

Course Syllabus

ภาควิชา : วิศวกรรมไฟฟ้า

ชื่อวิชา : Digital Circuits Design

Prerequisite : 162 361 Digital Electronics

Textbooks : R. H. Katz , "*Contemporary Logic Design*", Benjamin/Cummings Publishing Company, 1994.

Recommendation Reading :

1. K. J. Breeding, "*Digital Design Fundamentals*", 2nd Edition, Prentice Hall International Edition, 1992.
2. C. H. Roth, Jr., "*Fundamentals of Logic Design*", 4th Edition, West Publishing Company, 1992.
3. D. D. Gajski, "*Principles of Digital Design*", Prentice Hall International Edition, 1997.
4. G. de Micheli, "*Synthesis and Optimization of Digital Circuits*", McGraw-Hill, 1994.
5. R. S. Sandige, "*Modern Digital Design*", McGraw-Hill International Editions, 1990.

Objective :

1. To provide fundamental concepts used in designing general digital circuits or systems.
2. To provide a basic understanding of some computer-aided techniques used in the design verification, synthesis, optimization, and implementation of digital systems.

Examination :

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| 1. Midterm Test | 40 % |
| 2. Final Test | 50 % |
| 3. Attention and Assignment | 10 % |

Language of Lecture : Thai

Language of Examination : English

Course Description :

แนะนำเกี่ยวกับการออกแบบวงจรดิจิทัล การลดทอนและการออกแบบวงจรคอมบินเนชัน วงจรเอ็มเอสไอ และแอลเอสไอ การวิเคราะห์วงจรซีควเอนเชียล การออกแบบซิงโครนัสซีควเอนเชียลไฟไนต์สเตตแมชีน การออกแบบอะซิงโครนัสซีควเอนเชียลไฟไนต์สเตตแมชีน การออกแบบระบบควบคุมหลายอินพุต ระบบควบคุมโดยใช้เอ็มเอสไอและแอลเอสไอ แนะนำเกี่ยวกับระบบควบคุม

Introduction to digital circuits design, Combinational circuits design and minimization, MSI and LSI circuits, Sequential circuits analysis, Design of synchronous sequential finite state machines, Design of asynchronous sequential finite state machines, Design of multiple inputs control systems, Control systems using MSI and LSI, Introduction to controllers.

Chapter	Topics	Hours
1	Introduction • The Process of Design • Digital Hardware Systems • Multiple Representations of a Digital Design • Rapid Electronic System Prototyping	4 1 1 1 1
2	Two-Level Combinational Logic • Logic Functions and Switches • Gate Logic • Two-Level Simplification • CAD Tools for Simplification	4 1 1 1 1
3	Multilevel Combinational Logic • Multilevel Logic • CAD Tools for Multilevel Logic Synthesis • Time Response in Combinational Networks • Hazards and Glitches	4 1 1 1 1
4	Programmable and Steering Logic • Programmable Arrays of Logic Gates • Beyond Simple Logic Gates • Combinational Logic Word Problems • Case Study	4 1 1 1 1
5	Arithmetic Circuits • Binary Addition • Arithmetic Logic Unit Design • BCD Addition • Case Study	6 1 2 1 2
6	Sequential Logic Design • Sequential Switching Networks • Timing Methodologies • Realizing Circuits with Different Kinds of FFs • Metastability and Asynchronous Inputs	4 1 1 1 1
7	Sequential Logic Case Studies • Registers and Counters • Counter Design Procedure • Random-Access Memory	4 1 2 1
8	Finite State Machine Design • The Concept of the State Machine • Basic Design Approach • Moore and Mealy Machine Design Procedure • Finite State Machine Word Problems	6 2 1 2 1
9	Finite State Machine Optimization • Motivation for Optimization • State Minimization/Reduction • State Assignment • Finite State Machine Partitioning	6 1 2 2 1
10	Finite State Machine Implementation • Finite State Machine Design with Programmable Logic • Finite State Machine Design with Counters • Finite State Machine Design with more Sophisticated Programmable Logic Devices • Case Study	6 1 1 2 2
Total		48