



**BANGLADESH TECHNICAL EDUCATION BOARD**

Agargoan, Dhaka-1207.

*4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM*  
SYLLABUS (PROBIDHAN-2016)

**COMPUTER SCIENCE & TECHNOLOGY**

TECHNOLOGY CODE: **685**

4th SEMESTER

DIPLOMA IN ENGINEERING  
PROBIDHAN-2016

## COMPUTER SCIENCE & TECHNOLOGY (685)

### 4<sup>th</sup> SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	68541	Operating System	2	6	4	40	60	50	50	200
2	68542	Web Programming	0	6	2	00	00	50	50	100
3	68543	Mathematics for Computing	2	0	2	40	60	00	00	100
4	66641	Object Oriented Programming	2	3	3	40	60	25	25	150
5	66642	Data Structure & Algorithm	2	3	3	40	60	25	25	150
6	66653	Sequential Logic Systems	3	3	4	60	90	25	25	200
7	65841	Business Organization & Communication	2	0	2	40	60	00	00	100
<b>Total</b>			<b>13</b>	<b>21</b>	<b>20</b>	<b>260</b>	<b>390</b>	<b>175</b>	<b>175</b>	<b>1000</b>

**AIMS:**

- To be able to develop the skill and attitude to direct, control and manage of computer using operating system.
- To be able to install the Windows Operating system.
- To be able to install the LINUX Operating system.
- To be able to develop skills to configure Windows Operating System.
- To be able to develop skills to configure and customize LINUX Operating.

**SHORT DESCRIPTION:**

Basic concepts of operating system; Process Management; CPU Scheduling, Deadlocks; I/O systems; Memory management; File system and Linux fundamentals; windows and Linux commands and utilities.

**DETAIL DESCRIPTION:****Theory:****1. Understand the general features of operating system.**

- 1.1 Define operating system, Kernel and monitor program.
- 1.2 Describe the functions (of kernel) and services of operating system
- 1.3 Describe the abstract view of the components of computer system.
- 1.4 Describe the evolution (history) of operating system.
- 1.5 Explain the role of operating system as an extended machine and as a resource manager.
- 1.6 Mention the important features of DOS, Windows, UNIX and LINUX.
- 1.7 Define the terms-Multiuser, Multitasking and GUI.

**2. Understand the terms related to operating system.**

- 2.1 Define batch processing system
- 2.2 Describe the method of batch processing system.
- 2.3 State the disadvantages of batch processing.
- 2.4 Describe the uses of job control language for operating system.
- 2.5 Describe the process of spooling.

**3. Understand the basics of process management.**

- 3.1 Define Process.
- 3.2 Describe the process state with diagram.
- 3.3 Mention the difference between process and program.
- 3.4 Describe the importance of process control.
- 3.5 Describe the function of Scheduler and traffic controller.
- 3.6 Explain the process Scheduling and scheduling queues.
- 3.7 Describe Synchronization (Re-condition, Reader-Writer problem, dining philosopher, Peterson solution)
- 3.8 Describe the manner in which multiple processors may be used for multiprogramming.

**4. Understand the concept of CPU Scheduling.**

- 4.1 Define Scheduling.
- 4.2 State the types of Scheduling
- 4.3 Describe the Scheduling criteria.
- 4.4 State the terms CPU and I/O burst cycle, CPU Scheduler, Dispatcher.
- 4.5 Describe Scheduling Algorithms. (FCFS – First come first serve, SJF – Shortest job first, RR- Round Robin, Priority)

## **5. Understand the concepts of deadlock.**

- 5.1 Define Deadlock, Preempt able and Non-Preempt table resources.
- 5.2 Mention the Necessary conditions of Deadlocks.
- 5.3 Describe the Deadlock Prevention.
- 5.4 Explain the Deadlock avoidance and their algorithm.
- 5.5 Describe the Deadlock detection algorithm
- 5.6 Explain the way of recovery from Deadlock.

## **6. Understand the concept of I/O system.**

- 6.1 State the Characteristics and principle of I/O hardware.
- 6.2 Describe the role of Operating system in I/O operation.
- 6.3 Describe the I/O aspects of Operating System.
- 6.4 Describe the goals of I/O software.
- 6.5 Describe the function of each layer of I/O system.

## **7. Understand the technique of memory management.**

- 7.1 Mention the function of memory management.
- 7.2 Describe the Single / Multiple partition schemes.
- 7.3 Explain fixed memory partition with separate / single input queue.
- 7.4 Explain the external and internal fragmentation.
- 7.5 Describe re-locatable and dynamically re-locatable partitioned allocation.
- 7.6 Describe Swapping.
- 7.7 Describe the segmented allocation and segmented page.
- 7.8 Describe the concept of virtual memory and demand paging.

## **8. Understand the concept of file system.**

- 8.1 Mention the concept and attributes of file.
- 8.2 Describe the basic file operation.
- 8.3 State the terms: the file pointer, file open count, disk location of file.
- 8.4 Mention the file types with common features.
- 8.5 Define file system.
- 8.6 Describe the organization of file system.
- 8.7 Describe the features of general file system.
- 8.8 Describe the free space management of disk space.
- 8.9 Describe the allocation methods of disk space.

## **9. Understand the features of Windows Operating system**

- 9.1 Describe History and Design Principles
- 9.2 State System Components
- 9.3 Describe Terminal Services and Fast User Switching
- 9.4 State File System and Networking concept

## **10. Understand the features of Linux Operating system**

- 10.1 State the background and importance of Linux.
- 10.2 Describe the features of Linux Kernel.
- 10.3 State the advantages of Linux Operating system.
- 10.4 State the features of GNOME and KDE desktop
- 10.5 Define Shell and Mention the name of different shell for different user.
- 10.6 State the f-unction of Linux Shell.

## **PRACTICAL**

### **1. Perform the task to install Windows Desktop Operating System**

- 1.1 Follow workplace health and safety – OSH
- 1.2 Install and configure Windows Operating System (Latest Version)
- 1.3 Performs necessary steps to configure Basic Desktop Experience.
- 1.4 Perform necessary steps to configure Network.
- 1.5 Perform popular Windows Commands and configure network by CMD.
- 1.6 Perform necessary steps to install and configure third party application.
- 1.7 Perform necessary steps to analyze running processes and to kill any process.

### **2. Perform the task to install VMWare and Create Virtual Machines**

- 2.1 Install and configure VMWare Player/Workstation
- 2.2 Perform necessary steps to configure Virtual Machines
- 2.3 Configure multiple virtual machines
- 2.4 Configure virtual network system
- 2.5 Install Operating systems on virtual machines

### **3. Perform the task to install Linux operating system.**

- 3.1 Follow workplace health and safety – OSH
- 3.2 Identify the purpose and functions of operating system
- 3.3 Install and configure Operating system
- 3.4 Set Boot sequence, Root password, Drive selection for installation, Drive partitioning, Necessary Packages
- 3.5 Use Necessary command to up Network card, Configure Browsers.
- 3.6 Use Basic Command for customization
- 3.7 Create Partition as per requirements.
- 3.8 Create Directories as per specifications.
- 3.9 Set Directories and file permission
- 3.10 Perform Copy and move operation.
- 3.11 Mount External Drive as per specifications.
- 3.12 Create Users and group as per instruction
- 3.13 Identify and Unpack Utility package

### **4. Perform the task to Make partition to a Hard disk (Linux Based) with fdisk.**

- 3.1 Use fdisk command to list all partition, to see each partition is being used and to change the partition.
- 3.2 Delete the partition.
- 3.3 Create partitions.
- 3.4 Change the partition type.
- 3.5 Display the partition table and exit.
- 3.6 Write a report.

### **5. Perform the task to Use GRUB boot loader.**

- 4.1 Boot the computer with GRUB.
- 4.2 Change or Add boot options (Temporarily or permanently).
- 4.3 Add a new GRUD boot image.
- 4.4 Write a report

### **6. Perform the task to work with Linux Desktop.**

- 5.1 Log on into the Linux.
- 5.2 Familiar with the Desktop.

- 5.3 Check the home folder.
- 5.4 Change the preferences.
- 5.5 Configure the panel/desktop.
- 5.6 Use the GNOME desktop.
- 5.7 Use the Metacity window manager
- 5.8 Use the GNOME Panel
- 5.9 Use menu
- 5.10 Add applet, application launcher and drawer.
- 5.11 Change panel properties.
- 5.12 Choose and use KDE desktop.
- 5.13 Write a report.

## **7. Apply basic Linux commands and utilities.**

- 7.1 Use the command options to modify the basic function of Linux commands.
- 7.2 Use two or more Linux commands in tandem by using input and output redirection.
- 7.3 Use the parameters with Linux commands.
- 7.4 Select and use the notational shorthand used in Linux documentation.
- 7.5 Use the Linux online man pages and help facilities.
- 7.6 Use the wildcards.
- 7.7 Check the environmental variables.
- 7.8 List the processes running on the Linux system.
- 7.9 Kill the processes.
- 7.10 Write a report.

## **8. Work with the Linux file system.**

- 8.1 List the type of files and directories.
- 8.2 Move one directory to another.
- 8.3 Make a new file and directory.
- 8.4 Move and copy files.
- 8.5 Remove the files and directories.
- 8.6 Use chown and chgrp to change file and directory ownership.
- 8.7 Use chmod to change the file and directory permissions.
- 8.8 Use gunzip command to uncompress .gz files compressed by gzip.
- 8.9 Write a report.

## **9. Work with bash (shell system).**

- 9.1 Select the most common shells used in Linux.
- 9.2 Enter commands into bash.
- 9.3 Use wildcards that bash shell supports.
- 9.4 Use the history command with or without options.
- 9.5 Use the aliases command.
- 9.6 Use the input/output redirection command.
- 9.7 Show the use of pipeline.
- 9.8 Modify the bash shell.
- 9.9 Write a report.

## **10. Use file systems, disks and other devices.**

- 10.1 Mount the flash / optical drives
- 10.2 Make a new file system.
- 10.3 Unmount the flash / optical drives.
- 10.4 Use tar and gzip.

- 10.5 Use tar command to backup files in flash / optical drives
- 10.6 Write a report.
- 11. Manage the users account.**
  - 11.1 Make the root (superuser) suppresser accounts.
  - 11.2 Make the user accounts.
  - 11.3 Add and delete users.
  - 11.4 Delete groups.
  - 11.5 Write a report.
- 12. Work with text editors.**
  - 12.1 Select the text editor in Linux.
  - 12.2 Use vi editor to enter & edit text.
  - 12.3 Use emacs to enter & edit text.
  - 12.4 Write a report
- 13. Work with the printer in Linux.**
  - 13.1 Select the printer to support in Linux.
  - 13.2 Configure the printer.
  - 13.3 Use the commands lpr, lpq, lprm and lpc for printing documents under Linux.
  - 13.4 Write a report.
- 14. Work with Process System Calls**
  - 14.1 Write program to implement the Process System Calls
  - 14.2 Start the Program
  - 14.3 Declare PID and get the PID by using the getpid() method.
  - 14.4 Create a child process by calling the fork() system call.
  - 14.5 Check if(pid==0) then print the child process id and then print the parent process value Otherwise print.
  - 14.6 Stop the program.
- 15. Work with I/O System Calls**
  - 15.1 Write program for I/O System calls.
  - 15.2 Start the Program
  - 15.3 Open a file for O\_RDWR for R/W, O\_CREATE for creating a file, O\_TRUNC for truncate a file
  - 15.4 Using getchar(), read the character and stored in the string[] array.
  - 15.5 The string[] array is write into a file, close it.
  - 15.6 Then the first is opened for read only mode and read the characters and displayed it and close the file.
  - 15.7 Stop the program
- 16. Work with Scheduling (FCFS, SJFS)**
  - 16.1 Write a program to implement CPU & scheduling for scheduling
  - 16.2 Start the program. Get the number of processes and their burst time.
  - 16.3 Initialize the waiting time for process 1 as 0.
  - 16.4 The processes are stored according to their busrt time.
  - 16.5 The waiting time for the processes are calculated as follows:
    - Process for FCFS ( $i < 2; i \leq n; i++$ ),  $wt.p[i] = p[i-1] + bt.p[i-1]$
    - Process for SJFS ( $i < 2; i \leq n; n++$ ),  $wt.p[i] = p[i=1] + bt.p[i-1]$
  - 16.6 The waiting time for all the processes is summed then average value time is calculated.
  - 16.7 The waiting time of each process and average times are displayed
  - 16.8 Stop the program

## **17. Work with PIPE Processing**

- 17.1 Write a program to create a PIPE processing
- 17.2 Start the program. Declare variables.
- 17.3 Read the Choice.
- 17.4 Create a piping processing using IPC
- 17.5 Assign the variable lengths
- 17.6 "strcpy" the message lengths
- 17.7 To join the operation using IPC
- 17.8 Stop the program

## **18. Work with File Manipulation**

- 18.1 Write a program for file manipulation for displays the file and directory in Memory
- 18.2 Start the program
- 18.3 Use the pre-defined function list out the files in directory
- 18.4 Main function is used to check the file present in the directory in root
- 18.5 Using the file pointer in the file to that the argument is less than a times means print
- 18.6 By using if loop check in file, open two means print error
- 18.7 Stop the program

## **19. Simulate for Deadlock Prevention**

- 19.1 Start the program
- 19.2 Attacking Mutex condition.
- 19.3 Attacking preemption.
- 19.4 Attacking hold and wait condition: make a process hold at the most 1 resource
- 19.5 At a time. Make all the requests at the beginning.
- 19.6 Attacking circular wait: Order all the resources. Make sure that the requests are issued in the
- 19.7 Correct order so that there are no cycles present in the resource graph. Resources numbered 1 ... n.
- 19.8 Resources can be requested only in increasing
- 19.9 Order resources.
- 19.10 Stop the program

## **REFERENCE BOOKS:**

1. Operating System Concepts - By - Silberschatz Galvin, Gagne  
Publication- John Wiley & Sons (Asia) Pte ltd.
2. Operating Systems - By - Achyut S. Godbole  
Publication - Tata McGraw-Hill
3. Modern Operating Systems - By - Andrew S. Tanenbaum  
Publication - Prentice Hall of India
4. Computer Fundamentals - By- P.K.Sinha
5. Red Hat Fedora Linux 2 bible- By – Christopher Negus
6. Learning Red Hat Linux - By – Bill Mc Carty



## **Reference Websites**

- 1) [www.denett.com](http://www.denett.com)
- 2) [www.tatamcgrawhill.com](http://www.tatamcgrawhill.com)
- 3) [www.phindia.com](http://www.phindia.com)
- 4) [ww.wiley.com/college/silberschatz6e/0471417432/slides/ppt](http://ww.wiley.com/college/silberschatz6e/0471417432/slides/ppt)
- 5) [www.en.wikipedia.org](http://www.en.wikipedia.org)
- 6) [www.computerworld.com](http://www.computerworld.com)
- 7) [www.computer.howstuffworks.com](http://www.computer.howstuffworks.com)
- 8) [www.willamstallings.com/os4e.html](http://www.willamstallings.com/os4e.html)
- 9) [www.deitel.com/books/os3e/slides.html](http://www.deitel.com/books/os3e/slides.html)

**AIMS**

- Able to develop knowledge, skills and attitude to create a dynamic website.
- Able to develop knowledge, skills and attitude about PHP and MySQL.

**DESCRIPTION**

Development of a dynamic website using PHP (Version 5.0 or above) and MySQL (Version 5.0 or above). In PHP, various topics are discussed and practiced such as variable, operators, conditional statements, looping, Arrays, functions and objects. In MySQL, connect with PHP form, create and modify database, tables, insert data into table and retrieve, update, delete data from table are practiced.

**Evaluation of PHP**

PHP was designed for the web, and it does the job well. This programming language is particularly popular for freelance work, since many small businesses or non-technical people would want to use WordPress, Joomla or other popular content management systems (CMS) to set up their websites or shopping carts. Now 80% of the top 10 million websites are using PHP. Facebook has made serious investments into PHP.

**1. Demonstrate Web Programming**

- 1.1. Show differences between Web Design and Web Programming
- 1.2. Show differences between Static webpage and Dynamic webpage

**2. Demonstrate Web Programming Tools**

- 2.1. Use Text Editor - Notepad/Sublime Text/Notepad++
- 2.2. Use XAMPP/WAMP

**3. Demonstrate PHP**

- 3.1. Install a web server and PHP on Windows/Linux OS
- 3.2. Install a web server and PHP using XAMPP/WAMP
- 3.3. PHP File Structure
- 3.4. Basic PHP Syntax
- 3.5. Use of Comments in PHP

**4. Demonstrate PHP Variables**

- 4.1. Identify types of PHP Variables
- 4.2. Create (Declare) PHP Variables
- 4.3. Scopes of PHP Variable
  - 4.3.1. Local Scope
  - 4.3.2. Global Scope
  - 4.3.3. Static Scope
  - 4.3.4. Parameter Scope
- 4.4. String Variables in PHP
- 4.5. PHP Concatenation Operator
- 4.6. PHP strlen() and strpos() function
- 4.7. Different types of Operators

## **5. Demonstrate Date and Time Function**

- 5.1. Use date() function
- 5.2. Use getdate() function

## **6. Demonstrate PHP Conditional Statements & Looping**

### **Practice:**

- 6.1. if statement
- 6.2. if...else statement
- 6.3. if...else if....else statement
- 6.4. switch statement
- 6.5. PHP Loops
- 6.6. while Loops
- 6.7. do...while Loops
- 6.8. "for" statement
- 6.9. "foreach" statement

## **7. Demonstrate PHP Arrays**

### **Practice:**

- 7.1. Array
- 7.2. Numeric Arrays
- 7.3. Associative Arrays
- 7.4. Multidimensional Arrays

## **8. Demonstrate PHP Functions**

- 8.1. Practice different types of Built-in Functions
- 8.2. Create PHP Functions
- 8.3. Add parameters in function
- 8.4. Practice Return values from function

## **9. Demonstrate Html Form with PHP**

- 9.1. Create Html Form with PHP
- 9.2. Validate Form Field
- 9.3. Use Data Dealing with Multi-value field
- 9.4. Generate File uploaded form
- 9.5. Redirect a form after submission
- 9.6. Use \$\_GET Variable
- 9.7. Use \$\_POST Variable
- 9.8. Use \$\_REQUEST Variable

## **10. Work with file and Directories**

- 10.1. Open and close a file
- 10.2. Copy, rename and delete a file
- 10.3. Work with directories
- 10.4. Create and delete folder
- 10.5. Upload & download files

## **11. Demonstrate Session and Cookie**

- 11.1. Introduce Session Control
- 11.2. Practice Session Functionality
- 11.3. Introduce Cookie
- 11.4. Set Cookies with PHP
- 11.5. Use Cookies with Sessions
- 11.6. Delete Cookies

- 11.7. Register Session variables
- 11.8. Destroy the variables and Session

## **12. Demonstrate PHP MySQL**

- 12.1. Introduce Database, Tables, Queries and phpMyAdmin
- 12.2. Use phpMyAdmin
- 12.3. Create a Connection to MySQL Database using PHP
- 12.4. Close a Connection
- 12.5. Create a Table in MySQL Database using PHP
- 12.6. Create Primary Keys and Auto Increment Fields

## **13. Demonstrate Insert, Retrieve, Update, Delete in PHP MySQL**

- 13.1. Insert Data Into a Database Table
- 13.2. Insert Data From a Form Into a Database
- 13.3. Select Data From a Database Table
- 13.4. Display the Result in an HTML Table
- 13.5. Fetch data using WHERE clause
- 13.6. Use ORDER BY Keyword
- 13.7. Update Data In a Database
- 13.8. Delete Data In a Database

## **REFERENCES:**

- i. Learning PHP, MySQL, books by 'O' riley Press
- ii. Beginning PHP – Matt Doyle
- iii. [www.w3schools.com/php](http://www.w3schools.com/php)
- iv. [www.w3schools.com/php/php\\_examples.asp](http://www.w3schools.com/php/php_examples.asp)
- v. [www.rashidul.com/php](http://www.rashidul.com/php)

**AIMS**

- To develop knowledge of mathematical logic applied in digital computers.
- To assist to acquire knowledge of mathematics in developing algorithms.
- To provide knowledge of mathematics in solving problems by computers.

**SHORT DESCRIPTION**

Basics of Sets, relations, Vector and Matrices, Counting, Probability theory, Graphs and Binary trees.

**DETAIL DESCRIPTION:****Theory:****1. Understand the basics of sets and set theory.**

- 1.1 Describe basic set notation and types of sets.
- 1.2 Describe Ven Diagrams.
- 1.3 Define different set operations.
- 1.4 Practice exercises on sets.

**2. Understand the fundamentals of relations.**

- 2.1 Define relations.
- 2.2 Mention the properties of relation.
- 2.3 Describe the kinds of relations.
- 2.4 Define inverse relation.
- 2.5 Mention the representations of relations on finite sets.
- 2.6 Describe the composition of relations.
- 2.7 Describe the composition of relation and matrices.

**3. Understand the concept of vectors and matrices.**

- 3.1 Define vectors and matrices.
- 3.2 Define Echelon matrix .
- 3.3 Describe the Gaussian elimination in matrix form.
- 3.4 Describe the algorithm of matrix arithmetic.
- 3.5 Matrix solution of a system of Linear Equation .

**4. Understand the concept of counting.**

- 4.1 Define counting.
- 4.2 Describe the binomial coefficients and Pascal's triangle.
- 4.3 Describe the counting problems and tree diagram.
- 4.4 Define Modular Arithmetic.
- 4.5 Describe Modulo 2 binary division method

**5. Understand the probability theory.**

- 5.1 Define simple space and events.
- 5.2 Describe the finite probability spaces.
- 5.3 Describe the theorems on finite probability spaces.
- 5.4 Define conditional probability.
- 5.5 Define independent events.
- 5.6 Describe the repeated trials.

**6. Understand the features of graphs, directed graphs and machines.**

- 6.1 Describe the graphs and multi graphs.
- 6.2 Describe the degree of a vertex.
- 6.3 State the meaning of connectivity.
- 6.4 Define finite graphs and trivial graphs.
- 6.5 Describe sub graph, isomorphic and homomorphic graph.

**7. Understand the features of binary trees.**

- 7.1 Define binary trees.
- 7.2 Describe the complete and extended binary trees.
- 7.3 Mention the properties of trees.
- 7.4 Describe the method of binary search trees.
- 7.5 Describe the method of traversing binary trees.

**REFERENCE BOOKS:**

- 1. Discrete Mathematics  
BY- Seymour Lipschutz, Marc Lipson (Schaum's Outline Series)
- 2. Modern Computer Algebra  
BY – Joachim von zur Gathen
- 3. <http://www.mathgoodies.com/lessons/sets/>

**66641**

## **Object Oriented Programming**

<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>3</b>	<b>3</b>

### **OBJECTIVES**

To develop knowledge and skill on Object Oriented Programming (OOP).

To develop knowledge and skill on C# language as OOP, it's syntax, keywords and programming.

To develop knowledge on the .Net Framework.

### **SHORT DESCRIPTION**

Overview of C# Programming and The .net framework; Program structure and Basic syntax of C#; Data types, Variables, Constants and Literals of C#; Operators and expressions of C#; Decision making statements, Looping statements of C#; Arrays and strings; Methods; Classes and structures; Polymorphism; Inheritance; Interface and Delegates.

### **DETAIL DESCRIPTION**

#### **Theory:**

- 1 Overview of C# programming and the .net framework
  - 1.1 State Programming Features of C#
  - 1.2 Overview the .NET Frameworks
  - 1.3 Describe Common Language Runtime (CLR)
  - 1.4 Explain Integrated Development Environment (IDE) for C#
  - 1.5 Describe .NET Framework Class Library
  - 1.6 Describe Common features of Object Oriented programming
  - 1.7 Describe Comparison between C# and Java
- 2 Understand program structure and basic syntax of C#
  - 2.1 Describe Program Structure of C#
  - 2.2
  - 2.3 Compile and Execute the C# Program
  - 2.4 Uses of Input/output in C#
  - 2.5 Explain the Variables in C#
  - 2.6 Describe Namespaces
  - 2.7 Define of C# Keywords
- 3 Understand data types, variables, constants and literals of C#
  - 3.1 Describe Different kind of data types:  
Integer, Floating Point, Decimal, Characters & Strings, Boolean and Null able Types.
  - 3.2 Define and Initialize Variables
  - 3.3 Define constants
- 4 Understand operators and expressions of C#
  - 4.1 Describe Arithmetic, Logical, Relational, Assignment, Bitwise and Miscellaneous Operators
  - 4.2 Explain Operator Precedence
  - 4.3 Define Checked and Unchecked Operators
  - 4.4 Describe the Expressions of C#
  - 4.5 Explain the Lvalue and Rvalue Expressions in C#

- 5 Understand decision making statements of C#
  - 5.1 Explain if Statement
  - 5.2 Explain if...else Statement
  - 5.3 Describe The if...else if...else Statement
  - 5.4 Explain Nested if Statements
  - 5.5 Describe Switch Statement
  - 5.6 Describe Conditional Operator
- 6 Understand looping statements of C#
  - 6.1 Explain While Loop, For Loop, Do...While Loop and Nested Loops
  - 6.2 Explain Loop Control Statements
  - 6.3 Describe Infinite Loop
- 7 Understand arrays and strings
  - 7.1 Declare and Initialize an Array
  - 7.2 Explain Classifications of Arrays
  - 7.3 Describe Jagged Arrays
  - 7.4 Create a String Object
  - 7.5 Describe the Properties of the String Class
  - 7.6 Describe the Methods of String Class
- 8 Understand methods
  - 8.1 Define Methods in C#
  - 8.2 Explain the Calling Methods in C#
  - 8.3 Describe the Calling of Recursive Method
  - 8.4 Explain the method of passing Parameters to a Method
  - 8.5 Explain the method of passing Parameters by Value
  - 8.6 Explain the method of passing Parameters by Reference
  - 8.7 Explain the method of passing Parameters by Output
- 9 Understand classes
  - 9.1 Define C# Class
  - 9.2 Explain Member Functions and Encapsulation
  - 9.3 Mention the uses of Constructors and Destructors
  - 9.4 Mention the uses of Static Members of a C# Class
  - 9.5 Explain Class versus Structure
- 10 Understand polymorphism
  - 10.1 Describe Polymorphism
  - 10.2 Describe Types of Polymorphism
  - 10.3 Explain Method overloading
  - 10.4 Explain Operator Overloading
- 11 Understand inheritance
  - 11.1 State Inheritance
  - 11.2 Describe Base and Derived Classes
  - 11.3 Describe Initialization of Base Class
  - 11.4 Explain Single Inheritance
  - 11.5 Describe Multilevel Inheritance
  - 11.6 Explain Multiple Inheritance
  - 11.6 Describe Hierarchical Inheritance



**Practical:** Perform skill to create, compile, debug & execute C# programs to solve specific problems.

**1 Develop programs using basic structure of c# programming language**

- 1.1 Prepare a C# program for printing a message.
- 1.2 Prepare a C# program for adding two integer numbers using Windows from.

**2 Develop programs using different variable and operators**

- 2.1 Prepare a C# program to swap two numbers
- 2.2 Prepare a C# Program to calculate Age in YY-MM-DD
- 2.3 Prepare a C# program that takes two numbers as input and returns true or false when both numbers are even or odd.

**3 Practice programs using conditional statement exercises**

- 3.1 Prepare a C# program to find the largest of three numbers.
- 3.2 Prepare a C# program to read mark of six subjects of a student and calculate the GPA according to BTEB Diploma in Engineering Probidhan 2016.
- 3.3 Prepare a C# program to check whether an alphabet is a vowel or consonant.

**4 Exercise programs using loop exercises**

- 4.1 Prepare a C# program to find the sum of first 10 natural numbers. (The first 10 natural number is : 1 2 3 4 5 6 7 8 9 10; The Sum is : 55)
- 4.2 Prepare a C# program to convert a decimal number to hexadecimal.
- 4.3 Prepare a C# program to calculate the factorial of a given number
- 4.4 Prepare a C# program to display first N prime numbers
- 4.5 Prepare a C# program to display the first N terms of Fibonacci series

**5 Develop programs using arrays and strings**

- 5.1 Prepare a C# program to store elements in an array and print it.
- 5.2 Prepare a C# program to find the sum of all elements of the array
- 5.3 Prepare a C# program to find maximum and minimum element in an array
- 5.4 Prepare a C# program to sort N numbers in ascending/descending order
- 5.5 Prepare a C# program to find the second largest element in an array
- 5.6 Prepare a C# program to separate the individual characters from a string.
- 5.7 Prepare a C# program to count a total number of alphabets, digits and special characters in a string

**6 Practice programs using methods**

- 6.1 Prepare a C# program to create a user define function.
- 6.2 Prepare a C# program to create a user define function with parameters
- 6.3 Prepare a C# program to create a function for the sum of two numbers
- 6.4 Prepare a C# program to create a function to swap the values of two integer numbers.
- 6.5 Prepare a C# program to create a recursive function to find the factorial of a given number.

## 7 Practice programs using classes and structures

- 7.1 Prepare a program for manipulating information of a student (Name, Roll, GPA) in using C# class.
- 7.2 Prepare a C# program using Constructor and destructor
- 7.3 Prepare a C# program using Structure.

## 8 Develop program using polymorphism

- 8.1 Prepare a C# program using function overloading.
- 8.2 Prepare a C# program using operator overloading.

## 9 Exercise programs using inheritance

- 9.1 Prepare a C# program using single inheritance.
- 9.2 Prepare a C# program using multilevel inheritance.
- 9.3 Prepare a C# program using multiple inheritances.
- 9.4 Prepare a C# program using hybrid inheritance.

## 10 Practice programs using interface and delegates

- 10.1 Prepare a simple program using C# Interface.
- 10.2 Prepare a simple program to implement delegate in C#.

### Reference Books:

1. *Programming in C# (3<sup>rd</sup> Edition) by E. Balagurusamy*
2. [\*Head First C# by Andrew Stellman\*](#)
3. *C# 5.0 in a Nutshell (5<sup>th</sup> Edition) by Ben Albahari, Joseph Albahari*

### Online References:

1. <https://www.tutorialspoint.com/csharp/index.htm>
2. <http://www.c-sharpcorner.com/beginners/>
3. <http://www.csharp-station.com/Tutorial.aspx/>
4. <http://stackoverflow.com/questions/294128/c-sharp-web-developmentlearning-strategy>
5. <http://www.sitepoint.com/vb-dot-net-c-sharp-programming/>
6. <http://www.csharp411.com/best-c-web-sites/>
7. [http://msdn.microsoft.com/en-us/library/67ef8sbd\(v=vs.80\).aspx](http://msdn.microsoft.com/en-us/library/67ef8sbd(v=vs.80).aspx)
8. <http://www.pgacon.com/csip21/default.htm>
9. <http://www.homeandlearn.co.uk/csharp/csharp.html>

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**AIMS**

- To provide the knowledge & skill on data structures.
- To provide the knowledge & skill on writing simple algorithms.
- To develop and test simple programs related to data structures.

**SHORT DESCRIPTION**

Data types, data structure and algorithm; Arrays, records, pointers and linked lists; Stack, queue and recursion; Searching & sorting.

**DETAIL DESCRIPTION****Theory:****1 Understand the idea of data structure.**

- 1.1 Define data & information.
- 1.2 State data types.
- 1.3 Define Memory Location
- 1.4 Define data structure.
- 1.5 Mention Different types of data structure.
- 1.6 Describe different types of data operation.

**2 Understand the basic concept of algorithm**

- 2.1 State the characteristics of algorithm
- 2.2 Define the pseudo code & algorithmic notations.
- 2.3 Describe the structured programming and flowcharts.
- 2.4 Describe the Complexity of algorithm

**3 Understand the concept of arrays, records and pointers.**

- 3.1 Define linear array.
- 3.2 Write the algorithm for traversing linear arrays.
- 3.3 State the representation of linear array in Memory.
- 3.4 Write the algorithm for inserting and deleting elements into/from linear arrays.
- 3.5 Write the algorithm of matrix multiplication.
- 3.6 State the use of pointer arrays, Jagged array and records.

**4 Understand the properties of the linked lists.**

- 4.1 Define linked lists.
- 4.2 Describe the representation of linked lists in memory.
- 4.3 Write the algorithms to traverse a linked list.
- 4.4 Write the algorithms for searching a linked list.
- 4.5 Write the algorithms for inserting/deleting nodes into/from a linked list.

**5. Understand the Operation of Stack**

- 5.1 State the meaning of the terms PUSH, POP&LIFO.
- 5.2 Write the algorithm for adding or removing data into / from a Stack.
- 5.3 Describe the Polish and Reverse Polish Notation of arithmetic expression.
- 5.4 Describe the operation of Infix, Postfix & Prefix transformation.
- 5.5 Write the algorithms to transform Prefix expression into Prefix expression and vice versa.

**6. Understand the Operation of Queue**

- 6.1 Define Queue.
- 6.2 Describe Priority queues.
- 6.3 Mention differences between stack and queue
- 6.4 Write the algorithms for inserting/deleting data into/from queues.

**7. Understand the Operation of Recursion.**

- 7.1 Define Recursion
- 7.2 Explain the uses of recursive functions.
- 7.3 Write the algorithms to compute factorial N by recursive functions.
- 7.4 Explain Fibonacci number generation algorithm by recursive functions.

## **8 Understand the Operation of searching.**

- 8.1 State the different techniques of searching.
- 8.2 Describe the linear and binary search algorithm.
- 8.3 Write the algorithms for linear & binary search.
- 8.4 Compare the complexity of linear & binary search algorithms.

## **9 Understand the Operation of sorting.**

- 9.1 State the different techniques of Sorting.
- 9.2 Describe the technique of bubble sort, quick sort, heap sort, insertion sort, selection sort and merge sort.
- 9.3 Write 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.

## **10 Understand the basics of Storing string**

- 10.1 Define String
- 10.2 State the types of structures for storing strings.
- 10.3 Describe the Record – oriented, Fixed-Length storage procedure of strings.
- 10.4 State the advantages and disadvantages of record oriented, fixed-length storage.

## **PRACTICAL:**

1. Develop and Test a program for data insertion & Deletion in a Linear Array.
2. Develop and Test a program for Multiplication of two Matrices
3. Develop and Test a program for inserting/Deleting nodes into/from a Linked List.
4. Develop and Test a program using PUSH and POP Operation in Stack.
5. Develop and Test a program to convert an infix expression to postfix expression.
6. Develop and Test a program for Data insertion and Deletion from a Queue.
7. Develop and Test a program for calculating factorial N and Fibonacci number using Recursion.
8. Develop and Test a program to find out data using linear search and binary search.
9. Develop and Test a program to arrange Data Ascending and Descending using Bubble Sort algorithm.
10. Develop and Test a program to arrange Data Ascending and Descending using Quick Sort algorithm.

## **REFERENCE BOOKS:**

1. Data Structures - BY- Seymour Lipchitz (Schaum's Outline Series)
2. Data Structure and Algorithm - By- Md. Mokter Hossain, Md. Masud Karim & Md. Moynul Hoque

**AIMS**

- To be able to acquire the knowledge & skill on Flip Flop, counters, shift registers and their applications
- To be able to acquire the knowledge & skill on semiconductor memories & ALU
- To be able to acquire the knowledge & skill on A/D and D/A converters
- To familiarize with PLD & simple computer (SAP-1& SAP-2)

**SHORT DESCRIPTION**

Sequential system concept; Flip-flops; Registers & counters; Semiconductor Memories; A/D & D/A converters; PLD and SAP-1& SAP-2.

**DETAIL DESCRIPTION****Theory:****1. Understand the features of sequential logic circuits**

- 1.1 Define Sequential logic circuit.
- 1.2 Define the synchronous and asynchronous sequential logic circuit.
- 1.3 Define Clock, Timing diagram, Latch & Flip-Flop.
- 1.4 State the concept of level clocking and edge triggering.
- 1.5 Describe the operation of sequential logic system with block diagram.

**2. Understand Flip Flops**

- 2.1 Define Flip Flop & list the different types of Flip Flops.
- 2.2 Explain the operation of clocked SR Flip Flop.
- 2.3 State the advantages of edge triggering in Flip Flop.
- 2.4 Explain the operation of clocked D, T, JK and Master-slave Flip Flops.
- 2.5 Describe the operation of Flip Flop as a frequency division circuit.
- 2.6 State the application field of Flip Flops.

**3. Understand Registers**

- 3.1 Define register & list the different types of registers.
- 3.2 Explain the operation of serial in - serial / parallel out shift registers.
- 3.3 Explain the operation of parallel in- parallel / serial out shift registers.
- 3.4 Describe the operation of shift left & shift right register.
- 3.5 Describe the operation of buffer register and universal shift registers.
- 3.6 Mention the uses of registers.

**4. Understand binary counter circuits**

- 4.1 Define binary counter.
- 4.2 State the difference between asynchronous and synchronous counter.
- 4.3 Explain the operation of asynchronous, synchronous and decade counter.
- 4.4 State the modulus of a counter & describe the principle of divide - by- n counter.
- 4.5 Describe the operation of a binary up / down counter.
- 4.6 State the principle of ring, Johnson & Cascaded counter.
- 4.7 State the application of different types of counters.

**5. Understand semiconductor memories**

- 5.1 List the type of memories.
- 5.2 Describe the principle of serial and parallel access memory.

- 5.3 Explain the internal organization of semiconductor memory.
- 5.4 Describe the technique of memory addressing.
- 5.5 Explain the read and write operation of semiconductor memory.
- 5.6 Explain the principle of static and dynamic RAM.
- 5.7 Describe the principle operation of ROM, PROM, EPROM and EEPROM.
- 5.8 Mention the maximum clock speed, bus width and bandwidth of SDRAM, RDRAM, DDR SDRAM, DDR2 SDRAM, DDR3 SDRAM & DDR4 SDRAM.

**6. Understand arithmetic logic circuit:**

- 6.1 Mention the basic principle of ALU.
- 6.2 List the application of ALU.
- 6.3 Mention the principle of digital comparators.
- 6.4 List the application of digital comparators.
- 6.5 Mention the principle of binary rate multiplier with block diagram.

**7. Understand D/A converter**

- 7.1 Mention the principle of level conversion/A conversion.
- 7.2 Mention the types of D/A converter.
- 7.3 Explain the operation of a binary weighted D/A and R-2R ladder D/A converter.
- 7.4 State the terms – resolution, percentage of resolution, accuracy, offset error and settling time as specification of D/A converter.
- 7.5 State the application field of D/A converter.

**8. Understand A/D converter.**

- 8.1 State the general principle of A/D conversion and list the types of A/D converter.
- 8.2 State the working principle of 3-bit parallel A/D converter.
- 8.3 Describe the operation of Digital Ramp A/D converter
- 8.4 Explain the operation of successive approximation, dual slope and Flash A/D converter.
- 8.5 State the terms – resolution, accuracy, and conversion time as pecification of A/D converter.
- 8.6 Describe the operation of sample & hold circuits and its application.

**9. Understand the programmable logic devices.**

- 9.1 Defines PLD and the advantages of PLD.
- 9.2 Describe the principle of PLD.
- 9.3 Discuss simplified logic diagram of PLA, PAL and GAL.
- 9.4 State the basic feature of FPGA.
- 9.5 Describe the programming process SPDL
- 9.6 Describe the complex programmable logic device (CPDL).

**10. Understand the organization of a SAP-1**

- 10.1 State the meaning of SAP.
- 10.2 State the function of each stage of SAP-1 with block diagram.
- 10.3 State the function of control signals i.e. Enable, Load, Clock and Clear of each register.
- 10.4 State the instruction for accessing and storing data in RAM of SAP-1.
- 10.5 Describe the bus organization of SAP- 1.

**11. Understand the organization of a SAP-2**

- 11.1 State the function of each stage of SAP-2 with block diagram.
- 11.2 State the function of control signals of SAP-2
- 11.3 Describe the bus organization of SAP-2.
- 11.4 State the concept of Instruction Set of SAP-2.
- 11.5 Mention the differences between SAP-1 & SAP-2.

**PRACTICAL:**

1. Prepare the clocked RS flip-flops and check its truth table and operation.
2. Prepare the clocked D & T flip-flops and check its truth table and operation.
3. Prepare the clocked JK & Master-slave flip-flops and check its truth table and operation.
4. Prepare the serial / Parallel in - serial / parallel out shift registers and check its working operation.
5. Prepare the left shift & right shift register and check its working operation.
6. Prepare the Decade counter and check its operation with truth table.
7. Prepare the Ring counter and check its operation with truth table.
8. Prepare the Up/Down counter and check its operation with truth table.
9. Prepare a 4 bit ALU and check the operation of ALU
10. Show the read / write operation of a 4 bit memory chip.
11. Show the D/A conversion procedure of D/A converter.
12. Show the A/D conversion procedure of A/D converter.
13. Prepare a digital clock & observed the output.

**REFERENCE BOOKS**

1. Digital principles and application – Albert PaulMalvino
2. Digital Computer Electronics– Albert PaulMalvino
3. Digital Systems–Ronald J.Tocci
4. Modern Digital Electronics - R. P. Jain

**AIMS:**

- To be able to understand the basic concepts and principles of business organization.
- To be able to understand the banking system.
- To be able to understand the trade system of Bangladesh.
- To be able to understand the basic concepts of communication and its types, methods.
- To be able to perform in writing, application for job, complain letter & tender notice.

**SHORT DESCRIPTION:**

Principles and objects of business organization; Formation of business organization; Banking system and its operation; Negotiable instrument; Home trade and foreign trade. Basic concepts of communication Communication model & feedback; Types of communication; Methods of communication; Formal & informal communication; Essentials of communication; Report writing; Office management; Communication through correspondence; Official and semi- official letters.

**DETAIL DESCRIPTION:****Theory:****1 Concept of Business organization.**

- 1.1 Define business.
- 1.2 Mention the objects of business.
- 1.3 Define business organization.
- 1.4 State the function of business organization.

**2 Formation of Business organization.**

- 2.1 Define sole proprietorship, partnership, Joint Stock Company. and co-operative
- 2.2 Describe the formation of sole proprietorship, partnership, joint stock Company, & co operative.
- 2.3 Mention the advantages and disadvantages of proprietorship, partnership and Joint Stock Company.
- 2.4 State the principles of Co operative & various types of Co operative.
- 2.5 Discuss the role of co-operative society in Bangladesh.

**3 Basic idea of Banking system and negotiable instrument.**

- 3.1 Define bank.
- 3.2 State the service rendered by bank.
- 3.3 Describe the classification of bank in Bangladesh.
- 3.4 State the functions of Bangladesh Bank in controlling money market.
- 3.5 State the functions of commercial Bank in Bangladesh
- 3.6 Mention different types of account operated in a bank.
- 3.7 Mention how different types of bank accounts are opened and operated.
- 3.8 Define negotiable instrument.
- 3.9 Discuss various types of negotiable instrument.
- 3.10 Describe different types of cheque.



#### **4 Home & foreign trade**

- 4.1 Define home trade.
- 4.2 Describe types of home trade.
- 4.3 Define foreign trade.
- 4.4 Mention the advantages and disadvantages of foreign trade.
- 4.5 Discuss the import procedure & exporting procedure.
- 4.6 Define letter of credit.
- 4.7 Discuss the importance of foreign trade in the economy of Bangladesh.

#### **5 Basic concepts of communication**

- 5.1 Define communication & business communication.
- 5.2 State the objectives of business communication.
- 5.3 Describe the scope of business communication.
- 5.4 Discuss the essential elements of communication process.

#### **6 Communication model and feedback.**

- 6.1 Define communication model.
- 6.2 State the business functions of communication model.
- 6.3 Define feedback.
- 6.4 State the basic principles of effective feedback.

#### **7 Types and Methods of communication.**

- 7.1 Explain the different types of communication;-
  - a) Two-way communication
  - b) Formal & informal communication
  - c) Oral & written communication
  - d) Horizontal & vertical communication
  - e) external & internal communication
  - f) Spoken & listening communication.
- 7.2 Define communication method.
- 7.3 Discuss the various methods of communication.
- 7.4 Distinguish between oral and written communication.

#### **8 Essentials of communication.**

- 8.1 Discuss the essential feature of good communication.
- 8.2 Describe the barriers of communication.
- 8.3 Discuss the means for overcoming barriers to good communication.

#### **9 Report writing.**

- 9.1 Define report, business report & technical report.
- 9.2 State the essential qualities of a good report.
- 9.3 Describe the factors to be considered while drafting a report.
- 9.4 Explain the components of a technical report.
- 9.5 Prepare & present a technical report.

#### **10 Office management.**

- 10.1 Define office and office work.
- 10.2 State the characteristics of office work.
- 10.3 Define filing and indexing.
- 10.4 Discuss the methods of filing.

- 10.5 Discuss the methods of indexing.
- 10.6 Distinguish between filing and indexing.

#### **11 Official and semi-official letters.**

- 11.1 State the types of correspondence.
- 11.2 State the different parts of a commercial letter.
- 11.3 Define official letter and semi-official letter.
- 11.4 Prepare & present the following letters: Interview letter, appointment letter, joining letter and application for recruitment. Complain letters, tender notice.

#### **REFERENCE BOOK:**

1. উচ্চ মাধ্যমিক ব্যবসায়নীতি ও প্রয়োগ -মোহাম্মদ খালেকুজ্জামান
2. উচ্চ মাধ্যমিক ব্যাংকিং ও বীমা -প্রফেসর কাজী নুরুল ইসলাম ফারুকী
3. আধুনিক কারবার পদ্ধতি -লতিফুর রহমান
4. কারবার যোগাযোগ ও সচিবের কার্যপদ্ধতি -প্রফেসর লতিফুর রহমান ও প্রফেসর কাজী নুরুল ইসলাম ফারুকী
5. ব্যবসায়িক যোগাযোগ এবং অফিসের কর্মপ্রণালী -ড. এম, এ, মান্নান
6. ব্যবসায় যোগাযোগ – মোহাম্মদ খালেকুজ্জামান ও মোঃ মুশাররফ হোসেন চৌধুরী
7. Business organization & management- M.C. Shukla
8. Business organization & management- R.N. Gupta