Lecture Videos

Digital Design & Computer Architecture: RISC-V Edition, Harris & Harris, © Elsevier

These videos accompany the textbook *Digital Design & Computer Architecture: RISC-V Edition*, Harris & Harris, Elsevier © 2021. Chapter 1-5 videos may also be used with other versions of the textbook (Digital Design & Computer Architecture, 2nd Edition, Harris & Harris, Elsevier © 2012 and *Digital Design & Computer Architecture: ARM Edition*, Harris & Harris, Elsevier © 2015).

Chapter 1: Introduction to Digital Design: Number Systems and Gates

#	Topic	Link	Minutes
0	Introduction	https://youtu.be/958A8CAXWn0	**2**
1	Managing Complexity / Design Principles	https://youtu.be/yPjfTGhaGGM	**14**
2	Unsigned Binary Numbers	https://youtu.be/IurbwMTfw5E	**8**
3	Hexadecimal Numbers	https://youtu.be/OQV4QhoOQig	**6**
4	Bytes, Nibbles & All That Jazz	https://youtu.be/W9MXhTBpq8U	**5**
5	Binary Addition	https://youtu.be/Abz1HMfwFE8	**5**
6	Signed Numbers	https://youtu.be/wyDPuw25kg8	**8**
7	Extension	https://youtu.be/EZHBs5LCsQ0	**3**
8	Logic Gates	https://youtu.be/nmGqNZjbmRM	**10**
9	Transistors	https://youtu.be/IjXd75_yQ0Y	**10**
10	Gates from Transistors	https://youtu.be/mYAm41jPAg0	**11**
11	Power Consumption of Digital Circuits	https://youtu.be/YZfejVqnPGM	**8**

Chapter 2: Combinational Logic

#	Topic	Link	Minutes
1	Introduction	https://youtu.be/q3dPMXn9nvw	**2**
2	Combinational Circuits	https://youtu.be/RjbSbmlpVVY	**4**
3	Boolean Equations: SOP and POS Forms	https://youtu.be/H-tJrtPDfTY	**11**
4	Boolean Axioms	https://youtu.be/rRoI_RZFekA	**3**
5	Boolean Theorems of One Variable	https://youtu.be/wYwLzRy9ABc	**5**
6	Boolean Theorems of Multiple Variables	https://youtu.be/Ovb-rE9sJkA	**8**
7	Simplifying Equations & Proving Theorems	https://youtu.be/zlCry56C7xY	**5**
8	From Logic to Gates	https://youtu.be/pRP3kea6FuE	**9**
9	Bubble Pushing	https://youtu.be/7SorxhEX5L0	**7**
10	X's and Z's	https://youtu.be/omB00TtQtYc	**6**
11	Karnaugh Maps (K-Maps)	https://youtu.be/l6rO5IjyrcQ	**11**
12	K-Maps with Don't Cares	https://youtu.be/0ad4tLq65sA	**4**
13	Multiplexers	https://youtu.be/gm7t2Fb4784	**7**
14	Decoders	https://youtu.be/-vv-BolYZaA	**3**
15	Timing of Combinational Logic	https://youtu.be/0KK4qXW7IUI	**5**

Chapter 3: Sequential Logic			
#	**Topic**	**Link**	**Minutes**
1	Introduction	https://youtu.be/6BjQnkaDnFs	5
2	State Element 1: Bistable Circuit	https://youtu.be/rk9g27QwvBw	5
3	State Element 2: SR Latch	https://youtu.be/Mr29gcrRL5c	12
4	State Element 3: D Latch	https://youtu.be/aYs2FmVoOF8	9
5	State Element 4: D Flip-Flop	https://youtu.be/jFYAqAYtQW8	13
6	Flip-Flop Variations	https://youtu.be/184gcRnccmU	18
7	Synchronous Sequential Logic	https://youtu.be/HRX75LSF9vg	5
8	Intro to Finite State Machines (FSMs)	https://youtu.be/bk9s_tmSF6c	5
9	Moore FSM Example 1	https://youtu.be/JLhYdwr7joQ	32
10	Moore FSM Example 2	https://youtu.be/KNxbiOl6LGc	37
11	Mealy FSM Example	https://youtu.be/R7NHqLgMBRI	18
12	Factored FSMs	https://youtu.be/vu2ag7NN0ec	5
13	Timing	https://youtu.be/BZE-8ZiVzTw	26
14	Clock Skew	https://youtu.be/1OodJEhXHS4	10
15	Metastability	https://youtu.be/UbiDx55VvhI	12
16	Synchronizers	https://youtu.be/CmXY0mtw6a8	10
17	Parallelism	https://youtu.be/xX2Crru3xCg	19

Chapter 4: Introduction to SystemVerilog			
#	**Topic**	**Link**	**Minutes**
1	Introduction	https://youtu.be/sVy31HJj4lA	**14**
2	Combinational Logic	https://youtu.be/sVy31HJj4lA	**15**
3	Delays in Simulation	https://youtu.be/sVy31HJj4lA	**5**
4	Sequential Logic	https://youtu.be/sVy31HJj4lA	**9**
5	Combinational logic using always	https://youtu.be/Fhp83VG2fag	**7**
6	Signal Assignments	https://youtu.be/KO6kF3Mkm0s	**5**
7	Finite State Machines (FSMs)	https://youtu.be/GLJ9tkHClH4	**19**
8	Parameterized Modules	https://youtu.be/wF1I1Wl5Owk	**3**
9	Testbenches	https://youtu.be/V14aROKd6zU	**21**

Chapter 5: Digital Building Blocks

#	Topic	Link	Minutes
1	Introduction	https://youtu.be/sBPDVe7Juzc	2
2	Adders Introduction	https://youtu.be/hZq1Fj-j630	8
3	Ripple-Carry Adders	https://youtu.be/mSwJvYz8nOQ	7
4	Carry Lookahead Adders (CLAs)	https://youtu.be/aD-qA-jEKV0	41
5	Prefix Adders	https://youtu.be/Ue5CjG31E-c/	40
6	Subtractors & Comparators	https://youtu.be/ZbZ33tj-ncg	5
7	Arithmetic Logic Units (ALUs)	https://youtu.be/WXMf0y4NoBw	31
8	Shifters, Multipliers & Dividers	https://youtu.be/9vK08yitnSo	41
9	Fixed Point Numbers	https://youtu.be/CWfM5i6qkQY	8
10	Floating-Point Numbers	https://youtu.be/YbLy6g57N-w	20
11	Floating-Point Addition	https://youtu.be/f03hxEWt1bw	8
12	Counters & Shift Registers	https://youtu.be/okczOaycfqk	15
13	Memory Introduction	https://youtu.be/x2NfNfMbIJE	12
14	RAM	https://youtu.be/CqZW44iWwYk	6
15	ROM	https://youtu.be/KBLery-6LKU	9
16	Memory Arrays in SystemVerilog	https://youtu.be/H85sfjE2stU	8
17	Logic Arrays	https://youtu.be/fP-oQ7vz_4c	18

Chapter 6: RISC-V Architecture

#	Topic	Link	Minutes
1	Introduction	https://youtu.be/7tM4XkqoFro	6
2	Instructions	https://youtu.be/SdjPQtMPPmo	3
3	Operands	https://youtu.be/7_o_ypB5XDY	7
4	Memory Instructions	https://youtu.be/P2oFPtdDgTg	6
5	Immediates (Constants)	https://youtu.be/zO6JiJ_BBkI	5
6	Logical Instructions	https://youtu.be/gW5tdyS6ONE	9
7	Multiply & Divide Instructions	https://youtu.be/_PqFr2MADmk	3
8	Branches	https://youtu.be/npONPosFIDA	4
9	Conditional Statements & Loops	https://youtu.be/LfD4n2buV9w	15
10	Arrays	https://youtu.be/XQDKFlPE_mo	11
11	Functions	https://youtu.be/nwwgvbP5ueA	8
12	The Stack	https://youtu.be/To-UZOUoeWA	11
13	Recursive Functions	https://youtu.be/fABbEKsTQPA	9
14	More on Jumps & Pseudoinstructions	https://youtu.be/nKoAcN0P9ek	10
15	Machine Language: R-Type Instruction Formats	https://youtu.be/jv3JZ94E0LM	7
16	Machine Language: I, S/B, U/J-Type Instr. Formats	https://youtu.be/G7R3P6n4nAI	14
17	Immediate Encodings	https://youtu.be/r8fLbbkScg0	4
18	Decoding Instructions & Addressing Modes	https://youtu.be/5xFu8_2u4UY	8
19	Compiling, Assembling & Loading Programs	https://youtu.be/_v7-QM9A6aU	13
20	Big-Endian & Little-Endian Memory	https://youtu.be/52zOvEyNm7A	3
21	Signed & Unsigned Instructions	https://youtu.be/soJmKmVqiZE	9
22	Compressed Instructions	https://youtu.be/a3PvyELxhpg	5
23	Floating-Point Instructions	https://youtu.be/KGhe7_NReXo	5

Chapter 7: RISC-V Microarchitecture

#	Topic	Link	Minutes
1	Introduction	https://youtu.be/lrN-uBKooRY	7
2	Single-Cycle Processor: Datapath `lw` Instruction	https://youtu.be/AoBkibslRBM	8
3	Single-Cycle Processor: Datapath Other Instr.	https://youtu.be/sVZmqLRkbVk	15
4	Single-Cycle Processor: Control	https://youtu.be/EZb1_VF-yMg	16
5	Single-Cycle Processor: Extending	https://youtu.be/z6qxMFgNEM4	10
6	Single-Cycle Processor: Performance	https://youtu.be/w82mNGranjA	6
6a	Single-Cycle Processor: Testbench	https://youtu.be/ouwuXl5AG-k	9
6b	Single-Cycle Processor: SystemVerilog	https://youtu.be/a8yewzP-kJc	14
6c	Single-Cycle Processor: Tie Celebration	https://youtu.be/EHOSM9tEhMw	1
7	Multicycle Processor: Datapath for `lw`	https://youtu.be/sATaQNCC0-g	10
8	Multicycle Processor: Datapath for Other Instr.	https://youtu.be/dnITBQQDmwU	5
9	Multicycle Processor: Control FSM for `lw`	https://youtu.be/YUJhNTpunqI	11
10	Multicycle Processor: Control for Other Instr.	https://youtu.be/rSodrnsYXQ8	8
11	Multicycle Processor: Extending	https://youtu.be/8EhVN192FRU	6
12	Multicycle Processor: Performance	https://youtu.be/UTUOhh2uQzM	5
13	Pipelined Processor: Introduction	https://youtu.be/UZdURUwQMmk	12
14	Pipelined Processor: Data Hazards	https://youtu.be/zuegcg6ZSFQ	15
15	Pipelined Processor: Control Hazards	https://youtu.be/VcnwVxD4LAc	4
16	Pipelined Processor: Performance	https://youtu.be/iPyoRxOaWOE	6
17	Advanced Microarchitecture	https://youtu.be/JA1LXFNrGWQ	10
18	Superscalar & Out of Order Processors	https://youtu.be/284A8DXNLcc	11
19	Multithreading & Multiprocessors	https://youtu.be/oQLigD2qCMw	5

Chapter 8: Memory Systems

#	Topic	Link	Minutes
	Not yet produced		

Chapter 9: Embedded I/O Systems

#	Topic	Link	Minutes
1	Introduction	https://youtu.be/EZID65YxdVI	9
2	RISC-V Microcontrollers	https://youtu.be/6SmPiqVM1Yo	8
3	Memory-mapped I/O	https://youtu.be/eq7XDJEq_k8	9
4	General-Purpose I/O (GPIO)	https://youtu.be/WpFlGp8WOhU	9
5	RISC-V Device Driver Library	https://youtu.be/s0bk50el100	8
6	Timers	https://youtu.be/uSG07gp_iAw	5
7	Morse Code Example	https://youtu.be/Puv3FSzqugM	5
8	Interfaces	https://youtu.be/ONaDDtJAyP4	5
9	SPI	https://youtu.be/JWnEqTE5NcY	19
10	SPI Accelerometer Example	https://youtu.be/tiLSwNshVwM	20