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 233 ปฏิบัติการการออกแบบวงจรดิจิทัล

   (English) EGCI 233 Digital Circuit Design Lab

2. **Number of Credits** 1(0-2-1) (Lecture/Lab/Self-study)

3. **Curriculum and type of subject**
   3.1 Curriculum Bachelor of Engineering (Computer Engineering)
   3.2 Type of subject Major Course (Required Major)

4. **Responsible faculty member**
   Dr.Ruj Akavipat

5. **Trimester / year of study**
   5.1 Trimester 1st / year of study 2nd year
   5.2 Number of students 5-40 students

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

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

8. **Venue of study** Mahidol University, Salaya campus

9. **Date of latest revision** October 2011

Section 2 Goals and Objectives

1. **Goal** At the end of the course, students should
   1. Capable of designing and constructing various simple digital circuits e.g. adder, subtractor, decoder, and encoder circuits.
   2. Capable of designing digital circuits to solve engineering problems.

2. Objective of development revision

To up-date the knowledge content of the course

Section 3 Course Management

1. Course Description

การทดลองมีเนื้อหาสอดคล้องกับ EGCI 231 ตัวอย่างหัวข้อทดลองมีเช่น แนะนำปฏิบัติการระบบดิจิทัล การดำเนินการประตูสัญญาณเบื้องต้น พีชคณิตบูลีน การออกแบบวงจรบวกและวงจรลบ วงจรเข้ารหัสและวงจรถอดรหัส วงจรอุปกรณ์รวมส่งสัญญาณและวงจรอุปกรณ์รวมแยกสัญญาณ การออกแบบวงจรเชิงลำดับ

Laboratory experiments related to EGCI 231course. Examples of included experimental topics are Introduction to Digital Systems Lab, Basic Gates' Operations, Boolean algebra, Design of Adder and Subtractor Circuits, Encoder and Decoder Circuits, Multiplexer and Demultiplexer Circuits, Design of Sequential Circuits.

2. Credit hours / trimester

Lecture (hours)	Additional Class (hours)	Laboratory/field trip/internship (hours)	Self-study (hours)
-	-	22 hours (2 hours x 11 weeks)	11 hours (1 hours x 11 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

- Self-study
- Experiment

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 To pay respect to the rule of organization and social.
- 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 Self study
- 1.2.2 Group experiment

1.3 ***Evaluation methods:***

- 1.3.1 Class attendance, class participation and behavior in class
- 1.3.2 On-time submission of reports and assignments and their quality

2 Knowledge development

2.1 ***Expected outcome on knowledge development:***

- 2.1.1 To process the knowledge related to principles, theories and practice in the course
- 2.1.2 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.
- 2.1.3 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

- 2.2.1 In-class participation

2.2.2 Group experiment
2.2.3 Self study

2.3 ***Evaluation methods:***
2.3.1 Lab 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 Lab examination
3.3.2 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 have initiative in problem solving.
4.1.6 To take responsibility in a life-long learning.

4.2 ***Teaching methods:***
4.2.1 Group experiment
4.2.2 Self study

4.3 ***Evaluation methods:***
4.3.1 Behavior in class

4.3.2 Lab examination

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 Group experiment with exercises

5.2.2 Self study e.g. via internet

5.3 ***Evaluation methods:***

5.3.1 Lab examination

5.3.2 Quality of work e.g. on-time submission of reports and assignments

Section 5 Teaching and Evaluation Plans

1. Teaching plan

week	Topics	Hours			Teaching methods/multi media	Instructor
		Lecture	Lab	Self-Study		
1	Introduction to Digital Lab Devices	0	2	1	Lecture, Group experiment	Thanadol Pritranan
2	Using Digital Lab Devices 1	0	2	1	Group experiment	
3	Basic Gates	0	2	1	Group experiment	
4	Boolean Algebra	0	2	1	Group experiment	
5	Arithmetic Circuit: Adder and Subtractor Circuits	0	2	1	Group experiment	
6	Encoder and Decoder Circuits	0	2	1	Group experiment	

week	Topics	Hours			Teaching methods/multi media	Instructor
		Lecture	Lab	Self-Study		
7	Multiplexer and Demultiplexer	0	2	1	Group experiment	
8	Flip Flops: Basic	0	2	1	Group experiment	
9	Flip Flops: Shifters and Counters	0	2	1	Group experiment	
10	ADC and DAC	0	2	1	Group experiment	
11	Lab Examination	0	2	1	Individual experiment	
	Total	0	22	11		

2. Evaluation Plan

Expected outcomes	Methods / activities	Week	Percentage
1.1.2, 1.1.3, 2.1.1, 2.1.2, 3.1.1, 3.1.3, 4.1.2, 4.1.4, 5.1.1, 5.1.4	Attendance, in class behavior and Report and Exercises	1-10	80%
2.1.1, 2.1.2, 3.1.1, 3.1.3, 4.1.2, 4.1.4	Final examination	11	20%

.

Section 6 Teaching Materials and Resources

1. **Texts and main documents**
   Digital Lab Manual
2. **Documents and important information**
   TTL and CMOS IC Data Sheet
3. **Documents and recommended information**
   Website: http://wps.prenhall.com/chet_tocci_electech_10/

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 Behavior of students in class
   1.3 Student evaluation
2. **Evaluation strategies in teaching methods**
   2.1 Examination Result
   2.2 Analysis of students' learning outcomes
3. **Improvement of teaching methods**

Use evaluation from 1 and 2 for course improvement

4. **Evaluation of students' learning outcome**
   4.1 Randomly check students' works by qualified reviewers from outside.
   4.2 Analysis of students' learning outcomes using scores from class attendance, group activity and presentation of project and poster presentation by programme committee.
5. **Review and improvement for better outcome**
   Review the course before trimester starts, before each teaching period and review course contents every 3 years.

Symbol ● represents main responsibility / Symbol ○ represents minor responsibility / Space represent no responsibility
These symbols will appear in Curriculum Mapping