TQF 3 Course Specification

Section 1 General Information

1. Course Code and Title

In Thai EGCI 333 สถาปัตยกรรมคอมพิวเตอร์

In English EGCI 333 Computer Architecture

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 3

5.2 Number of Students Allowed Approximately 30 Students

6. Pre-requisite None

7. Co-requisites None

8. Study Site Location Faculty of Engineering

Section 2 Aims and Objectives

1. Course Goals

To develop student knowledge about computer system's major components and data representation methods. The steps of components, datapath, arithmetic and control circuits design are described step-by-step toward the completion. Performance analysis of some circuits will be discussed. Computer language translator is explained and used to explore more sophisticated operations. Techniques to improve computer system's performance are introduced, i.e. cache memory, pipelining and parallel architectures to allow students to understand and choose appropriate architectures suitable to handle problem's needs.

2. Objectives of Course Development/Revision

2.1 Course Objectives

This course aims to provide knowledge and abilities as follows:

1. Explain computer's architecture and data representation methods.
2. Explain computer language translator and methods used to improve computer system performance.
3. Apply computer architecture to solve engineering problems.

2.2 Course-level Learning Outcomes: CLOs

On completion of the course, the students will be able to

1. CLO1 Describe how computer's major components connect and work together.
2. CLO2 Understand how computer language translator works and how to improve computer system performance using different techniques.
3. CLO3 Apply computer architecture to solve engineering problems.

Section 3 Course Description and Implementation

1. Course Description

(Thai) ส่วนประกอบต่างๆ ของคอมพิวเตอร์ การออกแบบวงจรตรรกะ การทำงานและการออกแบบส่วนประกอบระดับรีจิสเตอร์ที่ใช้ในระบบคอมพิวเตอร์ การแทนข้อมูลในระบบคอมพิวเตอร์ สัญญาณนาฬิกา การออกแบบวิถีข้อมูล การออกแบบหน่วยควบคุมโดยใช้ไมโครโปรแกรม (สถาปัตยกรรมแบบซีไอเอสซี) และแบบใช้วงจรตรรกะ (สถาปัตยกรรมแบบริสก์) การทำงานของคอมพิวเตอร์ของแต่ละสถาปัตยกรรม การเพิ่มประสิทธิภาพ ระบบสายท่อของคอมพิวเตอร์ ระบบหน่วยความจำ หลักการและการทำงานของหน่วยความจำแคช การออกแบบระบบรับเข้าส่งออก การสื่อสารข้อมูลแบบอนุกรมและแบบขนานเบื้องต้น สถาปัตยกรรมสำหรับประมวลผลแบบขนาน การทนต่อความผิดพร่อง

(English) Computer components: design of logic circuits; working of and designing register level components used in computer systems; data representation in computer systems; clock signal; datapath design; design of control unit using microprogram (CISC architecture) and logic circuit (RISC architecture); working of computer of each architecture; performance enhancement; pipeline systems of computer; memory systems; principles and working of cache memory; input-output system design; fundamentals of serial and parallel communication; parallel processing architecture. Fault tolerance.

2. Number of hours per trimester

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

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

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 how computer's major components connect and work together.
2. CLO2 Understand how computer language translator works and how to improve computer system performance using different techniques.
3. CLO3 Apply computer architecture 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 Assignment	Homework	Quiz	Written Examination	Individual Evaluation	Report
CLO1	√	√			√	√	√	√	
CLO2	√	√	√		√	√	√	√	
CLO3				√			√		√

SECTION 5 Lesson Plan and Evaluation

1. Lesson Plan

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
1-2	Review : Design of Logic Circuits	2-2		Lecture, Discussion	Thanadol
3-4	Working of and Designing register level Computer's Components	2-2		Lecture, Discussion	
5-6	Data Representation in Computer Systems	2-2		Lecture, Assignment, Discussion	
7-8	Datapath Design (Quiz 1)	2-2		Lecture, Assignment, Discussion	
9-11	Design of RISC	2-2-2		Lecture, Assignment, Discussion	
12-13	Programming with Assembly	2-2		Lecture	
14	Midterm Exam	2			
15-17	Design of CISC	2-2-2		Lecture, Assignment, Discussion	
18-19	Pipeline Systems (Quiz 2)	2-2		Lecture, Assignment, Discussion	
20-22	Memory Systems Architectures & Cache Memory	2-2-2		Lecture, Assignment, Discussion	
23-24	Parallel Processing Architecture	2-2		Lecture, Discussion, Report	
	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.

B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes	Evaluation Method*					Weight (Percentage)
	HW	Quiz	Discussion	Report	Examination	
CLO1 Describe how computer's major components connect and work together.	2.5	7.5			11	**21**
CLO2 Understand how computer language translator works and how to improve computer system performance using different techniques.	2.5	7.5	8		45	**63**
CLO3 Apply computer architecture to solve engineering problems.				8	8	**16**
Total	**5**	**15**	**8**	**8**	**64**	**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.

Section 6 Teaching Resources

1. Required Texts

1) John L. Hennessy, David A. Patterson, Computer Architecture A Quantitative Approach, 5th edition, *Morgan Kaufmann*, 2012, ISBN: 978-0-12-383872-8
2) John P. Hayes, *Computer Architecture and Organization*, 3rd edition, McGraw Hill, 1999, ISBN 0-07-115997-5
3) Morris Mano, *Computer Systems Architecture*, 3rd edition, Prentice Hall, 1993, ISBN 0-13-175738-5

2. Suggested Materials

1) Andrew S Tanenbaum, *Structured Computer Organization*, 3rd edition, Prentice Hall, 1990, ISBN 0-13-852872-1.
2) Harold S Stone, *High-Performance Computer Architecture*, 3rd edition, Addison Wesley, 1993, ISBN 0-201-52688-3.
3) Kai Hwang, *Advanced Computer Architecture: Parallelism, Scalability, Programmability*, McGraw-Hill, 1993, ISBN 0-07-113342-9.
4) Robert J Baron, Lee Higbie, *Computer Architecture*, Addison Wesley, 1992.

3. Other Resources (if any)

None

Section 7 Evaluation and Improvement of Course Implementation

1. Strategy for Course Effectiveness Evaluation by Students

1.1 Student evaluation

2. Strategy for Teaching Evaluation

2.1 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.

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 how computer's major components connect and work together.		2.2				
CLO2 Understand how computer language translator works and how to improve computer system performance using different techniques.		2.2				
CLO3 Apply computer architecture to solve engineering problems.		2.1				

Table 3 PLOs and SubPLOs that the course is responsible for

PLOs	*SubPLOs*
PLO2: Integrate computer engineering knowledge with other related sciences and pursue new knowledge in computer engineering.	2.1 Use computer engineering knowledge to solve problems in other fields
	2.2 Peruse new knowledge in computer engineering using other related science