Course Specification

Name of Institution Mahidol University

Campus/Faculty/Department Salaya campus

Mahidol University International College

Science Division

Section 1 General Information

1. **Course Code and Course Title**

   (Thai) EGCI 461 ปัญญาประดิษฐ์

   (English) EGCI 461 Artificial Intelligence

2. **Number of Credits** 4(4-0-8) (Lecture-Lab-Self Study)

3. **Curriculum and Type of Subject**

   3.1 Curriculum Bachelor of Engineering (Computer Engineering)

   3.2 Type of Subject Elective Course

4. **Responsible Faculty Member**

   Asst.Prof.Dr. Tanasanee Phienthrakul

5. **Trimester / Year of Study**

   5.1 Depending on Demand / 4st Year of Study

   5.2 Number of Students 20-31 Students

6. **Pre-requisite(s)** None

7. **Co-requisite(s)** None

8. **Venue of Study** Mahidol University, Salaya Campus / Online Course

Section 2 Goals and Objectives

1. Goal

1. Students should explain meaning of artificial intelligence system and AI algorithms.
2. Students should be able to select the suitable AI algorithm for developing AI system.
3. Students should be able to apply artificial intelligence for solving engineering problem.

2. Objective of development revision

To update knowledge content of course.

Section 3 Course Management

1. Course Description

(Thai) พื้นฐานของปัญญาประดิษฐ์ การแก้ปัญหาด้วยการค้นหา การแทนความรู้ ตรรกศาสตร์อันดับที่หนึ่ง การอนุมานในตรรกศาสตร์อันดับที่หนึ่ง การวางแผน ระบบเหตุผลโดยใช้ความน่าจะเป็น โปรล็อกขั้นแนะนำ การประมวลผลภาษาธรรมชาติ ขั้นตอนวิธีเชิงพันธุกรรม และเทคนิคการเรียนรู้ของเครื่อง

(English) Foundations of artificial intelligence, solving problems by searching, knowledge representation, first-order logic, inference in first-order logic, planning, probabilistic reasoning systems, introduction to Prolog, natural language processing, genetic algorithm, and machine learning techniques.

2. Credit Hours / Trimester

Lecture (Hours)	Additional Class (Hours)	Laboratory/Field Trip/Internship (Hours)	Self-study (Hours)
48 Hours (4 Hours × 12 Weeks)	-	-	96 Hours (8 Hours × 12 Weeks)

3. Numbers of hours that the lecturer provides individual counseling and guidance

1 Hour/Week

Section 4 Development of Students' Learning Outcome

1. Expected outcome on students' skill and knowledge

Student will be able to apply the knowledge from lecturer and additional research with the ideas received from analysis and synthesis to set up solutions / precautions to benefit individuals and their community.

2. Teaching Methods

- Lecture
- Self-study
- Practical, Laboratory, and Exercises

3. Evaluation methods

1. Morality and Ethics

1.1 Expected outcome on morality and ethics:

○ 1.1.1 To be aware of values and morality, ethics, scarification, and honesty.

● 1.1.2 To process self-discipline, punctuality, self-responsibility, and social responsibility.

1.1.3 To process leadership and supporter skills and be able to work in a team with integrity and cooperation.

1.1.4 To demonstrate good listening behavior and have respect for the rights and value of others.

1.1.5 Respect and follow rules and regulations of institution and society

● 1.1.6 To demonstrate the ability to analyze ethical impacts of computer usage to personals, organizations, and social.

○ 1.1.7 To demonstrate good academic ethical behaviors.

1.2 Teaching methods:

Learning Centered Education: Emphasis on knowledge development, important skills in career development and living, encourage students to use their full potentials

1.2.1 Lecture

1.2.2 Emphasis on morality and ethics

1.2.3 Group assignments

1.2.4 Group discussion

1.3 Evaluation methods:

1.3.1 Written examination

1.3.2 Presentation

1.3.3 Class attendance, class participation, and behavior in class

1.3.4 On-time submission of reports and assignments and their quality

2. Knowledge Development

2.1 Expected outcome on knowledge development:

- 1.1.1 To process the knowledge related to principles, theories, and practice in the course.
- 1.1.2 To be able to analyze, understand, and explain the computer requirements and be able to apply knowledge and skills using the appropriate tools to solve a problem.

1.1.3 To be able analyze, design and install and/or evaluate computer components to meet the requirements of the users.

- 2.1.4 To have the ability to remain current in research, and pursue new knowledge and perform ability to apply the knowledge.

2.1.5 To know, understand, and perform eagerness to develop computer knowledge and skills continuously.

2.1.6 To have a breadth knowledge in order to oversee the changes and understand the impact of new technology.

2.1.7 To have a hand-on experience in software development and/or software applications.

- 2.1.8 To demonstrate knowledge integration with other related sciences.

2.2 Teaching methods:

Learning Centered Education: Emphasis on knowledge development, important skills in career development and living, encourage students to use their full potentials

1.2.1 Lecture and in-class participation

1.2.2 Case studies with past experiences and current events

1.2.3 Self-study

2.3 Evaluation methods:

2.3.1 Written examination

2.3.2 Quality of reports and assignments

3. Intellectual Development

3.1 Expected outcome on intellectual development:

- 3.1.1 To have discretionary and systematic thinking skill.

- 3.1.2 To have the ability to search, consolidate, and evaluate ideas and evidence for problem solving.
- 3.1.3 To be able to apply knowledge and experience to analyze and creatively solve problems both in general and in academic contexts.
- 3.1.4 To be able to apply knowledge and experience to synthesize solution and precautions.

3.2 Teaching method:

3.2.1 Systematic problem solving examples and case studies with past experiences and current events

3.2.2 Self-Study

3.3 Evaluation methods:

3.3.1 Written examination

3.3.2 Presentation

3.3.3 Quality of reports and assignments

4. Interpersonal Relationship and Responsibility

4.1 Expected outcome on interpersonal relationship and responsibility:

4.1.1 To perform good communication skills with various groups of people.

- 4.1.2 To be a constructive team member (in various roles).

4.1.3 To process the knowledge of the course to identify social problems.

- 4.1.4 To demonstrate self and team responsibility.
- 4.1.5 To be initiative in problem solving.
- 4.1.6 To take responsibility in a life-long learning.

4.2 Teaching methods:

4.2.1 Group discussion in case studies

4.2.2 Group discussion

4.3 Evaluation methods:

4.3.1 Presentation

4.3.2 Class attendance, class participation, and behavior in class

4.3.3 On-time submission of reports and assignments and their quality

5. Mathematical Analytical Thinking, Communication Skills, and Information Technology Skills

5.1 Expected outcome on mathematical analytical thinking, communication skills and information technology skills:

5.1.1 To be able to select and apply existing tools for computer related work.

- 5.1.2 To possess the ability to apply information technology for data gathering, processing, interpreting, and presenting information/results.
- 5.1.3 To have the ability to communicate effectively and select appropriate methods for presentation.
- 5.1.4 To use information technology appropriately.

5.2 Teaching methods:

5.2.1 Computer programming with exercises.

5.2.2 Case studies with past experiences and current events

5.2.3 Group discussion

5.2.4 Self-Study

5.3 Evaluation methods:

5.3.1 Written examination

5.3.2 Presentation with appropriate technology

5.3.3 Class attendance, class participation, and behavior in class

5.3.4 On-time submission of reports and assignments and their quality

Section 5 Teaching and Evaluation Plans

1. Teaching plan

Week	Topics	Hours			Teaching Methods/ Multimedia	Instructor
		Lecture	Lab	Self-Study		
1	Introduction to Artificial Intelligence	4	-	8	Lecture and Discussion	Asst.Prof.Dr. Tanasanee Phienthrakul
2	State Space and Searching Algorithms	4	-	8	Lecture, Case Studies, and Exercise	
3	Heuristic Search	4	-	8	Lecture, Case Studies, and Exercise	
4	Knowledge Representation and First-Order Logic	4	-	8	Lecture, Case Studies, and Exercise	
5	Inference in First-Order Logic and Introduction to Prolog	4	-	8	Lecture, Case Studies, and Exercise	
6	Planning and Probabilistic Reasoning Systems	4	-	8	Lecture, Case Studies, and Exercise	
	Midterm					
7	Natural Language Processing	4	-	8	Lecture, Discussion, and Exercise	
8	Machine Learning Techniques, Rote Learning, and Learning by Analyzing Differences	4	-	8	Lecture, Case Studies, and Exercise	
9	Version Space and Decision Tree	4	-	8	Lecture, Case Studies, and Exercise	
10	Explanation-based Learning and Bayes' Learning	4	-	8	Lecture, Case Studies, and Exercise	
11	Artificial Neural Networks and Other Learning Algorithms	4	-	8	Lecture, Case Studies, and Exercise	
12	Genetic Algorithm				Lecture, Case Studies, and Exercise	
	Final Examination					
	Total	48	-	96		

2. Evaluation Plan

Expected outcomes	Methods / activities	Week	Percentage
1.1.1, 1.1.2, 1.1.6, 1.1.7, 4.1.2, 4.1.4, 4.1.5, 5.1.3	Attendance and Participation	1-12	10%
2.1.1, 2.1.4, 3.1.1, 3.1.4, 5.1.2	Midterm Examination Final Examination	After Week 6th After Week 12th	35% 35%
2.1.2, 2.1.8, 3.1.2, 3.1.3, 4.1.7, 5.1.3, 5.1.4	Exercises	1-12	20%

Section 6 Teaching Materials and Resources

1. Texts and Main Documents

G.F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th edition. Addison-Wesley, 2009.

E. Rich & K. Knight, *Artificial Intelligence*. McGraw-Hill, 1991.

S. Russell & P. Norvig, *Artificial Intelligence: A Modern Approach*. Prentice Hall, 2006.

T. Mitchell, *Machine Learning*. McGraw-Hill, 1997.

2. Documents and Important Information

None

3. Documents and Recommended Information

None

Section 7 Evaluation and Improvement of Course Management

1. Strategies for Effective Course Evaluation by Students

1.1 Evaluation of peers by students

1.2 Student evaluation

1.2.1 Course content

1.2.2 Course management

1.2.3 Suggestions

1.2.4 Overall opinion

2. Evaluation Strategies in Teaching Methods

Student evaluation

3. Improvement of Teaching Methods

Workshop on course improvement with the participation of all instructors in the course

4. Evaluation of Students' Learning Outcome

Analysis of students' learning outcomes using scores from class attendance, group activity and presentation of project and poster presentation

5. Review and Improvement for Better Outcome

Review the course before trimester starts and before each teaching period

Symbol ● represents major responsibility / Symbol ○ represents minor responsibility / Space represents no responsibility

These symbols will appear in Curriculum Mapping