BANGLADESH TECHNICAL EDUCATION BOARD

Curriculum

ADVANCED CERTIFICATE COURSE IN COMPUTER TECHNOLOGY CURRICULUM
ONE YEAR PROGRAM
(Effective from 2023 Academic Year)

COURSE STRUCTURE
OF
ADVANCED CERTIFICATE COURSE IN COMPUTER TECHNOLOGY
TECHNOLOGY CODE: 22

FIRST SEMESTER:

Sl.	Subject Code	Subject Name	T	P	C	Marks				
						Theory		Practical		
						Cont. Assess	Final Exam	Cont. Assess	Final Exam	Total
1	12211	ICT & Computer Office Application	1	6	3	20	30	50	50	150
2	12212	Computer Fundamentals & Operating System	2	3	3	40	60	25	25	150
3	12213	Data Structure & Algorithm	2	3	3	40	60	25	25	150
4	12214	Programming in Python	2	6	4	40	60	50	50	200
5	12215	Graphics design	0	6	2	-	-	50	50	100
6	12216	Business English	1	3	2	20	30	50	-	100
		Total	8	27	17	160	240	250	200	850

SECOND SEMESTER:

Sl.	Subject Code	Subject Name	T	P	C	Marks				
						Theory		Practical		
						Cont. Assess	Final Exam.	Cont. Assess	Final Exam	Total
1	12221	Digital Marketing	0	6	2	0	0	50	50	100
2	12222	Programming in C	2	3	3	40	60	25	25	150
3	12223	Computer Networking & Security	2	3	3	40	60	25	25	150
4	12224	Web Development	0	9	3	0	0	75	75	150
5	12225	Database Management System	2	3	3	40	60	25	25	150
6	12226	Digital System	2	3	3	40	60	25	25	150
7	12227	Industrial Attachment	-	-	6	-	-	150	150	300
		Total	8	27	23	160	240	375	375	1150

BANGLADESH TECHNICAL EDUCATION BOARD

Curriculum

ADVANCED CERTIFICATE COURSE IN COMPUTER TECHNOLOGY CURRICULUM
(FIRST SEMESTER)

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12211	ICT & COMPUTER OFFICE APPLICATION	1	6	3

Subject Description	This subject is designed to provide basic knowledge on ICT; basic rules of typing; and function of computer and allied devices. This subject also helps students develop required skill to typing Bangla & English; using the internet for E-Communication ICT the forTeaching Learning Process and use of Word processor, Spread sheet, analysis and Presentation Packages.
Learning Outcome	After completing this subject, students will be able to: • present the application of ICT and basic rules of Typing • perform the use internet for e-communication & interaction • explain the function of computers and allied devices • operate the Word Processing and Spreadsheet Application • develop a Presentation document • use of ICT in the Teaching-Learning Process.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Period
1	**ICT APPLICATION** 1.1 ICT uses in Bangladesh: Policy, Plan, and current status. 1.2 Scopes and current scenario of the use of ICT in private and public sector 1.3 Digital Bangladesh: E-governance, E-commerce, E-agriculture 1.4 Major features of Digital Act. 2018.	5
2	**COMPUTER AND ALLIED DEVICES** 2.1 Computer Peripherals & Its classification 2.2 Characteristics and features of different types of Printer 2.3 Basic Features of Scanner 2.4 Function of Special Peripherals devices (OMR, OCR, Digitizer, Light Pen, Speech recognizer, etc.)	2
3	**ENGLISH AND BANGLA TYPING** 3.1 Rules of typing practice for Occupational safety and health (OSH) 3.2 Specification of furniture used for typing to maintain the OSH. 3.3 Home-keys for English & Bangla typing practice 3.4 Concepts of CPS, WPM, Accuracy, and percentage of error in typing;	1
4	**USE THE INTERNET FOR E-COMMUNICATION & INTERACTION** 4.1 Concept of Internet Resources 4.2 Familiar with Internet terminologies (Browser, web page, URL, HTML and http/https, www, E-mail, social media, IP, Download, Malware, Router, Bookmark, E-commerce, etc.) 4.3 Concept about Web services 4.4 Features of Webmail and Email.	2
5	**WORD PROCESSING APPLICATION** 5.1 Features of menus and ribbon items of word processor software 5.2 Different file formats of saving documents in the word processor 5.3 shortcut commands of word processor 5.4 Mail merge & features of mail merge	1
6	**SPREADSHEET ANALYSIS PACKAGE** 6.1 Features of menus and ribbon items of Spreadsheet Analysis Package 6.2 Different file formats of saving documents in the Spreadsheet	1

	6.3 Formula & Function of Spreadsheet Analysis Package 6.4 Syntax of functions (include but not limited to: SUM, AVERAGE, IF, MAX, MIN, COUNT, RANK, Date and Time, AND, OR, NOR, Between, ABS, etc.)	
7	**ICT in Teaching-Learning Process:** 7.1 Features of presentation software 7.2 Digital content & Digital content in the classroom 7.3 E-book, E-textbook, and E-learning material 7.4 Online/Virtual classroom	3
	Total	15

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment name with the procedure	Period
1	**OPERATE A COMPUTER AND ALLIED DEVICES** 1.1 Operate Computer properly as per startup and shutdown method 1.2 Perform Basic Settings (such as date-time display system, OS version, system information, font installation as per requirement, adjust the screen resolution, color setting, etc.) of a PC. 1.3 Install Printer and Scanner drivers 1.4 Perform basic settings Printer & Scanner	6
2	**TYPE TEXT AND DOCUMENTS IN ENGLISH AND BANGLA** 2.1 Install the Typing Tutor software. 2.2 Install required fonts for typing Bangla and English. 2.3 Practice text typing in English and Bangla. 2.4 Practice English & Bangla Home key drilling systematically. 2.5 Practice Typing in English as per Standard procedure (30 WPM) and Bangla (25 WPM)	15
3	**USE INTERNET FOR E-COMMUNICATION & INTERACTION** 3.1 Access resources from the internet using browser, Search engines, from/to website and social media. 3.2 Use Web Services & Google services. 3.3 Use and manage E-mail (include but not limited to: create a new e-mail, send E-mail to different types of recipients using CC and BCC option; Read, forward, reply, and delete E-mail as per requirement; Create and manipulate custom email folders; Print E-mail message)	9

4	**OPERATE WORD PROCESSING APPLICATION** 4.1 **Start word processing application** package properly. 4.2 **Create word documents** ((include but not limited to: Word documents with different text & Fonts, image and table, Application / Official letter/CV with proper paragraph and indenting, spacing, styles, illustrations, tables, header & footers and symbols, Standard report/newspaper items with the column, footnote and endnote, drop cap, indexing and page numbering) use Document templates as per job required. 4.3 **use Formatting Tools** when creating the document (such as Bold, Italic, Underline, Strikethrough, Subscript, Superscript, Change case, Text highlight color, Font color, Font, Font size, Clear formatting, Format painter, Illustrations and styles, Text, Table, Symbols, Header & footer, Text alignment) 4.4 **Insert and edit Equation** as per requirement. 4.5 **Customize basic settings to meet page layout conventions** 4.6 **Change Alignment and line spacing** according to document requirements and Modify Margins to suit the purpose of the document. 4.7 **Format documents** using formatting features, Symbol and styles; Insert headers and footers; Save Documents as file format (such as .doc, .docx, .pdf, . xps , .xml) 4.8 **Save and close document** to a Storage device (such as Flash Drive, Hard Disk Drive, Memory Card) as per requirements. 4.9 **Create table** (Insert standard table into the document; Split and /or merge the cells to meet the information requirement; Insert, delete, modify and move columns and rows if necessary; Insert Text into the table; Add formula to the table as per job requirement). 4.10 **Add illustrations** (Picture, clip art, Shapes, Smart Art, Chart) into document and Position and resize images according to the requirements. 4.11 **Perform mail merge operation** 4.12 **Create references** (such as Footnote, endnote and citation) into the documents as required. 4.13 **Print documents**	21
5	**OPERATE SPREADSHEET APPLICATION** 5.1 **Create spreadsheets:** Create spreadsheet files and enter numbers, text and symbols into cells according to information requirements. 5.2 **Enter simple *formulas and functions*** (include but not limited to: SUM, AVERAGE, IF, MAX, MIN, COUNT, RANK, Date and Time, Math and Trig, AND, OR, NOR, Between, ABS, Greater than, less than etc. and apply Mathematics, Logical, Simple statistical functions) 5.3 **Format spreadsheet: (**Use formatting **tools**, Align information, Insert headers and footers using formatting features) 5.4 **Sort and filter data in worksheet.** 5.5 **Create worksheets:** (include but not limited to: Simple data sheet; salary sheet; Grade sheet; Tabulation sheet; electric bill) 5.6 **Sort and filter data in worksheet** 5.7 **Create charts**: (Column, Pie, Line, Bar, Table, Scatter, etc.) 5.8 **Incorporate object and chart in spreadsheet.** 5.9 **Print spreadsheet.**	21
6	**OPERATE PRESENTATION PACKAGE** **6.1 Create presentations with a simple design using a presentation template** **6.2 Customize basic settings of Presentation:** (different toolbar view option, font setting, view multiple slides at once, etc.) **6.3 Use various Illustrations in Presentation:** (Picture, Clip art, Photo, Shape, Smart art, Chart, etc.) **6.4 Use various Effect in Presentation**: (Entrance, Emphasis, Exit, Motion path, Sound,	18

	transition, and animation, etc.) **6.5 Format presentation as per Requirement** **6.6 Add Slide show effects** **6.7 Create template using master slide** **6.8 Print presentation and notes**	
	Total	90

Necessary Resources (Tools, equipment, & Machinery):

Sl	Item Name	Quantity
01	PC: System Unit, Monitor, Mouse, Keyboard	25 set
02	Printer	1 Set
03	Scanner	1 set
04	Windows operating system & MS Office software	in all PC
05	Typing software for Bangla & English type practices	in all PC
06	Internet connectivity	in all PC

Recommended Books:
It is recommended to follow the Competency standard of Computer Operation of BTEB

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
12212	COMPUTER FUNDAMENTALS & OPERATING SYSTEM	T	P	C
		2	3	3

Subject Description	This subject is designed to provide basic knowledge on Computer & Computer organization; Memory & Storage systems of Computer; and Hardware & Software of Computer. This subject also helps students develop required skill to Assemble & Disassemble of PC; Install an OS, Application software, Anti-virus, Printer & Scanner; and perform basic operation of OS.
Learning Outcome	After completing this subject, students will be able to: • present evolution, characteristics, generation & organization of computer • explain memory & storage system of computer • describe function of hardware components and peripherals of the computer • explain functions of different types of software • identify the different units & components of a Personal Computer • perform Disassemble & Assemble a desktop computer • install an operating system, Office Software, and Antivirus Software • connect & install printer & scanner • perform basic operations of operating system

Detailed Syllabus (Theory)

Chapter	Content	Period
1.	**COMPUTER BASICS** 1.1. Evolution of computer 1.2. Characteristics of different types of a computer depend on data processing, capability, size, speed, etc. 1.3. State the Generation of Computer 1.4. Explain the Basic organization of the computer with a block diagram	3

2.	**COMPUTER MEMORY** 2.1 State Computer memory 2.2 Characteristics of different types of Computer memory (RAM, ROM, PROM, EPROM, EEPROM, etc.) 2.3 Function of Primary and secondary in computer system 2.4 Differences between RAM and ROM 2.5 State memory units (Bit, Byte, Word, Kilobyte, Megabyte, Terabyte, etc.)	3
3.	**COMPUTER COMPONENTS & STORAGE** 3.1 Mention the Computer System Components 3.2 State the function of each component of the Computer system 3.3 State Computer Storage Devices 3.4 Mention the classification of different types of Storage Devices (HDD, SSD, Flash Memory, Optical Memory, etc.) 3.5 Characteristics of different types of Hard Disk (PATA, SATA, SSD, etc.) 3.6 Basic concept of Cloud storage	5
4.	**COMPUTER PERIPHERALS** 4.1 Classification of Peripheral Devices 4.2 Function and specification of general Peripheral devices (Keyboard, Mouse, Printer, Monitor, etc.) 4.3 Function of special Peripheral devices (Scanner, OMR, OCR, MICR, Digitizer, Light Pen, Speech recognizer, etc.) 4.4 Characteristics of different types of Printer 4.5 Features of Peripheral connection ports (Serial, Parallel, HDMI, USB/PS2, etc.) 4.6 Prepare Hardware specifications for a PC	6
5.	**SOFTWARE** 5.1 Mention the classification of Software 5.2 Show the relationship between Hardware, Application software, Operating system software, and user 5.3 Functional differences between Application software, System software, and Utility software 5.4 Necessity of Anti-Virus software	3
6.	**COMPUTER OPERATING SYSTEM (OS)** 6.1 Overview of Operating system software 6.2 State the functionalities and characteristics of OS 6.3 Explain the organization of OS 6.4 Basic concept of Process (Process states, Concurrent Process, Process control block, Process Context, Interrupt Processing, etc.) 6.5 Basics of Techniques of Job & Process Scheduling 6.6 Concept of Deadlock 6.7 Concept of Virtual memory & Machine	10
		30

Detailed Syllabus (Practical)

Chapter	Content	Period
1.	**Identify the different units & components of a Personal Computer:** 1.1 Disconnect the PC from electrical supply 1.2 Disconnect units from each other 1.3 Open the Casing of system unit 1.4 Identify all components, ports and connectors of motherboard of PC 1.5 Set the casing properly 1.6 Reconnect all units of PC and electric supply properly.	3

2.	Disassemble and then assemble a Desktop PC: 2.1 Disconnect the PC from electrical supply 2.2 Disconnect units from each other 2.3 Open the Casing of system unit 2.4 Disassemble all units and components form motherboard 2.5 Assemble all units and components to motherboard properly 2.6 Set the casing properly 2.7 Connect the electric supply and switch on the PC 2.8 Check whether the PC is working OK or not.	6
3.	**Install Operating System software:** 3.1 Select a PC to install OS 3.2 Select OS software as per requirement 3.3 Start installation step by step according to software guidelines 3.4 Complete the installation with proper HDD partition. 3.5 Install driver software as per requirement 3.6 Install Anti-Virus if necessary	9
4.	**Install Office Software/Application software:** 4.1 Select an OS installed PC to install Office/Application software 4.2 Select Office/Application software as per requirement 4.3 Start installation step by step according to software guidelines 4.4 Test the software after installation	9
5.	**Connect & Install Printer & Scanner:** 5.1 Connect Printer & Scanner to PC according to the port connectivity properly 5.2 Connect electric supply 5.3 Install the driver software for Printer & Scanner 5.4 Test the Printer & Scanner	3
6.	**Practice with Operating System Environment:** 6.1 Select, open, and close Desktop icons for navigation purposes 6.2 Create / Rename a folder 6.3 Cut/Copy/Paste a File or Folder 6.4 Run program/application based on job requirements 6.5 Create and manage User Accounts 6.6 Create Administrator & Local accounts 6.7 Set password for a user account	15
		45

Necessary Resources (Tools, equipment, & Machinery):

Sl	Item Name	Quantity
01	PC: System Unit, Monitor, Mouse, Keyboard	25 set
02	Printer	1 Set
03	Scanner	1 set
04	Windows operating system & MS Office software	in all PC
05	Windows operating system & MS Office software CD	10 set
06	PC servicing Toolbox	10 set

Recommended Books:

It is recommended to follow the Competency standard of BTEB

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12213	Data Structure & Algorithm	2	3	3

Subject Description	This subject is designed to provide basic concepts on different types of structures of data organizations & their algorithm. This subject also helps students develop the required skills to develop algorithms for different types of data operations.
Learning Outcome	After completing this subject, students will be able to: • present basics of data structure & algorithm • explain the function of basic types of data structures • describe the working principle of the searching & sorting algorithm • develop the algorithm to program coding

Detailed Syllabus (Theory)

Unit	Topics with Contents	Period
1	**Data structure** 1.1 Define data structure. 1.2 Mention the necessity of data structure. 1.3 Mention standard data types. 1.4 State types of data structure. 1.5 Describe different types of data operation.	2
2	**Algorithm** 2.1 State the characteristics of algorithm 2.2 Define pseudo code. 2.3 Explain algorithmic notations. 2.4 Discuss stepwise refinement of algorithm 2.5 Describe the Complexity of algorithm	3
3	**Arrays and List structure** 3.1 Point out the Characteristics of array and list data structure 3.2 Mention dimension of array with diagram 3.3 Distinguish between Memory location and index 3.4 Describe traversing Algorithm in arrays/list. 3.5 Describe algorithm for inserting element into array/list. 3.6 Explain algorithm for deleting elements from array/list.	4
4	**Stack structure** 4.1 State the stack data structure 4.2 State the terms of PUSH, POP, FIFO & LIFO. 4.3 Describe algorithm for adding data into a Stack. 4.4 Describe algorithm for removing data from a Stack. 4.5 Mention concept of Infix, Postfix & Prefix expression 4.6 Convert the simple infix expression to postfix and prefix expression and Vice versa.. 4.7 Explain the algorithms to transform infix expression into polish Expression.	3
5	**Queue structure** 5.1 State the queue data structure. 5.2 Discuss priority queues.	2

	5.3 Differentiate between stack and queue. 5.4 Describe algorithms for inserting data into queues. 5.5 Explain algorithms for deleting data from queues. 5.6 Describe the de-queue data structure.	
6	**Linked list structure** 6.1 State the linked list data structure. 6.2 Represent memory allocation in linked list. 6.3 Explain the algorithms to traverse a linked list. 6.4 Explain the algorithms for searching a linked list. 6.5 Describe the algorithms for inserting data into a linked list 6.6 Describe the algorithm for deleting data from a linked list.	**3**
7	**Tree data structure** 7.1 State the tree data structure. 7.2 State common tree terminologies: Root, Node, Leaf, Keys, Sub-tree, Level, etc. 7.3 Describe types of tree structure. 7.4 Explain the algorithms for inserting data into a tree structure. 7.5 Explain the algorithm for deleting data from a tree structure. 7.6 Explain the algorithm for traversing a tree structure.	**3**
8	**Searching operation.** 8.1 State different techniques of search operation. 8.2 Explain algorithm for binary search in array / list. 8.3 Explain the algorithm for linear search in array / list. 8.4 Compare the complexity of linear & binary search algorithms.	**2**
9	**Sorting operation.** 9.1 State the sorting techniques. 9.2 Describe the technique of bubble sort, quick sort, heap sort, insertion sort, selection sort and merge sort. 9.3 Explain the algorithms for bubble sort, quick sort, heap sort, insertion sort, selection sort and merge sort. 9.4 Compare the complexity of different sorting algorithms.	**6**
10	**Graphical Data structure** 10.1 State the graphical data structure. 10.2 State common terminologies: Vertex, edge, Adjacency, Path 10.3 Describe basic operation of graph: Add vertex, add edge, display edge. 10.4 Explain the algorithms for draw graphical edge.	**2**
		30

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Period
1	**Develop and Test a program for data insertion and deletion into / from a Linear Array/list.** 1.1 Prepare algorithm for given problem. 1.2 Draw the flowchart as per the prepared algorithm. 1.3 Write code for given problem. 1.4 Compile the code and debug if required. 1.5 Execute the compile code. 1.6 Maintain the record of performed job.	3
2	**Develop and Test a program using PUSH and POP Operation in Stack.** 2.1 Prepare algorithm for given problem. 2.2 Draw the flowchart as per the prepared algorithm.	3

	2.3 Write code for given problem. 2.4 Compile the code and debug if required. 2.5 Execute the compile code. 2.6 Maintain the record of performed job.	
3	**Develop and Test a program to convert an infix expression to postfix expression.** 3.1 Prepare algorithm for given problem. 3.2 Draw the flowchart as per the prepared algorithm. 3.3 Write code for given problem. 3.4 Compile the code and debug if required. 3.5 Execute the compile code. 3.6 Maintain the record of performed job.	6
4	**Develop and Test a program for Data insertion and Deletion from a Queue.** 4.1 Prepare algorithm for given problem. 4.2 Draw the flowchart as per the prepared algorithm. 4.3 Write code for given problem. 4.4 Compile the code and debug if required. 4.5 Execute the compile code. 4.6 Maintain the record of performed job.	3
5	**Develop and Test a program for inserting and deleting nodes into / from a Linked List.** 5.1 Prepare algorithm for given problem. 5.2 Draw the flowchart as per the prepared algorithm. 5.3 Write code for given problem. 5.4 Compile the code and debug if required. 5.5 Execute the compile code. 5.6 Maintain the record of performed job.	6
6	**Develop and Test a program for inserting/Deleting item into/ from a tree structure** 6.1 Prepare algorithm for given problem. 6.2 Draw the flowchart as per the prepared algorithm. 6.3 Write code for given problem. 6.4 Compile the code and debug if required. 6.5 Execute the compile code. 6.6 Maintain the record of performed job.	3
7	**Develop and Test a program to find out data using linear search (item searching , location searching, max and min element, etc.)** 7.1 Prepare algorithm for given problem. 7.2 Draw the flowchart as per the prepared algorithm. 7.3 Write code for given problem. 7.4 Compile the code and debug if required. 7.5 Execute the compile code. 7.6 Maintain the record of performed job.	3
8	**Develop and Test a program to find out data using binary search.** 8.1 Prepare algorithm for given problem. 8.2 Draw the flowchart as per the prepared algorithm. 8.3 Write code for given problem. 8.4 Compile the code and debug if required. 8.5 Execute the compile code. 8.6 Maintain the record of performed job.	3
9	**Develop and Test a program to arrange data ascending and descending using Bubble sort and selection sort algorithm.** 9.1 Prepare algorithm for given problem.	6

	9.2 Draw the flowchart as per the prepared algorithm. 9.3 Write code for given problem. 9.4 Compile the code and debug if required. 9.5 Execute the compile code. 9.6 Maintain the record of performed job.	
10	**Develop and Test a program to arrange Data Ascending and Descending using Quick Sort and Merge sort.** 10.1 Prepare algorithm for given problem. 10.2 Draw the flowchart as per the prepared algorithm. 10.3 Write code for given problem. 10.4 Compile the code and debug if required. 10.5 Execute the compile code. 10.6 Maintain the record of performed job.	6
11	**Develop and Test a program to draw a graphical edge with two vertex** 11.1 Prepare algorithm for given problem. 11.2 Draw the flowchart as per the prepared algorithm. 11.3 Write code for given problem. 11.4 Compile the code and debug if required. 11.5 Execute the compile code. 11.6 Maintain the record of performed job.	3
	Total	45

Necessary Resources (Tools, equipment's and Machinery):

Sl	Item Name	Quantity
01	A well perform PC	1 set per student
02	Power Supply	
03	Windows Operating System	
04	Programming Language such as : Thonny	

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Data Structures	Seymour Lipchitz	(Schaum's Outline Series)
02	Data Structure and Algorithm	Md. Mokter Hossain Md. Masud Karim Md. Moynul Hoque	

Website References:

Sl	Web Link	Remarks
01	https://www.tutorialspoint.com/data_structures_algorithms	
02	https://www.*programiz.com* › dsa	
03	https://www.google.com	

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12214	PYTHON PROGRAMMING	2	6	4

Subject Description	This subject is designed to provide basic concepts of computer programming using Python language. This subject also helps students to develop the required skills in program coding.
Learning Outcome	After completing this subject, students will be able to: • present basics structure program • explain the function of Branching, looping, user-defined functions • Describe the working principle of list, tuple, set and dictionary operation. • Develop the simple program using Python language.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Period
1	**BASICS OF PROGRAMMING** 1.1 State Computer Programming. 1.2 Explain Programming Language and its Classification. 1.3 State Translator Programs. 1.4 Define Algorithm and Flowchart. 1.5 Explain the uses of Flowchart symbols 1.6 Prepare Algorithm and Flowchart for simple problems. 1.7 Explain the Process of Program Planning.	3
2	**BASICS OF PYTHON** 2.1 State the features of Python. 2.2 Explain Identifiers and Keywords. 2.3 Explain Lines, Indentation, Multi-Line Statements. 2.4 State the uses of Quotation and Comments in Python. **2.5** Describe Command Line Arguments.	2
3	**VARIABLES AND DATA TYPES** 3.1 State variables 3.2 Explain the rules of naming variables 3.3 Assign Values to Variables. 3.4 Describe Standard Data Types. 3.5 Explain Data Type Conversion. 3.6 Write programs using variable/multiple variables.	2
4	**PYTHON OPERATORS** 4.1 State Operators and their types. 4.2 Describe Arithmetic Operators, Comparison Operators, and Logical Operators. 4.3 State Assignment Operators, Bitwise Operators, Membership Operators, and	3

	Identity Operators. 4.4 Explain Operators Precedence. 4.5 Calculate the value of expression according to the precedence of operators.	
5	**BRANCHING STRUCTURE** 5.1 State conditional and unconditional branching with flowchart. 5.2 Explain the syntax of if, if .... else, if....elif statements. 5.3 Draw the flowchart of if, if .... else, if....elif statements. 5.4 Write programs using if, if .... else, if....elif statements.	**4**
6	**LOOPING STRUCTURE** 6.1 State conditional and unconditional loop with flowchart. 6.2 Explain the syntax of for & while statements. 6.3 Draw the flowchart of for & while statements. 6.4 Describe nested loop. 6.5 Write programs using for, while & nested loop.	**4**
7	**LIST STRUCTURE** 7.1 Define List structure 7.2 Assign Values in List. 7.3 Explain Updating and Deleting List Elements. 7.4 State Basic List Operations. 7.5 Explain Built-in List Functions and Methods. 7.6 Write programs using List	**2**
8	**TUPLES STRUCTURE** 8.1 Define Tuple 8.2 Distinguish between List & Tuple 8.3 Assign Values in Tuple 8.4 Explain Updating and Deleting Tuple Elements 8.5 Describe Basic Tuple Operations 8.6 Explain Built-in Tuple Functions. 8.7 Write program using Tuples.	**2**
9	**SET STRUCTURE** 1.1 State Set structure in Python. 1.2 Mention the properties of Set items. 1.3 Explain creating a Set using curly braces and set() method. 1.4 Explain Adding items to the set and Removing items from the set. 1.5 Describe Python set operation (Union, Intersection, difference). 1.6 Write programs using Set in Python.	**2**
10	**DICTIONARY STRUCTURE** 10.1 Define Dictionary in Python. 10.2 State Accessing Values in Dictionary 10.3 Describe the process of values are Added into dictionary values 10.4 Describe the process of elements are Deleted from the Dictionary 10.4 Mention the properties of Dictionary Keys 10.5 Explain Built-in Dictionary Functions & Methods 10.6 Write programs using Dictionary	**2**
11	**FUNCTION OPERATION** 1.1 Define a Function 1.2 Distinguish between library & user-defined function 1.3 State Calling a Function 1.4 Explain Passing by Reference Versus Passing by Value	**2**

	1.5 Describe Function Arguments 1.6 Mention Uses of Date and Time Functions. 1.7 Write programs using user-defined functions.	
12	**FILES I/O OPERATION** 1.1 State the File Operation. 1.2 Describe the File opening modes. 1.3 Describe the File Opening and Closing functions. 1.4 Explain the File Reading and Writing functions. 1.5 Write programs for file input/output operation.	**2**
	Total	**30**

Detailed Syllabus (Practical)

Sl.	Experiment name with the procedure	period
1	**WRITE & EXECUTE PROGRAMS USING VARIABLES & OPERATORS** 1.1 Prepare Algorithm for given problems (include but not limited to: message printing, arithmetic operation, area calculation, temperature unit conversion) 1.2 Draw the flowchart as per the prepared algorithm 1.3 Write code for the given problem 1.4 Compile the code and debug if required. 1.3 Execute the compiled code. 1.4 Maintain the Record of Performed Job.	6
2	**WRITE & EXECUTE PROGRAMS USING BRANCHING STATEMENTS** 2.1 Prepare Algorithm for given problems (include but not limited to: larger/largest number from two/three numbers; given number is odd /even, +ve/-ve; area of different types triangles; calculate the different discount for different bill amount, determine GP; GPA calculation; given year is a leap year or not; roots of a quadratic equation, Arithmetic calculator;) 2.2 Draw the flowchart as per the prepared algorithm 2.3 Write code for the given problem 2.4 Compile the code and debug if required. 2.3 Execute the compiled code. 2.4 Maintain the Record of Performed Job.	12
3	**WRITE & EXECUTE PROGRAMS USING LOOPING STATEMENTS** 3.1 Prepare Algorithm for given problems (include but not limited to: Printing of series, even, odd, prime, and Fibonacci number; summation of arithmetic series; check prime number; print prime & Fibonacci; Find factorial value) 3.2 Draw the flowchart as per the prepared algorithm 3.3 Write code for the given problem 3.4 Compile the code and debug if required. 3.5 Execute the compiled code. 3.6 Maintain the Record of Performed Job.	12
4	**WRITE & EXECUTE PROGRAMS USING LISTS/ARRAY** 4.1 Prepare Algorithm for given problems (include but not limited to: search an item; Largest/Smallest number; print all index number of the same item; delete all the same item; summation of all elements; sorting data) 4.2 Write code for the given problem using LIST/ARRAY structure (don't use the python methods) 4.3 Compile the code and debug if required. 4.4 Execute the compiled code. 4.5 Maintain the Record of Performed Job.	3

5	**WRITE & EXECUTE PROGRAMS USING USER-DEFINED FUNCTIONS** 5.1 Prepare Algorithm for given problems (include but not limited to: create user-defined function, calling function in different techniques, use of different types of arguments, programs using **def** and **lambda** functions) 5.2 Write code for the given problem 5.3 Compile the code and debug if required. 5.4 Execute the compiled code. 5.5 Maintain the Record of Performed Job.	6
6	**WRITE & EXECUTE PROGRAMS USING SET** 6.1 Prepare Algorithm for given problems (include but not limited to: programs using Union, intersection, difference, and symmetric set operations) 6.2 Write code for the given problem 6.3 Compile the code and debug if required. 6.4 Execute the compiled code. 6.5 Maintain the Record of Performed Job.	3
7	**WRITE & EXECUTE PROGRAMS USING A DICTIONARY** 7.1 Prepare Algorithm for given problems (include but not limited to: creating a dictionary; accessing elements from the dictionary; adding/removing elements to/from the dictionary) 7.2 Write code for the given problem 7.3 Compile the code and debug if required. 7.4 Execute the compiled code. 7.5 Maintain the Record of Performed Job.	3
8	**WRITE & EXECUTE PROGRAMS USING FILES** 8.1 Prepare Algorithm for given problems (include but not limited to: creating a file using python methods; file open and close in different modes, file read/write operation) 8.2 Write code for the given problem 8.3 Compile the code and debug if required. 8.4 Execute the compiled code. 8.5 Maintain the Record of Performed Job.	6
9	**COURSE PROJECT (Mandatory):** • **Prepare a small Database project using Python** 1.1 First of all, the Course Instructor will develop a small project as a sample and display it to students. 1.2 Students will develop the teacher's project as per the requirement 1.3 Teachers may follow the video link to prepare a small sample project as below: https://www.youtube.com/watch?v=-fWXAN9xcVg 1.4 Presentation session for the developed project by students.	39
		90

Necessary Resources (Tools, equipment and Machinery):

Sl	Item Name	Quantity
01	System Unit, Monitor, Mouse, KeyBoard	25 set
02	Printer	1 Set
03	VSCode, IDLE ,PyCharm, SublimeText, Anaconda	5 Set
04	Jupiter notebook	5 Set

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Learning Python	Mark Lutz	5th Edition

02	Python Programming: An Introduction to Computer Science	John Zelle	3rd Edition
03	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython	Wes Mckinney	2nd Edition
04	Learn Python the Hard Way	ZED SHAW	3rd Edition
05	Learn Python in 1 Day: Complete Python Guide with Examples	ZED SHAW	

Website References:

Sl	Web Link	Remarks
01	http:// python.howtocode.com.bd http://	
02	http://www.learnpython.org	
03	http://pythontutor.com	
04	https://www.gcreddy.com/2021/07/python-data-types.html	
05	https://www.guru99.com/python-tutorials.html	
06	https://docs.python.org/3/tutorial/modules.html	
07	https://techvidvan.com/tutorials/top-python-books/	
08	https://www.w3schools.com/python/default.asp	
09	For Project work: https://www.youtube.com/watch?v=-fWXAN9xcVg	

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12215	Graphics Design	0	6	2

Subject Description	Graphic Design is a foundation course that familiarize the student with basic principles and fundamentals in visual art and design; develop basic skills using tools and theory used in design process; understand the creative process, develop techniques, and methods of creative problem solving.
Learning Outcome	**After completing this subject, students will be able to:** • perform image retouching • prepare secondary and tertiary color • create vector image using adobe illustrator software • generate design concepts and sketches for client's approval • manipulate image • perform creative design using multiple design software

Detailed Syllabus (Practical)

Unit	Topics with Contents	Period
1	**PERFORM IMAGE RETOUCHING** **1. Identify image sources, standards, and import images for retouching** **1.1** Image sources (Scanner, Digital camera, Internet, Flash disk/memory, CD, DVD, HDD) are identified as per job requirement. **1.2** Images are successfully imported from the appropriate source.	15

	1.3 Image information are identified and demonstrated as per requirement **2. Perform colour correction, retouch the image and Save or transfer the image** 2.1 Appropriate image mode is selected for colour correction. 2.2 Various color correction methods (Brightness and contrast, Hue and saturation, Level, Curve, Selective colour, Variations) are identified and used. 2.3 Image enhancement is compared with the original one. **3. Retouch image** 3.1 Retouching tools are identified as per job requirement 3.2 Tools are calibrated as required. 3.3 Layers are created and preserved for further reference of work. Different retouch tools (Healing brush tool, Spot healing, Patch tool, Clone stamp tool, Pen tool, Magic wand tool, Leso tools, Brush tools, Crop tools, Selection tools) are used as per requirement. **4. Save and transfer the image as per requirement**	
2	**PREPARE SECONDARY AND TERTIARY COLOUR** **1. Identify elements of design principles and elements of visual design for preparing colour** 1.1 Elements of design principles (Balance, Proximity, Alignment, Visual hierarchy, Repetition / Pattern, Contrast, Colour, Space, Typography) are interpreted for performing standard design. 1.2 Elements of visual design (Line, Shape, Form, Colour, Texture, Space, Value) are interpreted. **2. Interpret colour** 2.1 Colour theory (Primary colour-Red, Blue, Yellow)(Secondary colour- Purple, Orange, Green) (Tertiary- Yellow – green, Yellow – orange, Red – orange, Red – purple, Blue – purple, Blue – green) Hue, Saturation, Tint is interpreted. 2.2 Colour modes (RGB, Greyscale, CMYK, Lab, Bitmap) Index colour are interpreted. 2.3 Colour psychology is interpreted. **3. Prepare Secondary and Tertiary colour using primaries and by mixing primary and secondary colours** 3.1 Secondary colour is prepared using primaries. 3.2 Tertiary colour is prepared by mixing primaries and secondaries. 3.3 Shade is prepared by adding black. 3.4 Tint is prepared by adding white.	15
3	**CREATE VECTOR IMAGE USING ADOBE ILLUSTRATOR SOFTWARE** 3.1 Design a colorful business Card 3.2 Create a Comp Slip & Letterhead 3.3 Design Banner for printing 3.4 Design Letterhead Pad, Cash memo / Invoice/ Money receipt/ Form 3.5 Create Flyer / leaflet/ Brochure 3.6 Create an Invitation card 3.7 Design Festoon/ Poster, Follow steps and strategies as below when creating/designing the graphics • Take necessary preparation and collection of the materials • apply colour theory, colour psychology and design principles • Create an outline and transfer it to the recipients	15
4	**GENERATE DESIGN CONCEPTS AND SKETCHES FOR CLIENT'S APPROVAL** **1. Identify client's needs for designing a product** 1.1 Client requirements are identified through discussion and questions politely.	15

	1.2 Client requirements are gathered using the client's brief and documented as per organization standards. **2. Determine alternative ideas for developing design concept and select one** 2.1 Inspiration are re-searched for similar product or services. 2.2 Target audiences are identified and ensured according to age, gender, society and income and /or client requirement. 2.3 Different concepts and options are identified according to client needs. **3. Perform primary sketches** 3.1 Tools, equipment, material and documents are selected and collected for primary sketches. 3.2 Basic design sketches (storyboard) are developed and suggested according to design principles. **4. Obtain client's approval** 4.1 Client's consent for basic design sketches are obtained. 4.2 Amendments/modifications are made as suggested by the client. 4.3 Client's approval is obtained for the design concept.	
5	**MANIPULATE IMAGE** **1. Open or import an existing image** 1.1 Image sources are identified for manipulation 1.2 Scanned, retrieved, tonal corrected image(s) is/are collected as per requirement. 1.3 Image is optimized according to print design and output requirements. 1.4 Manipulation techniques are identified. 1.4 Manipulation tools are identified and selected. **2. Perform separation, resizing, edge refining, cropping, combining and colour adjusting & balancing of the image** 2.1 Images are separated using a separating tool as per requirement. 2.2 Images are cropped and resized as per requirement. 2.3 Manipulation techniques are applied as per requirement. 2.4 Typography is applied using font attributes as per requirement. **3. perform Blending and masking of the image** **4. perform Collaging of image** **5. Apply layer style** **6. Apply manipulation technique and effect**	15
6	**PERFORM CREATIVE DESIGN USING MULTIPLE DESIGN SOFTWARE** Select/determine the product for following creative design 6.1 Design a new magazine cover 6.2 Perform artwork design for T-shirt/ Bag etc. 6.3 Create Online Flayer / Online Banner 6.4 Perform design for Packet / Packaging Labels Follow steps and strategies as below when creating/designing the graphics • Identify requirements and analyze the customer's/user's psychology • Prepare for design and perform vector design and image editing • Apply colour theory, colour psychology and design principles Save and transfer the image to the authority/clients	15
	Total	90

Recommended Books:

It is recommended to follow the Competency standard of Graphics Design, NTVQF Level II,III

Website References:

http://www.btebcbt.gov.bd/utility/searchUser?sector=8&occupation=23&level=&btnSearch=Search

Sl	Web Link	Remarks
1	https://www.youtube.com/watch?v=pFyOznL9UvA	
2	https://www.youtube.com/watch?v=LV7ld2y0vYw	
3	https://fixthephoto.com/adobe-illustrator-cs6-crack.html	
4	https://www.youtube.com/watch?v=ka2dh5wU6Es	
5	https://www.youtube.com/watch?v=ntKZDCgSUPE	

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12216	Business English	1	3	2

Subject Description	The main focus of Business English is on improving the English language by using the right vocabulary and expressions for Soft skills, speaking & writing skills.
Learning Outcome	After completing this subject, students will be able to: • expand vocabulary related to general business situations • develop basic skills to deal with people in the workplace & business situations • develop speaking skills in different situations • develop writing skills in business

Detailed Syllabus

Sl.	Experiment name with the procedure	period (T+P)
1	**SOFT SKILLS:** 1.1 Work in a Team Environment 1.2 Demonstrate work values, practice career professionalism, and integrity in the workplace 1.3 Maintain health and safety procedures in the workplace 1.4 Maintain Personal Manner in the workplace	4+12
2	**SPEAKING SKILLS:** 2.1 Interpret the meaning of given words improving Vocabulary skills. 2.2 Speaking on a Specific Situation. 2.3 Public speaking. 2.4 Exchanging views with target persons. 2.5 Self Introducing. 2.6 Describing & narrating events, places, objects, etc.	5+15
3	**WRITING SKILLS:** 3.1 Improve writing skills using Task/Paragraph writing 3.2 Business letter writing 3.3 Business email writing 3.4 Business report writing 3.5 Essay writing.	6+18
		15+45

BANGLADESH TECHNICAL EDUCATION BOARD

Curriculum

ADVANCED CERTIFICATE COURSE IN COMPUTER TECHNOLOGY CURRICULUM
(SECOND SEMESTER)

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12221	DIGITAL MARKETING	0	6	2

Subject Description	This subject is designed to provide fundamentals of digital marketing and its business implications. This subject also helps students develop required skill on social media & other digital media marketing; Search engine optimization and Affiliate Marketing.
Learning Outcome	**After completing this subject, students will be able to:** • present digital marketing & content development process for digital marketing • perform Search Engine Optimization & Social Media Marketing • apply Lead Generation • Perform Affiliate Marketing

Detailed Syllabus (Practical)

1. CONCEPT OF DIGITAL MARKETING — 06 Periods

Elements of Competency	Performance Criteria
1. Describe Basic concept of marketing	1.1 Marketing and Marketing Mix are interpreted. 1.2 Difference between Marketing and Digital Marketing is comprehended 1.3 Types of Digital Marketing are identified. 1.4 Scope of Digital Marketing is identified. 1.5 Required Software for Digital Marketing are identified.
2. Identify career opportunities in the Digital Marketing	2.1. Local and international Digital Marketing job platforms are explored and identified 2.2. Job in the Digital Marketing are identified. 2.3. Emerging career path is defined.
3. Interpret Ethics and guidelines for Digital Marketing	3.1. Required Digital Marketing ethics and guidelines are explained. 3.2. Code of conduct for digital marketing is explained 3.3. Ethical Digital Contents are defined.
4. Strategize Digital Marketing	4.1 Demands from clients are identified 4.2 Target audience and customer segmentation are identified based on the strategy 4.3 Marketing Channels and unique selling point are identified. 4.4 Digital Marketing strategies are explained

2. INTERPRET CONTENT DEVELOPMENT PROCESS FOR DIGITAL MARKETING — 09 Periods

Elements of Competency	Performance Criteria

1. Generate Ideas for Content development	1.1 Client requirements are collected 1.2 Marketing objective is identified 1.3 Audience is identified 1.4 Best content channels are figured out 1.5 Content types are decided
2. Illustrate content development process	2.1. Information is gathered based on the content type 2.2. Topic is analyzed and finalized 2.3. Content is prepared and reviewed 2.4. Content is optimized

3. PERFORM SEARCH ENGINE OPTIMIZATION (SEO) **27 Periods**

Elements of Competency	Performance Criteria
1. Interpret basic concept of SEO	1.1 SEO is explained 1.2 Major Search Engines are identified 1.3 Browsers and Addons or extensions are recognized 1.4 Backlink and its importance are illustrated 1.5 Domain Authority and Page Authority are defined
2. Apply On-Page SEO techniques	2. 1 Keyword research & analysis are performed 2. 2 Title, URL, meta, header tag and contents are optimized 2. 3 Anchor text and internal/external links are shown and applied 2. 4 Pillar content is explained 2. 5 Initial site analysis is applied 2. 6 Page speed is optimized
3. Apply Off-Page SEO techniques	3.1. Search Engines and directory are submitted 3.2. Social Bookmarking is performed 3.3. Forum posting and directory submission are applied 3.4. Guest Posting, authority backlink are performed
4. Apply Technical SEO	4.1 Technical SEO is interpreted 4.2 Technical On-Page SEO is applied 4.3 Technical On-page optimization in site is applied 4.4 Structured data/schema markup is setup 4.5 Algorithm is explained 4.6 "Content is king" is explained
5. Apply Local SEO Techniques	5.1 The concept of local SEO is interpreted 5.2 Search engine optimization of a local business website is interpreted 5.3 Google My Business (GMB) page is setup 5.4 Structure of website for local SEO is created

4. PERFORM SOCIAL MEDIA MARKETING **24 Periods**

Elements of Competency	Performance Criteria
1. Interpret Social media marketing	1.1 Social media platforms are identified 1.2 Social Media Management Tools are identified

2. Create Profile on Social Media	2. 1 Profile is created and optimized 2. 2 Company page is created and managed 2. 3 Company group is created and managed
3. Perform Social Media Marketing (SMM)	3.1 Facebook marketing is performed 3.2 Twitter marketing is performed 3.3 LinkedIn marketing is performed 3.4 Pinterest marketing is performed 3.5 Instagram marketing is performed 3.6 Ad is created and managed 3.7 Reports & analytics are reviewed
4. Apply video Marketing	4.1 Basic video marketing is interpreted 4.2 Account is created and optimized 4.3 Ways of growing subscribers are explained 4.4 YouTube contents and YouTube tools are applied 4.5 Video monetization techniques are applied 4.6 Ad is created and managed 4.7 Reports & analytics are reviewed

5. **APPLY LEAD GENERATION** **24 Periods**

Elements of Competency	. Performance Criteria
1. Interpret and apply Email Marketing	1.1 Email marketing is defined 1.2 Sending procedure of bulk email is stated 1.3 Bulk email is collected 1.4 Business email is identified and collected 1.5 Business email from linkedIn is collected
2. Manage and Analyze Email Marketing	2.1. Duplicate email is checked and verified 2.2. Accounts are created using E-mail marketing tools 2.3. Effective email template is designed. 2.4. E-mail body is created 2.5. Email marketing campaign is performed 2.6. Reporting and analytics are reviwed
3. Identify and Apply Lead Generation	3.1. Basic and lead funnel are interpreted and applied 3.2. Outbound lead generation is applied 3.3. Inbound lead generation is applied 3.4. Social media marketing and lead generation tools is applied

6. **PERFORM AFFILIATE MARKETING** **24 Periods**

Elements of Competency	Performance Criteria
1. Interpret Affiliate Marketing	1.1 Affiliate marketing and common terms are defined 1.2 Advantages of affiliate marketing are defined 1.3 Requirements for an affiliate are identified 1.4 Profitable niches are identified 1.5 Factors for successful affiliate marketing are identified

	1.6 Available payment methods are identified and explained
2. Select Network/Platform for affiliate marketing	2.1. Types of affiliate networks are interpreted 2.2. Physical products network are listed 2.3. Affiliate with digital products is defined 2.4. Affiliate with print on demand is defined
3. Apply Marketing with affiliate	3. 1 Niche for amazon affiliate is researched 3. 2 Products research and topics for amazon affiliate are identified 3. 3 Niche site with WordPress is built 3. 4 SEO to promote website is applied 3. 5 SMM to promote website is applied

Recommended Books:

It is recommended to follow the Competency standard of Digital Marketing under NTVQF.

Website References:

http://www.btebcbt.gov.bd/

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
		T	P	C
12222	PROGRAMMING IN C	2	3	3

Subject Description	This subject is designed to help students becoming competent in C Programming. It provides students opportunities of gaining a clear understanding of C language and its structure as well as hands on activities of Programming. The contents include Operators and expressions of C; Decision making statements, Looping statements of C; Classes and structures; Polymorphism; Inheritance; Interface and Delegates.
Learning Outcome	After completing this subject, students will be able to: • Describe program structure of C. • Identify Data type, variable & operators in C programming • Explain Input output statement • Describe Control Statement • Write programs by using Array, Function & pointer. • Describe Common features of Object Oriented programming

Detailed Syllabus (Theory)

Unit	Content	Period
1.	**INTRODUCTION TO C** 1.1 Characteristics of C program 1.2 Program flowchart and algorithm 1.3 Structure of C program 1.4 C data type 1.5 Variable & Constant 1.6 Expression	3

	1.7 Keywords	
2.	**OPERATORS & STATEMENT** 2.1 Types of operator (Arithmetic, Logical, Relational, Assignment, Bitwise and Miscellaneous Operators etc.) 2.2 Operator Precedence 2.3 Input & Output Statement 2.5 Format specifier & Backslash Character	4
3.	**BRANCHING STATEMENT** 3.1. Syntax of if, if..else, nested if statement 3.2. Use of if, if..else, nested if statement 3.3. Syntax of switch statement 3.4. Use of switch statement 3.5. Prepare programs using branching statements	5
4.	**LOOP CONTROL STATEMENT** 4.1. Syntax of for, while, do-while, continue, go to loop 4.2. Use of for, while, do-while, continue, go to loop 4.3. Prepare programs using loop control statements	5
5.	**ARRAY & FUNCTION** 5.1 Array & its classification 5.2 Classifications of Function 5.3 Structure of function 5.4 Use of recursive function 5.5 Use of Pointers in C·programs 5.6 Prepare programs using user-defined function	3
6.	**OBJECT ORIENTED PROGRAMMING** 6.1 Concept of object oriented programming 6.2 Use of class in OOP 6.3 Use of Inheritance, Polymorphism and Encapsulation 6.5 Describe Base and Derived Classes 6.6 Use of common Methods in C	7
7.	**MEMORY MANAGEMENT IN PROGRAMMING** 7.1 Uses of Constructors and Destructors 7.2 Operator Overloading 7.3 Garbage collection 7.4 Exception handling and Packages	3
		30

Detailed Syllabus (Practical)

Chapter	Content	Period
1.	**DEVELOP PROGRAMS USING BASIC STRUCTURE, DIFFERENT VARIABLE AND OPERATORS OF C PROGRAMMING LANGUAGE** 1.1. Prepare Algorithm for given problem (include but not limited to: message printing, arithmetic operation, area calculation, temperature unit conversion, write program using different types of operator). 1.2. Draw the flowchart as per the prepared algorithm. 1.3. Write code for the given problem. 1.4. Compile the code and debug the code if required. 1.5. Execute the compiled code.	6

	1.6. Maintain the Record of Performed job.	
2.	**CREATE PROGRAMS USING DECISION STATEMENT** 2.1. Prepare Algorithm for given problem (include but not limited to: find the largest of three numbers, check whether the entered year is leap year or not, check whether input alphabet is vowel or not, calculate the GPA). 2.2. Draw the flowchart as per the prepared algorithm. 2.3. Write code for the given problem. 2.4. Compile the code and debug the code if required. 2.5. Execute the compiled code. 2.6. Maintain the Record of Performed job.	9
3.	**DEVELOP PROGRAMS USING LOOP STATEMENT EXERCISE** 3.1. Prepare Algorithm for given problem (include but not limited to: find the sum of first 10 natural numbers, calculate the factorial number, display first N prime numbers, find GCD and LCM of two numbers. 3.2. Draw the flowchart as per the prepared algorithm. 3.3. Write code for the given problem. 3.4. Compile the code and debug the code if required. 3.5. Execute the compiled code. 3.6. Maintain the Record of Performed job.	12
4.	**DEVELOP PROGRAMS USING FUNCTION & ARRAY** 4.1. Prepare Algorithm for given problem (include but not limited to: create a recursive function to find the Fibonacci number, call by reference and call by value, store elements in an array and print it, find the sum of all elements of the array, multiply two 3*3 matrix. 4.2. Draw the flowchart as per the prepared algorithm. 4.3. Write code for the given problem. 4.4. Compile the code and debug the code if required. 4.5. Execute the compiled code. 4.6. Maintain the Record of Performed job.	9
5.	**DEVELOP PROGRAMS USING OBJECT OREINTED PROGRAMMING** 5.1. Prepare Algorithm for given problem (include but not limited to: Perform Program to calculate Age in YY-MM-DD, program using Constructor and destructor, program using operator overloading, program using single inheritance, etc.) 5.2. Draw the flowchart as per the prepared algorithm. 5.3. Write code for the given problem. 5.4. Compile the code and debug the code if required. 5.5. Execute the compiled code. 5.6. Maintain the Record of Performed job.	9
		45

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	The C++ Programming Language	Bjarne Stroustrup	4th edition
02	Programming in C	E. Balagurusamy	3rd edition
03	C Programming Absolute Beginner's Guide	Greg Perry and Dean Miller	3rd Edition

Subject Code	Subject Name	Theory (T) & Practical (P)	Credit (C)

		Period/Week		
12223	COMPUTER NETWORKING & SECURITY	T	P	C
		2	3	3

Subject Description	This subject is designed to provide basic knowledge on Computer data communication; Communication medias; Computer networking & Security issues and basics of IoT. This subject also helps students develop required skill to establish LAN network; Install a Printer under LAN.
Learning Outcome	After completing this subject, students will be able to: • present data communication system, different types of cables & connectors • explain network topologies, protocols and securities • establish peer to peer and LAN network • install Printer in LAN network • perform to configure the firewalls of networks

Detailed Syllabus (Theory)

Chapter	Content	Period
1.	**CONCEPT OF DATA COMMUNICATION** 1.1. Define Data communication system 1.2. Explain communication system and data communication system with simple block diagrams. 1.3. State the terms: Frequency, Wavelength, Spectrum, Bandwidth, Throughput, Propagation speed, Propagation time, Noise figure & SNR 1.4. Describe Simplex, half-duplex and full duplex modes of communication system 1.5. Explain Synchronous and asynchronous communication techniques.	3
2.	**FUNDAMENTALS OF TRANSMISSION MEDIA** 2.1 State Transmission Media & its Classification 2.2 Describe the construction of Twisted-pair (STP, UTP), Co-axial and Fiber optic media 2.3 Advantage and disadvantages of each type of media 2.4 Explain the working principle of Radio, Microwave and Satellite communication system. 2.5 Explain Multiplexing and De-multiplexing process of communication system. 2.6 Characteristics of Bluetooth, WiFi & WiMAX system	5
3.	**BASICS OF COMPUTER NETWORKING** 3.1 Concept of Computer Network. 3.2 Advantages of Computer network. 3.3 Application of computer network. 3.4 General features of LAN, MAN and WAN. 3.5 Client / server and peer-to-peer network. 3.6 Network Device: NIC, Modem, Router, Gateway, Hub & Switch	5
4.	**NETWORK TOPOLOGIES & PROTOCOLS** 4.1 Network topology. 4.2 Difference between physical and logical topology. 4.3 Physical connection of bus, ring, star, mesh and hybrid topologies. 4.4 Main elements of protocol.	6

	4.5 List different types of network protocols. 4.6 State the function of TCP/IP and OSI protocol 4.7 IP address formats of class A,B,C,D &E with example. 4.8 Subnet and subnet masks. 4.9 Address format of IPv4 & IPv6.	
5.	**BASICS OF SECURITY** 5.1 State the Risk, vulnerability, and threat of computer network 5.2 Explain different types of attacks on a computer network 5.3 Cyber Bullying, propaganda, blackmailing 5.4 ICT and Ethics: Copyright, Intellectual Property, Rights, plagiarism 5.5 Symmetric Ciphers 5.5.1 Substitution &Transposition Techniques 5.5.2 Block Cipher 5.5.3 DES 5.6 Public Key Cryptography 5.6.1 Need and Principles of Public Key Cryptosystems 5.6.2 RSA Algorithm 5.7 Network Security 5.7.1 Firewalls 5.7.2 IP Security 5.7.3 VPN 5.7.4 Web security	6
6.	**INTRODUCTION TO INTERNET OF THINGS (IoT)** 6.1 State IoT & benefits of using IoT with example 6.2 Explain the building Blocks of IoT system 6.3 Working principle of IoT system 6.4 Specific types of IoT and its applications (IIoT, IoMT,V2X, IoBT) 6.5 Use of sensors in IoT 6.6 Challenges of IoT technology	5
		30

Detailed Syllabus (Practical)

Chapter	Content	Period
1.	**IDENTIFY DIFFERENT TYPES OF GUIDED COMMUNICATION MEDIA & CONNECTOR.** • Constructional features of UTP, STP, Co-axial Cable and Fiber Optic media • Identify different types of media and connector	3
2.	**PERFORM THE CONNECTIVITY OF MEDIA AND CONNECTORS** • Twisted Pair Cable- RJ45 Connectors and their constructional features. • Make a straight through cable and crossover cable by using crimping tools • Test the connectivity using cable Tester	9
3.	**ESTABLISH A PEER TO PEER NETWORK** • Select the all hardware for establish a peer to peer network • Complete the connectivity as per guideline • Check the performance	6
4	**ESTABLISH A WORKGROUP LAN** • Select the all hardware for establish a peer to peer network • Complete the connectivity as per guideline	12

	• Install software for create workgroup • Configure the LAN • Test the performance	
5	**INSTALL PRINTER IN A LAN NETWORK** • Select network Printer • Complete the connectivity as per guideline • Install software for printer configuration if necessary • Share the printer as per requirement • Test the Printer	6
6	**ESTABLISH IP ADDRESS, SUBNET** • Identify the network connectivity • Generate IP and Subnet as per requirement • Configure firewalls	9
		45

REFERENCE BOOKS:

Data communications and Networking – Behrouz A. Forouzan.
Cryptography & Network Security", PHI - William Stalling

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
12224	WEB DEVELOPMENT	T	P	C
		0	9	3

Subject Description	This subject is designed to provide basic knowledge on Web development. This subject also helps students develop required skill to using Markup language; web development using Framework, Scripting language, CMS and deploy the website.
Learning Outcome	After completing this subject, students will be able to: • present Web Technology and Industry Requirement • convert UI / UX to Markup Language • develop Responsive Website Using Framework and Scripting language • develop Dynamic Website Using CMS • deploy Website

Detailed Syllabus (Practical)

1. INTERPRET WEB TECHNOLOGY AND INDUSTRY REQUIREMENT

Elements of Competency	Performance Criteria
1. Interpret web technology	1.1 Web technology, web development is interpreted. 1.2 Front end and back end, full stack developer is stated. 1.3 UI/UX design layout is interpreted. 1.4 Roles of web developer is stated.

2. Identify career opportunities	2.1 Personal strengths and weaknesses are identified and analyzed. 2.2 Personal strengths and weaknesses are mapped according to purpose and objectives. 2.3 Trends of IT industry - its past, present and future are identified. 2.4 ***Career opportunities*** of a web developer are identified.
3. Perform requirement analysis for setting development environment	3.1 ***IT infrastructure*** and e-mail is ensured. 3.2 ***Operating system*** is selected. 3.3 ***Version control software*** is installed as required. 3.4 ***Webserver tools and webserver*** is installed. 3.5 ***Browser*** and ***browser extension*** are selected and ***IDE*** (Integrated Development Environment) is ensured. 3.6 ***Task management tools*** are selected and ensured as per job requirement 3.7 ***Communication channel*** are identified and used as per customer requirement. 3.8 Test is performed to ensure all the setup is work effectively.

2. CONVERT UI / UX TO MARKUP LANGUAGE

Elements of Competency	Performance Criteria
1. Plan a website	1.1 Purpose and intended audience of the website are identified. 1.2 Design requirements and constraints of using provided templates are identified. 1.3 Required design is collected or selected.
2. Convert UI/UX to markup language	2.1 Given UI/ UX design template is converted into required ***format.*** 2.2 Website layout is developed as per job requirement. 2.3 File and folder are named properly and saved in a proper location. 2.4 Appropriate ***markup language*** is selected. 2.5 Web **content** is placed into the right position by using ***markup language tags.*** 2.6 Content is formatted properly by maintained standards and following ***legislation*** issues. 2.7 Hyperlinks are added to allow successful navigation between pages of website.
3. Test website	3.1 Website is tested to ensure functionality, correct any errors and log in according to testing procedures as per ***plan***. 3.2 Website is opened in a variety of common browsers and check for ***accessibility***, readability, legibility and presentation in accordance with client requirements. 3.3 Website is evaluated for fitness purpose in terms of purpose, target audience and specifications of client requirements.

3 DEVELOP RESPONSIVE WEBSITE USING FRAMEWORK

Elements of Competency	Performance Criteria
1. Determine purpose and accessibility	1.1 Purpose of markup language document is identified. 1.2 ***Accessibility*** options are identified and determine for visually, physically or otherwise impaired persons.
2. Set styles	2.1 CSS (Cascading Style Sheets) to markup language documents is linked and verified. 2.2 Appropriate styles that are to be controlled by CSS are identified as per responsive design. 2.3 Styles are defined and documented in accordance with established design principles.
3. Create CSS using framework	3.1 ***Frontend framework*** is identified. 3.2 CSS is created using determined styles by maintain standards and be aware of ***legislation.*** 3.3 CSS is edited as per client requirement. 3.4 Changes are confirmed in linked markup language document. 3.5 CSS is tested / validated according to established design principles required ***website or browsers.***

4. DEVELOP WEBSITE USING CLIENT SIDE SCRIPTING LANGUAGE

Elements of Competency	Performance Criteria
1. Plan features	1.1 Purpose and intended audience of the website are identified. 1.2 Design requirements and constraints are identified. 1.3 Conceptual idea is developed. 1.4 Necessary software is installed and checked for functionality .
2. Apply JavaScript	2.1 JavaScript elements are added, and attributes are assigned to meet client requirements 2.2 Interactivity is added, edited and formatted to the website in accordance with client requirements. 2.3 Markup content is rendered via JavaScript. 2.4 JavaScript variable, conditions, loop and functions are stated.
3. Apply jQuery	3.1 ***jQuery built- in functions*** are interpreted. 3.2 jQuery is added and attributes are assigned to meet client requirements. 3.3 Interactivity is added, edited and formatted to the website in accordance with client requirements. 3.4 Content is added in every page, if required, in accordance with client requirements. 3.5 ***jQuery plug in*** is installed and used as per plug in configuration.

4. Perform website test	4.1 Website is tested according to the ***testing criteria***. 4.2 Website is opened in a variety of common ***browsers*** 4.3 Accessibility, readability, legibility and appearance are checked in accordance with client requirements. 4.4 Website is evaluated for ***suitability*** as per client requirement.

5. DEVELOP DYNAMIC WEBSITE USING CMS

Elements of Competency	Performance Criteria
1. Plan CMS project	1.1 Purpose and intended audience of website are identified. 1.2 Design requirements and constraints are identified. 1.3 A conceptual ***design*** is developed. 1.4 Necessary software is installed and checked as per requirement.
2. Develop CMS project	2.1 ***CMS (Content Management System)*** is selected and installed. 2.2 Project structure is prepared as per CMS guideline. 2.3 Structure, element tags, necessary files are added to meet client requirements. 2.4 Attributes are assigned according to client requirements. 2.5 Content are added to site also formatted in accordance with client requirements and be aware of ***legislation***. 2.6 CMS plugin is installed and configured as per requirement.
3. Perform test	3.1 Website is tested according to the ***testing criteria***. 3.2 Website is opened in a variety of common ***browsers*** 3.3 Accessibility, readability, legibility and appearance are checked in accordance with client requirements. 3.4 Website is evaluated for ***suitability*** as per client requirement.

6. DEPLOY WEBSITE

Elements of Competency	Performance Criteria ***Bold & Italicized*** terms are elaborated in the range of variables
1. Analyze requirements for hosting server	1.1 Business, technical and security requirements of server are identified. 1.2 Version control is identified and verified.

2. Configure server and repository	2.1 Hosting space size, bandwidth and back-up options are selected in accordance with project requirements. 2.2 Appropriate web application server is chosen. 2.3 ***Security options*** are chosen in accordance with client requirements. 2.4 Name server is assigned properly with the domain name. 2.5 Virtual website or folder is created and mapped with domain. 2.6 The entire site is deployed into virtual folder. 2.7 Local work pushed to ***repository***.
3. Perform speed optimization	3.1 Test web speed using site ***testing tools*** and prepare plan according to the report. 3.2 HTTP (Hypertext Transfer Protocol) requests is minimized. 3.3 Files are minified and combined. 3.4 Asynchronous loading is used for CSS (Cascading Style Sheets) and JavaScript files. 3.5 JavaScript loading is deferred. 3.6 Server response time is reduced. 3.7 Right hosting option is selected as per project requirement.
4. Perform test	4.1 Website testing is performed at live. 4.2 Website is tested according to the testing criteria. 4.3 Website is opened in a variety of common browsers 4.4 Accessibility, readability, legibility and appearance are checked in accordance with client requirements. 4.5 Website is evaluated for suitability as per client requirement

Recommended Books:

It is recommended to follow the Competency standard of Web Development under NTVQF.

Website References:

http://www.btebcbt.gov.bd/

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
12225	DATABASE MANAGEMENT SYSTEM	T	P	C
		2	3	3

Subject Description	This subject is designed to provide basic knowledge on database system concept, data models, relational database. This subject also helps students develop required skill to create a database, manipulate database and data query.

Learning Outcome	After completing this subject, students will be able to: • present database system, languages and data models • explain SQL expressions, operations and functions • create a new database and manipulate • install database software • perform task to manipulate, update and modify database

Detailed Syllabus (Theory)

Unit	Content	Period
1.	**CONCEPT OF DATABASE SYSTEM** 1.1 Define database management system. 1.2 Explain the purpose of database management system. 1.3 Mention the difference between conventional file system and database management system. 1.4 Mention the advantages & disadvantages of database management system. 1.5 Define data abstraction, instances and schemas. 1.6 Mention the types of schema. 1.7 Data type concept.	3
2.	**CONCEPTS OF DATABASE LANGUAGES, USERS, MANAGER AND ADMINISTRATOR** 2.1 Describe the database languages with examples. 2.2 Describe the basic operation of DDL, DML and data dictionary. 2.3 Describe the different types of database system users. 2.4 Example the different tasks of database manager. 2.5 Describe the functions of a database administrator. 2.6 Describe the functional components of a database system.	4
3.	**UNDERSTAND THE DATA MODELS** 3.1 Define the entity, entity set and data model. 3.2 Mention the meaning of E-R diagram symbol. 3.3 Describe the E-R diagram for different mapping constrains. 3.4 State different types of attribute uses in E-R diagram. 3.5 State the techniques to convert E-R diagram to table. 3.6 Describe the different types of data models with examples. 3.7 Describe the constraints in entity-relationship (mapping, cardinalities and existences) with diagrams. 3.8 State the meaning of different types of keys in RDBMS (primary key and foreign key, super key, candidate key). 3.9 Distinguish between strong and weak entity sets.	5
4	**RELATIONAL DATABASE QUERY LANGUAGE** 4.1 Define query language. 4.2 Mention the different among SQL, QBE and Datalog. 4.3 Describe the fundamental operations of relational algebra(**select, project, union, set difference, Cartesian product, rename, set intersection, natural joint, division** and **assignment**).	5

5	**SQL AND PL/SQL** 5.1 Mention the several parts of SQL and PL/SQL. 5.2 Explain five clauses of SQL expression (**select, from, where, group by and having**). 5.3 Describe the uses of SQL set operations (**union, intersect,** and **except**). 5.4 Describe the uses of SQL aggregate functions (**avg, min, max, sum, count, upper, lower, initcap, string operation etc.**). **5.5** Describe the technique to add, remove and change information with SQL (**delete, insert,** and **update**).	5
6	**INTEGRITY AND SECURITY OF DATABASE** 6.1 Define integrity constraint. 6.2 Describe the referential integrity in SQL. 6.3 Describe the assertions in RDBMS. 6.4 Define the triggers and need for triggers in RDBMS. 6.5 Define the security in RDBMS. 6.6 Describe the protection of database. 6.7 Define encryption and authentication in database. 6.8 Mention the technique of encryption.	4
7	**DESIGN OF RELATIONAL DATABASE** 7.1 Define the normalization. 7.2 Mention the need for normalization. 7.3 Describe the term redundancy in RDBMS. 7.4 Explain the three stages/rules of normalization in database management system (1NF, 2NF, and 3NF) **7.5** Describe the overall database design process.	4
		30

Detailed Syllabus (Practical)

Unit	Content	Period
1.	Arrange the necessary hardware and operating system for installing MS-Access, SQL Server or Oracle.	3
2.	Create a new database for the result process application using MS-Access, SQL server or Oracle.	4
3.	Create tables such as Student Information, Department Information, Subject Information, Year information and Mark Information (including): I. Create a new user/database and permission assign. II. Create a table space. III. Create a new table with appropriate data types. IV. Define primary key, Foreign key, candidate key and different constraints. V. Drop primary key and foreign key. VI. Save the table structure VII. Edit a table structure VIII. Insert a record, Update the record and Delete the row.	

	IX. Alter a field with Field Name, Data Type, Length etc. X. Change or remove a key field	
4	Create relationship among tables using inner join or outer join. I. Create a query involving only one table. II. Query linked tables and create a form from a query. III. Create a total query to find the GPA of each student of particular year.	
5	Create data entry form for entering data in Student Information, Department Information, Subject Information, Year Information and Mark Information tables. Then apply Normalization (1NF, 2NF and 3NF) on result process database.	
6	Use Auto Report to create table reports of result process. Use the report wizard to create a grade sheet /mark sheet/transcript, Merit list and tabulation sheet.	
7	Perform the task to install Oracle Database Language and Invoking SQL Plus.	
8	Perform the task to manipulate data in data base management system (select, project, union, set difference, cartesian product, rename, set intersection, natural joint, division and assignment).	
9	Perform the task to view, delete and update data into a table (delete, insert, and update) and perform the task to modify the structure of a table.	
10	Perform the task to work with grouping data from tables and manipulate dates by SQL in Oracle	

REFERENCE BOOK

1. Database System Concepts – Henry F. Korth.
2. Successful projects in ACCESS - P.M Heathcote
3. SQL, PL/SQL
4. Introduction To Oracle 10g SQL Volume-1
5. Introduction To Oracle 10g SQL Volume-2
6. Introduction To Oracle 10g PL/SQL Volume-1
7. Introduction To Oracle 10g PL/SQL Volume-2

REFERENCES WEB SITE:-

www.java2s.com/Tutorial/Oracle/CatalogOracle.htm
www.docs.oracle.com

Subject Code	Subject Name	Theory (T) & Practical (P) Period/Week		Credit (C)
12226	DIGITAL SYSTEM	T	P	C
		2	3	3

Subject Description	This subject is designed to acquire the knowledge and skill on concept of number system. logic gates, Boolean algebra, combinational logic circuits, Simplification of logic circuits and Sequential circuits which are used in most of digital system and the foundation of Microprocessor and Microcontroller.

Learning Outcome	After completing this subject, students will be able to: • Verify the truth tables of logic gates • present the operation of NAND & NOR gate as universal gates. ▪ develop a code converter circuit ▪ Verify the functions of half adder & half sub tractor, full adder & full sub tractor. ▪ design binary 4-bit parallel adder, encoder & decoder. ▪ apply decoder driver & display operation using 7 segments Display. ▪ verify the operation of multiplexer, de-multiplexer, s-r & d flip-flops.

Detailed Syllabus (Theory)

Unit	Contents	Period
1	**FUNDAMENTALS OF DIGITAL ELECTRONICS.** 1.1 Define digital Electronics. 1.2 Mention the characteristics of digital signal. 1.3 Compare digital signal with analog signal. 1.4 Describe logic level, Negative logic level and positive logic level, 1.5 Explain the parameter Frequency, Time period, Rise time, Fall time, Rising edge, falling edge, On time, Off time and Duty cycle of digital signal. .	2
2	**NUMBER SYSTEMS AND CODES** 2.1 Define Number system and Base of number system. 2.2 Describe different types of number system (Decimal, Binary, Octal and Hexadecimal). 2.3 Convert one number system to another. 2.4 Determine 1's & 2's complement of binary number. 2.5 Compute binary arithmetic. 2.6 Describe 8421, Excess–3code, Gray code, BCD code, Hamming code, Unicode, and ASCII code. 2.7 Convert of one code to another. 2.8 Describe the addition and subtraction BCD coded number. 2.9 Describe Repeated Shift methods for division multiplication.	5
3	**LOGIC GATES** 3.1 Define logic gate. 3.2 Classify logic gate. 3.3 Describe logic statements, truth table, Boolean equation and symbol of different logic gates. 3.4 Analyze the electrical circuit for each gate. 3.5 Describe pin and signals of different gate IC.	2
4	**SIMPLIFICATION OF LOGIC CIRCUITS** 4.1 Define Boolean algebra. 4.2 Describe the laws and rules of Boolean Algebra. 4.3 State the DE Morgan's theorems. 4.4 Derive standard SOP and POS equation from truth table. 4.5 Explain shorthand notation $Y = m_1 + m_3 + m_4 + \ldots = \Sigma (1, 3, 4 \ldots)$ and $Y = m_1 . m_3 . m_4 . \ldots = \Pi (1. 3. 4 \ldots)$ 4.6 Simplify Boolean expression and logic circuit using Boolean algebra and DE Morgan theorem. 4.7 Define Karnaugh map. 4.8 Describe the structure and simplification methods of Karnaugh map. 4.9 Simplify up to four variable standard and nonstandard Boolean expression using Karnaugh map.	4
5	**Digital IC and Logic Family.**	2

	5.1 Define Logic Family. 5.2 Classify digital IC based on scale of integration. 5.3 List the advantages of using IC in digital system. 5.4 Mention the different types of IC logic families 5.5 Explain fan-in, fan-out, noise-margin, propagation delay, TTL and CMOS logic levels and power dissipation 5.6 Describe the TTL, DTL, CMOS circuitry of NOT, AND, OR, NAND & NOR gates.	
6	**COMBINATIONAL LOGIC CIRCUITS.** 5.7 Define Combinational logic circuit. 5.8 Explain the operation of Binary comparator circuits. 5.9 Describe the Pin diagram of commonly used 4-bit comparator ICs. 5.10 Describe the operation of parity generator and detector circuit. 5.11 Describe the logic circuit error detection and correction with humming code.	3
7	**ARITHMATIC LOGIC CIRCUITS** 7.1 Describe the operation of half adder, full adder and4 bit parallel adder. 7.2 Explain the operation of half Sub tractor, full Sub tractor and 4 bit subtraction circuit. 7.3 Mention the Basic principle of ALU 7.4 Describe the pin and signals of ALU chips. 7.5 Explain the operation of shift and add multiplier circuit. 7.6 List the application of combinational logic circuit.	3
8	**MULTIPLEXERS AND DEMULTIPLEXER** 8.1 Define multiplexers and demultiplexer. 8.2 Describe the operation of 2:1, 4:1 and 8:1 multiplexer with logic diagram. 8.3 Describe the operation of 1:2, 1:4 and 1:8 demultiplexers with logic diagram. 8.4 State the use of multiplexer & demultiplexer. 8.5 Describe the Pin diagram of commonly used 4-bit comparator ICs 8.6 Distinguish between Decoder and Demultiplexer.	2
9	**ENCODER AND DECODER** 9.1 Define Encoder and Decoder. 9.2 Explain the logic circuit of 4 to 2, 8 to 3 & priority encoder. 9.3 Analyz the logic circuit of 2 to 4, 3 to 8 decoder circuit. 9.4 Describe the pins and signals of 74138 and 74154 decoder IC. 9.5 State the working principle of LCD, LED, Seven-segment and Dot matrix display. 9.6 Sketch the diagram of commonly used 4-bit BCD encoder/driver for seven segment display of common Anode/Cathode type.	3
10	**SEQUINTIAL LOGIC CIRCUITS** 10.1 Define sequential logic circuit. 10.2 Describe the operation of SR latch, D Latch with truth table and timing diagram. 10.3 Mention the disadvantages of SR Latch. 10.4 Discuss positive & negative level and edge triggering. 10.5 Explain the operation of JK Flip-Flop, D Flip-Flop and Master-slave Flip-Flop with truth table and timing diagram. 10.6 Define three state logic. 10.7 Describe the pin and signals of 7474,7476, 74273 and 74573 IC 10.8 List the application of different types of Flip-Flops. 10.9 Describe internal block diagram of 555 timer IC. 10.10 Explain the operation of Clock generator ciruit using 555 timer.	4
	Total	30

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class
1	**VERIFY THE TRUTH TABLES OF LOGIC GATES Select the logic gate ICs.** 1.1 Select appropriate required tools, equipment's and materials. 1.2 Insert the IC to the Breadboard. 1.3 Connect and checked the circuits as per diagram on trainer board. 1.4 Switch on the DC power supply, 1.5 Verify the truth tables.	1
2	**DESIGN & DEVELOP CODE CONVERTER CIRCUITS AND OBSERVE ITS OUTPUT.** **2.1 Select the ICs.** **2.2** Select appropriate required tools, equipment and materials. **2.3** Insert the selected IC to the Breadboard. **2.4** Connect and checked the circuits as per diagram on trainer board. **2.5** Switch on the DC power supply, **2.6** Verify the truth tables	1
3	**OBSERVE THE FUNCTIONS OF ADDER & SUBTRACTOR** 3.1 Select ICs. 3.2 Draw the pin diagram and internal connection. 3.3 Draw appropriate circuits. 3.4 Select required tools, equipment and materials. 3.5 Connect and checked the circuits as per diagram on trainer board. 3.6 Switch on the DC power supply, 3.7 Verify the truth tables.	1
4	**VERIFY THE OUTPUT OPERATION OF BINARY 4 BIT PARALLEL ADDER.** **4.1 Select appropriate ICs.** 4.2 Draw the pin diagram and internal connection. 4.3 Draw appropriate circuits. 4.4 Select required tools, equipment and materials. 4.5 Connect the circuits as per diagram on trainer board. 4.6 Switch on the DC power supply, 4.7 Verify the truth tables.	1
5	**VERIFY THE OPERATION OF BINARY COMPARATOR** 5.1 Draw appropriate circuits. 5.2 Select required tools, equipment and materials. 5.3 Connect and checked the circuits as per diagram on trainer board. 5.4 Switch on the DC power supply. **5.5 Verify the truth tables.**	
6	**OBSERVE THE OPERATION OF ENCODER & DECODER.** **6.1 Select appropriate ICs.** 6.2 Draw the pin diagram and internal connection. 6.3 Draw appropriate circuits. 6.4 Select required tools, equipment and materials. 6.5 Connect and checked the circuits as per diagram on trainer board. 6.6 Switch on the DC power supply,	1
7	**CONSTRUCT A 7 SEGMENT DISPLAY DRIVER** **7.1 Select appropriate ICs.** 7.2 Draw the pin diagram and internal connection. 7.3 Draw appropriate circuits.	1

	7.4 Select required tools, equipment and materials. 7.5 Connect and checked the circuits as per diagram on trainer board. 7.6 Switch on the DC power supply, Verify the truth tables.	
8	**OBSERVE THE OPERATION OF MULTIPLEXER & DEMULTIPLEXER.** 8.1 Select appropriate ICs. 8.2 Draw the pin diagram and internal connection. 8.3 Draw appropriate circuits. 8.4 Select required tools, equipment and materials. 8.5 Connect and checked the circuits as per diagram on trainer board. 8.6 Switch on the DC power supply. 8.7 Verify the truth tables.	1
9	**VERIFY THE TRUTH TABLE OF DIFFERENT S-R & D FLIP-FLOPS. Select appropriate ICs.** 9.2 Draw the pin diagram and internal connection. 8.1 Draw appropriate circuits. 8.2 Select required tools, equipment and materials. 8.3 Connect and checked the circuits as per diagram on trainer board. 8.4 Switch on the DC power supply, 8.5 Verify the truth tables. 8.6 Make D flip flop from SR Flip-Flop	1
10	**VERIFY THE TRUTH TABLE OF DIFFERENT J-K FLIP-FLOPS.** 10.1 Draw the pin diagram. 10.2 Draw appropriate circuits. 10.3 Select required tools, equipment and materials. 10.4 Connect and checked the circuits as per diagram on trainer board. 10.5 Switch on the DC power supply, 10.6 Verify the truth tables. 10.7 Make D and T Flip-Flop from JK Flip-Flop	1
10	**CONSTRUCT A CLOCK GENERATOR CIRCUIT** 10.1 Draw appropriate circuits. 11.1 Select required tools, equipment and materials. 11.2 Connect and checked the circuits as per diagram on trainer board. 11.3 Switch on the DC power supply, 11.4 Observe the output wave shape.	
	Total	10

Necessary Resources (Tools, Equipment and Machinery):

Sl. No.	Item Name	Quantity
1	*DC power Supply, Function generator, Oscilloscope,Digital Electronics Trainer, Power project board/ bread board*	**30 Nos**
2	7400, 74002, 7404, 7408, 7432, 7483, 7485, 7486, 7441, 7442, 7446, 7447, 7474, 7476, 74137, 74138, 74141,74157, 4511.	**10 Nos each**
3	7-segment Display Module, 555IC	**10 Nos each**
4	Resin, Soldering lead, Soldering tip, Fixable wire, Wire Brush,	**As required**

Recommended Books:

Sl No.	Book Name	Writer Name	Publisher Name & Edition
1	A Text Book of Digital Electronics	R. S. Sedha	Chand
2	**Modern Digital Electronics**	R P JAIN	

3	Digital Fundamentals	Thomas L. Floyd	
4	**Digital Electronics**	**D. R. Kaushik**	**Dhanpat Rai Publication Company**

Website References:

Sl. No.	Web Link	Remarks
1	https://www.tutorialspoint.com/	
2	https://www.electronics-tutorials.ws/	
3	https://www.youtube.com/channel/	
4	https://youtu.be/qsWkA-5grogo	
	https://youtu.be/eXyGIPrD5Qk	
	https://you.be/f-WiulYIrow	