

**Dissemination of Education for Knowledge, Science and Culture”  
- Shikshanmaharshi Dr. Babuji Salunkhe**

**Shri Swami Vivekanand Shikshan Sanstha’s  
Vivekanand College, Kolhapur (Empowered Autonomous)**



*B.Sc. Computer Science Entire*

**Part - II  
Semester-III &IV  
Syllabus**

**Under NEP 2020  
To be implemented from Academic Year 2024-25**

**Examination pattern:** semester wise for Theory and Practicals

**Structure of program:**

Abbr. TH-Theory, PR-Practical, ESE- End Semester Examination, CIE-Continuous Internal Examination

Note:	Minimum passing for 25 marks Theory paper	= 10 marks
	Minimum passing for 35 marks Theory paper	= 14 marks
	Minimum passing for 40 marks Theory paper	= 16 marks
	Minimum passing for 10 marks Internal evaluation	= 04 marks
	Minimum passing for 25 marks Practical	= 10 marks
	Minimum passing for 50 marks Practical	= 20 marks
	Separate passing for every head- ESE, CIE and Practicals	

**B.Sc. Computer Science Entire –II Semester- III &IV**

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	ESE	CIE	PR	Marks	
<b>Semester-III</b>										
1	DSC-V	DSC06COM3 1	OOP with C++	2	-	40	10	-	50	2
2	DSC-VI	DSC06COM3 2	RDBMS with MYSQL	2	-	40	10	-	50	2
3	MIN-V	MIN06ELE31	8051 Microcontroller	2	-	40	10	-	50	2
4	MIN-VI	MIN06ELE32	Introduction to IoT	2	-	40	10	-	50	2
5	VSC-PR-II	VSC06STA39	Introduction to R	-	4	-	-	25	25	2
6	AEC-III	AEC06ENG3 1	Communication Skills -I	2	-	40	10	-	50	2
7	VEC-I	VEC06DEG3 1	Democracy, Election and Good Governance(DEGG)	2	-	50	-	-	50	2
8	VEC-II	VEC06EVS31	Environmental Science	2	-	35	-	15	50	2
9	DSC-PR-III	DSC06COM3 9	DSC Computer Lab-3	-	8	-	-	50	50	4
10	MIN-PR-III	MIN06ELE39	MIN Electronics Lab-3	-	4	-	-	25	25	2
	<b>Total (Semester-III)</b>			<b>14</b>	<b>16</b>	<b>285</b>	<b>50</b>	<b>115</b>	<b>450</b>	<b>22</b>
<b>Semester-IV</b>										
1	DSC-VII	DSC06COM4 1	Data structure	2	-	40	10	-	50	2
2	DSC-VIII	DSC06COM4 2	RDBMS with SQL server	2	-	40	10	-	50	2
3	MIN-VII	MIN06ELE41	Raspberry Pi	2	-	40	10	-	50	2
4	MIN-VIII	MIN06ELE42	Computer Networks	2	-	40	10	-	50	2
5	VSC-PR-III	VSC06STA49	Statistical methods using R	-	4	-	-	25	25	2
6	AEC-IV	AEC06ENG4 1	Communication Skills - II	2	-	40	10	-	50	2
7	VEC-III	VEC06EVS41	Environmental Science	2	-	35	-	15	50	2
8	CC	CC06	Co- Curricular Courses	2	-	50	-	-	50	2

9	DSC-PR-IV	DSC06COM4 9	DSC Computer Lab-4	-	8	-	-	50	50	4
10	MIN-PR-IV	MIN06ELE49	MIN Electronics Lab-4	-	4	-	-	25	25	2
<b>Total (Semester-IV)</b>				<b>14</b>	<b>16</b>	<b>285</b>	<b>50</b>	<b>115</b>	<b>450</b>	<b>22</b>
<b>Cumulative Total (2<sup>nd</sup> Year)</b>				<b>28</b>	<b>32</b>	<b>570</b>	<b>100</b>	<b>230</b>	<b>900</b>	<b>44</b>

### Semester: III

**Course Title: Object Oriented Programming Using C++**

**Course Code: DSC06COM31**

**Theory: 30 Lectures Credits: 02**

**Course Outcomes:**

The student will be able:

1. To build C++ program structure, Input and output Streams, memory management operators, inline function, default argument, function overloading and explain Object Oriented Programming Concepts.
2. To explain class, access modifiers and define member functions of a class, develop the programs using array of object, define a constructor, destructor and explain features of constructor, destructor and types of constructor
3. To explain static data members and member function, friend function and friend class, rules for operator overloading and implement programs using unary and binary operator overloading.
4. To explain inheritance and define Base class and derived class and implement programs using types of inheritance, define polymorphism and explain types of polymorphism and implement programs using virtual function and explain concept of pure virtual function and abstract class.

Unit	Title and Contents	Allocated hours
1	<b>Introduction to C++ and Basics of Object Oriented Programming Concepts</b> <ul style="list-style-type: none"> <li>• Introduction to C++: Structure of C++ program</li> <li>• Input and output Streams</li> <li>• Memory management operators: new and delete</li> <li>• Functions: inline function, default argument, functions overloading.</li> <li>• OOP Concepts: Data abstraction, Data Encapsulation, Inheritance, Polymorphism, Message Passing</li> </ul>	08
2	<b>Class and Object, constructor and destructor</b> <ul style="list-style-type: none"> <li>• Class declaration</li> <li>• Access modifiers: public, private, protected</li> <li>• defining member functions (Inside the class and outside the class)</li> <li>• array of object</li> <li>• Constructor and Destructor: Definition and features of constructor, Types of constructor, Definition, syntax and use of Destructor</li> </ul>	08
3	<b>Static data member and member function, Friend Function, Operator</b>	07

	<b>Overloading</b> <ul style="list-style-type: none"> <li>• Static data members and member function</li> <li>• friend function and friend class</li> <li>• Operator Overloading: Concept, Rules for operator Overloading, Unary and Binary Operator overloading</li> </ul>	
4	<b>Inheritance and Polymorphism</b> <ul style="list-style-type: none"> <li>• Inheritance: Concept, Definitions of base class and derived class</li> <li>• Types of inheritance (Single, Multiple, Multilevel, Hierarchical and Hybrid inheritance)</li> <li>• Polymorphism: Definition of polymorphism, Types of polymorphism, virtual function, pure virtual function, Abstract class.</li> </ul>	07

### ReferenceBooks

1. K.R.Venugopal,RajkumarBuyya,MasteringC++,TataMcGrawHill.2010
2. Pooranchandra Sarang, Object Oriented Programming with C++,PrenticeHall.2004
3. Junaid Khateeb,Dr.G.T.Tampi,Computer Programmingin C++,Dreamtech.2010
4. Rajendra Akerkar, Sudhakar Bhoite, Glimpses of C++ Object Oriented Programming, Mahalaxmi publication.2002
5. D.Ravichandran, Programming with C++,McGrawHill.2001
6. Poonam Ponde,Object Oriented Programming with C++,Vision publication.2013

### Course Title: Introduction to RDBMS using MySQL Part-I

**Course Code: DSC06COM32**

**Theory: 30 Lectures Credits: 02**

### Course Outcomes:

The student will be able:

1. To understand DBMS, RDBMS and relational database models
2. To understand DFD, ERD, types of relations and draw DFD, ERD.
3. To understand normalization and different forms of normalization with real world problems.
4. To understand MySQL basics, features of MySQL and classify DDL, DML, DCL commands, Data constraints.

Unit	Title and Contents	Allocated hours
1	<b>Introduction to RDBMS</b> <ul style="list-style-type: none"> <li>• Data, Database, Database Management System, Concept of RDBMS, RDBMS Terminologies : relation, attribute, domain, tuple, entities, DBA &amp; Responsibilities of DBA</li> <li>• Relational Model: Structure of Relational Databases, Relational Algebra</li> </ul>	<b>08</b>
2	<b>Introduction to Data Models</b> <ul style="list-style-type: none"> <li>• Data Flow Diagram: concept of DFD, Symbols, Levels of DFDs, example</li> </ul>	<b>11</b>

	<ul style="list-style-type: none"> <li>Entity Relationship Diagram: Concept of Entity, Attributes, Symbols, Types of relations, examples.</li> </ul>	
<b>3</b>	<b>Normalization</b> <ul style="list-style-type: none"> <li>Introduction to Normalization</li> <li>Forms of Normalization – 1NF, 2NF, 3NF, BCNF, 4NF.</li> </ul>	<b>6</b>
<b>4</b>	<b>Introduction to MySQL</b> <ul style="list-style-type: none"> <li>What is MySQL, features of MySQL,</li> <li>Basic Data types in MySQL,</li> <li>Classification of Commands : DDL- Create, Alter, Drop, Truncate,</li> <li>DML- Insert, Update, Delete, Select. DCL- Grant, Revoke. TCL- Commit, Rollback, Savepoint.</li> <li>Select statement with - where, group by, order by clause.</li> </ul>	<b>5</b>

### Reference Book

- MySQL The Complete Reference By Vikram Vaswani
- Learning MySQL by O'reilly
- MySQL in Nut Shell by Dyer 2nd Edition
- MySQL - Joel Murach 2012 edition

### Lab Course- III

**Paper Title: Laboratory Course in Computer Science – III**

**Paper code: DSC06COM39**

- OOP using C++**
  - Write a C++ program to perform arithmetic operations using inline function
  - Write a C++ program to calculate area of circle ,rectangle and triangle using function Overloading
  - Write an object oriented program to display details of n number of students using class and object
  - Write an object oriented program to display salary statement of n number of employees using array of object
  - Write an object oriented program to perform time addition using friend function
  - Write an object oriented program to handle saving account system using constructor and Destructor
  - Write an object oriented program to reverse a string using unary operator overloading
  - Write an object oriented program to perform addition of two complex numbers using binary operator overloading
  - Make a class named Fruit with a data member to calculate the number of fruits in a basket. Create two other class named Apples and Mangoes to calculate the number of apples and mangoes in the basket. Print the number of fruits of each type and the total number of fruits in the basket.
  - Write an object oriented program to display the result of student using hybrid inheritance.
  - Create class Shape, derive the two classes Rectangle and Circle from Shape class and calculate area of rectangle and circle using virtual function.

- **MySQL**

1. Create the following table

Book\_Master (B\_id, B\_name, B\_auther, B\_Publication, B\_Price)

Perform the following operations on above table

- i) Display table structure.
- ii) Insert 5 relevant records in table Book\_Master.
- iii) Sort the records Book\_Master in descending order by B\_Price.
- iv) Update Book Name to “Python” where B\_no=1.
- v) Display all records.

2. Write a MySQL command/Statement to Create a database Student\_details and create a table

Student inside it with fields – stud\_rollno, stud\_name, stud\_address, stud\_course, stud\_ph\_no and perform following commands:

- i) Display table structure.
- ii) Alter table to add new column marks.
- iii) Insert 10 appropriate records.
- iv) Display all records in descending order of stud\_rollno.
- v) Update record of stud\_rollno=2 change name from „Supriya” to „Priya”.
- vi) Delete record of stud\_name=08.
- vii) Drop table Student.

3. Write a MySQL command/Statement to

Create a table Employee with fields – emp\_id, emp\_name, emp\_city, emp\_deptid, contact\_no, email and perform following commands:

- i) Display table structure.
- ii) Insert 7 relevant records in table Employee
- iii) Alter table Employee to change data type of field emp\_id
- iv) Display all records in ascending order of emp\_deptid
- v) Display the emp\_id and emp\_name of employees who live in “Pune”
- v) Truncate table Employee.

**Course Title: 8051 Microcontroller**

**Course Code: MIN06ELE31**

**Theory: 30 Hours Marks: 50 Credits -2**

**Course Outcomes:**

After completion of this course, students will be able to –

- CO1: understand the architecture of 8051 microcontroller
- CO2: understand the knowledge about assembly language programs of 8051 microcontroller
- CO3: understand the timer, counter, serial and interrupts of microcontroller
- CO4: build systems using microcontroller with real time interfacing

Unit	Title and Contents	Allocated hours
1	<b>Introduction to Microcontroller 8051</b> <ul style="list-style-type: none"> <li>• Comparison of Microcontroller &amp; Microprocessor</li> <li>• Architecture of 8051</li> <li>• Internal RAM Structure</li> <li>• SFRS, Pin diagram of 8051, I/O ports structure, Reset and Clock, Registers.</li> </ul>	07
2	<b>8051 Instruction Set</b> <ul style="list-style-type: none"> <li>• Study of 8051 Instruction Set and Addressing Modes</li> <li>• Data transfer</li> <li>• Arithmetic, Logical, Branch and Bit manipulation Instructions</li> <li>• Assemble language programming: Arithmetic and logical.</li> </ul>	07
3	<b>Facilities in 8051</b> <ul style="list-style-type: none"> <li>• Timer and Counter: Timer and Counters, Timer modes, Programming the timers in different modes using assembly / C for time delay generation.</li> <li>• <i>Serial Port</i>: Serial port of 8051, RS-232 standard and IC MAX-232, Baud rate in 8051, Programming for transmitting/receiving character through serial port using assembly / C.</li> <li>• <i>Introduction to Interrupt</i>: Interrupt types and their vector addresses, Interrupt enable register (IE) and interrupt priority register (IP).</li> </ul>	07
4	<b>Real World Interfacing</b> <ul style="list-style-type: none"> <li>• Programming through embedded C: Interfacing with LED</li> <li>• Liquid Crystal Display (LCD), Analog to Digital Converter (ADC), Digital to Analog Converter (DAC), Stepper Motor and DC motor.</li> </ul>	08

**Reference Books:**

1. 8051 microcontroller and embedded system using Assembly and C - Mazidi, Mazidi andMcKinley, Pearson Education, 2nd Edition.
2. The 8051 microcontroller - Architecture, programming and applications: K. Uma Rao and AndhePallavi, Pearson publications, First Edition.
3. Programming and Customizing the 8051 Microcontroller –MykePredko, Tata McGraw-Hill Publishing Company Ltd, Tata McGraw-Hill Edition.
4. Microcontroller: Architecture, Programming & Applications - Ayala, Kenneth J., 2nd Edition, Penram Publisher.



**Course Title: Internet of Things (IoT)**  
**Course Code: MIN06ELE32**  
**Theory: 30 Hours Marks: 50 Credits -2**

Course Outcomes:

After completion of this course, students will be able to –

CO1: gain knowledge about the architecture of IoT systems

CO2: study the working principle of various types of sensors and actuators used in IoT applications

CO3: explore wireless technologies for IoT and gain an overview of different IoT protocols

CO4: explore cloud platforms used in IoT, including IoT dashboards and various cloud service providers

Unit	Title and contents	Allocated Hours
1	<b>IoT Introduction &amp; Concepts</b> <ul style="list-style-type: none"> <li>• IoT Architecture,</li> <li>• Physical &amp; Logical IoT design</li> <li>• Basics IoT Enabling,</li> <li>• Technologies,</li> <li>• IoT Stack, IoT Applications</li> </ul>	07
2	<b>Sensors &amp; Actuators</b> <ul style="list-style-type: none"> <li>• Sensor working</li> <li>• Sensor Characteristics</li> <li>• Types of sensors and working principle, Sensors used in IoT (Temperature, humidity, Proximity, Accelerometer, Infrared, optical, GAS sensors)</li> </ul>	07
3	<b>Wireless Technologies for IoT</b> <ul style="list-style-type: none"> <li>• Overview of Wireless Sensor Networks,</li> <li>• IEEE standards for IoT</li> <li>• Overview of Wireless Modems (RF, GSM/GPRS, Bluetooth, Wi-Fi etc.)</li> <li>• Node MCU and ESP32</li> <li>• IoT Protocol : Overview, MQTT, COAP, http/https , 6LowPAN</li> </ul>	08
4	<b>Cloud platforms for IoT</b> <ul style="list-style-type: none"> <li>• IoT dashboards,</li> <li>• Introduction to various cloud platforms</li> <li>• Device and data management from Cloud Platforms</li> <li>• Uploading data from hardware platforms to cloud</li> <li>• Applications: Home Automation, Smart</li> </ul>	08

**Reference Books:**

1. “Internet of Things: A Hands-on Approach”, ArshdeepBahga and Vijay Madiseti, Universities Press.2nd Edition.
2. “IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things”, David Hanes, Gonzalo salgueiro Cisco Press, Kindle 2017 Edition.
3. “Analytics for the Internet of Things (IoT)”,Andrew Minter, Kindle Edition,1st edition.
4. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Paperback Publications, 1st edition.

**Lab –III : MIN ELECTRONICS****Paper Code: MIN06ELE39****Marks: 25(Credits02)****Microcontroller 8051 programming & IOT Lab (Minimum 12 Practical's)**

1. Arithmetic and logical operations using 8051 microcontroller (Use 8051 Simulator)
2. Time delay generation using timers of 8051 microcontroller
3. Study the interfacing of Relay and LED using microcontroller
4. Study the interfacing Stepper motor with 8051
5. Study waveform generator (square, triangular and saw tooth using DAC) with microcontroller.
6. Study of interfacing of 16 x 2 LCDwith8051 microcontroller
7. Study the interfacing of ADC IC0804 with8051 microcontroller
8. Study the interfacing of DC motor with8051 microcontroller
9. Study the fundamental of IOT architecture, Arduino board and necessary software and create the thingspeak account
10. Interface Bluetooth with Arduino and send data to smartphone through Bluetooth.
11. Interface Bluetooth with Arduino and receive data to smartphone through Bluetooth to turn LED ON/OFF
12. Interface Wi-Fi module with Arduino to upload sensor data to thing speak cloud
13. Interface Wi-Fi module with Arduino to retrieve sensor data to thing speak cloud
14. Interface GSM module with Arduino to upload sensor data to thing speak cloud
15. Read the sensor data and upload the data to thing speak cloud using Node MCU
16. Study and implement MQTT protocol using Arduino.

17. IOT Application Case study: Home Automation.

**Course Title: Introduction to R Theory**

**Course Code: VSC06STA39**

**Marks-25 (Credits: 02)**

Unit	Title and contents
1	<p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Installation and introduction to R</li> <li>• History and features of R</li> <li>• Why R?</li> <li>• data input / output variables in R: Numeric, character, logical and complex</li> <li>• Class (), Object identification: is.na, is.numeric, is.character, is.matrix, is.vector, is.null, is.factor, as. functions, Creation of vector using commands: combine, scan, seq, rep, edit, sort, length, which, order</li> <li>• Operations on data: Assignment operators in R, leftwards assignments (&lt;- &lt;&lt;-, =) rightwards assignments (-&gt;, -&gt;&gt;, =), Listing and deleting the objects: matrix, data.frame, cbind, rbind ,converting objects,</li> <li>• Arithmetic and simple functions: sum, prod, sort</li> </ul>
2	<p><b>Control Structure in R, Data visualization &amp; interpretation</b></p> <ul style="list-style-type: none"> <li>• Matrix computation: addition, multiplication, determanant, inverse, rank, Import and export data: read.table, read.csv, file.choose,write.table, write.csv.</li> <li>• Data Visualization: -Diagrammatic representation: simple bar diagram, sub-divided bar diagram, multiple bar diagram. -Graphical representation: Scatter plot, histogram, frequency polygon, ogive curve.</li> <li>• Control structure: for loop, while loop, if else statement, break statement, switch case.</li> <li>• Installation of packages, Exploratory data analysis: mean, quantiles, aggregate function, functions from apply family.</li> </ul>

**Practical**

1. R-tools for statistical computing (Some commonly used built-in R-functions)
2. R-tools for statistical computing (Data Frames)
3. R-tools for statistical computing (Matrix calculations)
4. R-tools for statistical computing (Diagrammatic representation of data: multiple bar diagram.)
5. R-tools for statistical computing (Graphical representation of data: Histogram, Frequency polygon.)
6. R-tools for statistical computing (Control structure)
7. R-tools for statistical computing (Installation of packages)

## Semester-VI

**Course Title: Introduction to Data Structure Using C++**

**Course Code: DSC06COM41**

**Theory: 30 Lectures Credits: 02**

### Course Outcome:

The student will be able:

1. To define Data Type, Data structure, Data object and explain Abstract Data Type, Linear and nonlinear data structures, explain Algorithm efficiency, array, types of array
2. To implement programs using Linear and Binary searching techniques and Bubble sort, Selection sort, Insertion sort and Merge sort sorting techniques
3. To define Stack and demonstrate operations and static implementation of stack, explain applications of stack, to define queue and demonstrate operations and static implementation of queue and explain types of queues.
4. To explain Linked list and types of linked list, define Tree and explain tree terminologies and tree traversal.

Unit	Title and contents	Allocated Hours
1	<b>Introduction to Data structure and Linear Data Structure (Array)</b> <ul style="list-style-type: none"><li>• Introduction to Data Structure: Definitions: Data types, Data Object, Data structure, Abstract Data Type (concept)</li><li>• Data Structure classification</li><li>• Algorithm Efficiency: Complexity, Big O notation</li><li>• Array: Definition, Types of array (one dimensional and multidimensional array)</li></ul>	06
2	<b>Searching and Sorting</b> <ul style="list-style-type: none"><li>• Searching: Linear search and binary search</li><li>• Sorting: Bubble Sort, Selection Sort, Insertion sort, Merge Sort</li></ul>	07
3	<b>Stack and Queue</b> <ul style="list-style-type: none"><li>• <b>Stack:</b> Definition of Stack, Operations on Stack and Static Implementation of stack,</li><li>• Applications of stack: Recursion, inter conversions between infix, prefix and postfix Expressions.</li><li>• <b>Queue:</b> Definition of Queue, Operations on Queue, Static Implementation of Queue.</li></ul>	09

	Types of Queue: Linear, Circular and Priority queue, Applications of Queue	
4	<b>Linked List and Trees</b> <ul style="list-style-type: none"> <li>• <b>Linked List:</b> Concept of Linked List</li> <li>• Operations on Linked List</li> <li>• Implementation of Linear Linked List</li> <li>• Types of Linked List</li> <li>• <b>Trees:</b> Definition of tree</li> <li>• Tree terminologies</li> <li>• Types of Tree, Tree Traversal (inorder, preorder, postorder).</li> </ul>	08

### Reference Books

1. Data Structure using C and C++ -Rajesh Shukla
2. Data Structure using C and C++ -Tanenbaum
3. Data Structure using C++ - E Balagurusamy
4. Data Structure using C++ - Yashwant Kanetkar
5. Data Structure using C++ -D.S. Malik

**Course Title: Introduction to RDBMS using MySQL II**

**Course code: DSC06COM42**

**Theory: 30 Lectures Credits: 02**

### Course Outcome:

#### The student will be able:

1. To understand and implement MySQL constraints and operators.
2. To understand and implement MySQL functions.
3. To understand and implement MySQL Sub Queries, Join, Views, Index and Sequence.
4. To understand and implement Cursor and Trigger in MySQL

Sr. No.	Title and contents	Allocated Hours
1	<b>Data Constraints and MySQL operators</b> <ul style="list-style-type: none"> <li>• Data Constraints: Primary Key, Foreign Key, Unique, NOT Null, Check, Default.</li> <li>• SQL Operators: Logical, Relational/Comparison, Special - In, Between, Like.</li> </ul>	06
2	<b>MySQL functions</b> <ul style="list-style-type: none"> <li>• Arithmetic functions (abs, ceil, floor, mod, pow, sqrt, round, truncate)</li> <li>• Date and time functions</li> <li>• Aggregate Functions (count, min, max, avg, sum).</li> </ul>	07
3	<b>MySQL Sub-queries and Join</b>	09

	<ul style="list-style-type: none"> <li>• Introduction to Sub Queries: Sub queries, Nested Sub query.</li> <li>• Introduction to Joins: imple/Inner Two table Join, Left, Right, Outer join, Self join.</li> <li>• Views, Indexes, Sequence.</li> </ul>	
<b>4</b>	<b>Cursor and Trigger</b> <ul style="list-style-type: none"> <li>• Introduction to Cursors and Trigger.</li> <li>• Example of Trigger</li> </ul>	<b>08</b>

### Reference Book

- MySQL The Complete Reference By Vikram Vaswani
- Learning MySQL by O'reilly
- MySQL in Nut Shell by Dyer 2nd Edition
- MySQL - Joel Murach 2012 edition

### Lab Course- IV

**Code: DSC06COM49**

**Paper Title: Laboratory Course in Computer Science – IV**

- **Data Structure through C++**
  1. Write a program to perform various operations on array –matrix operations using array, string array program etc
  2. Write a program to implement stack using static method.
  3. Write a program to implement Queue using static method.
  4. Write a program to create linked list, perform insertion at begin, at end and at specific location and delete from begin, from end and from specific location on linear linked list.
  5. Write a program to sort given elements using insertion sort, bubble sort, selection sort.
  6. Write a program to search given element using Linear and Binary Search
- **MySQL**
  1. Create following tables and perform following Queries:
    - i) Table Salesperson with columns s\_no, s\_name, city, commission.
    - ii) Table Customers with columns c\_no, s\_no,c\_name, city.
    - iii) Table Orders with columns order\_no, c\_no, amount, order\_dt.
    - iv) Apply following Constraints:
      - a) Add primary key constraint on s\_no in salesperson table, c\_no on customers table and order\_no in orders table.
      - b) Add foreign key constraint on c\_no, s\_no column in order table.
      - c) Add constraint on customer table to check city which should be from the

following list(satara, sangli, Kolhapur, pune).

- d) add default value „0“ to commissions column of salesperson table.
  - v) Select records from salesperson where city is “Sangli”.
  - vi) Select distinct city from salesperson.
  - vii) Display records whose amount is between 4000 to 5000.
  - viii) Display records of customer whose city is not “sangli” and “Kolhapur”.
2. Write a MySQL program to perform following Join Operations:
- i) Create a table dept\_dtls with following fields (dept\_no int(5), dept\_name varchar2(20), location varchar2(20)).
  - ii) create a table emp\_dtls(emp\_no int(5), emp\_name varchar2(20), job varchar2(20), mgr\_no int(5), dept\_no int(5));
  - iii) insert 5 relevant records in each table.
  - iv) Perform following queries:
    - a) Use simple join and display dept\_name, location, emp\_no, emp\_name, job.
    - b) Use outer left and outer right join to display information of dept\_no, dept\_name, location, emp\_no, emp\_name, job.
    - c) Use self join to display emp\_no, emp\_name, job, dept\_no.
3. Solve the following subqueries as follows
- a) Create table student with fields(Rollno,Name,Address,Age,Rank) Insert 7 Records in table
  - b) Create table Marks with Fields(Rollno,CS,Maths,Electronics,Total,Percentage) Insert 7 Records in table
  - c) Display marks of student whose name is ‘Vikram’
  - d) Display Rollno,Total,Percentage of those Students Who Live In Kolhapur
  - e) Display Marks of those Students Who dont Live In Pune
  - f) Display Student details whose Percentage is greater than equal to 70
  - g) Find the student whose address count greater than 2
4. Create table Employee with fields (Eid, EName, Address, age)
- i) Insert 7 Records in table Employee
  - ii) Create table Department (Did, Dname, Eid)
  - iii) Insert 4 Records in table Department
  - iv) Find all Employees details who work in department
  - v) Find the Employee details who is not working in any department
5. Create a table
- i) Supplier with Fields (Sup\_Id, Sup\_Name, Sup\_Name ,Sup\_Address) and insert record into it.
  - ii) Order\_detail (Order\_ID, Sup\_Id, orderDate) and insert record into it.
  - iii) Create View for Displaying Sup\_Id,Sup\_Name,orderDate
  - iv) Alter or Replace View for add field Sup\_Address and Order\_Id in existing View
  - v) Rename Veiw Demo to SupplierView
  - vi) Create table old\_order with field (O\_ID, O\_name, price ,quantity) and insert 4 relevant value in it.

**Course Title : Raspberry Pi**  
**Course Code: MIN06ELE41**  
**Theory: 30 Hours Marks: 50 Credits -2**

**Course Outcomes:**

After completion of this course, students will be able to –

CO1: Understand the working of Raspberry Pi, its features and how various components can be used with Pi

CO2: Understand the Raspbian OS

CO3: Understand the introduction to Python programming

CO4: Python programming and apply creative thinking skills in the design of practical solutions to specific case studies and projects.

Sr. No.	Title and Contents	Allocated Hours
1	<b>Introduction to Single board computer</b> <ul style="list-style-type: none"> <li>• Basics of Single board computer</li> <li>• Introduction to ARM Cortex Processor, Raspberry Pi Series and Model</li> <li>• Comparison of various models of Raspberry Pi,</li> <li>• Detailed specifications of Raspberry Pi 3B+: CPU, Storage devices, GPIO, Ethernet, Wi-Fi, Bluetooth, Power supply, Ports: USB, Display, Camera etc.</li> </ul>	07
2	<b>Operating System (OS) of Raspberry Pi :</b> <ul style="list-style-type: none"> <li>• Benefits of Operating system</li> <li>• Different types of OS</li> <li>• Overview of Raspbian OS</li> <li>• OS Installation</li> <li>• Configuration of Raspberry Pi</li> <li>• Installation of libraries.</li> </ul>	06
3	<b>Programming of Raspberry Pi using Python:</b> <ul style="list-style-type: none"> <li>• Basic Python Programming (Script programming)</li> <li>• Functions: I/O function (GPIO, Digital), Time functions (Delays), Library functions Basic Arithmetic Programs.</li> </ul>	08
4	<b>Interfacing using Python Programming :</b> <ul style="list-style-type: none"> <li>• Basic: LED and Switch, LCD, Relay and Buzzer.</li> <li>• Advanced: Bluetooth, Wi-Fi, Ethernet, I2C, SPI.</li> <li>• External: Camera interfacing, Serial Communication, Temperature, humiditysensor interfacing.</li> </ul>	09



**Recommended Books:**

1. Raspberry Pi Cookbook: Software & Hardware problems and Solutions by Simon Monk, O'Reilly Media, 3rd Edition.
2. Pi Robotic Projects - Third Edition Machine Learning For Absolute Beginner
3. Raspberry Pi by Eben Upton and Gareth Halfacree - 3rd Edition.
4. Learn Raspberry Pi programming with Python by Wolfram Donat.

**Course Title: Computer Network**

**Course Code: MIN06ELE42**

**Theory: 30 Hours Marks: 50 Credits -2**

**Course Outcomes:**

After completion of this course, students will be able to –

CO1: know the fundamentals of computer networks

CO2: get familiarize with different public switched telephone networks

CO3: apply knowledge of transmission media, multiplexing and telephone networks

CO4: design and analyze the computer network protocols.

<b>Sr. No.</b>	<b>Title and Contents</b>	<b>Allocated Hours</b>
1	<b>Introduction :</b> <ul style="list-style-type: none"><li>• The use of computer network</li><li>• Network Hardware, Network software</li><li>• The OSI reference model, The TCP/IP reference model, Comparison of OSI &amp; TCP/IP reference model.</li></ul>	05
2	<b>Physical layer &amp; Transmission:</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Guided Transmission media – co-axial cable, Fiber optics, wireless transmission media</li><li>• Public Switched telephone networks: Structure of Telephone systems, Local loop Modems, ADSL and fiber.</li><li>• Circuit switching, Packet Switching Hybrid Switching. Mobile Telephone systems: From 1G, 2G and 3G</li></ul>	08
3	<b>Data Link Layer :</b> <ul style="list-style-type: none"><li>• Data Link Layer design issues</li><li>• Error detection and correction</li><li>• Elementary data link protocols</li><li>• sliding window protocols performance</li><li>• The Medium Access Sub-layer: The local and metropolitan area networks</li></ul>	08

	<ul style="list-style-type: none"> <li>• the ALOHA protocols</li> <li>• IEEE standard 802 for LAN</li> <li>• Ethernet, Bluetooth and RFID</li> </ul>	
4	<b>Network Layer, Transport layer &amp; Application layer:</b> <ul style="list-style-type: none"> <li>• Design issues</li> <li>• Routing algorithms – optimality principle, shortest path algorithm, flooding, distance vector routing</li> <li>• Congestion control algorithms</li> <li>• Network layer in the Internet</li> <li>• The Transport Layer: Transport service, transport protocols, Internet transport protocol (TCP &amp; UDP)</li> <li>• Application layer- DNS (Domain name System), application layer protocols.</li> </ul>	09

#### Reference Books:

1. Computer Networks, Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, Prentice Hall of India Publishers, 2011
2. Computer Networks, Protocols, Standard and Interfaces, Ulyses Black, 2nd Edition, Prentice Hall of India Pub, 2010
3. Data Communication and Networking, Behrouz. A. Forouzan, 5th Edition, McGraw Hill, 2009
4. Computer Networks: A Systems Approach, Larry L. Peterson, Bruce S. Davie, 4th Edition, Elsevier, 2007

#### Lab Course- IV

**Paper Title: Laboratory Course in Electronics – IV**

**Paper code: MIN06ELE49**

**Marks: 25 (Credits02)**

#### Raspberry Pi and Computer Network Lab (Minimum 12 Practical's)

1. Interfacing light emitting diodes (LEDs) with Raspberry Pi
2. Interfacing Switch with Raspberry Pi to read its ON OFF status
3. Interfacing relay with Raspberry Pi
4. Interfacing Temperature sensor with Raspberry Pi
5. Interfacing Humidity sensor with Raspberry Pi
6. Interfacing Photocell/LDR with Raspberry Pi
7. Programming Raspberry Pi for Motion detection

8. Interfacing camera with Raspberry Pi to capture the image
9. Study of different types of Network cables and practically implement the cross- wired cable and straight through cable using clamping tool.
10. Establish Peer to Peer network connection using two systems using Switch and Router in a LAN.
11. Study of Network Devices in Detail (Switch, Hub, Router etc.)
12. Study of Network IP.
13. Connect the computers in Local Area Network.
14. Connect the computers in wide Area Network
15. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).
16. Configure Internet connection and use IPCONFIG, PING / Tracer and Net stat utilities to debug the network issues.
17. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.

**Course Title: Statistical methods using R Theory**

**Course Code : VSC06STA49**

**Theory- 30hrs.Marks-25 (Credits:02)**

Sr. No.	Title and contents
1	<p><b>Sampling Methods, Measures of Dispersion &amp; Moments, Skewness and Kurtosis</b></p> <p>1.1 Simple random sampling (SRSWR, SRSWOR, Stratified sampling and Systematic sampling)</p> <p>1.2 Mean, Median and Mode.</p> <p>1.3 Range, quartile deviation, mean deviation, (Relative measures) Standard deviation, Variance, C.V.</p> <p>1.4 Karl Pearson's coeff. of skewness, Bowles coeff. Of skewness, Pearsonian coeff. of skewness, Kurtosis</p>
2	<p><b>Correlation, Regression, Probability distribution and Design of Experiment</b></p> <p>2.1 Scatter diagram, Karl Pearson's coefficient of correlation, Spearman's Rank Correlation coefficient</p> <p>2.2 lines of regression.</p> <p>2.3 Probability and Probability Distributions (Uniform distribution, Binomial distribution, Geometric distribution, poison distribution), Plots to check normality: Box plot, Q- Q plot. shapiro.test(x)</p> <p>2.4 Design of experiment (One-way ANOVA, Two-way ANOVA).</p>

## **Practical**

1. R-tools for statistical computing (Measures of central tendency)
2. R-tools for statistical computing (Measures of dispersion)
3. R-tools for statistical computing (Correlation and Regression)
4. R-tools for statistical computing (Discrete probability distribution)
5. R-tools for statistical computing (Check for normality)
6. R-tools for statistical computing (One-way ANOVA)
7. R-tools for statistical computing (Two-way ANOVA)

**Question Paper Format:**

Seat No.	
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**VIVEKANAND COLLEGE, KOLHAPUR  
(EMPOWERED AUTONOMOUS)  
B.Sc. Computer Science Entire Part- I**

Course Code and Name:

Day:

Date: --/--/----

Time: 2 hours

Marks : 40

Instructions:

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labelled diagrams wherever necessary.
- 4) Use of log table/calculator is allowed.

Q. 1. Select correct alternative (One mark each): [8]

- i) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- ii) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- iii) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- iv) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- v) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- vi) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- vii) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----
- viii) Xyzabcdefg -----  
a) ----- b) ----- c) ----- d) -----

Q.2. Attempt any TWO (Eight marks each): [16]

- i) Xyzabcdefg.
- ii) Xyzabcdefg.
- iii) Xyzabcdefg.

Q.3. Attempt any FOUR (Four marks each): [16]

- i) Xyzabcdefg.
- ii) Xyzabcdefg.
- iii) Xyzabcdefg.
- iv) Xyzabcdefg.
- v) Xyzabcdefg.
- vi) Xyzabcdefg.

