COURSE SYLLABUS

1.Name of Curriculum: Bachelor of Science (Computer Science)
Mahidol University International College

2.Course Code: ICCS 204 **Course Title**: Introduction to Digital Electronics

3.Number of Credits: 4 **(Lecture/lab)** (4 - 0)

4.Prerequisites:
ICPY 211

5.Type of Course:
Core course for 2nd year students

7.Course Description:
Digital arithmetic, number systems, binary and hexadecimal base codes and logic. Boolean algebra. The Karnaugh map simplification. Digital electronic circuits : logic gate, flip-flop combinational circuits, data representation, code conversion, gate minimization. Hardware realization and interfacing technique.

8.Course Objectives:
The objective for this course is to provide the basic concepts of computer hardware. It is a prerequisite course for computer logics, computer systems, microprocessors etc. Even advanced technology such as Pentium microprocessor is still based on digital electronics concepts.

We will study from the fundamental principles of digital numbers, digital circuits and systems. Then we will go on, step-by-step, the design methods of digital circuits such as combinational logic circuits, synchronous counter etc. The lists below are the topics which I would like to cover in each week. They may be rearranged, depending on the time we spent in each lecture. After finish this course, the students are able to understand the following topics :

- Understand the number systems.
- Describe the fundamental of computer systems.
- Understand basic digital circuits such as AND, OR gate etc.
- Design and implement Digital ICs with combinational logic circuits.
- Understand basic of ALU inside the CPU.
- Understand internal circuits of the memory and its operation.
- Design application circuits such as counter registers.

9.Course Outline

Class	Topic				Lecturer
	Lecture / Seminar	Hour	Lab	Hour	
1	Digital systems, Digital circuits, Digital v.s. Analog Digital computer.	2	-	2	Asst. Prof. Decha Wilairat
2	Number systems, Binary, Octal Decimal and Hexadecimal number systems.	2	-	2	
3	BCD, Digital codes : Binary to Decimal conversions, Parity method, ASCII code. Introduction to Boolean algebra. 2's Compliment, Addition and subtraction.	2	-	2	
4-5	Basic logic gates : AND, OR, NOR, NAND, INVERTER and EX-OR, EX-NOR gate. Boolean theorems, DeMorgan's Theorem.	4	-	4	
6-7	Combination logic circuits, Sum-of-Product and Product-of Sum form, Karnaugh map and logic circuit design methods, Parity checker .	4	-	4	
	Midterm Exam. (40%) (To be announced) Probably in June (…Wed. 4 or 11 June.)	**2**	-	**2**	
8	Latch logic circuits, Clock signals, Introduction to Flip-Flop : SC, JK, D and Enable Flip-Flop, Flip-Flop timing operations.	2	-	2	
9-10	Master / Slave Flip-Flop, Synchronous and Asynchronous systems. Detecting an input sequence, Parallel / Series data transfer , Data bus operation.	4	-	4	
11-12	Basic adder circuit, Full adder, BCD adder, Carry propagation, Computer multiplication / division, ALU unit.	4	-	4	
13	Counters and registers, Asynchronous (ripple) counter.	2	-	2	
14-15	Synchronous (parallel) counter , MOD number . MOD-X counter. UP/DOWN counters, BCD counter.	4	-	4	
16-17	Shift-register counters , decade counters. Presettable counter , 74LS193/74HC193 and some commercial ICs counter. IEEE/ANSI notation , Decoding a counter.	4	-	4	

	Synchronous counter design, irregular counter				
18-19	design. Counter application circuits, parallel (serial) data in / serial (parallel) data out.	4	-	4	
20-21	Review overall	4	-	4	

Final Exam (40%) (TBA)

10. Teaching Methods:
Lectures, in-class case studies, discussion, self-study and student presentations.

11. Teaching Media:
Text and teaching materials, PowerPoint, handouts, some programming such as MutiSim. Simulation software .

12. Course Achievement:
After finish this course, the students are able to understand how the digital circuits work and realize the digital circuit concepts for the PC hardware.

13. Course Evaluation:

1. Mid-term exam 40%
2. Final exam 40%
3. Homework and MultiSim. 10%
4. MultiSim. project 10%

Grading scale	Grade	Point
90 - 100	A	4.0
85 - 89	B+	3.5
80 - 84	B	3.0
75 - 79	C+	2.5
70 - 74	C	2.0
65 - 69	D+	1.5
60 - 64	D	1.0
Below 60	F	0

Notes for more grading policy :

a) For those students who receive the total score below 60% will get a grade "F" and above 90% will be an "A". The other grades depend on an average of the class like the tentative scale above.
b) Both exams are close book, no calculator. But you are allowed to use the "formula sheet" (size A4 – one side) attached with the exam paper during the test.
c) Please come on time to the lecture. I will randomly check your attendance. You are able to absent the lectures three times. Your grade will be deducted 1% for each lecture you missing the class (if you have more than three times).

14. References:

Textbook : 1 **"**Digital Design with CPLD Applications and VHDL" by Robert K. Dueck 2nd ed. Thomson 2005 (TK7872.L64D84 2004)

Additional textbooks : There are several texts available for this subject. Here are some books if you wish to keep as your references.

1) "Digital Systems : Principles and Applications " by Ronald J. Tocci 10th ed. Pearson Publishing (TK 7868.D5 T631 d 2007)
2) "Introduction to Logic Design" by Alan B. Marcovitz 2nd edition McGraw Hill 2005 (TK 7876.L6M321i 2005)
3) "Digital Principles and Design" by Donald G.Givone McGraw Hill 2003. (TK7868.D5 G539d 2003)
4) "Digital Fundamentals" by Thomas L. Floyd 8th edition Prentice Hall 2003. (TK 7868.D5 F645d 2003)
5) "Digital Electronics : Principles and Applications" by Roger L. Tokheim 6th. Edtion McGraw Hill 2003. (TK7868.D5 T646d 2003)
6) "Fundamental of Digital Logic : with Verilog Design" by Stephen Brown and Zvonko Vranesic McGraw Hill 2003 (TK7868.L6 B76 2003)

15. Instructors:

Instructor : Asst. Prof. Decha Wilairat ; Instructor in Electrical Engineering Department.
Office : Electrical Engineering Department , Faculty of Engineering Mahidol University. Engineering Building Room #507 Tel. : 0-2889-2138 ext. 6501-2
Office Hour : Mon. 9:00- 12:00 and Thru. 9:00- 12:00 or give an appointment in advance.
Email : decha.wil@mahidol.ac.th, dewilairat@gmail.com

16. Course Coordinator:

Please contact Ajarn Dr. Boonyarit or K. Sopa at Computer Science Department , MUIC.