

COURSE BOOK

Duration of Semester	19 Sep 2022 To 31 Dec 2022	# of Lecture Hours/ Week	3
Degree	BE	Dept-Sem-Sec	EC-7-A
Course Name	VLSI DESIGN	Course Code	18EC72
IA Marks	40	Exam Marks	60
Exam Hours	3	Credits	3
Name of the Faculty	Dr Abdullah Gubbi	# of Lecture Hours	40

Time Slot

Mon	09:20 AM - 10:15 AM	Thu	10:15 AM - 11:15 AM
Tue	11:20 AM - 12:10 PM	Fri	11:20 AM - 12:10 PM
Wed	12:10 PM - 01:00 PM	Sat	-

Lesson Plan And Execution

Source Material List

TEXT 1	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill
TEXT 2	CMOS VLSI Design- A Circuits and Systems Perspective”- Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education
REF 1	Adel Sedra and K. C. Smith, “Microelectronics Circuits Theory and Applications”, 6th or 7th Edition, Oxford University Press, International Version, 2009
REF 2	Douglas A Pucknell & Kamran Eshragian, “Basic VLSI Design”, PHI 3rd Edition, (original Edition – 1994)
REF 3	Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, TMH, 2007

Course Objective List

1	Impart knowledge of MOS transistor theory and CMOS technologies
2	Learn the operation principles and analysis of inverter circuits
3	Design Combinational, sequential and dynamic logic circuits as per the requirements
4	Infer the operation of Semiconductors Memory circuits
5	Demonstrate the concepts of CMOS testing

Course Outcome List

1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling
2	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects
3	Demonstrate ability to design Combinational, sequential and dynamic logic circuits as per the requirements
4	Interpret Memory elements along with timing considerations
5	Interpret testing and testability issues in VLSI Design

Period	Plan/ Execution	Date	Topic	Source Materials to be Referred	Course Outcomes	Duration	Bloom's Level	Execution Methods
Module 1								
1	P	19 Sep 2022	A Brief History			0 hour: 55 min		Lecture
1	E	19 Sep 2022	A Brief History	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture
2	P	20 Sep 2022	A Brief History			0 hour: 55 min		Lecture
2	E	20 Sep 2022	A Brief History	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture
3	P	21 Sep 2022	MOS Transistors			0 hour: 55 min		Lecture
3	E	21 Sep 2022	MOS Transistors	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture
4	P	22 Sep 2022	MOS Transistors			0 hour: 55 min		Lecture
4	E	22 Sep 2022	MOS Transistors	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	UNDERSTAND	Lecture
5	P	23 Sep 2022	CMOS Logic			0 hour: 55 min		Lecture

5	E	23 Sep 2022	CMOS Logic	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture
6	P	26 Sep 2022	CMOS Logic			0 hour: 55 min		Lecture
6	E	26 Sep 2022	CMOS Logic	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture
7	P	27 Sep 2022	Introduction			0 hour: 55 min		Lecture
7	E	27 Sep 2022	Introduction	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill	CO 1	0 hour: 55 min	REMEMBER	Lecture
8	P	28 Sep 2022	Introduction			0 hour: 55 min		Lecture
8	E	28 Sep 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture
9	P	28 Sep 2022	Long-channel I-V Characteristics			0 hour: 55 min		Lecture
9	E	28 Sep 2022	Long-channel I-V Characteristics	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	REMEMBER	Lecture

10	P	28 Sep 2022	Long-channel I-V Characteristics			0 hour: 55 min		Lecture
10	E	28 Sep 2022	Long-channel I-V Characteristics	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	UNDERSTAND	Lecture
11	P	28 Sep 2022	Non-ideal I-V Effects			0 hour: 55 min		Lecture
11	E	28 Sep 2022	Non-ideal I-V Effects	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	UNDERSTAND	Lecture
12	P	28 Sep 2022	DC Transfer Characteristics			0 hour: 55 min		Lecture
12	E	28 Sep 2022	DC Transfer Characteristics	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 1	0 hour: 55 min	UNDERSTAND	Lecture

Module 2

13	P	29 Sep 2022	CMOS Fabrication and Layout			0 hour: 55 min		Lecture
13	E	29 Sep 2022	CMOS Fabrication and Layout	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
14	P	30 Sep 2022	CMOS Fabrication and Layout			0 hour: 55 min		Lecture

14	E	30 Sep 2022	CMOS Fabrication and Layout	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
15	P	3 Oct 2022	VLSI Design Flow			0 hour: 55 min		Lecture
15	E	3 Oct 2022	VLSI Design Flow	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
16	P	6 Oct 2022	Introduction			0 hour: 55 min		Lecture
16	E	6 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
17	P	7 Oct 2022	CMOS Technologies			0 hour: 55 min		Lecture
17	E	7 Oct 2022	CMOSTechnologies	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
18	P	10 Oct 2022	Layout Design Rules			0 hour: 55 min		Lecture
18	E	10 Oct 2022	Layout Design Rules	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
19	P	11 Oct 2022	Geometry Effects			0 hour: 55 min		Lecture
19	E	11 Oct 2022	Geometry Effects	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo	CO 2	0 hour: 55 min	UNDERSTAND	Lecture

				Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill				
20	P	12 Oct 2022	Geometry Effects			0 hour: 55 min		Lecture
20	E	12 Oct 2022	Geometry Effects	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
21	P	12 Oct 2022	Geometry Effects			0 hour: 55 min		Lecture
21	E	12 Oct 2022	Geometry Effects	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
22	P	12 Oct 2022	MOSFET Capacitances			0 hour: 55 min		Lecture
22	E	12 Oct 2022	MOSFET Capacitances	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
23	P	12 Oct 2022	MOSFET Capacitances			0 hour: 55 min		Lecture
23	E	12 Oct 2022	MOSFET Capacitances	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
24	P	12 Oct 2022	MOSFET Capacitances			0 hour: 55 min		Lecture
24	E	12 Oct 2022	MOSFET Capacitances	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw- Hill	CO 2	0 hour: 55 min	UNDERSTAND	Lecture
Module 3								
25	P	13 Oct 2022	Introduction			0 hour: 55 min		Lecture

25	E	13 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
26	P	14 Oct 2022	Introduction			0 hour: 55 min		Lecture
26	E	14 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
27	P	17 Oct 2022	Transient Response			0 hour: 55 min		Lecture
27	E	17 Oct 2022	Transient Response	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
28	P	18 Oct 2022	RC Delay Model			0 hour: 55 min		Lecture
28	E	18 Oct 2022	RC Delay Model	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
29	P	19 Oct 2022	Linear Delay Model			0 hour: 55 min		Lecture
29	E	19 Oct 2022	Linear Delay Model	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
30	P	20 Oct 2022	Logical Efforts of Paths			0 hour: 55 min		Lecture

30	E	20 Oct 2022	Logical Efforts of Paths	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris 4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
31	P	21 Oct 2022	Introduction			0 hour: 55 min		Lecture
31	E	21 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris 4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
32	P	25 Oct 2022	Introduction			0 hour: 55 min		Lecture
32	E	25 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris 4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
33	P	25 Oct 2022	Introduction			0 hour: 55 min		Lecture
33	E	25 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris 4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
34	P	25 Oct 2022	Circuit families			0 hour: 55 min		Lecture
34	E	25 Oct 2022	Circuit families	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris 4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
35	P	25 Oct 2022	Circuit families			0 hour: 55 min		Lecture

35	E	25 Oct 2022	Circuit families	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture
36	P	25 Oct 2022	Circuit families			0 hour: 55 min		Lecture
36	E	25 Oct 2022	Circuit families	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 3	0 hour: 55 min	UNDERSTAND	Lecture

Module 4

37	P	27 Oct 2022	Introduction			0 hour: 55 min		Lecture
37	E	27 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	REMEMBER	Lecture
38	P	28 Oct 2022	Introduction			0 hour: 55 min		Lecture
38	E	28 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	UNDERSTAND	Lecture
39	P	31 Oct 2022	Introduction			0 hour: 55 min		Lecture
39	E	31 Oct 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	UNDERSTAND	Lecture

40	P	2 Nov 2022	Circuit Design for Latches and Flip- Flops			0 hour: 55 min		Lecture
40	E	2 Nov 2022	Circuit Design for Latches and Flip- Flops	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	UNDERSTAND	Lecture
41	P	3 Nov 2022	Circuit Design for Latches and Flip- Flops			0 hour: 55 min		Lecture
41	E	3 Nov 2022	Circuit Design for Latches and Flip- Flops	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	REMEMBER	Lecture
42	P	4 Nov 2022	Circuit Design for Latches and Flip- Flops			0 hour: 55 min		Lecture
42	E	4 Nov 2022	Circuit Design for Latches and Flip- Flops	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	REMEMBER	Lecture
43	P	7 Nov 2022	Introduction			0 hour: 55 min		Lecture
43	E	7 Nov 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	REMEMBER	Lecture
44	P	8 Nov 2022	Introduction			0 hour: 55 min		Lecture

44	E	8 Nov 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	REMEMBER	Lecture
45	P	8 Nov 2022	Basic Principles of Pass Transistor Circuits			0 hour: 55 min		Lecture
45	E	8 Nov 2022	Basic Principles of Pass Transistor Circuits	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	REMEMBER	Lecture
46	P	8 Nov 2022	Basic Principles of Pass Transistor Circuits			0 hour: 55 min		Lecture
46	E	8 Nov 2022	Basic Principles of Pass Transistor Circuits	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	REMEMBER	Lecture
47	P	8 Nov 2022	Synchronous Dynamic Circuit Techniques			0 hour: 55 min		Lecture
47	E	8 Nov 2022	Synchronous Dynamic Circuit Techniques	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	UNDERSTAND	Lecture
48	P	8 Nov 2022	Dynamic CMOS Circuit Techniques			0 hour: 55 min		Lecture

48	E	8 Nov 2022	Dynamic CMOS Circuit Techniques	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 4	0 hour: 55 min	UNDERSTAND	Lecture
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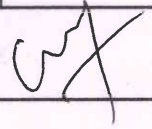
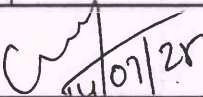
Module 5

49	P	9 Nov 2022	Introduction			0 hour: 55 min		Lecture
49	E	9 Nov 2022	Introduction	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
50	P	10 Nov 2022	Introduction			0 hour: 55 min		Lecture
50	E	10 Nov 2022	Introduction	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
51	P	14 Nov 2022	Introduction			0 hour: 55 min		Lecture
51	E	14 Nov 2022	Introduction	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
52	P	15 Nov 2022	Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM)			0 hour: 55 min		Lecture

52	E	15 Nov 2022	Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM)	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
53	P	16 Nov 2022	Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM)			0 hour: 55 min		Lecture
53	E	16 Nov 2022	Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM)	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
54	P	17 Nov 2022	Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM)			0 hour: 55 min		Lecture
54	E	17 Nov 2022	Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM)	CMOS Digital Integrated Circuits: Analysis and Design” - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill	CO 5	0 hour: 55 min	UNDERSTAND	Lecture

55	P	18 Nov 2022	Introduction			0 hour: 55 min		Lecture
55	E	18 Nov 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	REMEMBER	Lecture
56	P	21 Nov 2022	Introduction			0 hour: 55 min		Lecture
56	E	21 Nov 2022	Introduction	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	REMEMBER	Lecture
57	P	21 Nov 2022	Logic Verification Principles			0 hour: 55 min		Lecture
57	E	21 Nov 2022	Logic Verification Principles	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
58	P	21 Nov 2022	Logic Verification Principles			0 hour: 55 min		Lecture
58	E	21 Nov 2022	Logic Verification Principles	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	UNDERSTAND	Lecture
59	P	21 Nov 2022	Manufacturing Test Principles			0 hour: 55 min		Lecture

59	E	21 Nov 2022	Manufacturing TestPrinciples	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	REMEMBER	Lecture
60	P	21 Nov 2022	Design for testability			0 hour: 55 min		Lecture
60	E	21 Nov 2022	Design for testability	CMOS VLSI Design- A Circuits and Systems Perspective Neil H. E. Weste, and David Money Harris4th Edition, Pearson Education	CO 5	0 hour: 55 min	UNDERSTAND	Lecture

Module No.	# of Classes Planned (Till Date)	Planned Effort (Till Date)	# of Classes Executed (Till Date)	Actual Effort (Till Date)	% Coverage
1	12	11hrs 0min	12	11hrs 0min	100.0
2	12	11hrs 0min	12	11hrs 0min	100.0
3	12	11hrs 0min	12	11hrs 0min	100.0
4	12	11hrs 0min	12	11hrs 0min	100.0
5	12	11hrs 0min	12	11hrs 0min	100.0
Faculty in Charge  HOD's Signature 					

HOD
(Dept. of Electronics & Communication Engg.)
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