Program Bachelor of Engineering (Computer Engineering)
Course title Operating Systems
Course code EGCI 351

Academic degree level ☒ Bachelor ☐ Graduate Diploma ☐ Master
☐ Higher Graduate Diploma ☐ Doctor
Faculty / College / Institute MUIC
Department Science Division

TQF 3 Course Specification

Section 1 General Information

1. **Course Code and Title**

   In Thai   EGCI 351 ระบบปฏิบัติการ

   In English   EGCI 351 Operating Systems

2. **Number of Credits**   4

   (Theory ...48. hrs. Practice ...0... hrs. Self-Study ...48... hrs./week)

3. **Curriculum and Course Type**

   3.1 Curriculum   วิศวกรรมศาสตร์บัณฑิต (วิศวกรรมคอมพิวเตอร์)

   Bachelor of Engineering (Computer Engineering)

   3.2 Course Type   Compulsory Course

4. **Course Coordinator and Lecturer**

   4.1   Course Responsible Lecturers Asst. Prof. Thanadol Pritranan/ Department of Computer Engineering/ 089-764-7480/ Thanadol.pri@mahidol.ac.th

5. **Trimester/Class Level**

   5.1 Trimester

   5.2 Number of Students Allowed   Approximately 30 Students

6. **Pre-requisite**   EGCI 252 System Programming

7. **Co-requisites**   None

8. **Study Site Location** MUIC

หลักสูตร..
ชื่อรายวิชา.......................................
รหัสวิชา.................................

ระดับปริญญา ☐ ตรี ☐ ป.บัณฑิต ☐ โท ☐ ป.บัณฑิตขั้นสูง ☐ เอก
คณะ/วิทยาลัย.................................
ภาควิชา..

Section 2 Aims and Objectives

1. Course Goals

To provide student knowledge about operating systems, i.e. components, working and design. Covered topics are process management and deadlock, main memory management, secondary storage management, and protection and security. Design concepts and performance analysis of implementation alternatives will be discussed.

2. Objectives of Course Development/Revision

2.1 Course Objectives

1. Explain functions and working of operating systems.
2. Apply operating systems to solve engineering problems.

2.2 Course-level Learning Outcomes: CLOs

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

1. CLO1 Describe concepts and working of major components of operating systems.
2. CLO2 Analyze trade-offs of different techniques used to implement operating system components.
3. CLO3 Apply operating systems to solve engineering problems.

Section 3 Course Description and Implementation

1. Course Description

(Thai) แนวคิดร่วมสมัยของระบบปฏิบัติการสำหรับคอมพิวเตอร์ สายโยงใย การจัดกำหนดการของหน่วยประมวลผลกลาง นิยามและรายละเอียดของกระบวนการที่ทำงานร่วมประสานกัน การจัดการทรัพยากรระบบ การจัดการภาวะติดตาย การจัดการและการออกแบบหน่วยความจำหลัก การจัดการหน่วยความจำเสมือน การจัดการหน่วยความจำช่วย ระบบแฟ้มข้อมูล ระบบป้องกันและความมั่นคง แนะนำระบบปฏิบัติการแบบกระจาย

(English) Contemporary concepts of computer operating systems; Thread; CPU scheduling; definition and details of harmonizing cooperating process; system resources management; deadlock handling; main memory management and design; virtual memory management; auxiliary memory management; file systems; protection and security; introduction to distributed operating systems

2. Number of hours per trimester

Theory (hours)	Practice (hours)	Self-study (hours)
48	-	96

3. Number of Hours per Week for Individual Advice   1 hour/week

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Section 4 Development of the expected learning outcomes

1. A brief summary of the knowledge or skills expected to develop in students; the course-level expected learning outcomes (CLOs)

    On completion of the course, students will be able to:
    1. CLO1 Describe concepts and working of major components of operating systems.
    2. CLO2 Analyze trade-offs of different techniques used to implement operating system components.
    3. CLO3 Apply operating systems to solve engineering problems.

2. **How to organize learning experiences to develop the knowledge or skills stated in number 1 and how to measure the learning outcomes**

CLOs	Teaching and learning experience management				Learning outcomes measurements				
	Lecture	Assignment	Discussion	Group As-signment	Homework	Quiz	Written Examination	Individual Evaluation	Report
CLO1	√	√				√	√		
CLO2	√		√	√	√	√	√	√	√
CLO3	√						√		

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Section 5 Lesson Plan and Evaluation

1. Lesson Plan

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
1-2	Introduction to Computer Operating Systems Concepts	2-2		Lecture	Thanadol
3-4	Computer System Structures (Quiz 1)	2-2		Lecture	
5-6	Processes and Threads Concepts	2-2		Lecture	
7--8	CPU Scheduling	2-2		Lecture, Assignment, Discussion	
9-12	Process Synchronization	2-2-2-2		Lecture, Assignment, Discussion	
13	Deadlock	2		Lecture, Assignment	
14	Midterm Exam	2			
15-17	Memory Management	2-2-2		Lecture, Discussion, Report	
18-20	Virtual Memory (Quiz 2)	2-2-2		Lecture, Assignment, Discussion	
21-23	File Management & Secondary Storage Management	2-2-2		Lecture, Discussion,	
24	Protection and Security & Introduction to Distributed Operating Systems	2		Lecture	
	Final Exam				
	Total hours of the entire trimester	**48**			

2. Plan for Assessment of Expected Course-Level Learning Outcomes (CLOs)

2.1 Measurement and Evaluation of learning achievement

A. Formative Assessment

The assessment tools such as homework, quizzes, discussion and exam are used to evaluate student's understanding by their ability to describe functions and working of operating systems. Ability to analyze trade-offs of different techniques used to implement operating system components. Students should be able to explain how to apply operating systems to solve engineering problems. The assessments are made through their homework, report, quizzes, discussion and exams.

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B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes	Evaluation Method*					Weight (Percentage)
	HW	Quiz	Discussion	Report	Examination	
CLO1 Describe concepts and working of major components of operating systems..		5			25	**30**
CLO2 Analyze trade-offs of different techniques used to implement operating system components.	5	5	5	10	35	**60**
CLO3 Apply operating systems to solve engineering problems.					10	**10**
Total	5	10	5	10	70	100

(2) Measurement and evaluation

Grade	Achievement	Final Score (% range)
A	Excellent	90-100
+B	Very Good	85-89
B	Good	80-84
+C	Fairly Good	75-79
C	Fair	70-74
+D	Poor	65-69
D	Very Poor	60-64
F	Fail	Less than 60

(3) Re-examination (if the course allows any.)

N/A - (Not applicable with MUIC)

3. Students' Appeal

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.

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Section 6 Teaching Resources

1. Required Texts

1) A Silberschatz, P. Galvin, G. Gagne 'Operating System Principles', John Wiley, 9th edition, 2014, ISBN 978_1_118_06333_0

2. Suggested Materials

1) Andrew S Tanenbaum, Structured Computer Organization, 3rd edition, Prentice Hall, 1990, ISBN 0-13-852872-1.

3. Other Resources (if any)

None

Section 7 Evaluation and Improvement of Course Implementation

1. Strategy for Course Effectiveness Evaluation by Students

Student evaluation

2. Strategy for Teaching Evaluation

Student evaluation

3. Teaching Improvement

Use evaluation from 1 and 2 for course improvement

4. Verification of Standard of Learning Outcome for the Course

Analysis of students' learning outcomes using scores from each CLOs for evaluation.

5. Revision Process and Improvement Plan for Course Effectiveness

Review the course before trimester starts, before each teaching period and review course contents every 3 years.

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Appendix

Relations between the course and the program

Table 1 Relations between the course and the PLOs

Computer Architecture	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
EGCI 333						R

Table 2 Relations between CLOs and PLOs

EGCI 333	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1 Describe concepts and working of major components of operating systems.						6.1
CLO2 Analyze trade-offs of different techniques used to implement operating system components.						6.1
CLO3 Apply operating systems to solve engineering problems.						6.1

Table 3 PLOs and SubPLOs that the course is responsible for

PLOs	*SubPLOs*
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