

**EE2258 LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY 0 0 3 2**  
(Common to EEE, EIE & ICE)

**AIM**

To study various digital & linear integrated circuits used in simple system configuration.

1. Study of Basic Digital IC's. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)
2. Implementation of Boolean Functions, Adder/ Subtractor circuits.
3. Code converters, Parity generator and parity checking, Excess-3, 2s Complement, Binary to Gray code using suitable IC's .3(b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
4. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
5. Shift Registers:  
Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
- 6 Multiplex/ De-multiplex:  
Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer
- 7 Timer IC application:  
Study of NE/SE 555 timer in Astable, Monostable operation.  
Application of Op-Amp:
8. Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.
- 9 Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.
- 10 Study of VCO and PLL ICs:
  - i. Voltage to frequency characteristics of NE/ SE 566 IC.
  - ii. Frequency multiplication using NE/SE 565 PLL IC.

**P = 45 Total = 45**

**Detailed Syllabus**

**1. Study of Basic Digital IC's.**

(Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)

**Aim**

To test of ICs by using verification of truth table of basic ICs.

**Exercise**

Breadboard connection of ICs with truth table verification using LED's.

- 2. Implementation of Boolean Functions, Adder/ Subtractor circuits.**  
[Minimizations using K-map and implementing the same in POS, SOP from using basic gates]

**Aim**

Minimization of functions using K-map implementation and combination Circuit.

**Exercise**

1. Realization of functions using SOP, POS, form.
2. Addition, Subtraction of atleast 3 bit binary number using basic gate IC's.

s.

- 3a) Code converters, Parity generator and parity checking, Excess 3, 2's Complement, Binary to grey code using suitable ICs .**

**Aim**

Realizing code conversion of numbers of different bar.

**Exercise**

- 1 Conversion Binary to Grey, Grey to Binary;  
1's, 2's complement of numbers addition, subtraction,
2. Parity checking of numbers using Gates and with dedicated IC's

- 3b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO,PISO,PIPO modes using suitable ICs.**

**Exercise**

1. Decimal to binary Conversion using dedicated ICs.
2. BCD – 7 Segment display decoder using dedicated decoder IC& display.

- 4. Counters: Design and implementation of 4-bit modulo counters as synchronous and asynchronous types using FF IC's and specific counter IC.**

**Aim**

Design and implementation of 4 bit modulo counters.

**Exercise**

1. Using flipflop for up-down count synchronous count.
2. Realization of counter function using dedicated ICs.

**5. Shift Registers:**

Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.

**Aim**

Design and implementation of shift register.

**Exercise**

1. Shift Register function realization of the above using dedicated IC's For SISO, SIPO, PISO, PIPO, modes of atleast 3 bit binary word.
2. Realization of the above using dedicated IC's.

**6. Multiplex/ De-multiplex.**

Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

**Aim**

To demonstrate the addressing way of data channel selection for multiplex De-multiplex operation.

**Exercise**

1. Realization of mux-demux functions using direct IC's.
2. Realization of mux-demux using dedicated IC's for 4:1, 8:1, and vice

versa.

**7. Timer IC application. Study of NE/SE 555 timer in Astable, Monostable operation.**

**Aim**

To design a multi vibrator circuit for square wave and pulse generation.

**Exercise**

1. Realization of Astable multivibrator & monostable multivibrator circuit using Timer IC.

2. Variation of R, C, to vary the frequency, duty cycle for signal generator.

**8. Application of Op-Amp-I**

Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.

**Aim**

Design and Realization of Op-Amp application.

**Exercise**

1. Verification of Op-Amp IC characteristics.
2. Op-Amp IC application for simple arithmetic circuit.
3. Op-Amp IC application for voltage comparator wave generator and wave shifting circuits.

**9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.**

**Aim**

Realization of circuit for digital conversions.

**Exercise**

1. Design of circuit for analog to digital signal conversion using dedicated IC's.
2. Realization of circuit using dedicated IC for digital analog conversion.

**10. Study of VCO and PLL ICs**

- i) Voltage to frequency characteristics of NE/ SE 566 IC.
- ii) Frequency multiplication using NE/SE 565 PLL IC.

**Aim**

Demonstration of circuit for communication application

**Exercise**

1. To realize V/F conversion using dedicated IC's vary the frequency of the generated signal.
2. To realize PLL IC based circuit for frequency multiplier, divider.

**Requirement for a batch of 30 students**

<b>S.No.</b>	<b>Description of Equipment</b>	<b>Quantity required</b>	<b>Quantity available</b>	<b>Deficiency %</b>
1.	Interface such as, A/D, D/A converter, DMA, PIC Serial, Interface, Temperatures controller, Stepper motor, Key board	4 each		
2.	CRO and function generator	3 each		
3.	IC trainer Kit	15		
4.	Analog AC trainer kit	4		
5.	Components and bread boards	10 each		
6.	Chips IC – 7400	10		
7.	Chips IC – 7402	10		
8.	Chips IC – 7408	10		
9.	Chips IC – 7432	10		
10.	Chips IC – 7410	25		
11.	Chips IC – 555	10		
12.	Chips IC – 741	10		
13.	Chips IC – 74153	10		
14.	Chips IC – 7474	10		
15.	Chips IC – 7490	10		
16.	Chips IC – 7447	10		
17.	Chips IC – 7476	10		
18.	Chips IC – 7420	10		
19.	Chips IC – 7404	15		
20.	Chips LM – 317	10		

<b>S.No.</b>	<b>Description of Equipment</b>	<b>Quantity required</b>	<b>Quantity available</b>	<b>Deficiency %</b>
21.	Chips LM – 723	10		
22.	Chips MA – 7840	10		
23.	Chips LM – 380	10		
24.	Chips ICL - 8038	10		
25.	Traffic light control kit	2		
26.	VDU	2		
27.	7 segment Display	5		
28.	Interfacing card such as keyboard etc.	3 each		
29.	Work tables	15		