



## Government Polytechnic Mumbai

(Academically Autonomous Institute of Maharashtra Goyernment)  
49, Ali Yawar Jung Marg, Kherwadi, Bandra (E)

[gpmumbai@gpmumbai.ac.in](mailto:gpmumbai@gpmumbai.ac.in)

Programme: Computer Engineering

Third Semester

With effect from 2017-18

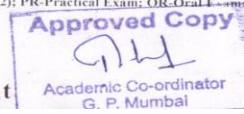
Course Code	Course Title	C/ O	Teaching Scheme				Credits	Examination Scheme						
			L	P	TU	Total		Theory TH	TS	PR	OR	TW	Total	
CO16302	Data Structures	C	03	04	--	07	07	70	30	50*	--	--	150	
CO16303	Object Oriented Programming	C	02	04	--	06	06	50#		50*	--	50	150	
CO16304	Computer Hardware & Maintenance	C	03	04	--	07	07	70	30	-	50*	--	150	
CO16305	Principles of Database Management Systems	C	03	04	--	07	07	70	30	50	--	--	150	
IT16204	Digital Techniques	C	03	02	--	05	05	70	30	50	--	--	150	
CO16306	Professional Practices	C	--	02	--	02	02	--	--	--	--	50	50	
HU16104	Environmental Studies	C	--	--	02	02	02	--	--	--	25*	25	50	
<b>Total</b>			<b>14</b>	<b>20</b>		<b>02</b>	<b>36</b>	<b>36</b>	<b>330</b>	<b>120</b>	<b>200</b>	<b>75</b>	<b>125</b>	<b>850</b>

Abbreviations: C- Compulsory; O- Optional; L- Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work \*Indicates assessment by Internal & External Examiners.

# Indicates Online Examination.

(Dr. R. A. Patel)  
Academic Coordinator 21-17

Head of Department



Principal

Programme : Diploma in Computer Engineering									
Course Code: CO16302				Course Title: Data Structures					
Compulsory / Optional: Compulsory.									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	04	7	70 (3 Hrs.)	30	50*			150

\*External Examiner

#### Rationale:

The study of Data Structure is essential part of Computer Science. Data structure is a logical and mathematical model for storing and organizing data in a particular way in a computer. The study of data structure helps the students in developing logic and structured programs.

#### Course Outcomes:

Student should be able to:

CO1	Describe different data structure.
CO2	Develop program to implement Stack and recursion.
CO3	Develop program to implement Queue.
CO4	Describe different Linked List and Tree Concept.
CO5	Implement different Searching and Sorting Techniques.

#### Course Content Details:

Unit No	Topics / Sub-topics
1	<b>Introduction to Data Structures:</b> Need of data structures. Definition of Data structure and Abstract data type Classification of Data structures: Linear, non-linear, homogeneous, non-homogeneous, static & dynamic.
2	<b>LINKED LIST</b> 2.1 Introduction and Terminologies <ul style="list-style-type: none"> <li>• Node, Next Address and Pointer, Null pointer, Empty list</li> </ul> 2.2 Types of Linked List <ul style="list-style-type: none"> <li>• Single Linked List</li> <li>• Doubly Linked List</li> <li>• Circular Linked List</li> </ul>

Data Structures

CO16302



	<ul style="list-style-type: none"> <li>• Doubly Circular Linked List</li> </ul> <p>2.3 Operations on Single Linked List</p> <ul style="list-style-type: none"> <li>• Searching</li> <li>• Insertion - (At Front ,In between and At End )</li> <li>Deletion - (From Front ,In between, From End)</li> </ul>
3	<p><b>STACKS</b></p> <p>3.1 Definition &amp; examples of Stack</p> <ul style="list-style-type: none"> <li>• Stack as an abstract data type</li> <li>• implementations using arrays and dynamic memory allocation</li> </ul> <p>3.2 operations on Stack</p> <ul style="list-style-type: none"> <li>• PUSH</li> <li>• POP</li> <li>• Top Of The Stack</li> </ul> <p>3.3 Overflow &amp; Underflow of Stack</p> <p>3.4 Applications of Stack</p> <ul style="list-style-type: none"> <li>• Polish Notation</li> <li>• Reversing a List</li> <li>• Recursion</li> </ul>
4	<p><b>QUEUES</b></p> <p>4.1 Definition &amp; examples of Queue</p> <ul style="list-style-type: none"> <li>• Queue as an abstract data type</li> <li>• implementations using arrays and dynamic memory allocation</li> </ul> <p>4.2 Operations on Queue</p> <p>4.3 Types of Queue</p> <ul style="list-style-type: none"> <li>• Priority queue</li> <li>• Circular queue</li> </ul> <p>4.4 Application Of Queue</p> <ul style="list-style-type: none"> <li>• Job Scheduling</li> <li>• Task Scheduling</li> </ul>
5	<p><b>TREES and GRAPHS</b></p> <p>6.1 Introduction and Terminologies</p> <ul style="list-style-type: none"> <li>• Sub-tree, root ,leaf , left, non-leaf, right, parent, child, ancestor, descendant, brother, level, depth, height.</li> </ul> <p>6.2 Types of Tree</p> <ul style="list-style-type: none"> <li>• General Tree</li> <li>• Binary Tree</li> <li>• Binary Search Tree</li> </ul> <p>6.3 Representation of Tree</p> <p>6.4 Operations on Trees</p> <ul style="list-style-type: none"> <li>• Insertion</li> <li>• Deletion</li> <li>• Searching - Depth-first search and Breadth-first search</li> </ul>



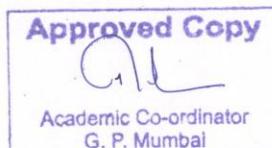
	<ul style="list-style-type: none"> <li>• Traversing - Pre-order, In-order ,Post-order</li> </ul> <p>6.5 Introduction to GRAPHS</p> <ul style="list-style-type: none"> <li>• Terminologies: graph, node (Vertices), arcs (edge), directed graph, in-degree, out-degree, adjacent, successor, predecessor, relation, weight, path, length.</li> </ul>
6	<p><b>SEARCHING &amp; SORTING</b></p> <p>6.1 Searching</p> <ul style="list-style-type: none"> <li>• Linear Search,</li> <li>• Binary Search ,</li> <li>• Hash Search.</li> </ul> <p>6.2 Sorting</p> <ul style="list-style-type: none"> <li>• Bubble Sort</li> <li>• Insertion Sort</li> <li>• Selection Sort</li> <li>• Merge Sort</li> <li>• Quick Sort</li> </ul>

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction To Data Structures	4	02	04		6
2	Linked List	10	04	04	06	14
3	Stack	08	02	04	06	12
4	Queue	08	02	04	06	12
5	Trees And Graphs	10	04	04	06	14
6	Searching & Sorting	08	02	04	06	12
<b>Total</b>		<b>48</b>	<b>16</b>	<b>24</b>	<b>30</b>	<b>70</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.



**List of experiments/Assignments: At least 16 programs to be completed .**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours												
1	1	Write a program for insertion and deletion of an element in an Array at given position.	4												
2	2	2.1 Write a program to implement following operations on Singly Linked List a)Create b)Insertion c)Deletion 2. 2Write a program to implement following operations on Doubly Linked List a)Create b)Insertion c)Deletion 2.3In a "Suryan" Shopy multiple Items are available for selling , the store wants to automate the billing system so that the customer gets printed bill .Each Item has unique Id, name and its rate associated with it. Write a menu driven program which will ask the customer to select the Items and quantity of the Items and will generate bill in following format. <table border="1"> <tr><td>Sr.no</td><td>Items</td><td>Rate</td><td>Quantity</td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td>Grand Total</td><td></td><td></td><td></td></tr> </table>	Sr.no	Items	Rate	Quantity					Grand Total				12
Sr.no	Items	Rate	Quantity												
Grand Total															
3	3	3.1 Write a program to implement the PUSH and POP operation of Stack 3.2 Write a program to implement the do and undo activity using Stack. 3.3 Write a program to implement Infix Prefix and Postfix Operation.	12												
4	4	4.1 Write a program to implement different operations on Queue. 4.2 Write a program to implement the concept of Doubly ended Queue. 4.3 Write a program to implement Ticket Reservation of system which is based on following priorities VIP=5, Senior =4, differently abled =3, Ladies=2, General =1 .	12												
5	5	5.1 Write a program to insert and delete nodes in a Tree. 5.2Write a program to implement Inorder,Preorder and Postorder of Tree nodes. 5.3 Write a program to implement DFS. 5.4 Write a program to implement BFS	12												
6	6	6.1 Write a program to implement Linear and Binary Search Techniques. 6.2Write a program to implement Hash Search Technique. 6.3 Given a text file which contain name , Roll_no, marks of students, arrange this information according to ranking using a)Quick sort b)Bubble sort. 6.4 Implement the following Write a function to generate 50 random numbers in a file, sort the file using following sorting methods	12												



	a)Insertion b)Selection	
7	Mini Project to be completed by the group of three or four students.	
	Total	64

**References/ Books:**

Sr. No.	Name of Book	Author	Publisher
1	Data Structure	Schaum's Series	Tata McGraw Hill
2	An Introduction to Data Structures with applications	Tremblay and Srenson	Tata McGraw Hill
3	Data Structure through 'C'	Ajit Abyankar	Tata McGraw Hill

**Course Curriculum Development Committee:****a. Internal Faculty**

- i. Mrs. Vandana S. Lokhande(Lecturer in Computer Engineering, Govt. Polytechnic, Mumbai)
- ii. Ms. Jijnasa S.Patil. (Lecturer in Computer Engineering, Govt. Polytechnic, Mumbai)

**b. External Faculty**

- i. Varsha Bhosale (Vice Principal Vidyalankar Institute of Technology)
- ii. Nilam S. Parmar. (Lecturer In Computer ,Thakur Poly Kandivali.)

  
Academic Coordinator  
(Dr. R. A. Patil)  
22-6-17

  
Head of Department  
(Computer Engineering)

  
Principal  
Govt. polytechnic Mumbai



Course Name:-Data Structures

Course Code :- CO16302

## CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	1	-	-	-	-	-	-	2
CO2	3	3	3	3	1	-	1	2	-	3
CO3	3	3	3	3	1	-	1	2	-	3
CO4	3	3	1	2	1	-	1	2	-	3
CO5	3	3	3	3	3	2	2	2	-	3

## CO Vs PSO matrix

	CO/POs	PSO1	PSO2	PSO3
CO1	Describe different data structure.	2	1	-
CO2	Develop program to implement Stack and recursion.	3	3	3
CO3	Develop program to implement Queue.	3	3	3
CO4	Describe different Linked List and Tree Concept.	3	2	1
CO5	Implement different Searching and Sorting Techniques.	3	3	3

## Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction to Data Structures	<b>CO1:</b> Describe different data structure
2	2	Linked List	<b>CO4:</b> Describe different Linked List and Tree Concept.
3	3	Stack	<b>CO:</b> Develop program to implement Stack and recursion.
4	4	Queue	<b>CO3 :</b> Develop program to implement Queue
5	5	Trees And Graphs	<b>CO4 :</b> Describe different Linked List and Tree Concept
6	6	Searching & Sorting	<b>CO5:</b> Implement different Searching and Sorting Techniques.



<b>Programme Code: Diploma in Computer Engineering</b>												
<b>Course Code: CO16303</b>				<b>Course Title: Object Oriented Programming</b>								
<b>Compulsory / Optional: Compulsory</b>												
Teaching Scheme and Credits				Duration of Examination			Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	TH	TS	PR	OR	TW	Total
2	--	4	6	2		4	50 <sup>#</sup>	--	50*	--	50	150
( # ) indicates Online examination												
( * ) indicates assessment by Internal and External examiners												

**Rationale:**

Object Oriented Programming is programming language model organized around objects rather than ‘actions’ and data rather than logic. The goal of this course is to provide the students with the fundamental knowledge of Object Oriented Programming. The programming ability has already been developed in students in the course Programming in C. In this course they will learn how to solve real life problems more efficiently and with fewer efforts using Object Oriented Programming. Basic file handling has also been included in the course so that a habit of programming in professional manner as per the needs of the industry will be developed in the students.

**Course Outcomes:**

Students will be able to

CO 1	Describe concepts of different programming paradigms and features of Object Oriented Programming.
CO 2	Know the concepts of functions.
CO 3	Summarize the concept of Encapsulation and Data Abstraction.
CO 4	Summarize the concept of Inheritance.
CO 5	Demonstrate the Polymorphism.
CO 6	Manipulate the files.



Topic No	Contents
1.	<b>Introduction</b> 1.1 Different programming paradigms 1.2 Limitations of Procedural Programming and need of OOP 1.3 Features of OOP 1.4 Beginning with C++: Basic Data Types, Tokens, Expressions, Control Structures, Arrays, Structures and Unions.
2.	<b>Functions in C++</b> 2.1 The main function 2.2 Function Prototyping 2.3 Call by Value, 2.4 Call by Reference, Return by Reference 2.5 Inline Functions 2.6 Default Argument and const Arguments 2.7 Friend Function
3.	<b>Classes and Objects</b> 3.1 Specifying a class 3.2 Defining member functions 3.3 Making Outside Functions Inline 3.4 Nesting of Member Functions 3.5 Private Member Functions 3.6 Arrays within a class 3.7 Memory Allocation for Objects 3.8 Static Data Members and Member Functions 3.9 Array of Objects and Objects as Function Arguments 3.10 Friendly Functions 3.11 Returning Objects
4.	<b>Constructors and Destructors</b> 4.1 Constructors and their types 4.2 Parameterized Constructors 4.3 Constructor Overloading 4.4 Constructors with Default Arguments 4.5 Dynamic Initialization Of Objects 4.6 Copy Constructors 4.7 Destructors
5.	<b>Inheritance</b> 5.1 Base Class 5.2 Derived Class 5.3 Single Inheritance 5.4 protected Members 5.5 Multilevel Inheritance 5.6 Multiple Inheritance 5.7 Hierarchical Inheritance 5.8 Hybrid Inheritance 5.9 Virtual Base Classes



	5.10 Abstract Classes 5.11 Constructors in Derived Classes
6.	<b>Polymorphism</b> 6.1 Function Overloading 6.2 Operator Overloading 6.3 Overloading Unary Operators 6.4 Overloading Binary Operators 6.5 Type Conversions 6.6 Virtual Functions 6.7 Pure Virtual Functions
7.	<b>IO Handling: Console and Files</b> 7.1 C++ Streams and Stream Classes 7.2 Formatted Console IO Operations 7.3 File Stream Classes 7.4 Opening and Closing a File 7.5 Deleting a File 7.6 File Modes

Suggested Specifications Table with Hours and Marks (Theory):

Unit No.	Title	Teaching Hours	Distribution of Theory Marks			Total Marks
			R Level	U Level	A Level	
1.	Introduction	3	02	04	--	06
2.	Functions in C++	4	--	02	04	06
3.	Classes and Objects	6	--	02	06	08
4.	Constructors and Destructors	4	02	02	04	08
5.	Inheritance	6	02	02	04	08
6.	Polymorphism	5	02	02	04	08
7.	IO Handling: Console and Files	4	--	02	04	06
<b>Total</b>		<b>32</b>	<b>08</b>	<b>16</b>	<b>26</b>	<b>50</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).



**List of Programming Experiments:**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1.	1	<b>User Input and Output</b> <p>1.1 Write a program to accept integers from user and print only those elements which are greater than average.</p> <p>1.2 Write a program to find the roots of any quadratic equation of the form <math>ax^2 + bx + c = 0</math> where a, b and c should be accepted from the user. Using the quadratic formula <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math> and display the output.</p> <p>1.3 Write a program to do matrix multiplication of length NxN. Output should be displayed in matrix form.</p> <p>1.4 Write a program to accept a character string and check whether it is a palindrome or not.</p> <p>1.5 Write a menu driven program for the operation of calculator having arithmetic operations such as addition, subtraction, division, multiplication and modulus of two integers using switch statement.</p>	4
2.	1	<b>Structures and Unions</b> <p>2.1 Design a structure Student_record to contain name, date_of_birth, roll_number and marks obtained in five subjects. Use the date structure to represent date_of_birth. Develop a program to read data for 10 students in the second year of the Computer Engineering Department and write function for following operations:</p> <ul style="list-style-type: none"> <li>a. List the students rank-wise.</li> <li>b. List the students roll_number-wise.</li> <li>c. Gives the detail of topper of the class.</li> </ul> <p>2.2 Declare a structure named complex number having two members viz., real_part and imaginary_part. Write functions for following operations:</p> <ul style="list-style-type: none"> <li>a. To return real part of a complex number</li> <li>b. To return imaginary part of a complex number</li> <li>c. To set real part of a complex number</li> <li>d. To set imaginary part of a complex number</li> <li>e. To represent a complex number in the Cartesian form and exponential form (Hint: Two separate functions to be written)</li> <li>f. To add two complex numbers</li> <li>g. To subtract two complex numbers</li> </ul>	4
3.	2	<b>Playing with Functions</b> <p>3.1 Write a function which will take a string as a parameter and will remove the blank spaces before and after a string. Use Call by Reference method to call the above function. <b>(Hint:</b> Create two function separately for 'a' and 'b').</p> <p>3.2 Create a function which will find sum of all the prime numbers up to n, where n is input by user.</p> <p>3.3 Write the following functions</p> <ul style="list-style-type: none"> <li>a. To return addition of two integers</li> <li>b. To return subtraction of two integers</li> </ul>	4



		<p>c. To return addition of two floats  d. To return addition of two doubles  e. To return addition of one integer and one float  f. To return addition of two integers  g. To return subtraction of two integers  h. To return subtraction of two floats  i. To return subtraction of two doubles  j. To return subtraction of one integer and one float</p> <p>Write a menu driven program to invoke the above written functions</p>	
4.	3	<p><b>Manipulating Classes and Objects</b></p> <p>4.1 Create a class Person with the data members name, dateOfBirth, adhaarNumber, street, city, pincode and member functions set and get accepting necessary parameters and returning appropriate values.</p> <p>4.2 Write a program to perform addition and subtraction of Complex Numbers</p> <p>4.3 Modify 4.2 with static data members and member functions.</p> <p>4.4 Create two classes Test1 and Test2 which stores marks of a student. Read values for class objects and calculate average of two tests.</p> <p>4.5 Create a class Matrix with size 3 x 3 for floating point data. Declare a member function inside the class which will find transpose of the matrix and define it outside the class. In main function input data in the appropriate object and make a call to the above function.</p> <p>4.6 Write a function which will find inverse of matrix. (Hint: check all the possibilities.)</p>	12
5.	4	<p><b>Constructors and Destructors</b></p> <p>5.1 Modify the class Complex in 4.2 as follows:</p> <ol style="list-style-type: none"> <li>Add parameterized and default constructors in the class.</li> <li>Add copy constructor/destructor in the class.</li> </ol> <p>5.2 In the main class create objects of the class modified in 5.1 with dynamic initialization.</p>	8
6.	5	<p><b>Inheritance</b></p> <p>6.1 Do the following:</p> <ol style="list-style-type: none"> <li>Modify 4.1 to add appropriate constructors to it.</li> <li>Derive a class Student from the class modified in 'a' part with data members rollNumber, programme, coursesRegistered and result with appropriate constructors as well as get functions.</li> <li>Derive a class Teacher from the class modified in 'a' part with data members qualification, experience, coursesTaught, department, payScale and salary with appropriate constructors as well as get functions.</li> <li>Write a main function to perform possible operations on above classes.</li> <li>Create following classes as shown in the figures to perform multilevel, hierarchical, hybrid and multiple inheritances. Write constructors, destructor, some</li> </ol>	12



		<p>private as well as protected data members and some member functions which access the private and protected data members. In main function create objects of all the classes and make appropriate function call on the objects.</p>	
7.	6	<p><b>Polymorphism</b></p> <p>7.1 Modify the class in 5.1 to overload add and subtract function.      7.2 Overload + operator in above class.      7.3 Write a C++ program for definition a class Account. The class Account has two subtypes. viz., Current and Savings. Write a virtual function 'calculateInterest' which will calculate interest. Current account has simple interest and Savings Account has Compound interest.      7.4 Create a class Shape with necessary data members and a function to find the area of the shape. Create two subclasses of the class Shape viz., Rectangle and Triangle. Override the function to find area of the Rectangle and Triangle.</p>	12
8.	7	<p><b>Console and File IO</b></p> <p>8.1 Write a program to display the following output.</p> <pre>       1       1 2 1       1 2 3 2 1       1 2 3 4 3 2 1       1 2 3 4 5 4 3 2 1     </pre> <p>8.2 Write a menu-driven program to create, update, display a data file containing customer records.      8.3 Write a program to open a file in different modes.</p>	8
9.	All	<p><b>Assignment</b>      Solve total 200 Multiple Choice Questions based on the above contents.</p>	
10.		<p><b>Mini Project</b>      (To be done in groups of 2-3 students.)</p>	
<b>Total</b>			<b>64</b>



**Reference Books:**

Sr. No.	Book Title	Author	Publication
1	Object Oriented Programming with C++, 6th Edition.	E. Balagurusamy	McGraw Hill Education (India) Private Limited, New Delhi.
2	C++ The Complete Reference, 4th Edition.	Herbert Schildt	McGraw Hill/ Oshome, New Delhi
3	Programming with C++, 2 <sup>nd</sup> Edition	John R. Hubbard	Schaum's Outlines

**Course Curriculum Development Committee:+**

**a. Internal Faculty**

Ms. Jijnasa S. Patil (Lecturer in Computer Engineering, Govt. Polytechnic, Mumbai)

**b. External Faculty**

Mr. Suraj S. Bhosale (Lecturer in IT, Govt. Polytechnic, Jalgaon)



Academic Coordinator  
(Dr. R. A. Patil)  
22-6-17



Head of Department  
(Computer Engineering)



Principal  
Govt. Polytechnic Mumbai



Course Name:-Object Oriented Programming

Course Code: - CO16303

## CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	1	-	-	2	1	3
CO2	1	3	3	2	3	-	-	2	1	3
CO 3	1	3	3	3	2	-	-	1	1	3
CO 4	1	3	3	3	2	-	-	1	1	3
CO 5	1	3	3	3	2	-	-	1	1	3
CO 6	1	3	2	3	2	-	-	1	1	3

## CO vs. PSO matrix

CO	CO/POs	PSO1	PSO2	PSO3
CO1	Describe concepts of different programming paradigms and features of Object Oriented Programming.	3	2	3
CO2	Know the concepts of functions.	3	3	3
CO3	Summarize the concept of Encapsulation and Data Abstraction.	3	3	3
CO4	Summarize the concept of Inheritance.	3	3	3
CO5	Demonstrate the Polymorphism.	3	3	3
CO6	Manipulate the files.	3	3	3

## Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	<b>CO1:</b> Describe concepts of different programming paradigms and features of Object Oriented Programming.
2	2	Functions in C++	<b>CO2:</b> Know the concepts of functions.
3	3	Classes and Objects	<b>CO3:</b> Summarize the concept of Encapsulation and Data Abstraction.
4	4	Constructors and Destructors	<b>CO4:</b> Summarize the concept of Encapsulation and Data Abstraction.
5	5	Inheritance	<b>CO4:</b> Summarize the concept of Inheritance.
6	6	Polymorphism	<b>CO5:</b> Demonstrate the Polymorphism
7	7	IO Handling: Console and Files	<b>CO6:</b> Manipulate the files.



Programme : Diploma in Computer Engineering									
Course Code: CO16304				Course Title: Computer Hardware And Maintenance					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	-	4	07	70	30		50*		150

\*External Examiner

#### Rationale:

For the smooth functioning of computer system it is frequently required to upkeep, maintain, repair, troubleshoot and take up preventive maintenance of the system and its peripheral devices. So, it is essential for the students to acquire skills in the area of computer maintenance and troubleshooting.

In this course, focus is given on developing skills in installation and configuration of Operating Systems, loading and configuring various device drivers, diagnosing the faults and troubleshooting the computer at software level as well as component level. This course will be helpful for students to get employment in the industry as well as self employment.

#### Course Outcomes:

Student should be able to

CO1	Identify Different Components and their Specifications.
CO2	Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its Peripherals.
CO3	Explain functionality of Computer peripherals ,Interface , Troubleshooting Tools
CO4	Install, Configure Operating Systems and Device Drivers
CO5	Install, Configure and Maintain various components in computer system and Peripheral Devices
CO6	Diagnose Faults, Repair and Maintain Computer System and its Peripherals.



**Course Content Details:**

Unit No	Topics / Sub-topics
1	<b>Inside the PC:</b> <ul style="list-style-type: none"> <li>1. 1 Motherboard: Concept like address lines, data lines, internal registers.</li> <li>1. 2 CPU: Modes of operation of CPU – Real mode, Protected Mode, IA-32 mode, IA-32</li> <li>1. 3 Processor socket&amp; slots</li> <li>1. 4 Introduction to processors (Intel Core2Duo, i3, i5, i7)</li> <li>1. 5 Chipset Basic, Chipset Architecture, North / South bridge &amp; Hub Architecture. Latest Chipset for PC</li> <li>1. 6 Overview &amp; features of PCI, PCI –X, PCI express, AGP bus</li> <li>1. 7 Overview &amp; features of SDRAM, DDR, DDR2, DDR3.</li> <li>1. 8 Concept of Cache Memory: L1 Cache, L2 Cache, L3 Cache</li> <li>1. 9 BIOS – Basics &amp; CMOS Set Up</li> <li>1. 10 Motherboard Selection Criteria.</li> </ul>
02	<b>Monitor and Display:</b> <ul style="list-style-type: none"> <li>2. 1 LCD: Functional Block Diagram of LCD monitor and its working principle.</li> <li>2. 2 Touch Screen Display – The construction and working principle</li> <li>2. 3 Plasma Display Technology: - Construction &amp; working principle</li> <li>2. 4 LED: Working Principal</li> <li>2. 5 Advantages of Plasma, LED ,LCD</li> <li>2. 6 Basic Block Diagram of Video Accelerator Card.</li> </ul>
03	<b>Storage Devices &amp; Interfacing:</b> <ul style="list-style-type: none"> <li>3. 1 Recording Techniques: FM, MFM , RLL.</li> <li>3. 2 Hard Disk : Its construction and working.</li> <li>3. 3 Terms related to Hard Disk: Track, sector, cylinder, cluster, landing zone, MBR, zone recording, write pre-compensation.</li> <li>3. 4 Formatting: Low level, High level &amp; partitioning</li> <li>3. 5FAT Basics: Introduction to file system, FAT 16, FAT 32, NTFS</li> <li>3. 6Hard Disk Interface: Features of IDE, SCSI, PATA, SATA, Cables, &amp; Jumpers.</li> <li>3. 7Solid State Drive, Introduction to RAID</li> <li>3. 8Latest Advance Storage Technology: SD Card, Blue Ray Disk</li> </ul>



04	<b>Input and Output Devices:</b> <ul style="list-style-type: none"> <li>4. 1 Keyboard: Keyboard Organization, Types of Keystrokes, Wireless Keyboard.</li> <li>4. 2 Mouse: Opto-Mechanical, Optical, Wireless Mouse, Touchpad.</li> <li>4. 3 Scanner: Flat Bed Scanner working principle. Handheld scanner.</li> <li>4. 4 Modem: Internal and External: Block diagram and specifications.</li> <li>4. 5 Printer: Printer Types (Impact and Non-impact) Printer Characteristics, Dot matrix, Inkjet, Laser: Block Diagram and Specifications.</li> <li>4. 6 Speaker and Mike.</li> <li>4. 7 Laptop, Kindle, Tablet, Smartphone.</li> <li>4. 8 LCD Projector : Construction and working principle</li> <li>4. 9 Webcam: Construction and working principle</li> <li>4. 10 Bar code Reader: Construction and working principle, QR Code Reader</li> <li>4. 11 Various Networking devices</li> </ul>
05	<b>Interfaces</b> <ul style="list-style-type: none"> <li>5. 1 Type Interfaces/connectors: IDE connector, SATA connector,</li> <li>5. 2 ps/2 connector, Serial (com)port, USB ,Parallel (LPT) port,</li> <li>5. 3 HDMI , FireWire</li> <li>5. 4 Thunderbolt</li> <li>5. 5 Audio in/out port</li> <li>5. 6 Card Reader slot</li> <li>5. 7 Ethernet port</li> </ul>
06	<b>Preventive Maintenance and Trouble Shooting</b> <ul style="list-style-type: none"> <li>6. 1 Preventive maintenance: Active, Passive, periodic maintenance procedure.</li> <li>6. 2 Diagnostic Tools: Logic Analyzer, Logic Probe, Logic Pulser</li> <li>6. 3 Display Problem (Problems related to monitor)</li> <li>6. 4 Problems related to CPU (Detecting Front panel connection.)</li> <li>6. 5 Problem related to Motherboard</li> <li>6. 6 CMOS Testing.</li> <li>6. 7 Problem related to Key-board / Display</li> <li>6. 8 Problem related to I/O devices</li> <li>6. 9 Port Problem Cable testing (VGA,SATA,POWER cable)</li> <li>6. 10 Error messages (beeps)</li> <li>6. 11 Problems related to display</li> <li>6. 12 Non-system disk or disk error at boot</li> <li>6. 13 SMPS Testing</li> <li>6. 14 Diagnostic software for Troubleshooting PC</li> </ul>
07	<b>Power Supply</b> <ul style="list-style-type: none"> <li>7. 1 Power Supply Characteristics</li> <li>7. 2 Power Problems</li> <li>7. 3 Symptoms of Power problems</li> </ul>



	7.4 SMPS Construction and working 7.5 UPS Online UPS and Offline UPS (Block Diagram and Working) 7.6 Protection devices for power problems Spike Guard, Concept of earthing.
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**SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Inside the PC:	06	02	04	04	10
2	Monitor and Display:	08		04	04	08
3	Storage Devices & Interfacing:	08	02	04	06	12
4	Input and Output Devices:	08	02	04	06	12
5	Interfaces	06	02	04	06	10
6	Preventive Maintenance and Trouble Shooting	08	02	04	04	10
7	Power Supply	04	02	04	--	08

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**List of experiments/Assignments:**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	01	Identify various Components of Computer System and study the latest motherboard connections and layout of chipset.	04
2	01	Perform Basic Input/output System (BIOS) setting and configuration setup using Complementary Metal Oxide Semiconductor (CMOS).	04
3	02	Identify different types of monitor available in your lab.	02
4	03	Identify different components of Hard Disk Drive (HDD).	02
5	03	Format, partition and install a Hard Disk Drive (HDD) and format a pen drive.	02
6	04	Install and understand Input Devices and its types.	04
7	04	Install and understand Output Devices and its types.	04
8	04	Identify various Networking Devices.	04
9	05	Demonstrate Interfacing using connectors.	04
10	07	Connect Switched Mode Power Supply (SMPS) and Identify different parts of SMPS. Understand the working of SMPS and Uninterrupted Power Supply (UPS).	04
11	06	Use diagnostic software to identify installed computer peripherals and test their working condition.	04
12	06	Find faults related to Motherboard, CPU, and Memory.	06



13	06	Find faults related to Monitor, Hard disk.	04
14	06	Find faults related to Printer, Scanner and other peripherals.	04
15	06	Demonstrate Preventive maintenance.	06
16	All	Assemble PC and install an operating system(Windows and Linux family)	06
<b>Total</b>			<b>64hrs</b>

**Notes:** If possible an industrial visit should be arranged for students and videos lectures on Troubleshooting and Maintenance should be arranged.

#### References/ Books:

Sr. No.	Name of Book	Author	Publisher
01	Upgrading & Repairing PCs	Scott Muller	Pearson
02	The Complete PC Upgrade & Maintenance Guide	Mark Minasi	Wiley India
03	PC Upgrade and Repair	Barry Press and Maricia Press	Wiley India
04	Bigelow's Troubleshooting, Maintaining & Repairing PCs	Bigelow	Tata McGraw Hill

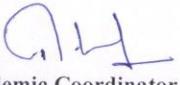
#### Course Curriculum Development Committee:

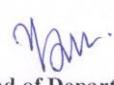
##### a. Internal Faculty

- i. Prof. Pooja S. Chame
- ii. Prof. M.H. Bhalerao

##### b. External Faculty

- i. Prof. Dipak Gaikar (Asst. Professor RGIT Mumbai)
- ii. Prof. Swapnil Mulke(Lecturer, Shah and Anchor Polytechnic,Mumbai)

  
Academic Coordinator  
(Dr. R.A. Patel)  
22-6-17

  
Head of Department  
(Computer Engineering)

  
Principal  
Govt. polytechnic Mumbai

Computer Hardware And Maintenance



CO16304

Course Name: - Computer Hardware &amp; Maintenance

Course Code: - CO16304

## CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	03	02	03	02	01	01	-	-	01	01
CO2	-	02	03	02	01	01	-	01	01	-
CO3	-	01	-	01	01	-	-	-	-	-
CO4	01	02	-	01	01	-	-	-	-	-
CO5	-	03	03	03	02	01	-	01	-	-
CO6	-	03	03	02	01	01	-	-	-	01

## CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Identify Different Components and their Specifications.	-	02	01
CO2	Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its peripherals.	03	02	02
CO3	Explain functionality of Computer peripherals ,Interface , Troubleshooting Tools	02	03	01
CO4	Install, Configure Operating Systems and Device Drivers	-	03	01
CO5	Install, Configure and Maintain various components in computer system and Peripheral Devices	-	03	01
CO6	Diagnose faults, Repair and Maintain Computer System and its Peripherals.	-	03	01

## Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Inside the PC:	<b>CO1:</b> Identify Different Components and their Specifications. <b>CO2:</b> Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its peripherals. <b>CO5:</b> Install, Configure and Maintain various components in computer system and Peripheral Devices
2	2	Monitor and Display:	<b>CO1:</b> Identify Different Components and their Specifications. <b>CO5:</b> Install, Configure and Maintain various components in computer system and Peripheral Devices
3	3	Storage Devices & Interfacing:	<b>CO1:</b> Identify Different Components and their Specifications. <b>CO2:</b> Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its peripherals. <b>CO5:</b> Install, Configure and Maintain various



			components in computer system and Peripheral Devices <b>CO6:</b> Diagnose faults, Repair and Maintain Computer System and its Peripherals.
4	4	Input and Output Devices:	<b>CO1:</b> Identify Different Components and their Specifications. <b>CO5:</b> Install, Configure and Maintain various components in computer system and Peripheral Devices <b>CO3:</b> Explain functionality of Computer peripherals ,Interface , Troubleshooting Tools
5	5	Interfaces	<b>CO1:</b> Identify Different Components and their Specifications. <b>CO5:</b> Install, Configure and Maintain various components in computer system and Peripheral Devices
6	6	Preventive Maintenance and Troubleshooting	<b>CO2:</b> Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its peripherals. <b>CO6:</b> Diagnose faults, Repair and Maintain Computer System and its Peripherals
7	7	Power Supply	<b>CO1:</b> Identify Different Components and their Specifications



<b>Programme : Diploma in Computer Engineering</b>									
<b>Course Code: CO 16 305</b>		<b>Course Title: Principles Of Database Management System.</b>							
Compulsory / Optional: <b>Compulsory.</b>									
Teaching Scheme and Credits		Examination Scheme							
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	04	7	70 (3 Hrs.)	30	50			150

**Rationale:**

Database management system creates, stores, manages a large amount of data which can be used by different software application. In comparison to file processing systems, use of this system increases efficiency of business operations and reduces overall costs. For Developing and managing efficient and effective database applications it requires understanding the fundamentals of database management systems, techniques for the design of databases, and principles of database administration. The course focuses on the fundamentals of database management systems and the recent developments.

**Course Outcomes:**

Students will be able to

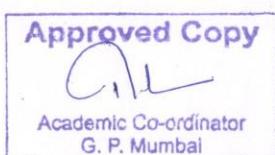
CO1	Describe fundamental concepts of database.
CO2	Execute Queries based on Structured Query Language.
CO3	Develop databases using Entity Relationship modelling approach.
CO4	Apply different constraints on data in the Relational database.
CO5	Apply data normalization and techniques on database

**Course Content Details:**

Unit No	Topics / Sub-topics
1	<b>Introduction to Database Fundamentals</b> <ul style="list-style-type: none"> <li>1.1 An Introduction to Database: Data, Database, Database Management Systems, advantages of DBMS over file processing system, Applications of DBMS</li> <li>1.2 Data abstraction, Data dictionary, Instance and schema,</li> <li>1.3 Data independence-Logical and Physical Independence</li> <li>1.4 Components of a DBMS and overall structure of a DBMS ,</li> </ul>



	Database Users, functions of Database Administrator
2	<p><b>Data Models And Types Of Database</b></p> <p>2.1 Database Models- Hierarchical Database Model, Network Database Model, Object-Oriented Database Model, Relational Database Model , ER model</p> <p>2.2 Relational Database Model- Domain, Attributes, Tuples and Relations.</p> <p>2.3 Codd's rules of RDBMS.</p> <p>2.4 Types of Database System-Centralized Database System, Parallel Database System, Client / Server Database System, Distributed Database System</p>
3	<p><b>Structured Query Language</b></p> <p>3.1 Structured Query Language :</p> <ul style="list-style-type: none"> <li>a) DDL, DML ,TCL,DCL</li> <li>b)Data types in SQL</li> </ul> <p>3.2 Clauses in SQL: Where, Having ,Group by, Order by clauses</p> <p>3.3 Functions in SQL: Date functions, Time functions, String functions, Aggregate functions</p> <p>3.4 Concept of Nested Query</p> <p>3.5 Concept of Join: Equi ,Non-equi ,outer ,self join</p> <p>3.6 Views Creating updating , Dropping Views,</p>
4	<p><b>Relational DataBase Model</b></p> <p>4.1 Relational Model: Basic concepts, attributes and domains</p> <p>4.2 keys concept: Super Key, Candidate key, primary Key, foreign key</p> <p>4.3 Constraints: Referential Integrity Constraints, Entity Integrity Constraints</p>
5	<p><b>Entity Relationship model</b></p> <p>5.1 Entities, Representation of entities, Entity set, Relationships, Relationship set attributes, Types Of Attributes .</p> <p>5.2 Strong and Weak Entity.</p> <p>5.3 Mapping Cardinality.</p> <p>5.4 Shortcomings of ER Model, Enhanced ER (EER) model, Subclass, super class, Specialization and Generalization.</p>



6	<b>Database Design</b> 6.1 Normalization , Data redundancy and updating anomalies 6.2 Normalization based on Functional dependencies and Multi-valued Dependencies. 6.3 Normal Forms: 1NF, 2NF, 3NF.
7	<b>Transaction Processing</b> 7.1 Transaction concept: Transaction properties, Transaction states 7.2 Schedule : Serial ,Concurrent ,Cascade less Schedule 7.3 Lock based Protocol.

**Suggested Specifications Table with Hours and Marks (Theory):**

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to Database Fundamentals	06	04	04		8
2	Data Models And Types Of Database	08	02	04	04	10
3	Structured Query Language	08	02	04	06	12
4	Relational DataBase Model	08	02	02	06	10
5	Entity Relationship model	06	02	04	06	12
6	Database Design	08	02	04	04	10
7	Transaction Processing	04	04	04		8
		<b>48</b>	<b>18</b>	<b>26</b>	<b>26</b>	<b>70</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.



**List of experiments/Assignments: At least 16 programs to be completed .**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	Install any open source database Product like My SQL.	2
2	2	Assignments based on Codd's Rules and data models. Study of Overall architecture and three level architecture of DBMS.	2
3	3	Create a New Database . And Perform Following operations on that Database. a)Create table b)Alter the table c)Rename Table d)Drop the table.	4
4	3	Create a New Database . And Perform Following operations on that Database a)Create a table b)Insert values in that table c)Update the table d) Delete the contents of the table.	4
5	3	Create a table and apply following clauses on it: Where , Having ,Group by, Order by clauses	4
6	3	Implement the following Functions in SQL a) Date functions b) Time functions c) String functions d) Aggregate functions	8
7	3	Implementation of Views of table and applying all options on Views.	4
8	3	Working with Nested -Query.	4
9	3	Implementation of all types of Joins.	4
10	3	Implementation of DCL commands: Grant, Revoke	4
11	3	Implementation of TCL commands :Commit, Rollback, Savepoint.	4
12	4	Create table student having column Name ,Roll_No, Marks , Address in which take Roll_no as primary key ,Apply NOT NULL on Address field .	4
13	4	Apply constraints such as check, NULL & default on table.	4
14	4	Implement foreign key concept.	4
15	5	Case Study on ER Model And EER Model	4



16	6	Normalize the table using different normal forms.	4
		Total	64

**References/ Books:**

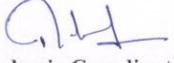
Sr. No.	Name of Book	Author	Publisher
1	Database System concepts	Abraham Silbershtz, Henry Korth & S. Sudarshan	Tata McGraw Hill International
2	Introduction to Relational Databases & SQL programming	Allen	Tata McGraw Hill
3	Database Management Systems	Gupta G. K.	McGraw Hill Education, New Delhi 2013, ISBN: 978-07-107273-1

**Course Curriculum Development Committee:****a. Internal Faculty**

- i. Mrs. Vandana S. Lokhande (Lecturer in Computer Engineering, Govt. Polytechnic, Mumbai)

**b. External Faculty**

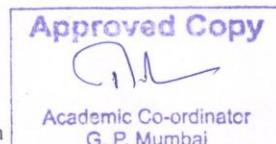
- i. Vaibhav Vasani (Asst. Professor  
Shah & Anchor Kutchhi Engineering College,)

  
 Academic Coordinator  
 (Dr. R. A. Patil)  
 22-6-17

  
 Head of Department  
 (Computer Engineering)

  
 Principal  
 Govt. polytechnic Mumbai

Principles of Database Management System



CO16305

**Course Name: Principles of DBMS****CO Vs PO****Course Code: CO16305**

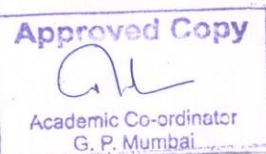
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	1				2	2
CO2	3	3	3	3	2	-	-	2	2	2
CO3	3	3	3	3	1	1	2	2	-	-
CO4	3	3	3	3	2	-	-	2	2	2
CO5	3	3	3	3	2	-	-	1	2	2

**CO Vs PSO**

	CO/POs	PSO1	PSO2	PSO3
CO1	Describe fundamental concepts of database.	1	2	
CO2	Execute Queries based on Structured Query Language.	1	3	2
CO3	Develop databases using Entity Relationship modelling approach.	2	2	1
CO4	Apply different constraints on data in the Relational database.	2	2	1
CO5	Apply data normalization techniques on database	2	2	2

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction to Database Fundamentals	<b>CO1:</b> Describe fundamental concepts of database.
2	2	Data Models And Types Of Database	<b>CO1:</b> Describe fundamental concepts of database.
3	3	Structured Query Language	<b>CO2:</b> Execute Queries based on Structured Query Language.
4	4	Relational DataBase Model	<b>CO4:</b> Apply different constraints on data in the Relational database.
5	5	Entity Relationship model	<b>CO3:</b> Develop databases using Entity Relationship modelling approach.
6	6	Database Design	<b>CO5 :</b> Apply data normalization techniques on database
7	7	Transaction Processing	<b>CO1:</b> Describe fundamental concepts of database.



<b>Programme : Diploma in IT / CO / IS</b>									
Course Code: <b>IT16204</b>				Course Title: <b>Digital Techniques</b>					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70 (3 Hrs.)	30	50	---	---	150

**Rationale :**

This course forms the foundation of computers. This course is introduced with the view that students will become familiar with various digital devices and circuits that are used in microprocessor, microcontroller, computers and other digital systems. It will enable the students to assemble, design, and test logical circuits like multiplexer, demultiplexer, counters, registers etc. This course covers the number systems, logic gates, combinational & sequential logic circuits, analog to digital and digital to analog converters which are important parts of digital systems.

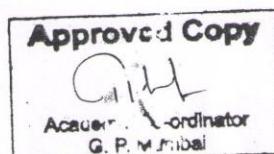
**Course Outcomes:**

After the completion of the course student will be able to

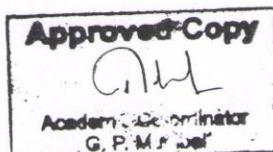
CO1	Convert one number system to another number system
CO2	Perform binary and BCD addition and subtractions
CO3	Identify different logic gates, truth tables, symbols and pin configuration
CO4	Simplify Boolean expressions and realize the combinational circuits such as adder, subtractor, multiplexer, demultiplexer, code converters etc using logic gates
CO5	Identify different flip flops and design sequential circuits using flip flop such as counters, registers etc.
CO6	Explain working of ADC and DAC

**Course Content Details:**

Unit No	Topics / Subtopics
1	<b>Number Systems and codes</b> <ul style="list-style-type: none"> <li>1.1 Introduction to digital signal, Difference between analog signal and digital signal, Advantages of digital systems over analog systems, positive and negative logic</li> <li>1.2 Concept of base of number system</li> <li>1.3 Decimal number system</li> <li>1.4 Binary number system,</li> <li>1.5 Octal number system</li> <li>1.6 Hexadecimal number system</li> <li>1.7 Conversion of one number system to another number system (fractional point numbers)</li> <li>1.8 Types of codes : BCD, Excess 3, Gray code</li> <li>1.9 Conversion of binary to gray and gray to binary</li> </ul>



	<b>Binary Arithmetic</b>
2	<p><b>Binary Arithmetic</b></p> <ul style="list-style-type: none"> <li>2.1 Rules for Binary addition and subtraction</li> <li>2.2 Concept of 1's and 2's complement of a binary number</li> <li>2.3 Binary subtraction using 2's complement</li> <li>2.4 Signed and unsigned binary numbers</li> <li>2.5 BCD addition and BCD subtraction using 9's &amp; 10's complement (Numericals based on above topic)</li> <li>2.6 Parity, Definition of even and odd parity</li> </ul>
3	<p><b>Logic Gates and Families:</b></p> <ul style="list-style-type: none"> <li>3.1 Basic Gates (AND, OR, NOT): circuit of basic gates using discrete components, symbol, truth table, logical expression</li> <li>3.2 Derived gates (EX-OR, EX-NOR): symbol, truth table and logical expression</li> <li>3.3 Universal gates (NAND, NOR) : symbol, truth table and logical expression, deriving all gates using universal gates</li> <li>3.4 Logic families: characteristics, classification</li> <li>3.5 Concept of integration: SSI, MSI, LSI, VLSI</li> </ul>
4	<p><b>Boolean Algebra:</b></p> <ul style="list-style-type: none"> <li>4.1 Boolean laws, De Morgan's theorems,</li> <li>4.2 Simplification of Boolean expression using Boolean laws and De Morgan's theorems.</li> <li>4.3 Construction of logic circuits using logic gates for Boolean expression</li> <li>4.4 Concept of SOP &amp; POS, Minterm &amp; Maxterm</li> <li>4.5 Karnaugh map (K-map) representation of logic function</li> <li>4.6 Simplification of K-map for 2, 3 and 4 variables with don't care condition</li> <li>4.7 Realization of reduced expression using logic gates.</li> </ul>
5	<p><b>Combinational Circuits:</b></p> <ul style="list-style-type: none"> <li>5.1 Design of Half adder and full adder using K-map and realization using gates</li> <li>5.2 Design of Half subtractor and full subtractor using k-map and realization using gates</li> <li>5.3 4 bit parallel binary adder (IC7483)</li> <li>5.4 Code converter using K-map: Binary to Gray code and Gray code to binary (upto 4 bit)</li> <li>5.5 BCD to seven segment decoder/driver (IC 7447 and IC 7448)</li> <li>5.6 Comparator: 1 bit, 2 bit (design using K-map and realization using logic gates), 4 bit comparator using IC 7485</li> <li>5.7 Multiplexer: Necessity of multiplexing, Principle of multiplexing, types of multiplexing 2:1, 4:1, 8:1 and 16:1, multiplexer tree</li> <li>5.8 Demultiplexer: Necessity of demultiplexing, Principle of demultiplexing, types of demultiplexing 1:2, 1:4, 1:8 and 1:16, demultiplexer tree, concept of decoder</li> </ul>
6	<p><b>Sequential circuits</b></p> <ul style="list-style-type: none"> <li>6.1 Difference between combinational and sequential circuits</li> <li>6.2 Basic concept of Flip-flop</li> </ul>



	<p>6.3 Types of flip flop: SR, JK, D and T flip flops, circuit of SR FF using transistors. Truth table, symbol and operation of all FFs</p> <p>6.4 Concept of preset and clear inputs</p> <p>6.5 Race around condition in JK FF, Master slave JK FF</p> <p>6.6 Triggering methods: Edge trigger and level trigger</p> <p>6.7 Excitation table of SR, JK, D and T FF</p> <p>6.8 Counters: basic concept of counters, classification (synchronous and asynchronous counter), concept of Up and Down counter, Modulus of counter(MOD N counter)</p> <ul style="list-style-type: none"> <li>a. Design of asynchronous up and down counter (3/4 bit) and their timing diagram</li> <li>b. Design of synchronous up and down counter (only 3bits)</li> </ul> <p>6.9 Shift Registers: Definition, classification (SISO, SIPO, PISO, PIPO), their circuit diagram and working, Universal shift register, bidirectional shift register, Ring counter, Twisted ring counter (circuit and timing diagrams)</p>
7	<p><b>Data Converters</b></p> <p>7.1 Need of data conversion</p> <p>7.2 Types of data converters ADC and DAC and their specifications</p> <p>7.3 Circuit diagram and working of R-2R ladder type DAC (mathematical derivation)</p> <p>7.4 Successive approximation and Ramp type ADC (their block diagram and working)</p>

Suggested Specifications Table with Hours and Marks (Theory):

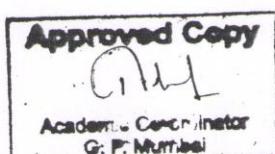
Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Number Systems and codes	04	02	04		06
2	Binary Arithmetic	04	04	02		06
3	Logic Gates and Families	05	04	04		08
4	Boolean Algebra	04	02	04		06
5	Combinational Circuits	12	02	04	12	18
6	Sequential circuits	12	02	06	10	18
7	Data Converters	04	04	04		08
<b>Total</b>		<b>45</b>	<b>20</b>	<b>28</b>	<b>22</b>	<b>70</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

**List of Practicals:- Minimum 10 experiments should be performed.**

1	Assemble AND, OR, NOT gate using discrete components such as diode, transistor
2	To verify Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICS.



3	To implement basic logic gates using universal logic gates(NAND ,NOR)
4	To construct Half Adder and Half subtractor & verify the Truth Table
5	To construct Full Adder verify the Truth Table
6	To construct Full subtractor & verify the Truth table
7	To construct binary to gray code converter using gates and verify truth table.
8	To construct gray code to binary code converter using gates and verify truth table.
9	To verify truth table of 8:1 multiplexer using IC.
10	To verify truth table of 3 line to 8 line decoder using IC.
11	To verify the truth table of Comparator ( IC 7485 ).
12	To verify truth table of SR and JK FF using ICs.
13	To verify truth table of D and T FF using ICs.
14	To construct 3 bit ripple counter using Flip Flop and verify its operation
15	To construct and test MOD-6 asynchronous counter using IC 7490.

**Reference Books:**

Sr. No.	Book Title	Author	Publication
1	Modern Digital Electronics	R. P. Jain	Tata McGraw Hill, Education
2	Principles of Digital Electronics	Malvino A. P. and Leach	Tata McGraw Hill, Education
3	Pulse Digital and Switching Waveforms	Milman and Taub	S. Chand
4	Digital Electronics	William Gothmann	Tata McGraw Hill, Education

**Course Curriculum Development Committee:****a. Internal Faculty**

Dr. R. A. Patil (Sel. Grade Lecturer, Electronics Engineering, Govt. Polytechnic Mumbai)

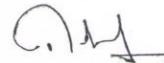
Ms. Nagargoje S. N. (Lecturer, Electronics Engineering, Govt. Polytechnic Mumbai)

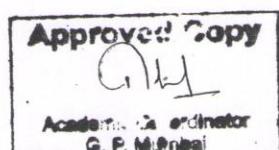
Ms. Kapse S. D. (Lecturer, Instrumentation Engineering, Govt. Polytechnic Mumbai)

**b. External Faculty**

Dr. Uday Khot (Lecturer, Electronics Engineering, St. Francis Institute of technology, Mumbai)

  
 Academic Coordinator  
 (Dr. R. A. Patil)

  
 Head of Department  
 (Information Technology)

  
 Principal  
 Govt. Polytechnic Mumbai


<b>Programme Code:</b> Diploma in Computer Engineering												
<b>Course Code:</b> CO16306				<b>Course Title:</b> Professional Practices								
<b>Compulsory / Optional:</b> Compulsory												
Teaching Scheme and Credits				Duration of Examination			Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	TH	TS	PR	OR	TW	Total
-	-	02	02	-	-	-	-	-	-	--	50	50

**Rationale:**

With rapid development of technology, competitive economy, globalization in the industrial and service sectors, the need of competent professionals is increased. In addition to basic technical concepts one should also have qualities like leadership, ability to communicate. The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence and professional attitude. Activities like visits to Industries, Technical Fest/Exhibition, Expert Lectures and professional presentations are planned in a semester so that there will be increased participation of students in professional events.

**Course Outcomes:**

Students will be able to

CO 1	Collect information from different sources.
CO 2	Prepare reports and make posters for given topic.
CO 3	Present given topic in a Slide Presentation (like PPT)/ Seminars/Poster Presentation/ Technical Paper Presentation seminar.
CO 4	Interact with people in society to share thoughts.



**Course Contents**

<b>Topic No</b>	<b>Contents</b>
1.	<p><b>Information Search</b></p> <p>Information search can be done through manufacturer's catalogue, internet, magazines; books etc. and submit a report. Following topics are suggested:</p> <ul style="list-style-type: none"> <li>a. Collect information about Buying of a new computer (cost, make, model etc.).</li> <li>b. Comparison of different computer architectures</li> <li>c. Collect information from Computer repairing center (at which level repairing is done, cost).</li> <li>d. Collect information regarding latest requirement for a job from any industry</li> <li>e. Collect information regarding at least 20 different industries open to IT/ Computer professional.</li> </ul>
2.	<p><b>Lectures by Professional / Industrial Expert</b></p> <p>Organize lectures on any two topics of the following suggested areas or any other suitable topics (2hrs each topic):</p> <ul style="list-style-type: none"> <li>a. Spoken English</li> <li>b. Personality Development</li> <li>c. Positive Thinking</li> <li>d. Professional Ethics</li> <li>e. Current trends in Computer and IT Industry</li> <li>f. Career Guidance</li> <li>g. Guidance for Professional Certification courses</li> </ul>
3.	<p><b>Professional Skills</b></p> <p>Following activities are to be conducted in a group of 5 or more students and write a brief report.</p> <ul style="list-style-type: none"> <li>a. Body Language with Video Recording</li> <li>b. Aptitude Test</li> <li>c. Group Discussion</li> <li>d. Interview Techniques</li> </ul>
4.	<p><b>Corporate Etiquettes &amp; Professionalism</b></p> <p>Write a brief report on a visit/ interact a BPO or alike to observe the following</p> <ul style="list-style-type: none"> <li>a. Ethics &amp; Etiquettes</li> <li>b. Personal Attire &amp; Grooming</li> <li>c. Cell phone manners</li> </ul>

Professional Practices



CO16306

<p><b>5.</b></p> <p><b>Presentation Skills</b> Presentations on any latest technology in Hardware and Software in the form of :</p> <ul style="list-style-type: none"> <li>a. Slide Presentation (like PPT)/ Seminars</li> <li>b. Poster Presentation .</li> <li>c. Technical Paper Presentation</li> </ul>
<p><b>6.</b></p> <p><b>Exposure to Industry and Other Organizations</b> Visits are to be arranged and report of the same should be submitted by the individual student (at least one)</p> <ul style="list-style-type: none"> <li>a. Visit to Technical Exhibitions</li> <li>b. Visit to Technical fest</li> <li>c. Industrial Visit</li> </ul>

*Notes: If possible an industrial visit should be arranged or videos of related topics should be shown*

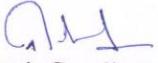
**Course Curriculum Development Committee:**

a. Internal Faculty

- i. Smt V M Aswar
- ii. Mrs. A J Bhat

b. External Faculty

- i. Ms. Swati Deshpande (Shah & Anchor Kutchhi Engineering College, Chembur, Mumbai.)

  
 Academic Coordinator  
 (Dr. R. A. Patil)  
 22-6-17

  
 Head of Department  
 (Computer Engineering)

  
 Principal  
 Govt. Polytechnic Mumbai



Course Name:- Professional Practices

Course Code:- CO16306

## CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	-	3	3	-	2	3	3	3
CO2	2	3	-	2	2	-	2	2	3	3
CO3	2	3	-	2	2	-	2	2	3	3
CO4	1	2	-	1	2	1	2	2	3	3

## CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Collect information from different sources.	2	-	3
CO2	Prepare reports and make posters for given topic.	2	2	3
CO3	Present given topic in a Slide Presentation (like PPT)/ Seminars/Poster Presentation/ Technical Paper Presentation seminar.	2	2	3
CO4	Interact with people in society to share thoughts.	2	1	3

## Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Information Search	<b>CO1:</b> Collect information from different sources. <b>CO2:</b> Prepare reports and make posters for given topic. <b>CO3:</b> Present given topic in a Slide Presentation (like PPT)/ Seminars/Poster Presentation/ Technical Paper Presentation seminar. <b>CO4:</b> Interact with people in society to share thoughts.
2	2	Lectures by Professional / Industrial Expert	<b>CO2:</b> Prepare reports and make posters for given topic. <b>CO4:</b> Interact with people in society to share thoughts.
3	3	Professional Skills	<b>CO1:</b> Collect information from different sources. <b>CO4:</b> Interact with people in society to share thoughts.
4	4	Corporate Etiquettes & Professionalism	<b>CO1:</b> Collect information from different sources. <b>CO2:</b> Prepare reports and make posters for



			given topic. <b>CO3:</b> Present given topic in a Slide Presentation (like PPT)/ Seminars/Poster Presentation/ Technical Paper Presentation seminar. <b>CO4:</b> Interact with people in society to share thoughts.
5	5	Presentation Skills	<b>CO1:</b> Collect information from different sources. <b>CO2:</b> Prepare reports and make posters for given topic. <b>CO3:</b> Present given topic in a Slide Presentation (like PPT)/ Seminars/Poster Presentation/ Technical Paper Presentation seminar. <b>CO4:</b> Interact with people in society to share thoughts.
6	6	Exposure to Industry and Other Organizations	<b>CO1:</b> Collect information from different sources. <b>CO2:</b> Prepare reports and make posters for given topic. <b>CO3:</b> Present given topic in a Slide Presentation (like PPT)/ Seminars/Poster Presentation/ Technical Paper Presentation seminar. <b>CO4:</b> Interact with people in society to share thoughts.

