TQF 3 Course Specifications

Section 1 General Information

1. Course code and course title

   Thai EGCI 463 การรู้จำแบบ

   English EGCI 463 Pattern Recognition

2. Number of credits 4 (4-0-8)

3. Program and type of subject

   3.1 Program Bachelor of Engineering (Computer Engineering)

   3.2 Type of Subject Major Course (Required Major)

4. Course Coordinator and Course Lecturer

   4.1 Course Coordinator Asst. Dr. Mingmanas Sivaraksa

   4.2 Course Lecturer Asst. Dr. Mingmanas Sivaraksa

5. Trimester/ Year of Study

   5.1 Trimester First trimester / for 4th year Computer Engineering

   5.2 Course Capacity Approximately 20 students

6. Pre-requisite ICMA 213 Calculus II

7. Co-requisites None

8. Venue of Study Mahidol University, Salaya campus

Section 2 Goals and Objectives

1. Course Goals

After successful completion of this course, students will be able to:

- Describe and analyze the principles of Pattern Recognition
- Choose Appropriate Pattern Recognition techniques
- Apply the knowledge and able to solve various problems using Patter Recognition

2. Objectives of Course Development/Revision

2.1 Course Objectives

Students should able to understand and use pattern recognition: features extraction, classification or linear techniques for recognition to solve problems in other field. They should have enough knowledge to pursue new knowledge, develop, choose tools and evaluate the validity of the development using pattern recognition knowledge.

2.2 Course-level Learning Outcomes: CLOs

By the end of the course, students will be able to (CLOs)

CLO1: Use Pattern Recognition techniques to solve problems in other fields

CLO2: Pursue new knowledge from pattern recognition concepts

CLO3: Evaluate the suitability of pattern recognition techniques for each problems

CLO4: Choose pattern recognition tools and techniques for development

Section 3 Course Management

1. Course Description

(Thai) การประมวลก่อนเพื่อการรู้จำข้อมูล การแยกลักษณะเด่น การจำแนกหรือเทคนิคเชิงเส้นเพื่อการรู้จำ เทคนิคอิงพารามิเตอร์และไร้พารามิเตอร์ ตัวจำแนกแบบเบส์ วิธี โครงข่ายงานระบบประสาท วิธีลูกผสม เทคนิคการเรียนรู้ การประยุกต์การรู้จำ

(English) Preprocessing for data recognition: features extraction, classification or linear techniques for recognition. Parametric and nonparametric techniques, Bayesian classifiers, methods, neural networks, hybrid method, learning techniques. Applications in pattern recognition.

2. Credit hours / trimester

Lecture (hours)	Additional Class (hours)	Laboratory/field trip/internship (hours)	Self-study (hours)
48 hours (4 hours x 12 weeks)	-	-	96 hours (8 hours x 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. Short summary on the knowledge or skills that the course intends to develop in students (CLOs)

By the end of the course, students will be able to

CLO1: Use Pattern Recognition techniques to solve problems in other fields

CLO2: Pursue new knowledge from pattern recognition concepts

CLO3: Evaluate the suitability of pattern recognition techniques for each problems

CLO4: Choose pattern recognition tools and techniques for development

2. Teaching methods for developing the knowledge or skills specified in item 1 and evaluation methods of the course learning outcomes

Course Code	Teaching methods	Evaluation Methods
CLO1	Interactive Lecture, Individual Assignment	Written Examination, Individual Evaluation
CLO2	Interactive Lecture, Individual Programming Assignment, Project Assignment	Written Examination, Project Evaluation ,Individual Evaluation
CLO3	Interactive Lecture, Case Study, Project Assignment	Written Examination, Project Evaluation, Individual Evaluation
CLO4	Interactive Lecture, Case Study, Project Assignment	Written Examination, Project Evaluation, Individual Evaluation

Section 5 Teaching and Evaluation Plans

1. Teaching plan

Week	Topic	Number of Hours		Teaching Activities/ Media	Evaluation
		Lecture Hours	Lab/Field Trip/Internship Hours		
1	Introduction and Data preparation for Patter Recognition	4	0	Interactive lecture and exercises	Interactive Lecture
2	Bayesian Theorem	4	0	Interactive lecture and exercises	Interactive Lecture, Individual Programming Assessment
3	Preprocessing & Data Preparation	4	0		
4	Linear Recognition and Perceptron	4	0		
5	Evaluation	4	0		
6	Applications	2	0	Interactive lecture and Group Assignment	Midterm Assessment
6	Midterm Review & Assessment	2	-		Written Exam
7	Data Visualization and Simple Dim. Reduction	2	-		Written Exam
7-8	Neural Networks	6	0	Lecture and homework	Interactive Lecture, Individual
9	Neural Network setting and Advanced techniques	4	0		
10	Advanced Neural Network	4	0	Lecture and homework	
11	Deep Learning	4	0	Lecture and homework	Final Assessment
12	Unsupervised Learning	2	0	Lecture and homework	Final Assessment
12	Advanced Topics and Applications	2	0	Discussion and presentation	Interactive Lecture, Project Assessment
	Total	24	0		

2. Plan for Assessing Course Learning Outcomes

2.1 Assessing and Evaluating Learning Achievement

a. Formative Assessment

The assessment tools such as exercises and assignments are used to evaluate student's understanding by their ability to choose, create and evaluate pattern recognition tools and techniques. Group assignment aims to build skills in pursuing new knowledges.

b. Summative Assessment

(1) Tools and Percentage Weight in Assessment and Evaluation

Learning Outcomes	Assessment Methods	Assessment Ratio (Percentage)	
CLO1: Use Pattern Recognition techniques to solve problems in other fields	Individual Assignment	10	25
	Midterm Examination	5	
	Final Examination	10	
CLO2: Pursue new knowledge from pattern recognition concepts	Individual Assignment	10	20
	Midterm Examination	5	
	Group Project	5	
CLO3: Evaluate the suitability of pattern recognition techniques for each problems	Individual Assignment	5	25
	Midterm Examination	5	
	Final Examination	5	
	Group Project	10	
CLO4: Choose pattern recognition tools and techniques for development	Individual Assignment	5	30
	Midterm Examination	5	
	Final Examination	10	
	Group Project	10	
Total			100

(2) Grading System

Grade	Achievement	Final Score (% range)	GPA
A	Excellent	90-100	4.0
B+	Very Good	85-89	3.5
B	Good	80-84	3.0

C+	Fairly Good	75-79	2.5
C	Fair	70-74	2.0
D+	Poor	65-69	1.5
D	Very Poor	60-64	1.0
F	Fail	Less than 60	0.0

(3) Re-examination (If course lecturer allows to have re-examination)

N/A - (Not applicable with MUIC)

3. Student Appeals

The student wishing to appeal according to grading result must submit a written and signed appeal form personally to the academic affair unit. It is prohibited to assign another person to appeal on one's behalf. The written appeal form is then sent to the program director and chair of department. The final decision is transferred for approval by the faculty committee. The result of appeal then is informed to the student.

Section 6 Teaching Materials and Resources

1. Textbooks and/or other documents/materials

1) Bishop, C.M., Pattern Recognition and Machine Learning; Springer; 2007

2) Chris Albon, Machine Learning with Python Cookbook,2018

3) VanderPlass, Jake, Python Data Science Handbook; O'Reilly 2016

2. Recommended textbooks and/or other documents/materials

1) Nabney,I.T. NETLAB:Algorithms for Pattern Recognition 3rd ed: Sprinter; 2004.

2) Duda, R.O, Hart, P.E., and Stork, D.G. Pattern Classification, Wiley-interscinece,2001

3) Muller, A.C. and Guido, S, Introduction to machine learning with python, O'Reilly, 2016

3. Other Resources (If any)

Section 7 Evaluation and Improvement of Course Management

1. Strategies for evaluating course effectiveness 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 opinions

2. Strategies for evaluating teaching methods
    2.1 Student evaluation
    2.2 Presentation
3. Improvement of teaching methods
    Use evaluation from 1 and 2 for course improvement.

4. Verification process for evaluating students' standard achievement outcomes in the course
    Analysis of students' learning outcomes using scores from each CLOs for evaluation.

5. Review and plan for improving the effectiveness of the course
    Review the course before trimester starts, before each teaching period and review course contents every 3 years.

Appendix

Alignment between Courses and Program

Table 1 The relationship between course and Program Learning Outcomes (PLOs)

	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
EGCI 465 Pattern Recognition		R	R			R

Note: Indicate the level of CLOs by letter I, R, P or M. Using the information as shown in the Curriculum Mapping of TQF2

Table 2 The relationship between CLOs and PLOs

EGCI 463	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1: Use Pattern Recognition techniques to solve problems in other fields		2.1				
CLO2: Pursue new knowledge from pattern recognition concepts .		2.2				
CLO3: Evaluate the suitability of pattern recognition techniques for each problems			3.4			
CLO4: Choose pattern recognition tools and techniques for development						6.1

Table 3 The description of PLOs and Sub Los of the course

PLOs	SubPLOs
PLO2. Integrate computer engineering knowledge with other related sciences and	2.1 Use computer engineering knowledge to solve problems in other fields

pursue new knowledge in computer engineering.	
	2.2 Peruse new knowledge in computer engineering using other related science
PLO 3 Evaluate the computer requirements and identify the appropriate engineering knowledge for developing computer applications	3.4 Evaluate the suitability of the tools used for different system development
PLO6. Create a related computer engineering development based on information technologies in mathematics or applied statistics.	6.1 Choose information technology tools properly for computer engineering development.