Government of Karnataka
Department of Technical Education
Bengaluru

	Course Title: **Digital and Computer Fundamentals**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15CS21T**
	Type of Course: **Lectures & Student Activity.**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Knowledge of Mathematics and Basic Electronics in secondary education.

Course Objectives:
1. To study the numbers systems and codes, combinational and sequential circuits
2. To know the fundamentals of computer and peripherals.

Course Outcome

On successful completion of the course, the students will be able to attain below Course Outcome (CO):

	Course outcome	CL	Linked PO	Teaching Hours
CO1	Describe various number system and codes.	*R, U, A*	1,2,3	10
CO2	Summarize different types of logic gates and apply Boolean laws and rules to simplify simple expressions.	*R, U, A*	1,2,3	08
CO3	Demonstrate different types of combinational logic circuits.	*U, A*	1,2,3,4,8,9,10	06
CO4	Construct different types of sequential logic circuits.	*U, A*	1,2,3,4,8,9,10	10
CO5	Identify and illustrate basic organization of computer.	*R, U*	1,2,5,9,10	06
CO6	Illustrate the memory concepts, I/O devices and peripherals.	*R, U*	1,2,5,9,10	12
		Total sessions		52

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Digital and Computer fundamentals	3	3	2	2	2	-	-	2	3	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks Weightage	Marks weightage (%)
			R	U	A	A	
I	Digital Principles	10	-	18	10	28	19.23
II	Boolean algebra & Logic gates	08	05	10	08	23	15.4
III	Combinational Circuits	06	-	07	10	17	11.52
IV	Sequential Circuits	10	-	10	18	28	19.23
V	Introduction to Computers & Computer software	06		12	05	17	11.52
VI	Peripherals & Memory	12	05	22	05	32	23.1
	Total	**52**	**10**	**79**	**56**	**145**	**100**

Course Contents

Unit-I : Digital Principles   10 Hrs

Number systems - Binary, octal, decimal and Hexa-decimal, Conversion from different number systems to others, 1's complement and 2's complement, Addition and Subtraction of 1's and 2's compliment, BCD, EBCDIC, ASCII Code, Gray code, Excess-3 code.

Unit-II : Logic gates & Boolean algebra   8 Hrs`

Logic gates - OR, AND, NOT, NAND, NOR, XOR, XNOR, Boolean Algebra - Laws, Rules, De-Morgan's theorems, Boolean expressions- SOP,POS, Simple expressions to simplify.

Unit-III : Combinational Circuits   6 Hrs

Half adder, Full adder, Encoder, Decimal-to-BCD encoder, Decoders, BCD-to-Seven Segment Decoder, Multiplexer, 4:1 mux and De Multiplexer, 1:4 Demux

Unit-IV : Sequential Circuits   10 Hrs

Flip-flops : Introduction, Flip-flop types : RS, Clocked RS, JK, JK Master slave, D; Applications of flip-flops, Shift Registers, Types of shift register – SISO, SIPO, PISO, PIPO and Applications shift Register, Counters – Classification – Asynchronous counter, 4-bit asynchronous ripple counter, Synchronous counter, 4-bit Up/Down counter, Applications.

Unit-V Introduction to Computers & Computer Software   6 Hrs

Introduction, Characteristics of Computers, Evolution of Computers (abstract only), Generations of Computers, Classification, Computer System, Applications.

Software, Software categories, Machine language, Assembly Language, High level language, Software terminologies.

Unit-VI : Peripherals & Memory   12 Hrs

Input devices**:** Keyboard and it's working principle, Mouse and it's working principle, Touch Screen, light Pen, Joystick, scanner, web camera. Output devices: Impact and Non-impact printers, Dot matrix printer, Inkjet printer, laser printer, basic principle of CRT.

Primary memory- RAM, ROM, Types of ROM, Secondary memory- Hard disk and its working principle, Optical disk – DVD, Blue Ray.

Text Book:

Unit-I to Unit IV – Digital Fundamentals, Thomas L. Floyd, Pearson Education, ISBN:9788131734483

Unit V & Unit-VI – Introduction to Computer Science, ITL Education Solutions Pvt. Ltd., Pearson Education.

Reference:

1. Fundamentals of Computers, V Rajaraman, PHI
2. Introduction to Computers and Data Processing, KOGENT Learning Solutions Inc, Dream Tech.

Course Delivery:

The course will be delivered through lectures and presentations

Course Assessment and Evaluation Scheme:

		What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Assessment		CIE (Continuous Internal Evaluation)	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1 to 6
					Student Activity	05	Assignment books	1 to 6
Direct method		SEE (Semester End Examination)	End Exam		End of the course	100	Answer scripts at BTE	1 to 6
Indirect Assessment		Student Feedback on course		Students	Middle of the course	-NA-	Feedback forms	1, 2,3 Delivery of course
		End of Course Survey			End of the course	-NA-	Questionnaires	1 to 6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

Sl. No	Bloom's Category	%
1	Remembrance	15
2	Understanding	45
3	Application	40

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year		Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM			20
	Year:			

Name of Course coordinator :   Units:__
CO's:____

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 AM	II SEM	Digital & Computer Fundamentals	20
	Year: 2015-16	Course code:15CS21T	

Name of Course coordinator :
Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	CL	CO	PO
1	What is binary number system and Explain. (5)	R, U	1	1,2
2	Convert the following (5) i. 11101_2 Binary to decimal number. ii. 146_8 Octal to decimal number. OR What is the purpose of binary coding system? Explain any two terms 1) BCD 2) EBCDIC 3) ASCII CODE 4) GRAY CODE	R, U	1	1,2
3	Realize NAND gate using NOR gate. (10) OR Write the Laws and Rules of Boolean Algebra. OR Simplify the expression $Y = \overline{(\overline{A} + C) \cdot (B + \overline{D})}$	R, U	2	1,2

Format for Student Activity Assessment

DIMENSION	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Score
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collects some basic information; refer to the topic	Collects relevant information; concerned to the topic	Collects a great deal of information; all refer to the topic	3
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs all duties	Performs all duties of assigned team roles with presentation	4
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Does the assigned job without having to be reminded.	Always does the assigned work without having to be reminded and on given time frame	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Listens, but sometimes talk too much	Listens and contributes to the relevant topic	Listens and contributes precisely to the relevant topic and exhibit leadership qualities	3
					TOTAL	13/4=3.25

All student activities should be done in a group of 4-5 students with a team leader.

II Semester Diploma in Computer Science & Engineering
Course**: Digital and Computer Fundamentals**

PART-A

I.   Answer any six questions.   5X6=30 marks

1. What do you mean by number system? Explain types of number system.
2. List any 5 Boolean algebra functions.
3. Write the truth table and logical symbol of OR gate.
4. List the applications of multiplexer.
5. What is a Flip-flop? Write the logical symbol of Flip-flop.
6. Define computer. List the characteristics of computers.
7. List the hierarchy of memory.
8. With a neat diagram explain the working of Keyboard.
9. Write a short note on laser printer.

PART- B

II.   Answer any seven full questions.   10X7=70 Marks

1. Explain the terms BCD, EBCDIC, ASCII CODE, GRAY CODE, and EXCESS-3 CODE.
2. Convert the following
   - iii. 11101_2 Binary to decimal number.
   - iv.   456 Decimal to binary number.
   - v. 146_8 Octal to decimal number.
   - vi. $5BC_{16}$ Hexadecimal to decimal number.
3. Construct the AND gate using NAND & NOR.
4. Explain the working of Half adder with logic diagram and truth table.
5. Explain the working of 4-bit serial in serial out(SISO) with logical circuit and truth table.
6. Explain Asynchronous counter. Give it advantages and disadvantages.
7. Draw a block diagram of computer system and explain.
8. List and explain the software categories.
9. a) What is Machine Language? write its advantages and disadvantages. (5marks)

   b) List the hierarchy of memory. (5 marks)
10. a) Define computer software. Write any 2 relationship between software and hardware. (4 marks)

   b) Write difference between Primary memory and Secondary memory. (6marks)

Course Title: **Digital and Computer Fundamentals**	Course Code: **15CS21T**

CO	Question	CL	Marks
I	What do you mean by number system? Explain types of number system.	U	05
	What is binary number system and Explain.	U	
	What is BCD and Explain.	U	
	Explain the concepts of 1's complement and 2's complement.	U	
	Addition of 1000 and 1010 using 1'complement.	U	
	Addition of 1111 and 1010 using 2'complement.	U	
	Subtraction of 1000 from 1010 using 1'complement.	U	
	Subtraction of 1010 from 1111using 2'complement.	U	
	How do you subtract a number in 1'compemnt?	U	
	How do you subtract a number in 2'compemnt?	U	

	Convert the following any 2
	    b. Binary to decimal i)11101_2
	    c. Decimal to binary i)456
	    d. Binary to octal i) 10001_2
	    e. Binary to hexadecimal i)1100_2
	    f. Octal to decimal i)146_8
	    g. Decimal to octal i)567
	    h. Decimal to hexadecimal i) 928
	    i. Hexadecimal to decimal i)$5BC_{16}$
	    j. Hexadecimal to Binary i)$7AC_{16}$
		U	

	What is Decimal number system and Explain?	U	
	What is octal number system and Explain?	U	
	What is hexadecimal number system and Explain?	U	
	What is ASCII code? Mention its applications.	U	
	Compare ASCII and EBCDIC.	U	
	What is the purpose of binary coding system? Explain the terms BCD, EBCDIC, ASCII CODE, GRAY CODE, EXCESS-3 CODE.	A	10
	How do you represent the number in excess-3 code and gray code?	A	
	What is the radix or base of the system? With the help of these systems, explain the various types of number system.	A	
II	Write the Laws of Boolean Algebra.	R	05
	Write the Rules of Boolean Algebra.	R	
	List any 5 Boolean algebra functions.	U	
	Write the truth table and logical symbol of OR gate.	U	
	Write the truth table and logical symbol of AND gate.	U	
	Write the truth table and logical symbol of NOT gate.	U	

	Write the truth table and logical symbol of NOR gate.	U	
	Write the truth table and logical symbol of NAND gate.	U	
	Write the truth table and logical symbol of XOR gate.	U	
	Write the Laws and Rules of Boolean Algebra	R	
	Explain Boolean algebra functions with an example.	U	
	Explain Logic gates - OR, AND, NOT, NAND, NOR, XOR, and EX-NOR	U	
	Write the truth table of basic gates. (OR, AND, NOT)	U	
	Construct the OR gate using NAND & NOR.	A	
	Construct the AND gate using NAND & NOR.	A	
	Realize NAND gate using NOR gate.	A	

	With expressions state the Boolean laws
	  a. Commutative law
	  b. Associative law
	  c. Distributive law
		U	10

	Simplify the expression $Y = A\bar{B}D + AB\bar{D}$	A	
	Simplify the expression $Y = (\bar{A} + B)(A + B)$	A	
	Simplify the expression $Y = ACD + \bar{A}BCD$	A	
	Simplify the expression $Y = \overline{A\bar{B} + C}$	A	
	Simplify the expression $Y = \overline{(A + C) \cdot (B + \bar{D})}$	A	
	Simplify the expression $Y = \overline{A + \bar{B} \cdot C}$	A	
III	What is the difference between a full-adder and a half-adder?	U	05
	List the applications of multiplexer.	A	
	Define encoder and decoder	U	
	Explain the working of half adder with logic diagram and truth table.	U	
	Explain the working of full adder with logic diagram and truth table.	U	
	Explain with a neat circuit and truth table the working of BCD to Decimal encoder.	A	
	Explain with a neat circuit and truth table the working of BCD to Decimal decoder.	A	10
	Explain with a neat circuit and truth table the working of decimal to BCD decoder.	A	
	Explain the working of 1:4 demultiplxer with logical circuit and truth table.	A	
	Explain the functioning of 4:1 multiplexer. With a block diagram and truth table	A	
IV	What is a Flip-flop? Write the logical symbol of Flip-flop.	U	
	List the different types of Flip-flops.	U	
	What is race around condition? In which Flip-flop it is overcome.	U	
	List the applications of Flip-flop.	A	
	What is Shift Registers? List its applications.	A	05
	Write the functions of Shift Registers and List its types.	A	

Define Counter. Write its applications.	A	
Compare Asynchronous and Synchronous counter.	U	
List and explain the different types of Flip-flops.	U	
Explain RS Flip-flop with truth table, logic symbol and logical circuit.	U	
Explain JK Flip-flop with truth table, logic symbol and logical circuit.	U	
Explain JK Master Slave Flip-flop with truth table, log symbol and logical circuit.	U	
Explain D-Flip-flop with truth table, logic symbol and logical circuit.	U	
Explain the working of 4-bit parallel in serial out (PISO) with logical circuit and truth table.	A	10
Explain the working of 4-bit serial in parallel out (SIPO) with logical circuit and truth table.	A	
Explain the working of 4-bit serial in serial out (SISO) with logical circuit and truth table.	A	
Explain the working of 4-bit parallel in parallel out (PIPO) with logical circuit and truth table.	A	
Explain 4-bit asynchronous ripple counter.	A	
Explain 4-bit synchronous up/down counter.	A	
V	Define computer. List the characteristics of computers.	U	
	List the classification of computers.	A	
	Explain the First Generations of Computers.	U	
	Explain the second Generations of Computers.	U	05
	Explain the third Generations of Computers.	U	
	Explain the Fourth Generations of Computers.	U	
	Explain the Fifth Generations of Computers.	U	
	List various applications of computers.	A	
	Draw a block diagram of computer system and explain. (Components of computer)	U	10
VI	Define computer software. What is the relationship between software and hardware.	R	
	What is Machine Language? Write its advantages and disadvantages.	U	
	What is Assembly Language? Write its advantages and disadvantages.	U	
	What is High level Language? Write its advantages and disadvantages.	U	
	List the Software terminologies.	R	
	List input devices of computer.	R	
	List output devices of computer.	R	
	With a neat diagram explain the working of keyboard.	U	05
	What is the use of joystick and light pen?	A	
	What is the use of scanner and web camera?	A	
	What is the use of mouse and touch screen?	A	
	Compare Impact and Non-impact printer?	U	
	Write a short note on dot-matrix printer.	U	
	Write a short note on laser printer.	U	

Write a short note on inkjet printer.	U	
What is memory? What are the different types of memory?	U	
Mention the various units, which are used for measuring the computer memory.	U	
List the hierarchy of memory.	U	
Compare RAM and ROM.	U	
What is ROM? What are the types of ROM?	U	
What is Primary memory? Give examples.	U	
What is Secondary memory? Give examples	U	
List and explain the software categories.	U	
Explain any four Software terminologies.	U	
Explain the working principles of keyboard.	U	
Explain the keyboard layout.	U	
Explain the working principles of mouse.	U	**10**
Draw the block diagram and explain the working principles of CRT	U	
List and Explain the hierarchy of memory	U	
Explain the working principle of hard disk.	U	
What is Optical disk? Give examples.	U	
Write difference between Primary memory and Secondary memory.	U	
List the advantages and disadvantages of Optical disk?	U	
What are the benefits of Secondary memory?	U	