nature of the program.

It is expected that any committee members participating remotely will have full audio and visual access to the presentation via teleconferencing equipment. It is the responsibility of the student to provide teleconferencing access to committee members participating remotely.

## Prospectus Procedure

Once the date, time and place of the prospectus have been confirmed, the student should email the completed Prospectus Declaration form to the Graduate Affairs Office at least one week before the presentation. An electronic copy of the proposal paper should be submitted to the Ph.D. Academic Program Advisor on or after the presentation date.

Students will be notified by the Graduate Affairs Office of the approval of their committee. Once the committee has been approved, the student will meet with his or her committee to present the prospectus to them. To encourage open and frank dialogue, this presentation is normally attended only by the student, the committee, and any other interested AiCE faculty members. Other attendees must be approved by the committee chair.

The outcome of this meeting will be either that the prospectus is accepted or not accepted. If the prospectus is not accepted, the student will be asked to revise it and meet again with the committee for approval. If the prospectus is accepted, then students should continue to move forward with his or her thesis.

## Milestone Review

Upon completion of the prospectus proposal, students should make an appointment to meet with the Ph.D. Academic Program Advisor to review the fulfillment of Course and Breadth Area requirements, as well as Teaching Internship (TI) requirements. Provided that the student has satisfied the aforementioned program milestones, he/she may be informed of their eligibility for All But Dissertation (ABD) status.

## All But Dissertation Status (ABD)

Once a student has completed all program requirements, with the exception of the thesis and defense, the student is required to go on All But Dissertation (ABD) status. Two ABD options are available to students:

- ABD in Residence (ABD): students continue enrolling for 36 units each semester and will continue to receive stipend support.
- ABD in Absentia (ABS): students stop enrolling at CMKL and no longer receive tuition or stipend support. The student will be responsible for paying the technology fee each semester he/she is ABS.

When the student is ready to come back and defend, he/she will notify the Graduate Affairs Office, which will work with the student to re-enroll him or her in AiCE. The student will be responsible for registering for and paying for 5 units of 41-910 Research and Development as well as all fees. Please note that international students may face additional constraints before going ABS and should consult with the Graduate Affairs Office to obtain more information.

The full university Policy for Doctoral Status is a series of policies that set forth a definition of All But Dissertation (ABD), time limits on doctoral candidacy status, a definition of in residence and in absentia status for ABD candidates and the tuition charged for candidates in each status. The ABD status agreement form and ABD status change form can be requested by the graduate affair office.

## Ph.D. Dissertation

Once the Ph.D. dissertation is written, the student must submit the Defense Declaration form to the Graduate Affairs Office at least two weeks before the student's defense date. The Thesis Committee is usually the same as the Prospectus Committee. If there is any change in the committee, the student must submit a biographical description of any new committee member from outside CMKL for approval. Additionally, students are expected to adhere to AiCE guidelines on providing defense committees with a copy of the thesis prior to the defense. AiCE recommends that students provide their committee with a copy of the thesis at least one and a half months prior to the defense.

The oral defense is a public examination open to all members of the CMKL community. All the members of the student's Prospectus Committee must actively participate in the defense meeting. It is desirable to have all committee members participate in person; however, a student is allowed to have one committee member participate remotely by teleconferencing. Any deviation from this teleconferencing policy must be requested via the Defense Declaration Form.

It is expected that any committee members participating remotely will have full audio and visual access to the presentation via teleconferencing equipment. It is the responsibility of the student to provide teleconferencing access to committee members participating remotely. Students can email [cube@cmkl.ac.th](mailto:cube@cmkl.ac.th) for assistance in setting up teleconferencing equipment.

In addition to these AiCE requirements, CMKL has its own requirements pertaining to the thesis and defense process. This site includes instructions for the document standards and format. Students should pay

particular attention to the format of the thesis title page and the required content of the acknowledgements section.

Per CMKL requirements, defense of all these should be completed at least two weeks prior to the final grade deadline of a given semester. Doing so should grant students sufficient time to make necessary revisions and complete all post-defense paperwork prior to the end of the semester. Any deviation from this timeline is discouraged and may hinder a student's ability to graduate on time. Such deviation from the cited timeline may be subject to additional departmental approval and should be discussed with the Graduate Affairs Office well in advance of the planned defense.

Please note: Students who do not successfully complete the dissertation, defense, and all defense-related paperwork prior to the final grades deadline of a given semester may be required to register for the following semester, and thus the faculty advisor will be responsible for supporting the student for an additional semester with tuition and stipend.

After the defense, the Graduate Affairs Office will review additional paperwork that will need to be completed prior to a student's degree certification with the student.

## Departmental Progress Reviews

All students working towards a Ph.D. degree must regularly demonstrate progress towards meeting the AiCE Ph.D. requirements by completing a Graduate Progress Review Statement each fall and spring semester.

In this statement, the student must describe his or her

- Activities as a graduate student researcher;
- Research goals and achievements;
- Activities as a member of the AiCE community;
- Courses taken since enrollment as a graduate student in AiCE, and;
- Plans for the following semester

These statements are typically due during the first week of November (fall semester) and April (spring semester). Students are encouraged to discuss the completed statement with their advisor.

Students who have passed the qualifying exam will also be asked to create a single-slide summary of his or her progress towards the AiCE Ph.D. degree.

The Graduate Progress Review Statement and slide summary inform faculty discussions during each semester's Graduate Progress Review meeting. The outcome of this review is a grade that characterizes the student's progress towards the Ph.D.: satisfactory ("S") and unsatisfactory or not passing ("N"). Students who receive an "N" grade for the first time must meet with their advisor and define a course of action to

achieve a satisfactory grade in the next semester. Students who continue to make inadequate progress towards the AiCE Ph.D. may be subject to dismissal.

In general, Ph.D. students do not receive a letter grade for their research work each semester. There is one exception: students will receive a letter grade in their final semester as a graduate student in the AiCE Department or prior to receiving an M.S. degree on the way to the Ph.D.

All students who have passed the qualifying exam will receive a letter from their faculty advisor each fall and spring semester summarizing their progress and offering suggestions for improvement or continued success. This letter is typically distributed by the final grade deadline of the fall and spring semesters.

## **EXCHANGE AND TRANSFER PROGRAMS**

### **University Credit Transfer and Student Exchange Programs**

Current AiCE students taking courses at other accredited institutions (colleges and universities), as part of exchange programs or other departmentally approved programs, or while on leave from CMKL, must arrange for the submission of official final transcripts to the University Registrar's Office. Upon receipt, Enrollment Services will verify these official transcripts then send a copy of the transcript to the AiCE program committee, who will make the transfer credit decisions. The official transcript will reside in the student's university academic folder in Enrollment Services.

### **AI Engineering Institute University Network**

Students participating in the study through AI Engineering Institute's (AIEI) university network can request for the credit transfer directly using the AIEI system in lieu of submitting the transcript. Students can also request for a dual, or multiple-degree program evaluation to be considered for additional degree recipients from other host universities through AIEI. Note that the students must complete AiCE program requirements in order to receive a CMKL degree.

## **POST-MATRICULATION GUIDELINES**

### **Return of University Property**

AiCE students must return all borrowed university materials—such as software, manuals, library books/materials, or any other CMKL University property—prior to their departure from the program.

## Career Services Employment Outcomes

AiCE students are asked to complete and return a survey for Career Services updating CMKL on their employment outcomes after graduation. Information about the survey is communicated in the students' final semester.

## “Grandfather” Clause

When policies are changed, it is because the program believes the new rules offer an improvement; any such changes will be communicated to students. In case degree requirements are changed and certain courses are no longer offered, the program will try to find some compromise that allows those students to satisfy the original requirements.

## TUITION AND FEES

Unless scholarship and financial-aid packages are arranged and approved in advance, AiCE students are full-time and will be charged full-time AiCE tuition. Total charges for a period of attendance and estimated schedule of total charges for entire educational program can be found on the financial service website: <https://www.cmkl.ac.th/cube/financial-services/overview>

All charges incurred at the university are reflected in the student account. Charges include tuition and fees and may include health Insurance, technology fee, transportation fee, student activities fee and other miscellaneous charges incurred. Miscellaneous charges may include, but are not limited to, library fines, parking fines, or emergency loans.

The university also offers need-based assistance for financial aid as well as merit-based scholarships. Interested students are advised to designate their requirement in the application form.

## Tuition Billing and Payments

The tuition rate for students entering AiCE programs is set in the spring for the class entering in the following fall semester. Tuition for a student's second fall semester will likely increase in accordance with the tuition increase for the new academic year. The tuition will increase approximately 3% per year.

Students will be charged tuition per semester for each semester in which they are enrolled. The tuition and required fee billing are handled centrally by CMKL University finance department.

Student account invoices are produced on the last day of each month. Invoices detail all transactions processed in the month, as well as any charges due in the future. Students receive an email notification to their CMKL email account when an invoice is ready for viewing on the Cube system. Payments for amounts due from a monthly invoice must be received by the 15th of the next calendar month. Any amounts not paid by the stated due date are subject to a 1.5% interest charge each month until the balance is paid in full.

## CONCLUSION

CMKL University is ready to welcome promising and proactive students who want to prepare themselves for the challenges of tomorrow. We hope that this handbook has answered your questions about our philosophy, policies and curriculum. Should you have any questions or concerns, please do not hesitate to contact us.

+66-65-8785000

[info@cmkl.ac.th](mailto:info@cmkl.ac.th)

# APPENDIX A: LIST OF PROGRAM COURSES

Courses offered at CMKL University

The following courses are offered in Thailand at CMKL (additional courses may be added later).

## **Computer Vision (CMKL 41-685) – 12 Units**

This course offers an in-depth introduction to computer vision, covering key areas such as image processing, detection and recognition, geometry-based and physics-based vision, and video analysis. Students will gain foundational knowledge in computer vision and practical experience in addressing real-world vision challenges.

## **Software Engineering for AI-Enabled Systems (SE4AI) (CMKL 41-645) – 12 Units**

This course addresses the software engineering challenges of integrating AI and machine learning components into scalable and maintainable systems, such as mobile apps, web applications, and IoT devices. It is designed for software engineers seeking to understand the unique aspects of working with AI, and for data scientists aiming to transition prototype models into production environments. Rather than concentrating on model development, the course emphasizes the collaborative relationship between software engineers and data scientists. It covers essential topics like design, implementation, operation, and assurance, focusing on how these aspects interact with the data scientist's work. By facilitating effective communication and collaboration between the two roles, the course aims to streamline the deployment of AI-driven solutions from initial concept to operational systems.

## **Computer Graphics (CMKL 41-662) – 12 Units**

Introduction to the principles of computer graphics in three dimensions. Topics include 3D geometry and affine transform, ray tracing, perspective and 3D viewing, the graphics pipeline, curves and surfaces, and human visual perception. This course emphasizes fundamental techniques in graphics, with practical assignments.

## **AI Infrastructure & Accelerated Computing (CMKL 41-699) – 12 Units**

This course introduces accelerated computing with GPUs, emphasizing CUDA programming. Initially, we will cover CUDA syntax extensions and the CUDA runtime API. As we progress, the focus will shift to advanced topics including bandwidth optimization, memory access performance, and floating-point considerations. We will explore common parallel computing patterns like scans and reductions and examine practical applications of GPU acceleration such as matrix multiplication and convolution. Although the primary focus is on CUDA, the principles taught will also be applicable to other GPU frameworks.

## **Natural Language Processing (CMKL 41-611) – 12 Units**

This course explores diverse methods for representing human languages computationally, focusing on applications such as translation, summarization, information extraction, question answering, database

interfaces, and conversational agents. Known as Natural Language Processing (NLP) or Computational Linguistics, this field integrates principles from Machine Learning and Linguistics. The curriculum delves into computational models of words, sounds, sentences, meanings, and dialogues, emphasizing the role of probabilities and real-world text data in advanced techniques like translation and information extraction. Students will learn rapid prototyping, a valuable skill in software engineering and beyond, essential for developing innovative solutions in Computer Science.

### **Foundation of Computer Systems (CMKL 41-613) – 12 Units**

This course emphasizes a programmer's view of how computer systems run programs, collect information, and communicate. This encourages and helps students to become more effective and efficient programmers, particularly in handling issues of performance, portability, and robustness by teaching them the basic concepts underlying all computer systems (e.g., compilers, networks, operating systems, and computer architecture). We also provide a deeper understanding of the upper-level systems classes with the appropriate practice for the students. The topics will be covered in machine-level code and its generation by optimizing compilers, performance evaluation and optimization, computer arithmetic, processor architecture, memory organization, and management, networking technology and protocols, and supporting concurrent computation. This course prepares students to have the intellectual tools to solve the problem and develop other graduate-level computer systems courses to work in the real world.

### **Generative AI (CMKL 41-623) – (12 units)**

This course delves into advanced techniques in machine learning and artificial intelligence that drive progress in generative modelling and foundational models. Students will learn to build and utilize state-of-the-art algorithms enabling machines to create realistic and innovative content. Key topics include the core principles of learning, constructing generative models like transformers for vision and language, and training such models effectively (including pre-training and fine-tuning). Scaling up to handle extensive datasets using multi-GPU and distributed optimization methods will also be covered. Additionally, students will explore practical applications such as generating code and integrating generative models into workflows. The course emphasizes both theoretical foundations and practical implementation, addressing challenges like bias, hallucination, adversarial attacks, and data quality issues, with strategies to mitigate these risks.

Prerequisites include prior knowledge of introductory machine learning or deep learning concepts.

### **Introduction to Information Security (CMKL 41-631) – 12 Units**

Our growing reliance on information systems for daily activities, ranging from remote communications to financial exchanges, has made information security a central issue of our critical infrastructure. The course introduces the technical and policy foundations of information security. The main objective of the course is to enable students to reason about information systems from a security engineering perspective, taking into account technical, economic and policy factors. Topics covered in the course include elementary cryptography; access control; common software vulnerabilities; common network vulnerabilities; policy and export control laws, in the U.S., Japan, and elsewhere; privacy; management and assurance; economics of security; and special topics in information security. Prerequisites: The course assumes a basic working knowledge of computers, networks, C and UNIX programming, as well as an elementary mathematics background, but does not assume any prior exposure to topics in computer or communications security. Students lacking technical background (e.g., students without any prior exposure to programming) are

expected to catch up through self-study.

### **Artificial Intelligence, Business and Future Markets (CMKL 41-651) – 12 Units**

This course explores how artificial intelligence (AI) influences and transforms both new and existing markets. Students will collaborate in teams to identify, analyze, and synthesize emerging trends, performing in-depth studies on how these trends impact market creation and evolution. Teams will evaluate various AI technologies and their potential applications to develop solutions that address specific market opportunities. By understanding the role of AI in market dynamics, students will gain insights into how technological advancements can disrupt and shape industry landscapes.

### **Foundations of Software Engineering (CMKL 41-652) – 12 Units**

In this course, students will get to understand computer software engineering paradigms that shaped the software industry over the past few decades. The course will emphasize the fundamental disciplines of computer software engineering together with engineering hands-on practices that crosscut systems, projects, and perspectives of the user. Moreover, the student will get an understanding to iteratively define requirements, and architect, design, implement, integrate, test, and apply knowledge with a solution. The student will get a chance to work on self-organizing teams and handle the work collaboratively. Besides, students will also learn to solve a problem in the real world which is subject to multiple limitations while having the stakeholders involved throughout the lifecycle and balancing the underlying engineering tradeoffs. The topic knowledge is essential to apply in a semester-long group project.

Prerequisites: Basic software development experience with proficiency in at least one modern programming language and modern programming concepts. Before registering, students must complete a programming assignment to demonstrate familiarity with required software technologies.

### **Software Requirements and Interaction Design (CMKL 41-658) – 12 Units**

This course refers to computer software design challenges through integrating two disciplines: requirements engineering and interaction design. Students will get an understanding of how to combine user research, design-based ideation and validation, and requirements definition, within an agile software development process. Students are essential to apply the knowledge on a semester-long project. We aim for the students to have the ability to design and implement the first version of an innovative software system that could achieve a unique contribution to our society. The system should address a problem in the real world, fulfill real stakeholders' satisfaction, and provide a superior user experience and agility. Students will get a chance to collaborate closely with stakeholders during the project for needs elicitation, design concept validation, and usability testing.

### **Introduction to Machine Learning for Engineers (CMKL 41-661) – 12 Units**

This course provides an introduction to machine learning with a special focus on engineering applications. The course starts with a mathematical background required for machine learning and covers approaches for supervised learning (linear models, kernel methods, decision trees, neural networks) and unsupervised learning (clustering, dimensionality reduction), as well as theoretical foundations of machine learning (learning theory, optimization). Evaluation will consist of mathematical problem sets and programming projects targeting real-world engineering applications.

### **Hardware/Software Co-Design (CMKL 41-701) – 12 Units**

This course explores how software and hardware come together to implement computer systems. The course will be extremely hands-on, with weekly development cycles. Students will learn a new concept within the language/processor stack (e.g., parsing) and will be expected to implement it by the following week. At the end of the course, each student will have a working version of a compiler, interpreter, and processor, that can all work in tandem with each other.

### **Introduction to Computer Security (CMKL 41-730) – 12 Units**

This course emphasizes on a principled introduction of defending against hostile adversary techniques in modern computer systems and computer networks. The topics are covered operating system security; network security, including cryptography and cryptographic protocols, firewalls, and network denial-of-service attacks and defenses; user authentication technologies; security for network servers; web security; and security for mobile code technologies (e.g., Java and JavaScript). Moreover, some advanced topics will additionally be covered in this course, for example: intrusion detection; techniques to provide privacy in Internet applications; and protecting digital content (music, video, software) from unintended use.

### **Computer Architecture and Systems (CMKL 41-742) – 12 Units**

This course begins with a review of traditional, sequential computer architecture concepts. Moreover, it will discuss the end of the convention as a result of the end of the steady trend and Moore's Law, as well as several trends that these changes precipitated. The first trend is a wholesale shift to parallel computer architectures and systems, which include parallel hardware and software execution models, cache coherence, memory consistency, synchronization, transactional memory, and architecture support for programming, debugging, and failure avoidance. The second trend is the incorporation of specialized, heterogeneous components into parallel computer architectures. Topics will include reconfigurable architectures, FPGAs in the datacenter, ASIC accelerators, GPGPU architectures, and the changes to the system stack that these components necessitate. The third trend is the emergence of newly capable hardware and software.

### **Bayesian Statistics (CMKL 41-747) – 12 Units**

One way or another, subjectivity has always been present in scientific activity, starting from the assumptions to analyze a phenomenon. However, it is the informal approaches in which subjectivity is incorporated that yields to basic errors, misrepresentations or overrepresentations that occur in science. Bayesian Statistics take advantage of expert and subjective knowledge, or previously learned knowledge of a phenomenon, incorporating it in mathematical models through an objective rule. The combination of expert information, current data, and the sequential learning framework make Bayesian models powerful tools to model complex systems which can learn from previous knowledge.

The course starts with a mathematical background of fundamental concepts in Bayesian statistics such as prior, posterior, and predictive distributions. We will introduce such concepts and understand their interrelations through simple models. Then, we will explore theoretical aspects such as conjugate models or non-informative priors. Finally, we will explore more complex models, analyzing the different distributions of the model as powerful tools for prior elicitation, or model evaluation. Due to the mathematical challenges for analyzing in whole formality such models, they have been successfully implemented computationally. Doing the current success of Bayesian analysis is also a success of the computational engineer.

### **Packet Switching and Computer Networks (CMKL 41-756) – 12 Units**

This course is intended to provide an understanding of the fundamental concepts in current and future computer networks. Previously, the bandwidth of transmission facilities was a scarce and expensive resource in communication networks. As a result, the networking and switching techniques used have been chosen to maximize the efficient use of this resource. These methods differed depending on the type of data carried: circuit switching for voice and packet switching for data. Circuit and packet switching elements are expected to be used in integrated networks. This course focuses on packet switching and protocol design for computer networks. The course covers computer networks in general, OSI layers, queuing theory, data link protocol, flow control, as well as congestion.

### **Network Management and Control (CMKL 41-757) – 12 Units**

This course teaches the fundamentals of broadband networks. Broadband networks differ from existing communication networks in many ways, and these issues will be addressed in the course. Broadband networks are designed to support a wide range of services, from low bandwidth (telemetry) to high bandwidth applications (digitized video). The course will cover the fundamental concepts of broadband networks as well as research problems in next-generation networks. Many concepts (SDN, MPLS, high-speed switching architecture, high-speed network control, unified control plane, and optical networks) will be discussed. The course project will investigate cutting-edge network technologies, design networking systems, and evaluate them using simulation techniques.

### **Introductions to AI Engineering (CMKL 41-763) – 12 Units**

This course goes beyond the theoretical foundation of AI algorithms, focusing on the practical implementation of Machine Learning and AI at scale, which necessitates a robust technical infrastructure. Students will gain hands-on experience with modern ML frameworks and infrastructure tools using large real-world datasets, making crucial engineering design choices. The curriculum covers Data Collection and Storage, Data Streaming, Data Engineering, Modern ML Frameworks, Model Validation and Monitoring, Neural Network Design and Implementation, Embedded Machine Learning, and Cloud Deployment of ML Models. Coursework includes substantial programming projects, where students design, implement, and analyze AI-model infrastructure, using an IoT-relevant dataset. The course combines lectures and hands-on labs, with readings from recent research papers and conference proceedings. Students will work on developing applications aiming to build a strong foundation in AI Infrastructure for future research and careers in data science and AI.

### **Multimodal Machine Learning (MMML) (CMKL 41-777) – 12 Units**

Multimodal machine learning (MMML) is a dynamic field combining multiple communication modalities like language, sound, and visuals to address AI's foundational goals. Originating with audio-visual speech recognition and evolving into projects like image and video captioning, MMML tackles the challenges of heterogeneous data and modality interdependence. This course covers key mathematical concepts for MMML, such as multimodal alignment, fusion, heterogeneous representation learning, and multi-stream temporal modeling. It also reviews recent advancements in probabilistic models and computational algorithms, addressing six core challenges: representation, alignment, reasoning, generation, transference,

and quantification. Topics include multimodal transformers, neuro-symbolic models, tensor fusion, mutual information, and graph networks. Applications like multimodal affect recognition, language grounding, and language-vision navigation will also be discussed.

### **Planning and Decision-making (CMKL 41-782) – 12 Units**

Planning and decision-making are essential for autonomous robotic systems, enabling them to navigate, strategize, and interact effectively with their environment. This course explores the algorithmic techniques fundamental to these processes, including path and motion planning, coverage, and task planning. Through case studies involving multi-agents and autonomous systems, students will learn and implement these algorithms in various programming projects. A solid understanding of programming and data structures is required for this course.

### **Ethics in AI Engineering (CMKL 41-784) – 12 Units**

Recent advancements in artificial intelligence, particularly in deep learning and reinforcement learning, have demonstrated capabilities comparable to human performance. However, the shift towards real-world applications, particularly in cyber-physical systems, raises significant concerns about safety. This course aims to provide a comprehensive understanding of trustworthy AI autonomy. It will cover essential topics such as adversarial attacks, generative models, hierarchical Bayesian models, safe reinforcement learning, rare-event learning, and robust evaluation methods. Through readings and research exploration, students will delve into cutting-edge research in trustworthy AI, focusing on its implementation and extensions. The course fosters teamwork and aims to equip students with the skills to conduct advanced research applicable to domains like autonomous driving, healthcare technology, robotics, and smart manufacturing. Suitable for students with backgrounds in statistical machine learning, robotics, control, or human-machine interaction, others are encouraged to consult with the instructor for suitability.

### **Introduction to Deep Learning (CMKL 41-786) – 12 Units**

Neural networks, now widely known as "deep learning," have become pivotal in AI and machine learning, setting benchmarks across diverse domains from computer vision and autonomous vehicle planning to gaming strategies. Understanding neural networks and their deep learning frameworks is essential for researchers and developers in AI and NLP fields today. This course offers a comprehensive introduction, tracing the evolution of neural network theory and design. It swiftly progresses to explore various formalisms including feedforward, convolutional, recurrent, and probabilistic models, examining their development rationale and the challenges in training such networks along with proposed solutions. Additionally, the course covers extensions and specialized models tailored for applications such as computer vision, speech recognition, machine translation, and game playing. This broad overview equips learners with fundamental knowledge and practical insights into leveraging neural networks for cutting-edge AI tasks.

### **Image and Video Processing (CMKL 41-793) – 12 Units**

This course focuses on signal processing techniques for 2D (images) and 3D (videos) signals. It extends 1D signal processing techniques and specializes in image and video processing. In this class, you will learn core tools and techniques for image and video processing, as well as how to apply them to a variety of practical applications. This course teaches the principles of image and video analysis. We will create picture and video-specific signal models, as well as associated optimization strategies for solving restoration challenges

such as denoising and inpainting, as well as research specialized compression algorithms. The emphasis will be on transform-domain, PDE, and sparsity-based models, as well as the accompanying optimization approaches. Applications in mobile devices, medical image processing, and compressive sensing will enhance these formal techniques.

### **AI in Geographic Computing Applications (CMKL 41-796) – 12 Units**

Geographic computing encompasses a wide range of important applications that relate to positioning, navigation and earth observation: location-based services, emergency response and disaster remediation, logistics, natural resources and environmental management, agricultural monitoring, industrial and commercial facilities siting, urban planning, etc. For decades, computer-based remote sensing image analysis and geographic information systems technologies have been applied to these problems. Now AI has greatly increased the power and scope of geographic computing. This course will introduce basic geographic concepts as well as data models and common algorithms for “classical” geographic computing, then examine a number of scenarios where AI techniques can significantly improve outcomes or make it possible to address previously intractable problems. Students in this course will complete a number of lab exercises involving classical geographic computing, then develop a small project that uses AI for a geographic application.

### **Historical Perspectives on AI (CMKL 41-801) – 12 Units**

Stories in contemporary media suggest that Artificial Intelligence is a new and revolutionary set of technologies poised to change the world. In fact, AI has a history that reaches back to the nineteen seventies or earlier. Many of today’s AI accomplishments are built on foundations established in previous periods. On the other hand, the AI techniques that have demonstrated such recent success in some cases contrast sharply with approaches in earlier research. This course will provide an overview of AI history with the goal of giving students a better understanding of its deep roots and its cycles of hype. Students will read and analyze primary sources describing earlier AI advances as well as investigating the economic and political background of AI popularization. The primary evaluation for this course will be an individual term paper that explores some aspect of AI history with linkage to the situation today.

### **Time Series and Forecasting (CMKL 41-835) – 12 Units**

Time series data appears across diverse fields, from meteorology and finance to econometrics and marketing. Through recording and analyzing this data, time series analysis enables us to examine industrial processes and monitor key business metrics, such as sales or engagement.

This course is dedicated entirely to time series forecasting. You’ll begin with simple forecasting methods that serve as foundational benchmarks for more complex models. From there, we will dive deeper into forecasting techniques, gradually increasing the complexity of models from statistical approaches to deep learning methods.

### **Game Engine Fundamentals (CMKL 41-541) – 6 Units**

This hands-on introductory course to game development uses the professional Unreal Engine to teach game engine fundamentals. Students will learn the engine's interface, basic scripting, level design tools, and fundamental workflows, covering game engine interface and navigation, visual scripting, level design basics (terrain, lighting), importing assets, basic material creation, and creating simple game interactions.

### **Advanced Game Mechanics and Techniques (CMKL 41-542) – 6 Units**

Building upon Game Engine Fundamentals, this course explores more advanced game engine features and techniques within Unreal Engine, specifically focusing on advanced game mechanics and development techniques, including advanced scripting, material functions and shaders, advanced lighting techniques, performance optimization, AI and navigation, and creating complex game mechanics.

### **Crowd AI: Simulating Group Behavior in Games (CMKL 41-543) - 6 Units**

This exploration course focuses on implementing AI-controlled group behaviors within game environments, teaching crowd AI for simulating group behavior in games. Students will learn techniques for creating realistic crowds, flocking simulations, and NPC interactions within group contexts, covering flocking algorithms (Boids etc.), crowd simulation techniques, navigation meshes and pathfinding, group behavior AI, state machines for groups, and optimizing AI for performance.

### **Character AI: Designing Believable Game Agents (CMKL 41-544) – 6 Units**

This course centers on designing and implementing AI for individual game characters, focusing on character AI for believable game agents. Students will explore techniques for creating believable NPC behaviors and incorporating AI influences, potentially touching upon virtual character technology, examining finite state machines, behavior trees, decision-making algorithms, AI perception (sight, hearing), pathfinding for individual agents, and integrating AI with animation.

### **Virtual Reality (VR) (CMKL 41-545) – 6 Units**

This course introduces Virtual Reality (VR) technology and its role in immersive media. Students will gain a foundational understanding of VR principles, hardware/software, and interaction design. Specifically, students will learn about VR hardware (headsets, controllers), VR software development kits (SDKs), interaction design specific to fully immersive environments, spatial audio within VR, and user experience considerations in VR. Students will explore the unique aspects of creating and interacting within completely simulated digital spaces.

### **Augmented Reality (AR) and Mixed Reality (MR) (CMKL 41-546) – 6 Units**

This course introduces Augmented Reality (AR) and Mixed Reality (MR) technologies and their application in blending digital and physical worlds. Students will gain a foundational understanding of AR/MR principles, hardware/software, and interaction design. Students will learn the differences between AR and MR, AR/MR hardware (smart glasses, mobile devices), AR/MR software development kits (SDKs), interaction design for overlaying digital elements onto the real world, spatial understanding, and user experience considerations in AR/MR. This will include learning how to create digital content that interacts with and responds to the user's physical environment.

### **Advanced Signal Processing with Machine Learning (CMKL 41-797) – 12 Units**

This 12-unit course examines the integration of machine learning techniques with signal processing, focusing on extracting meaningful information from various types of signals. Signal processing traditionally involves two key tasks: characterization and categorization. Characterization is typically achieved through mathematical transforms, while classification relies on statistical methods.

Machine learning, which emphasizes creating algorithms that learn directly from data, is increasingly being applied to both signal characterization and categorization, often blending the two approaches. In this course,

students will explore how machine learning methods can be used to enhance signal processing, particularly in areas like audio (e.g., speech), images, and video. The course will cover data-driven techniques for signal characterization and address key challenges in speech and image processing.

### **Autonomous Vehicle Technologies (CMKL 41-744) – 12 Units**

This course provides an in-depth introduction to the software architecture that powers autonomous vehicles (AVs), exploring the complex layers that enable their functionality. Autonomous driving has the potential to revolutionize transportation by reducing accidents, fatalities, and injuries. It also opens up new opportunities for productivity during driving time and enhances mobility for individuals with disabilities or visual impairments.

Despite its promise, autonomous driving remains one of the most challenging tasks in engineering, due to the complexities involved in replicating human driving capabilities. The course covers essential topics such as sensing, perception, localization, driving behaviours, route and path planning, vehicular communications, control systems, fault management, and user interfaces.

### **Linear Systems in Engineering (CMKL 41-771) – 12 Units**

This course takes a modern approach to the analysis and application of linear systems in engineering. Students will learn to model and linearize multi-input, multi-output dynamic physical systems, focusing on state-variable and transfer function matrices. The course covers key topics such as linear and matrix algebra, numerical matrix techniques, and computational challenges involved in solving systems of linear equations.

In addition to foundational concepts, the course explores advanced mathematical techniques like singular value decomposition, eigenvalue-eigenvector analysis, and least-squares problems. Analytical and numerical methods for solving differential and difference equations are also covered. Students will investigate the structural properties of linear dynamic systems, including controllability, observability, and stability. The course also addresses system design, including canonical realizations, linear state-variable feedback controllers, and asymptotic observer design, with practical applications in system design and computation.

### **Deep Learning for Real-World Applications (CMKL 41-707) – 12 Units**

This course builds on foundational knowledge in linear algebra, probability, and machine learning. It covers key concepts such as regression, classification, feedforward neural networks, backpropagation, optimization, regularization techniques, and convolutional models with applications in computer vision.

The course also explores advanced topics including graphical models, autoencoders, restricted Boltzmann machines (RBMs), and deep generative models like Deep Belief Networks, GANs, and Variational Autoencoders. Students will also learn Monte Carlo methods, inference techniques, and deep reinforcement learning. Other topics include advanced regularization, sequence modeling with RNNs, sequence-to-sequence architectures, and attention models.

### **Research, Entrepreneurship and Innovation requirement**

### **Research, Entrepreneurship and Innovation (CMKL 41-900) – 12 Units**

This unique course for the AiCE program introduces students to explore the connections between research, entrepreneurship and innovation. Students will be introduced to industries and tech communities. Students

will participate in exploratory projects which introduce research methodologies while also learning how to apply engineering techniques to solve challenging real-world problems.

### **Research and Development (CMKL 41-910) – 36 Units**

Students in AiCE programs will have the opportunity to participate in real-world supervised research and development projects. Students are encouraged to participate in existing projects with the university partners to gain professional experience in R&D.

### **Internship for Graduate Students (CMKL 41-995) – Variable**

Experiential learning experiences are key educational possibilities for graduate students in the Artificial Intelligence and Computer Engineering department. An internship, which is usually conducted during the summer, is one such alternative. The AiCE Graduate Office will add the course to the student's calendar. Any AI and Computer Engineering graduate student who wishes to have their internship experience recorded on their official University transcript should follow this procedure. International students must also be authorized by program representatives. The completion of written assignments and requirements will determine the letter grade for the course.

### **Graduate Teaching Internship (CMKL 41-999) – 12 Units**

The Teaching Internship for AI and Computer Engineering MS Students represents the capstone or culminating experience at CMKL University in the preparation of prospective lecturers as knowledgeable, reflective practitioners and emerging leaders who conduct themselves ethically and professionally. The semester-long internship provides MS Students many opportunities within diverse classroom settings to refine the knowledge, skills, and dispositions they have developed as active participants in the Electrical and Computer Engineering Program. A teaching assignment with major responsibility in the classroom for MS Students in AiCE course.