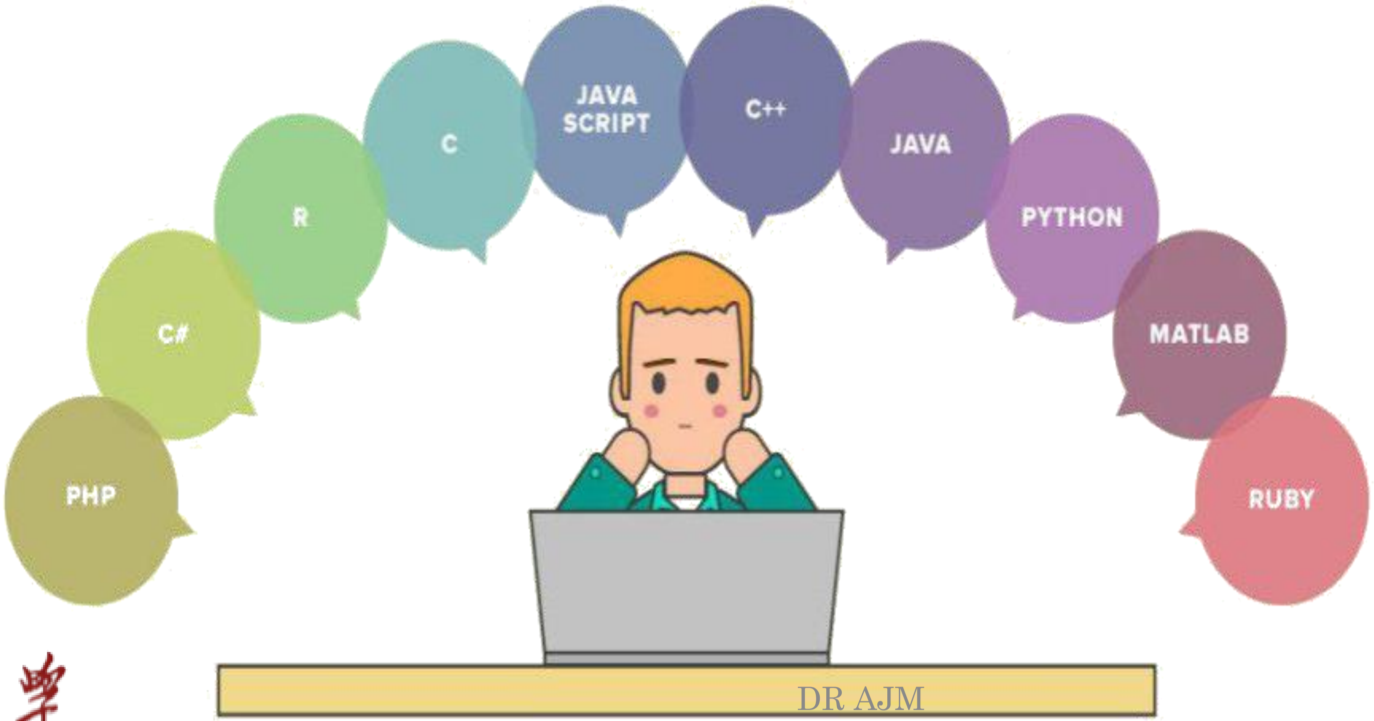
Jiangxi University of Science and Technology

DIGITAL SYSTEM DESIGN

Lecture0101 introduction / History

Nihau

- Let us have a brief view to our course
- Don’t worry we will learn lots of thing this semester



你好

Nǐ hǎo

Who Am i?

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Course name:
DIGITAL SYSTEM DESIGN, Spring 2020

- **Teacher: Dr Ata Jahangir Moshayedi**

- **Textbook and Resources:**
  Digital Design with an Introduction to the Verilog HDL, FIFTH EDITION
- **Course Description:**
- This course provides a modern introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic: logic gates, minimization techniques, arithmetic circuits, and modern logic devices such as field programmable logic gates. The second part of the course deals with sequential circuits: flip-flops, synthesis of sequential circuits, and case studies, including counters, registers, and random access memories. State machines will then be discussed and illustrated through case studies of more complex systems using programmable logic devices. Different representations including truth table, logic gate, timing diagram, switch representation, and state diagram will be discussed.A digital system is a combination of devices designed to manipulate logical information or physical quantities that are represented in digital form; that is, the quantities can take on only discrete values. These devices are most often electronic, but they can also be mechanical, magnetic, or pneumatic. Some of the more familiar digital systems include digital computers and calculators, digital audio and video equipment, and the telephone system—the world's largest digital system.

General objectives :

- The Objective of this course is to familiarize the student with fundamental principles of digital design. It provides coverage of classical hardware design for both combinational and sequential logic circuits. The course is supported by a digital logic design laboratory that uses the IDL-800 Digital Lab. device. This instrument is a circuit evaluator that enables users to design and connect standard Integrated Circuits.

Course outline :

- **Binary Systems** Digital Computers & Systems Binary numbers Number Base Conversion Octal & Hexadecimal Numbers 1's & 2's Complements Binary codes.
- **Boolean Algebra & Logical Gates** Basic Definitions Boolean Algebra Theorems of Boolean Algebra. Boolean Functions Digital Logic Gates. IC Digital Logic Families
- **Simplification of Boolean Function** Karnaugh Map Method 3 variable, 4 variable, 5 variable Map. Sum Of Product Product of Sum Dont care Tabulation Method
- **Combinational Logic** Design Procedure Adders Subtractors Code conversion Analysis procedure.
- **chap1 to chap7** Fundamental building blocks of logic gates. Bits, bytes, and words. Numeric data representation and number bases. Mathematical operations in different Numbering systems . Signed and twos-complement representations. Simplification of Boolean functions (algebraic method, Karnaugh maps, Quine McCluskey method) . Logic expressions, minimization, sum of product forms. Integrated combinatorial circuits. Sequential circuits. Flip-flops, registers, counters, memory units.

Course Topic and Lectures

Lecture	Topic
Lecture 1	Syllabus review & Introduction
Lecture 2	
Lecture 3	Truth table and symbolic representation Fundamental properties for Boolean algebra
Lecture 4	Implementing Circuits form Truth table , practice
Lecture 5	XOR gate, Demorgans Law Logical expression simplification using Fundamental properties, Demorgan , Practice
Lecture 6	Karnaugh map (3 input, 4 input), SOP,POS, practice
Lecture 7	Numbering systems, Binary numbers, Hexadecimal, Coding, Error detection, real number implementation, IEE754
Lecture 8	Combinational circuits, Design procedure, Practice
Lecture 9	Combinational circuits, Analysis procedure, Practice
Lecture 10	MSI circuits, 4Bit full adder, Decoder, Multiplexer, comparator, Building functions using MUX,or Decoder, building BCD to Ex-3 converter
Lecture 11	Design procedure Examples using design procedure, Full adder, Full subtractor BCD to Ex-3 code converter 4-bit ADDER/Subtractor using 4-bit Full adder,XOR gates, Comparator
Lecture 12	Demultiplexter, Encoder, Using Decoder for Implementing Logical functions Using Multiplexer for implementing logical fuctions
Lecture 13	Sequential circuits characteristics, synchronous, Asynchronous circuits. RS Latch(using NAND, using NOR gates),RS with Control, D Latch, JK flipflop,T-Flip flop, Characteristic table & equations for Flip flops
Lecture 14	Sequential circuits analysis procedure, Excitation table for the flip flops, Design procedure, Excitation table for sequential circuits,examples
Lecture 15	Using MSI 4 bit counter in building different counters Registers and Memory unit, course review