TQF 3 Course Specifications

Section 1 General Information

1. Course code and course title

      Thai   EGCI 425   การทำเหมืองข้อมูล

      English EGCI 425   Data Mining

2. Number of credits   4(4-0-8) (Lecture/Lab/Self-study)

3. Program and type of subject

      3.1 Program   Bachelor of Engineering (Computer Engineering)

      3.2 Type of Subject   Computer Engineering Elective Course

4. Course Coordinator and Course Lecturer

      4.1 Course Coordinator   Assoc. Prof. Dr. Rangsipan Marukatat

      4.2 Course Lecturer   Assoc. Prof. Dr. Rangsipan Marukatat

5. Trimester/ Year of Study

      5.1 Trimester   Trimester 1 of 4th year

      5.2 Course Capacity   Approximately 25 students

6. Pre-requisite   None

7. Co-requisites   None

8. Venue of Study   Mahidol University, Salaya campus and Online

Undergraduate Program

Mahidol University International College

Division Science

Section 2 Goals and Objectives

1. Course Goals

This course aims for students to sharpen their skills in advanced data analysis, which are essential for future career and research in computer engineering.

2. Objectives of Course Development/Revision

    2.1 Course Objectives

    1.   Students can use appropriate data mining techniques to analyze data

    2.   Students can conduct appropriate experiments and self-study research

    2.2 Course-level Learning Outcomes: CLOs

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

    1.   CLO1   Critically explain the principles of various data mining techniques

    2.   CLO2   Calculate and analyze data by using appropriate data mining techniques

    3.   CLO3   Discuss and evaluate results from data mining

Section 3 Course Management

1. Course Description

การค้นพบความรู้ในฐานข้อมูล การเตรียมข้อมูล การสร้างภาพนามธรรมข้อมูล และการแปลงข้อมูล การจัดกลุ่ม การวิเคราะห์การเชื่อมโยง การจำแนกและการจำแนกแบบรวม ตัววัดและการประเมิน คลังข้อมูล การประมวลผลเชิงวิเคราะห์แบบออนไลน์ (โอแล็ป) ผลกระทบของการทำเหมืองข้อมูล เทคโนโลยีปัจจุบันและแนวโน้ม การประยุกต์การทำเหมืองข้อมูล

Knowledge discovery in databases; data preparation, data visualization, and data transformation; clustering, association analysis, classification and ensemble classification; metrics and evaluation; data warehouse, online analytical processing (OLAP); effects of data mining, current technology and trend, applications of data mining

Course Title   Data Mining

Course Code   EGCI 425

2. Credit hours per trimester

Lecture (Hours)	Laboratory/field trip/internship (Hours)	Self-study (Hours)
48 hours (4 hours x 12 weeks)	0	96 hours (8 hours x 12 weeks)

3. Number 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

1. CLO1   Critically explain the principles of various data mining techniques
2. CLO2   Calculate and analyze data by using appropriate data mining techniques
3. CLO3   Discuss and evaluate results from data mining

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 - Examples and case studies - Self-study	- Written examinations
CLO2	- Interactive lecture - Examples and case studies - Group projects - Self-study	- Written examinations - Written exercises - Project reports
CLO3	- Examples and case studies - Group projects - Self-study	- Project reports

Course Title   Data Mining

Course Code   EGCI 425

Division Science

Section 5 Teaching and Evaluation Plans

1. Teaching plan

Class	Topic/Details	Number of hours		Online Sessions	On-Campus	Instructors	Note
		In-Class sessions	Lab sessions				
1	Tue. 14 Sep. (14.00 – 15.50) Chapter 1: data mining process	2		X		Assoc. Prof. Dr. Rangsipan Marukatat	
2	Thu. 16 Sep. (14.00 – 15.50) Chapter 2: data exploration	2		X			
3	Tue. 21 Sep. (14.00 – 15.50) Chapter 3: data preprocessing	2		X			
4	Thu. 23 Sep. (14.00 – 15.50) Chapter 3: data preprocessing	2		X			
5	Tue. 28 Sep. (14.00 – 15.50) Chapter 4: decision trees & rules	2		X			
6	Thu. 30 Sep. (14.00 – 15.50) Chapter 4: decision trees & rules	2		X			
7	Tue. 5 Oct. (14.00 – 15.50) Chapter 5: KNN & Naïve Bayes	2		X			
8	Thu. 7 Oct. (14.00 – 15.50) Chapter 6: neural network & SVM	2		X			
9	Tue. 12 Oct. (14.00 – 15.50) Chapter 6: neural network & SVM	2		X			
10	Thu. 14 Oct. (14.00 – 15.50) Chapter 7: evaluation	2		X			
11	Tue. 19 Oct. (14.00 – 15.50) Chapter 7: evaluation	2		X			
12	Thu. 21 Oct. (14.00 – 15.50) Review	2		X			
13	**Tue. 26 Oct. (14.00 – 15.50) Midterm exam**	**2**			**X (if possible)**		
14	Thu. 28 Oct. (14.00 – 15.50) Chapter 8: regression	2		X			
15	Tue. 2 Nov. (14.00 – 15.50) Chapter 8: regression	2		X			
16	Thu. 4 Nov. (14.00 – 15.50) Chapter 9: ensemble methods	2		X			
17	Tue. 9 Nov. (14.00 – 15.50) Chapter 10: K-means & EM	2		X			
18	Thu. 11 Nov. (14.00 – 15.50) Chapter 10: K-means & EM	2		X			
19	Tue. 16 Nov. (14.00 – 15.50) Chapter 11: HAC & DBSCAN	2		X			
20	Thu. 18 Nov. (14.00 – 15.50) Chapter 11: HAC & DBSCAN	2		X			
21	Tue. 23 Nov. (14.00 – 15.50) Chapter 12: Outlier detection	2		X			
22	Thu. 25 Nov. (14.00 – 15.50) Chapter 13: Text mining	2		X			

Class	Topic/Details	Number of hours		Online Sessions	On-Campus	Instructors	Note
		In-Class sessions	Lab sessions				
23	Tue. 30 Nov. (14.00 – 15.50) Chapter 13: text mining	2		X			
24	Thu. 2 Dec. (14.00 – 15.50) Review	2		X			
	Thu. 9 Dec. (14.00 – 15.50) Final exam				**X (if possible)**		
	Total	48					

2. Plan for Assessing Course Learning Outcomes

2.1 Assessing and Evaluating Learning Achievement

a. Formative Assessment

- Short discussion during lectures
- Discussion and feedbacks on exercises and group projects

b. Summative Assessment

(1) Tools and Percentage Weight in Assessment and Evaluation

Learning Outcomes	Assessment Methods	Assessment Ratio (Percentage)	
CLO1 Critically explain the principles of various data mining techniques	Midterm examination	20	40
	Final examination	20	
CLO2 Calculate and analyze data by using appropriate data mining techniques	Midterm examination	10	45
	Final examination	10	
	Written exercises	15	
	Project reports	10	
CLO3 Discuss and evaluate results from data mining	Project reports	15	15
	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 grading result or any academic decision 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 directed to the Program Director and the Department Chair. The final decision is approved by the Faculty Committee and the result of appeal is then informed to the student.

Section 6 Teaching Materials and Resources

1. Textbooks and/or other documents/materials

    1) Tan PN, Steinbach M, Kumar V. Introduction to data mining (2nd edition). Pearson, 2018.

    2) Witten IH, Frank E. Data mining: practical machine learning tools and techniques (4th edition). San Francisco (CA): Morgan Kaufmann, 2016.

    3) Han J, Kamber M. Data mining: concepts and techniques (3rd edition). Morgan Kaufmann, 2011.

2. Recommended textbooks and/or other documents/materials

    None

3. Other Resources (If any)

    Data analysis tools (RapidMiner). https://rapidminer.com/

Section 7 Evaluation and Improvement of Course Management

1. Strategies for evaluating course effectiveness by students

    -   Observation on students' behaviors and class participation
    -   Course evaluation by students at the end of the course

2. Strategies for evaluating teaching methods

    -   Formative and summative assessment

3. Improvement of teaching methods

    -   Use evaluation results in 1 and assessment results in 2 to identify areas of improvement

4. Verification process for evaluating students' standard achievement outcomes in the course

    -   Evaluate class achievement of each CLOs from the average score of all students

5. Review and plan for improving the effectiveness of the course

    -   Review content, teaching methods, and evaluation methods before the course starts
    -   Adjust teaching tactics during the course
    -   Review and update course content every 3 years

Appendix

Alignment between Courses and Program

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

Course	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
EGCI 425		R	R			R

Table 2 The relationship between CLOs and PLOs

Course	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1 Critically explain the principles of various data mining techniques		2.2				
CLO2 Calculate and analyze data by using appropriate data mining techniques		2.1 2.2	3.1			6.1
CLO3 Discuss and evaluate results from data mining		2.1	3.1			

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

PLOs	SubPLOs
PLO2 Integrate computer engineering knowledge with other related sciences and pursue new knowledge in computer engineering.	2.1 Apply knowledge about data mining to analyze data, evaluate results, and make conclusion
	2.2 Explain the principles of various data mining techniques and their potential applications; search relevant background about application domains
PLO3 Evaluate the computer requirements and identify the appropriate engineering knowledge for developing computer applications.	3.1 Identify potential problems and resolutions/cautions needed in data mining process
PLO6 Create a related computer engineering development based on information technologies in mathematics or applied statistics	6.1 Choose appropriate tools and techniques to analyze data