Syllabus of <<Digital circuits>>

Number of the course：102020 Number of credits： 4 Total hours：72

Instructor： Zhou Junhe Examiner：Yin Xuefeng

1. Characteristics and Objective

The aim of this course is to introduce the fundamental concepts of logic networks to the students, to enable them to design and analyze a digital system.

2. Basic Requirement

The attendees should understand the basic concept of the digital circuits, including the combinational and sequential circuits, be able to analyze and design the circuits with proper mathematical methods and development tools.

3. Basic Content

1.Number systems: binary systems, decimal systems, hex decimal systems. Transition between two different number systems.

2.Boolean algebra: basic postulates for algebra system, duality property, theorems, concept of Boolean functions, basic logic gates.

3.Combinational circuits analysis, K-map, Combinational circuits design.

4.Advanced combinational circuits: Adder, subtracter, mux, demux, encoder, decoder, ALU structures.

5.Introductions to sequential circuits: JK, D and T flip flop, RS D latches, state table, state equation, state diagram, finite state machine.

6.Synchronous sequential circuits design: state optimization (state reduction method, state assignment method), design using different

flip flops (JK, D and T flip flops)

7.Advanced synchronous sequential circuits: registers and counters.

8.Introduction to asynchronous sequential circuits design.

4. Experiment or Computer Operation

VHDL language based circuits design and analysis.

Matlab language based digital system analysis.

5. Ability and Personality Cultivation

Train the students to have the capability of the digital circuits design and the capability to use the computer to design the digital circuits. Let the student contact with the international professors to grasp the latest technology advance.

6. Preparatory Course Requirement

Circuits theory, analog circuit

7. Assessment and Examination

Final examination 60%, term paper 30%, homework/class attendance 10%

8. Hours Distribution

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number | Content | Arrangement of classes | | | | Sub-total | |
| Theory  (hours) | Experiments (Hours) | Exercising (Hours) | Practice on Computers (Hours) |  |
| 1 | Number systems | 4 | 0 | 0 | 0 | 4 | |
| 2 | Boolean algebra | 6 | 0 | 0 | 0 | 6 | |
| 3 | Combinational circuits analysis | 5 | 0 | 0 | 1 | 6 | |
| 4 | Advanced combinational circuits | 6 | 1 | 0 | 1 | 8 | |
| 5 | Introductions to sequential circuits | 4 | 0 | 1 | 1 | 6 | |
| 6 | Synchronous sequential circuits design | 6 | 1 | 0 | 1 | 8 | |
| 7 | Advanced synchronous sequential circuits | 6 | 0 | 1 | 2 | 8 | |
| 8 | Introduction to asynchronous sequential circuits design | 6 | 0 | 1 | 1 | 8 | |
| Total | | 48 | 8 | 6 | 10 | 54 | |

9. Textbooks and Main Reference Books

Moris Mano, Logic networks, Prentice Hall, third ed. 2002