*Rayat Shikshan Sanstha's*

**Yashavantrao Chavan Institute of Science, Satara (Autonomous)**

*Lead College of Karmaveer Bhaurao Patil University, Satara, Maharashtra*

**Undergraduate Programme**

**B. Sc. I Computer Science (Entire)**

**Syllabus**

**To be implemented w.e.f. from June 2023**

**NEP 2020**

# Index

There are bright career prospects for computer science professionals or software professionals in recent scenario. With the opening of huge software and IT companies in India, the job opportunities for trained professionals have increased considerably. India is known to be a leader in software and IT sector.

Computer science graduates pass outs find job opportunities in a variety of environments in academia, research, industry, government, private, business organizations and so on.

They are involved in analyzing problems for solutions, formulating and testing, using advanced communications or multi-media equipment, or working in teams for product development.

The software and IT companies are the major employers of computer science graduates. They offer the best packages to the young graduates which are unmatched with other branches of science.

## General Objectives of the Programme:

1. To nurture academicians with focus and commitment to their subject.
2. To shape good and informed citizens from the students entering into the Programme.
3. To create a skilled workforce to match the requirements of the society.
4. To impart knowledge of Science is the basic objective of this Programme.
5. To develop scientific attitude is the major objective so as to make the students open minded, critical and curious.
6. To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute to science.

## Programme Outcomes:

1. The students will graduate with proficiency in the subject of their choice.
2. The students will be eligible to continue higher studies in their subject.
3. The students will be eligible to pursue higher studies abroad.
4. The students will be eligible to appear for the examinations for jobs in government organizations.
5. The students will be eligible to apply for jobs with a minimum requirement of B.Sc. Programme.

## Program Specific Objectives of the Course:

1. The content of the syllabus have been framed as per UGC norms of CBCS Pattern.

2. The students are expected to understand the fundamentals, principles, mathematical, recent IT concepts and recent developments in the subject area.

3. The practical course is in relevance to the theory courses to improve the understanding of the concepts.

4. It is expected to inspire and boost interest of the students towards Computer Science as the main subject.

5. To develop the power of appreciations, the achievements in Computer and role in nature and society.

6. To enhance student sense of enthusiasm towards IT and to involve them in an intellectually stimulating experience of learning in a supportive environment.

## Program Specific Outcomes:

After successful completion of B.Sc. Computer Science (Entire) Course student will be ableto:

1. Understand the basics of Computer Science.

2. Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

3. Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Computer Science.

4. Identify their area of interest in academic, research and development.

5. Perform job in various fields' like IT, science, engineering, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach.

# Rayat Shikshan Sanstha's
## Yashavantrao Chavan Institute of science, Satara (Autonomous)
## Department of Computer Science (Entire)

### B.Sc. I SEM - I Computer Science (Entire)

| Sr.no | Course Category | | Name of Course |
|-------|-----------------|-----------|----------------|
| 1 | Major -I | BCSET 111 | C Programming-I |
| 2 | Major-II | BCSET 112 | DBMS |
| 3 | Lab I | BCSEP 113 | Lab I Based on BCSET 111 and BCSET 112 |
| 4 | Minor-I | BCSET 114 | Computational Electronics I |
| 5 | Minor-II | BCSET 115 | Computational Mathematics I |
| 6 | Lab II | BCSET 116 | Lab II Based on BCSET 115 and BCSET 116 |
| 7 | GE/OE under IDS | | Library and Information Science |
| 8 | GE/OE program for others | BCSET 117 | Fundamental of Computer |
| | | BCSET 118 | Fundamental of IOT |
| | | BCSEP 119 | Lab III Based on BCSET 117 and BCSET 119 |
| 9 | IKS | IKS 101 | History of Computers in India |
| 10 | CC | CC 102 | NSS/NCC/Yoga/Health & Wellness |

### B.Sc. I SEM - II Computer Science (Entire)

| Sr.no | Course Category | | Name of Course |
|-------|-----------------|-----------|----------------|
| 1 | Major -I | BCSET 121 | C Programming-II |
| 2 | Major-II | BCSET 122 | RDBMS |
| | Lab IV | BCSEP 123 | Lab IV Based on BCSET 121 and 122 |
| 3 | Minor-I | BCSET 124 | Computational Electronics II |
| 4 | Minor-II | BCSET 125 | Computational Statistics -I |
| | Lab V | BCSEP 126 | Lab V Based on BCSET 125 and BCSET 126 |
| 5 | GE/OE under IDS | | Library and Information Science |
| 6 | GE/OE program for others | BCSET 127 | Data Management |
| | | BCSET 128 | Data Security |
| | | BCSEP 129 | Lab VI based on BCSET 128 and BCSET 129 |
| 7 | SEC | SEC 103 | PC Assembling and Maintenance |
| 8 | VEC | VES 104 | Environmental Sociology |

# Major: Computer Science

## SEMESTER-I
### Theory Course I: BCSET 111: C Programming - I

**Course Objectives: -** Student should be able to …

1. learn a Programming logic concept.
2. understand the basic principles of programming.
3. discover skills for writing programs using 'C.'
4. study skill of Control structure and function concepts using 'C'

| Credits=2 | SEMESTER-I<br>BCSET 111: C Programming – I | No. of hours per unit (30) |
|---|---|---|
| **UNIT I** | **Introduction to 'C'** | **(7)** |
| | Basics of Linux Operating System (Ubuntu) and 'C' programming Language in Linux; History of 'C' ; Characteristics of C Language;  Algorithm; Flowcharts-(Definition, Symbol, features); Character set and keywords;  Structure of 'C' programming; Constant and its type; Compiling and debugging the program; Introduction of C Compiler-GCC Compiler; Vim Editor. | |
| **UNIT II** | **Input-Output Statements** | **(8)** |
| | Variable and its Data types in 'C'; Operators- Arithmetic, logical, relational, bitwise, increment, decrement, conditional, operator precedence; Formatted input-output - printf(), scanf(); Character input-output – getch(), getche(),getchar(),putchar() ; String input-output - gets(), puts(); | |
| **UNIT III** | **Control Structures** | **(7)** |
| | Conditional control statements- if, if else, nested if, else if ladder; switch Looping – for statements, nested for, while, do-while statements, nested while and do while, Infinite loop; Unconditional breaking control statements- break, continue, goto; | |
| **UNIT IV** | **Functions** | **(8)** |
| | Definition;  Declaration; prototype of function; Local and global variable; User defined Functions; Recursion; Call by value and Call by reference; Preprocessor; Macros.    String functions ( strcpy(), strcmp(), strcat(), strlen(), strrev()); | |

**Course Outcomes: -** Student will be able to …

1. illustrate the flowchart and design an algorithm for a given problem and to develop solution
2. develop conditional and unconditional statements to write C program.
3. exercise user defined functions to solve real time problems.

**Reference Books: –**

1) Kanetkar Yashavant , Let Us C: Authentic guide to C programming language 19th Edition , Delhi, BPB publication  Dec 2022,

2) E-Balagurusamy PROGRAMMING IN ANSI C 8th Edition, McGraw Hill, India,  25 March 2019.

3) Thareja Reema , Programming In C,2nd edition,Oxford Higher eduction publication,India,2016
4) Prinz Peter C in a Nutshell,ORelly Media,India December 2015.

5) Kochan G. Stephen, Programming in C, 4th edition,Pearson Education,USA,August 2014.

6) Perry Greg,C programming Absolute Beginner's Guide, British, Que Publishing ,2014.

7) Griffith David ,Head First C Abrain friendly guide,Grayscale Indian Edition 2012.

8) King K.N. , C Programming: A Modern Approach, 2nd edition,, New York London ,W.W. Norton, 2008

# Theory Course II: BCSET 112: Database Management System

**Course Objectives: -** Student should be able to…

1. study the concepts and terminologies of DBMS
2. explain the concept of Normalization concepts
3. understand ER-Model
4. observe the different database systems.

| Credits=2 | SEMESTER-I<br>BCSET 112: Database Management System | No. of hours per unit (30) |
|---|---|---|
| **UNIT I** | **Organization of Database System** | **(8)** |
| | Introduction of file; file types; organization of file- heap file organization; serial file organization; sequential; index sequential file; random access file (direct access file); Definition of Database; Needs; features Database Management Systems (DBMS): Definition, components, comparison of file processing system with DBMS. | |
| **UNIT II** | **Database concepts** | **(7)** |
| | Types of Database System: centralized database system; client-server system; distributed database system; Functions of DBMS; advantages; disadvantages of DBMS; Structure of DBMS; Services provided by DBMS; schema; subschema; data abstraction; data independence; architecture of database system; data dictionary; database administration; database manager. | |
| **UNIT III** | **Data Models** | **(7)** |
| | Introduction; definition; features of data models; Object based data models- Entity Relationship Model; cardinality; Record based models- Relational Model; Network Model; Hierarchical Model; Physical Data Models Keys: Primary key; foreign key; candidate key; super key; unique key Normalization: Concept of normalization; advantages; First NF; Second NF; Third NF; examples of normalizations. | |
| **UNIT IV** | **Conceptual Design (E-R model)** | **(8)** |
| | Overview of DB design; ER data model (entities, attributes, entity sets, relations, relationship sets); Additional constraints (key constraints; participation constraints; weak entities; aggregation / generalization; Conceptual design for small to large enterprises;     Case Study: Design Database System for- Library management system; Bank management system; Inventory management system. | |

**Course Outcomes: -** Student will be able to …

1. improve skill about data operation.

2. interpret to handle database.

3. design& develop proper database.

4. ability to design ER-Model on Case study

**Reference Books:**

1.  Silberschatz Abraham Korth Henry F. ,S. Sudarshan ,Database System Concepts 7th Edition , India,McGraw Hill ,21 July 2021
2.  Dr. Rajiv Chopra, Database Management Systems (Dbms), Delhi, S.Chand & company Pvt.Ltd. January 2016
3.  Ramez Elmasri and Shamkant B. Navathe , Fundamentals of Database Systems, 6th edition,

    India,Pearson Education, 2016
4. Ramakrishnan Raghu and Gehrke Johannes, Database Management Systems , India, McGraw Hill ,2010

5. Gill .P.S., Database Management Systems, India, Intrnational Publication House Pvt. Ltd., 30 July 2011.

6. Gupta S.B., Mittal Aditya, Intoduction to Databasse Management System, 1st edition, New Delhi, Laxmi Publication Pvt.Ltd., 2009.

7. Elmsari, Navathi, Fundamentals of database system, 5th edition, India, Pearson Education, 2008

8. Ullman Jeffrey, Database Systems: The Complete Book , June 9, 2008

### Lab Course I: BCSEP 113: Based on BCSET 111 and BCSET 112

### (C Programming – I and Database Management System)

**Course Objectives:** Student should be able to…

1.  understand programming and its roles in problem solving
2.  learn programming skills using the fundamentals and basics of C Language.
3.  study the concepts and terminologies of DBMS
4.  describe the ER-Model

| Credits=2 | SEMESTER-I<br>BCSEP 113:  Lab I- C Programming – I and Database Management System | No. of hours per unit (60) |
|---|---|---|
| Group A | C Programming – I | |
| | 1. Write a program on arithmetic operator<br>2. Write a Program to convert the Temperature in centigrade degree to the Fahrenheit degree.<br>3. Write a program to demonstrate whether given number is even or odd.<br>4. Write a program to find out First Fifty Prime numbers.<br>5. Write a program to display Fibonacci series.<br>6. Write a program to reverse the given number.<br>7. Write a program which display following output-<br>    A B C D E<br>    A B C D<br>    A B C<br>    A B<br>    A<br>8. Write a program for string functions<br>9. Write a program to calculate area of circle using function<br>10. Write a program calculate sum of two number using macro<br>11. Write a program to use of call by value and call by reference<br>12. Write a program to read single character (getchar()) | |

| Group B | Database Management System | |
|---|---|---|
| | 1. Create Employee master and Employee detailed table with appropriate field to apply following constraint on field.<br>    a. Primary Key<br>    b. Foreign Key<br>    c. Not null key<br>    d. default key<br>    e. Check constraint etc. | |
| | 2. Create student table with appropriate field and do.<br>    a. Insert 5 appropriate records<br>    b. Update city as Mumbai whose Roll No is 2.<br>    c. Delete record Who live in Satara | |
| | 3. Create Bank table with appropriate field and do.<br>    a. Insert 5 appropriate records<br>    b. Increment salary by 5000 whose EmpId id 101.<br>    c. Delete record Who Work in Satara City | |
| | 4. Create Hospital table with appropriate field and do.<br>    a. Insert 5 appropriate records<br>    b. Change the size of Patient Name by 50 Char.<br>    c. Delete Column name DOB.<br>    d. Drop Table. | |
| | 5. Case Study on Library System. | |

**Course Outcomes: -** Student will be able to …
1. exercise different Operators.
2. analyze basic Structure of the C-PROGRAMMING, declaration and usage of variables.
3. ability to design& develop proper database.
4. design ER-Model on Case study

**Reference Books:**

1) Kanetkar Yashavant , Let Us C: Authentic guide to C programming language 19th Edition , Delhi, BPB publication  Dec 2022,

2) E-Balagurusamy PROGRAMMING IN ANSI C 8th Edition, McGraw Hill, India,  25 March 2019.

3) Thareja Reema , Programming In C,2nd edition,Oxford Higher eduction publication,India,2016
4) Prinz Peter C in a Nutshell,ORelly Media,India December 2015.

5) Kochan G. Stephen, Programming in C, 4th edition,Pearson Education,USA,August 2014.

6) Perry Greg,C programming Absolute Beginner's Guide, British, Que Publishing ,2014.

7) Griffith David ,Head First C Abrain friendly guide,Grayscale Indian Edition 2012.

8) King K.N. , C Programming: A Modern Approach, 2nd edition,, New York London ,W.W. Norton, 2008

# Minor

**Theory Course III: BCSET 114: Computational Electronics I**

**Course Objectives: -** Student should be able to...

1. learn the principle of circuit analysis and design.
2. study the basic concepts and characteristics of electronic devices and circuits.
3. understand AC sources, DC sources and their concept.
4. describe the theoretical concept through laboratory experiment.

| Credits=2 | SEMESTER-I<br>BCSET 114: Computational Electronics I | No. of hours per unit/ credits |
|---|---|---|
| **UNIT I** | **Basic components and Network Theorems** | **(9)** |
| | AC Sources, DC Sources, Concept of Single Phase, Three phase, Power Supplies, Active, Passive Components, Resistor, Capacitor, Inductor, Transformer. (Qualitative Idea) Ohm's Law, Kirchhoff's Law, Thevenin's theorem, Norton Theorem, Superposition Theorem. | |
| **UNIT II** | **Semiconductor Device** | **(7)** |
| | Doping, P-N junction Diode, Characteristics, Clipper, Clamper, LED, Photodiode, BJT, Modes of Transistor. | |
| **UNIT III** | **Amplifiers and Oscillators** | **(7)** |
| | Transistor Amplifiers, Introduction of Oscillator, Phase Shift, Wein Bridge, Hartley, Colpitts, Crystal Oscillator. | |
| **UNIT IV** | **Multivibrators** | **(7)** |
| | UJT as sweep generator, Transistor as Astable, Bistable and Monostable Multivibrator. Using IC 555 as Astable and Monostable Multivibrator. | |

**Course Outcomes: -** Student will be able to…
1. categorize the basic electronic components.
2. examine electronic circuits using network theorems.
3. build various Oscillators Circuits.
4. construct multivibrators for electronic applications.

**Reference Books:**
1. Malvino Albert, Bates David J., Hoppe Patrick E., Electronic Principles(9th edition),India,McGraw Hill,Oct 2021
2. Boylestad Robert L., Electronic device and Circuit Theory, Banglore, Shree Hari Publications,2021
3. Sharma Sanjay, Electronic Devices and Circuit, Delhi, S.K.Kataria & sons,Jan 2013
4. Sharma Sanjay, Electronic Principle, Delhi, S.K.Kataria & sons,Jan 2012
5. Sedha R. S., A text of Applied Electronics, New Delhi, S Chand Publication,2019
6. Bhargava N. N., Kulshreshtra D. C., Gupta S. C. ,Basic Electronics and linear circuits, Tata McGraw Hill Publication.
7. Boyistead, Electronic Devices and Circuits, India,Tata McGraw Hill
8. Bell David A, Electronic Devices And Circuits, 5th edition, Oxford Higher Education ,30 April 2008

## Theory Course IV: BCSET 115: Computational Mathematics I

**Course Objectives: -** Student should be able to …

1. understand number system and their inter conversion.
2. learn concept of Lattice & Boolean algebra
3. describe the concept of graph & algorithms and tree graph
4. study the concept of directed graph, Network and flow.

| Credits=2 | SEMESTER-I<br>BCSET 115: Computational Mathematics I | No. of hours per unit (30) |
|---|---|---|
| **UNIT I** | **Number system** | **(6)** |
| | Decimal, Binary, and hexadecimal Number systems and their inter conversion, Binary addition, subtraction, multiplication and division, signed and unsigned binary numbers, 1's and 2's complement representation. | |
| **UNIT II** | **Boolean algebra** | **(9)** |
| | Partial Order Set, Hasse diagram, Lattice: Definition, principle of duality, Bounded, Distributive and Complemented lattice, Boolean algebra, Boolean expressions and Boolean functions, Disjunctive and conjunctive normal forms and examples, Simplification of switching circuit. | |
| **UNIT III** | **Graphs and Trees** | **(8)** |
| | Definition and Types of graphs, concept of degree of vertex, Hand-Shaking Lemma, Matrix representation of graphs: Adjacency matrix and Incidence matrix, Trails, Paths and Circuits, Connected and disconnected graph, Dijkstra's shortest path algorithm, Definitions and examples of trees, rooted trees, binary trees and their properties, spanning trees, Kruskal's algorithm. | |
| **UNIT IV** | **Directed Graphs** | **(7)** |
| | Definition, concept of degree of vertex, types of directed graphs, directed paths and cycles, connectivity and strongly connected digraphs, Directed (rooted) trees, arborescence and Polish notation, Network and flows: Definition, examples, Maximal flow algorithm. | |

**Course Outcomes**: Student will be able to …
1. apply addition and subtraction of Decimal, Binary, hexadecimal number systems and their conversions.
2. use the Boolean expression and Boolean functions.
3. evaluate the concept of graphs and various algorithms.
4. implement the types of directed graphs and their application.

**Reference Books:**

1. Raghunandan G.H. Roth Jr, Larry L. Kinney, Analog and Digital Electronics, 1st Edition, India,Cengage Learning,2019.
2. Arnold B.H., Logic and Boolean Algebra,USA, Dover publications inc reprint edition, 30 Dec 2011.
3. Kharate G.K., Digital Electronics, New Delhi, Oxford University Press, 11 March 2010.
4. Malik D.S., Sen M.K., Discrete Mathematics, Cengage Learning India Pvt. Ltd.,2009
5. Langote U., Discrete Mathematics, Pune: Tech-Max Publications, 2009
6. Sen M.K., Chakraborty B.C., Introduction to Discrete Mathematics, Kolkata, Arunabha Sen, 2007
7. Rosen Kenneth H., Discrete Mathematics and its Applications, India, McGraw Hill, 2002.
8. Deo Narsing, Graph Theory with Applications to Computer Science and Engineering ,India: Prentice Hall, 1974

# BCSEP 116- Lab II

## (Computational Electronics– I and Computational Mathematics)

**Course Objectives: -** Student should be able to …
1. learn basic electronic circuits and operations of Multimeter, CRO, function generator, power supplies.
2. study Laws and theorem and the characteristics of P-N Diode, FWR etc.
3. understand Decimal, Binary and hexadecimal number systems.
4. apply various algorithms of graph and directed graph.

| Credits=2 | SEMESTER-I<br>BCSEP 116- Lab II-<br>Computational Electronics– I and Computational Mathematics | No. of hours per unit/ credits (60) |
|---|---|---|
| **Group A** | **Computational Electronics– I** | |
| | 1. Study of Electronics components.<br>2. Study of CRO.<br>3. Verification of Kirchhoff's Law.<br>4. Verification of Thevenin's Theorem.<br>5. Study of I-V characteristics of PN junction Diode.<br>6. Study of Half wave Rectifier.<br>7. Study of Full wave Rectifier.<br>8. Study of Astable multivibrator using BJT/555.<br>9. Study of Monostable multivibrator using BJT/555.<br>10. Study of the Phase shift Oscillator using transistor. | |
| **Group B** | **Computational Mathematics** | |
| | 1. Interconversion of a Number system to another number system.<br>2. 1's and 2's complement with an example.<br>3. Representation of lattice with an example.<br>4. Disjunctive and Conjunctive normal forms of Boolean expression.<br>5. Switching Circuit with an example.<br>6. Dijkstra's shortest path algorithm.<br>7. Kruskal's algorithm to find shortest spanning tree.<br>8. Maximal flow algorithm. | |

**Course Outcomes: -** Student will be able to …
1. design and analyze basic electronics components and circuit.
2. analyze the operations of multi-meter (Analog & digital), function generator, power supply and CRO.
3. construct and solve Boolean expression.
4. apply algorithms in graph theory.

**Reference Books:**
1. Malvino Albert, Bates David J., Hoppe Patrick E., Electronic Principles(9th edition),India,McGraw Hill,Oct 2021
2. Boylestad Robert L., Electronic device and Circuit Theory, Banglore, Shree Hari Publications,2021
3. Sharma Sanjay, Electronic Devices and Circuit, Delhi, S.K.Kataria & sons,Jan 2013
4. Sharma Sanjay, Electronic Principle, Delhi, S.K.Kataria & sons,Jan 2012
5. Sedha R. S., A text of Applied Electronics, New Delhi, S Chand Publication,2019
6. Bhargava N. N., Kulshreshtra D. C., Gupta S. C. ,Basic Electronics and linear circuits, Tata McGraw Hill Publication.
7. Boyistead, Electronic Devices and Circuits, India,Tata McGraw Hill
8. Bell David A, Electronic Devices And Circuits, 5th edition, Oxford Higher Education ,30 April 2008

# Open Electives

**BCSET 117: Basics of Computer**

**Course Objectives: -** Student should be able to …

1. learn the basic components of a computer system, including hardware and software.

2. describe the functions and interactions of the central processing unit (CPU), memory, storage devices, and input/output devices.

3. identify and describe the various hardware components of a computer, such as the motherboard, processor, memory modules, and storage devices.

4. understand the purpose and usage of peripheral devices like keyboards, mice, monitors, printers, and scanners

| Credits=2 | BCSET 117: Basics of Computer | No. of hours per unit/credits |
|---|---|---|
| UNIT I | **Introduction to computers** | **(7)** |
| | Characteristics and limitations of computer, Block diagram of computer, types of computers, computer generations | |
| UNIT II | **Input and Output devices**: | **(7)** |
| | Input Device; Output Device; Pointing Devices; CPU. | |
| UNIT III | **Types of Software:** | **(8)** |
| | System software, Application software, commercial, open source, domain, and free ware software, | |
| UNIT IV | **Memories** | **(8)** |
| | Primary (RAM/ROM), Secondary (Hard Disk, CD, DVD) and cache memory**.** | |

**Course Outcomes: -** Student will be able to …

1. understand the basic components of a computer system and their functions.

2. explain the interactions between hardware and software components.

3. describe the role of operating systems in managing computer resources.

4. use and describe different hardware components of a computer.

5. demonstrate knowledge of peripheral devices and their functions.

6. understand computer connectivity options and their usage.

**Reference Books:**

1. Miller Michael, Computer Basics Absolute Beginner's Guide, Windows 8 Edition ,2012
2. Ellis & Horowitz Sartaj Sahni ,Fundamentals of Computer Algorithms , (1984-05-03)
3. Jessen Havill. Discovering Computer Science, Oct 27, 2020

**Course Objectives: -** Student should be able to …

1. study fundamental concepts of IoT

2. understand roles of sensors in IoT

3. describe and familiar with data handling and analytics tools in IoT

| Credits=2 | BCSET 118: Fundamentals of IOT | No. of hours per unit/credits |
|---|---|---|
| **UNIT I** | **Introduction to IoT:** | **(6)** |
| | Definition and concept of IoT. Evolution and history of IoT. Applications and benefits of IoT in various industries. | |
| **UNIT II** | **IoT Architecture and Components:** | **(9)** |
| | Overview of IoT architecture layers (sensing layer, network layer, application layer).<br>IoT hardware components (sensors, actuators, microcontrollers).<br>IoT software components (communication protocols, data management platforms). | |
| **UNIT III** | **IoT Devices and Sensors** | **(7)** |
| | Types of IoT devices and their functionalities., Various sensors used in IoT systems. | |
| **UNIT IV** | **Sensors Networks** | **(8)** |
| | Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, Raspberry Development Kit | |

**Course Outcomes:-** Student will be able to …

1. demonstrate a clear understanding of the concept, definition, and scope of IoT.

2. use the key components and technologies that form the basis of IoT systems.

3. explain the layered architecture of IoT, including the perception layer, network layer, and application layer.

4. understand the role of sensors, actuators, gateways, and cloud platforms in an IoT ecosystem.

**Reference Books**

1. Mishra Vishram and Singh Vikram Jeet ,Fundamentals of IoT: From Design to Implementation, September 2021

2. Kranz Maciej. Building the Internet of Things ,2016,

3. Buyya Rajkumar, Dastjerdi Amir Vahid, and Beloglazov Anton, Internet of Things: Principles and Paradigms, 2016

# BCSEP 119: Lab III

## (Fundamentals of Computer and Fundamentals of IOT Lab-I)

**Course Objectives:** Student should be able to…
1. understand the basic concepts of computer hardware, software, and their interaction
2. study the basic concepts of IoT
3. describe the concepts of Arduino and Raspberry
4. learn the interaction of sensors with of Arduino and Raspberry

| Credits=2 | SEMESTER-I<br>BCSEP 119: Lab III<br>(Fundamentals of Computer and Fundamentals of IoT) | No. of hours per unit/ credits (60) |
|---|---|---|
| Group A | **Fundamentals of Computer** | |
| | 1. Demonstration of Input Device.<br>2. Demonstration of Output Device<br>3. Demonstration of Pointing Devices<br>4. Demonstration of Memory Device.<br>5. Demonstration of CPU.<br>6. Demonstration of System Software<br>7. Demonstration of Application Software<br>8. Demonstration of Primary memory<br>9. Demonstration of Secondary memory<br>10. Demonstration of cache memory | |
| Group B | **Fundamentals of IoT** | |
| | 1.Demonstration of Sensors<br>2.Demonstration of actuator<br>3.Demonstration of Arduino IDE<br>4. Demonstration of Raspberry  IDE<br>5. Practical's for Arduino Kit<br>6. Practical's for Arduino Kit<br>7. Interface of Humidity / Temperature Sensors with Arduino<br>8. Interface of Humidity / Temperature Sensors with Raspberry<br>9. Interface of Sound Sensors with Arduino<br>10. Interface of Sound Sensors with Raspberry | |

**Course Outcomes: -**Student will be able to…
1. demonstrate a solid understanding of computer hardware components and their functions.
2. use and select appropriate sensors, actuators for specific IoT applications.
3. collect, process, and analyze data generated by IoT devices.
4. use IoT platforms to develop and deploy IoT solutions.

**Reference Books**

1. Vishram Mishra and Vikram Jeet Singh, Fundamentals of IoT: From Design to Implementation, September 2021

2. Maciej Kranz.,Building the Internet of Things, 2016,

3. Rajkumar Buyya, Amir Vahid Dastjerdi, and Anton Beloglazov, Internet of Things: Principles and Paradigms, 2016

# IKS

## IKS 101: History of Computers in India

**Course Objectives:** Student should be able to …

1) study a steam-powered, mechanical computer
2) understand digital computing replaced Analog methods in the 1940s and 1950s
3) learn the Evolution of Indian programming languages
4) demonstrate story behind the Modern Computing

| Credits=2 | Semester I<br>IKS 101: History of Computers in India | No. of hours<br>per unit/credits |
|---|---|---|
| Unit I | **Pre-Independence Era of Computers** | 7 |
| | Introduction: Computing in the Pre-industrial World, Establishment of the Tata Institute of Fundamental Research, Analog Computing in the 19th and early 20th, Introduction of electronic computers in India, Information Technology before 1945 | |
| Unit II | **Early Computing Initiatives** | 7 |
| | Development of the first indigenous electronic computer: HEC-2M, Role of F.C. Kohli in setting up the first computer manufacturing company in India, Computers and Culture in the 1960s, Early Computer Languages and Software | |
| Unit III | **Era of Mainframes and Minicomputers** | 8 |
| | Introduction of mainframe and minicomputer technologies in India, Role of the Department of Electronics (DoE) in promoting computerization, Evolution of Indian programming languages (FORTRAN, COBOL). | |
| Unit IV | **Modern Computing** | 8 |
| | Emergence of Indian IT companies and software exports, Role of NRIs in the growth of the Indian IT industry, Internet and Digital Revolution, Mobile computing and smartphone revolution in India, Artificial Intelligence (AI) and Machine Learning (ML) in Indian industries. | |

**Course Outcomes: -** Student will be able to …

1) a design for a steam-powered, mechanical computer
2) understand digital computing replaced Analog methods in the 1940s and 1950s
3) study the Evolution of Indian programming languages
4) understand the story behind the Modern Computing

**Required books:**

- Martin Campbell-Kelly and William Aspray, Computer: A History of the Information Machine (Basic Books, 2004). Please purchase the second edition (2004), not the first edition (1996)
- Fred Turner, From Counterculture to Cyberculture (University of Chicago Press, 2006)
- Martin Campbell-Kelly, From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry (MIT Press, 2003) Janet Abbate, Inventing the Internet (MIT Press, 1999)

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of Semester I\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

# Semester II
# Major

## BCSET 121: C Programming – II

**Course Objectives: -** Student should be able to…
i. develop a Programming logic.
ii. learn basic principles of programming.
iii. study skills for writing programs using 'C'.

| Credits=2 | SEMESTER-II<br>BCSET 121: C Programming – II | No. of hours per unit/credits |
|---|---|---|
| UNIT I | **Arrays** | **(8)** |
| | Definition and declaration of array; Features of Array; Initialization of array; Memory representation of array; Types of Arrays-Single Dimensional Array; Two-Dimensional Array; Multi-Dimensional Array. Addition of array; multiplication of arrays | |
| UNIT II | **Pointers** | **(7)** |
| | Definition and declaration; Pointer initialization; Operations on pointer; Use of Pointer in Function; Array of Pointer; Pointer of pointer; Dynamic memory allocation | |
| UNIT III | **Structures and Union** | **(7)** |
| | Definition and declaration; Array of structures; Passing structure to function; Pointer to structure; Nested structure; self-referential structure; Sizeof() and typedef( ); Definition of Union and declaration; Difference between structure and Union; | |
| UNIT IV | **File Handling** | **(8)** |
| | Concept of File; Text and binary files; Opening and closing files; File opening mode- (read, write, append ); Character and integer handling ( getc( ), putc( ) , getw( ), putw( ) ); Formatted input-[(scanf( ), sscanf( ), fscanf( ), fread( )); Formatted output- (printf( ), sprintf( ), fprintf( ), fwrite( )]; Functions-[fseek( ), ftell( ), fflush( ), fclose( ), fopen( ), rewind( )]; | |

**Course Outcomes:** Student will able to …

i. use different basic concepts arrays in C
ii. apply the different concepts of operations on Pointers.
iii. implement the concepts of Structure and Union.
iv. design and implement File handling in C.

**Reference Books:-**

1) Kanetkar Yashavant , Let Us C: Authentic guide to C programming language 19th Edition , Delhi, BPB publication  Dec 2022,

2) E-Balagurusamy PROGRAMMING IN ANSI C 8th Edition, McGraw Hill, India,  25 March 2019.

3) Thareja Reema , Programming In C,2nd edition,Oxford Higher eduction publication,India,2016
4) Prinz Peter C in a Nutshell,ORelly Media,India December 2015.

5) Kochan G. Stephen, Programming in C, 4th edition,Pearson Education,USA,August 2014.

6) Perry Greg,C programming Absolute Beginner's Guide, British, Que Publishing ,2014.

7) Griffith David ,Head First C Abrain friendly guide,Grayscale Indian Edition 2012.

8) King K.N. , C Programming: A Modern Approach, 2nd edition,, New York London ,W.W. Norton, 2008

# BCSET 122: Relational Database Management System

**Course Objectives: -** Student should able to …

1. study the concepts and terminologies of RDBMS
2. understand SQL concepts.
3. study MySQL Concepts
4. learn PL/SQL

| Credits=2 | SEMESTER-II<br>BCSET 122: Relational Data base Management System | No. of hours<br>per unit/credits |
|---|---|---|
| **UNIT I** | **Introduction to RDBMS** | **(8)** |
| | Data; Database; DBMS, RDBMS; Concepts of Data Models object based; Record based (Network; Hierarchical; Relational); Physical; Concept of RDBMS Terminologies: relation; attribute; domain; tuple; entities; DBA and Responsibilities of DBA; Relational Model: Structure of Relational Database; Relational Algebra. | |
| **UNIT II** | **Structured Query Language (SQL)** | **(7)** |
| | SQL: Data types-fixed length; variable length; ex., Data Constraints-Primary key; Foreign key; Null; Check; Default Clauses-(select, where, group by, order by);  SQL Operators: Logical; Relational; Special-In; Between; Like Sub Queries and Join-Sub queries and Nesting sub queries; Join: Equijoin; Simple join; Outer join; self-join; Views; Indexes; Sequence | |
| **UNIT III** | **Introduction to MySQL** | **(7)** |
| | Basic Concepts; Difference between SQL and MySQL; Creating a Database and Tables; Inserting; Selecting; Ordering; Limiting; Grouping; Analyzing and Manipulating Data; Changing; Deleting; Searching; Database and Table Schema Statements; Data Manipulation Statements and Functions; Table; Statements and Functions; Replication Statements and Functions; Aggregate Clauses; Aggregate; Functions; String Functions; Date and Time Functions; Mathematical Functions; | |
| **UNIT IV** | **Introduction to PL-SQL** | **(8)** |
| | Comparison between SQL & PL-SQL; Structure of PL-SQL block; Benefits of PL/SQL over SQL; Control structure: if statement; case statement; Loops-Simple looping; For; While; Need of Iterative and; looping statements in data handling; | |

**Course Outcomes:** Student will able to …

1. use skill about RDBMS.

2. apply the ability of  handle SQL.

3. design applications in  MySQL.

4. develop PL-SQL knowledge.

**Reference book-**

1. Silberschatz Abraham Korth Henry F. ,S. Sudarshan ,Database System Concepts 7th Edition , India,McGraw Hill ,21 July 2021
2. Dr. Rajiv Chopra, Database Management Systems (Dbms), Delhi, S.Chand & company Pvt.Ltd. January 2016
3. Ramez Elmasri and Shamkant B. Navathe , Fundamentals of Database Systems, 6th edition,

   India,Pearson Education, 2016
4. Ramakrishnan Raghu and Gehrke Johannes, Database Management Systems , India, McGraw Hill ,2010

5. Gill .P.S., Database Management Systems, India, Intrnational Publication House Pvt. Ltd., 30 July 2011.

6. Gupta S.B., Mittal Aditya, Intoduction to Databasse Management System, 1$^{st}$ edition, New Delhi, Laxmi Publication Pvt.Ltd., 2009.

7. Elmsari, Navathi, Fundamentals of database system, 5th edition, India, Pearson Education, 2008

8. Ullman Jeffrey, Database Systems: The Complete Book , June 9, 2008

## BCSEP 123: Lab IV-

### (C Programming – II and Relational Data base Management System)

**Course Objectives: -** Student should able to …

  i.   study a Programming logic.
  ii.  learn skills for writing programs using 'C'.
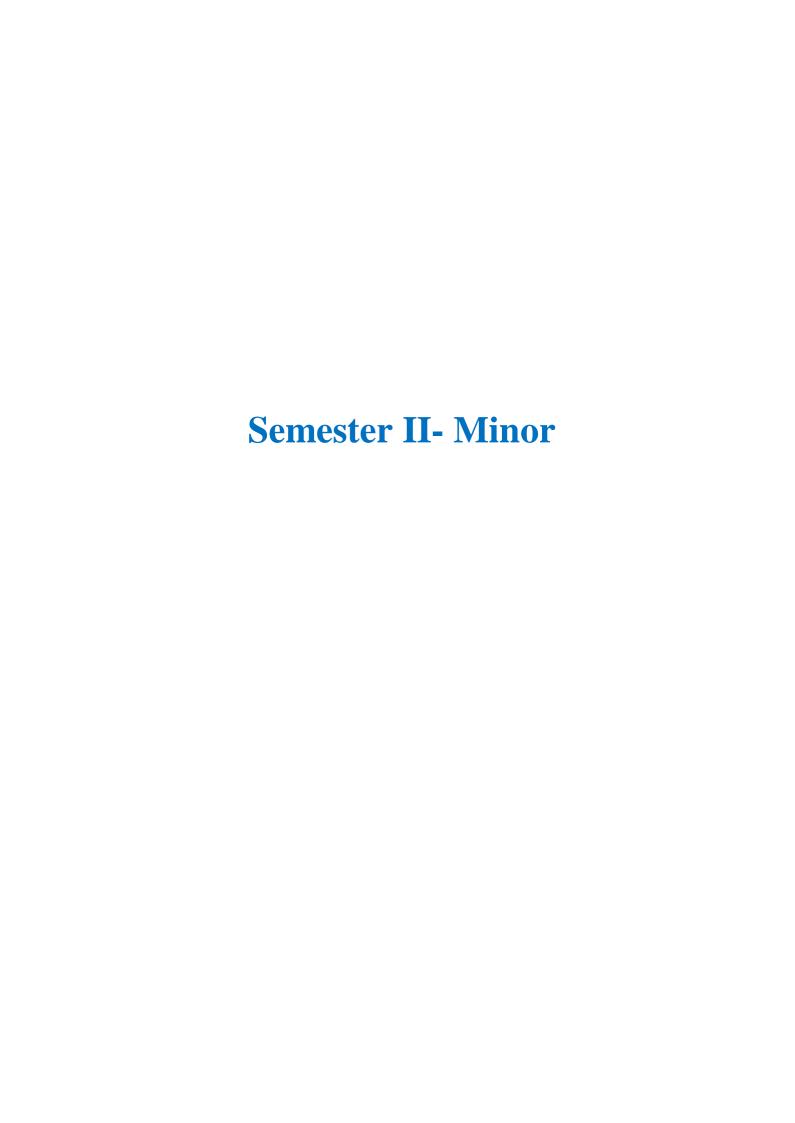  iii. execute the concepts and terminologies of RDBMS
  iv.  understand SQL concepts.

| Credits=2 | SEMESTER-I<br><br>BCSEP 123: Lab IV- (C Programming – II and Relational Data base Management System) | No. of hours per unit/ credits (60) |
|---|---|---|
| **Group A** | **C Programming – II** | |
| | 1) Write a program to calculate sum and average of given n numbers using array.<br>2) Write a program to add two Matrices; Use Two-Dimensional array.<br>3) Write a program to multiplication of two Matrices.<br>4) Student should explain program to reverse string using Pointer.<br>5) Write a program to perform Operation on Pointer.<br>6) Student should demonstrate a program that accepts the Roll No, Name, Marks obtained   in three tests of 'N' students & display the total and Average in tabular format.<br>7) Write a program to create Union for 5 records of Student.<br>8) Write a program of Pointer to structure.<br>9) Student should Write a program to separate even and odd numbers available in input file.<br>10) Write a program to Create emp.txt file and save 5 records of Employee | |

| Group B | Relational Data base Management System | |
|---|---|---|
| | 1. Create Database Railway System with appropriate Constraints<br>  a) Insert any 5 records<br>  b) Show the employee record who work in TC Department (using Group By Clause)<br>2. Create Database Library with appropriate Constraints<br>  a) Insert any 5 records<br>  b) Show the record of Books using Join<br>3. Create Database School with appropriate Constraints<br>  a) Insert any 5 records<br>  b) Show the record of Student with Topper, Lowest, Average, Total<br>4. Create table Stock Details in Computer Department.<br>  a) Insert any 5 records<br>  Create Procedure to display record in the month of August 2021<br><br>5. Create Database shop with appropriate Constraints<br>  a) Insert five records<br><br>  b) Show the record of shop with Highest Price thing, Average profit, Total profit | |

**Course Outcomes:** Student will able to …

i.     use different basic concepts arrays in C

ii.    apply the different concepts of operations on Pointers.

iii.   ability to handle MySQL.

iv.   develop PL-SQL knowledge.

**Reference Books: -**

1) Kanetkar Yashavant , Let Us C: Authentic guide to C programming language 19th Edition , Delhi, BPB publication  Dec 2022,

2) E-Balagurusamy PROGRAMMING IN ANSI C 8th Edition, McGraw Hill, India,  25 March 2019.

3) Thareja Reema , Programming In C,2nd edition,Oxford Higher eduction publication,India,2016

4) Prinz Peter C in a Nutshell,ORelly Media,India December 2015.

5) Kochan G. Stephen, Programming in C, 4th edition,Pearson Education,USA,August 2014.

6) Perry Greg,C programming Absolute Beginner's Guide, British, Que Publishing ,2014.

7) Griffith David ,Head First C Abrain friendly guide,Grayscale Indian Edition 2012.

8) King K.N. , C Programming: A Modern Approach, 2nd edition,, New York London ,W.W. Norton, 2008

# Semester II- Minor

**Course Objectives: -** Student should be able to...
     i. understands Logic gates and its interconversion.
     ii. learn Boolean Laws and solve K-Map.
     iii. study designing and analyzing attitude about sequential circuits.
     iv. learn designing and analyzing attitude about Combinational circuits.

| Credits=2 | **SEMESTER-I**<br>**BCSET 124: Computational Electronics II** | No. of hours per unit/ credits |
|---|---|---|
| **UNIT I** | **Logic Gates** | **(8)** |
| | AND, OR, NOT, NOR, NAND, EX-OR (Symbol, Expression and Truth Table), Universality of Logic Gates, ASCII Code, De Morgan's theorem, SOP, POS, Boolean Laws and rules, K-map. Introduction to logic families: TTL NAND Gate. | |
| **UNIT II** | **Sequential circuits** | **(8)** |
| | Latch, Flip Flops-RS Flip flop, Clocked RS Flip flop, D Flip flop, JK Flip flop, T Flip flop, Counters- 3 bit asynchronous, 3bit synchronous, Shift registers: SISO, SIPO, PISO, PIPO. | |
| **UNIT III** | **Combinational Circuits** | **(6)** |
| | Half adder, Full adder, Parallel adder, Half subtractor, Full Subtractor, Encoder Decoder, Multiplexer and De-Multiplexer. | |
| **UNIT IV** | **Memory Organization & I/O Devices** | **(8)** |
| | Introduction of Computer, Concept of Bus, Computer I/O devices, Memory: RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM, FLASH, Arithmetic logic unit. | |

**Course Outcomes:** Student will able to:

i. design and construct logic gates.

ii. analyze and solve the K-Map.

iii. develop and analyze sequential and combinational circuits.

iv. apply the computer system.

**Reference Books:**
1. Jain R.P., Sarawddekar Kishore, Modern Digital Electronics, India, Mc Graw Hill, July 2022
2. Anand Rishabh, Digital Electronics, India, Khanna Publisher,2021
3. Dr. Mishra K.P., Digital Electronics-I, India,Vayu education, 2020
4. Jain R.P., Modern Digital Electronics [4th Edition], India, McGraw Hill Education, July 2009.
5. Mano Morris M., Digital System Design, Third edition , Pearson Education Asia .2007
6. Leach Malvino, Digital Principals and applications, India,Tata McGraw Hill, 4th Edition
7. Strahglo C.F. ,Digital Electronics
8. L Thomas. Flyod, Digital Fundamentals, Pearson Education Asia 1994.

# BCSET 125: Computational Statistics

**Course Objectives: -** Students should be able to...
i) Understand the basic concepts of statistics
ii) Perform Frequency distribution and data presentation
iii) Compute various measures of central tendency, dispersion, correlation, and regression
iv) Analyse the data and interpret the results.

| Credit:02 | SEMESTER-II<br>BCSET 125: Computational Statistics | No. of hours/<br>lectures/Credits |
|---|---|---|
| Unit 1 | **Data Condensation and Graphical Methods** | 8 |
| | Definition, importance, scope and limitations of statistics w.r.to computer science, Data Condensation: Qualitative & Quantitative. Scales of measurement: Nominal, Ordinal, Interval and Ratio, Raw data, Attributes and variables, discrete and continuous variables, Organization of data, Collection of data, classification and construction of frequency distribution, Graphical Representation: Histogram, Frequency polygon, Frequency curve, Ogive Curves and their uses, Box-Plot, Examples and Problems. | |
| Unit 2 | **Measures of Central tendency and Dispersion** | 8 |
| | Concept of central tendency, Criteria for good measures of central tendency, Types: Arithmetic mean, Median, Mode, Quantiles, Combined Mean, Weighted Mean, Concept of dispersion and measures of dispersion, absolute and relative measures of dispersion, Types: Range, Quartile Deviation, S.D. and Variance, Numerical problems. | |
| Unit 3 | **Correlation (for ungrouped data)** | 7 |
| | Concept of bivariate data, scatter diagram. Concept of correlation, positive correlation, negative correlation, cause and effect relation, Karl Pearson's coefficient of correlation, Properties of correlation coefficient, interpretation of correlation coefficient. Spearman's Rank Correlation coefficient (formula with and without ties), Numerical problems. | |
| Unit 4 | **Regression (for ungrouped data)** | 7 |
| | Concept of regression. Derivation of lines of regression by method of least squares, Regression Coefficients, and their significance. Properties of regression coefficients, Point of intersection and acute angle between regression lines (without proof), Numerical problems. | |

**Course Outcomes:** Student will able to...
i) Apply various types of sampling methods to data collection.

ii) Create and interpret frequency tables.

iii) Display data graphically and interpret graphs

iv) Recognize, describe, and calculate the measures of central tendancy and dispersion

v) Measure the correlation between two variables and estimate the value.

**Books Recommended:-**

1. Gupta S. P.. Statistical Methods, 48th Edition, New Delhi, Sultan Chand and Sons, 2022.

2. Gupta S.C. and V.K.Kapoor Fundamental of Mathematical Statistics, 12th Edition, New Delhi, Sultan Chand and Sons Publication, 2020.

3. Gupta S. C.. Fundamental of Statistics, 7th Edition, Mumbai, Himalaya Publishing House, 2018.

4. Mood A.M., Graybill F.A. and D.C.Boes, Introduction to the Theory of Statistics, Third Edition, New Delhi, Tata McGraw-Hill Pub. Co. Ltd., 2017.

5. Goon A. M., Gupta M. K., Gupta B. Das. Fundamentals of Statistics, 9th Edition, Calcutta, The World Press Private Ltd., 2017.

6. Agarwal B. L. Basic Statistics, 6th Edition, New Delhi, New Age International Private Ltd. 2013.

7. Spiegel Murray R., Larry J. Stephens, Statistics, 4th Edition, New Delhi, Tata MacGraw-Hill Publishing Company Ltd., 2010.

8. Aczel Amir D., Jayavel Sounderpandian. Complete Business Statistics, 6th Edition, New Delhi, Tata MacGraw-Hill Publishing Company Ltd., 2006.

## BCSEP 126: LAB V

## Computational Electronics II and Computational Statistics Lab-II

## Group A

**Course Objectives: -** Student should be able to...
1) learn logic gates and verify De-Morgan's theorem.
2) understand the concept of Flip-Flops, adders, multiplexer, and De-multiplexer.
3) learn statistical frequency distributions
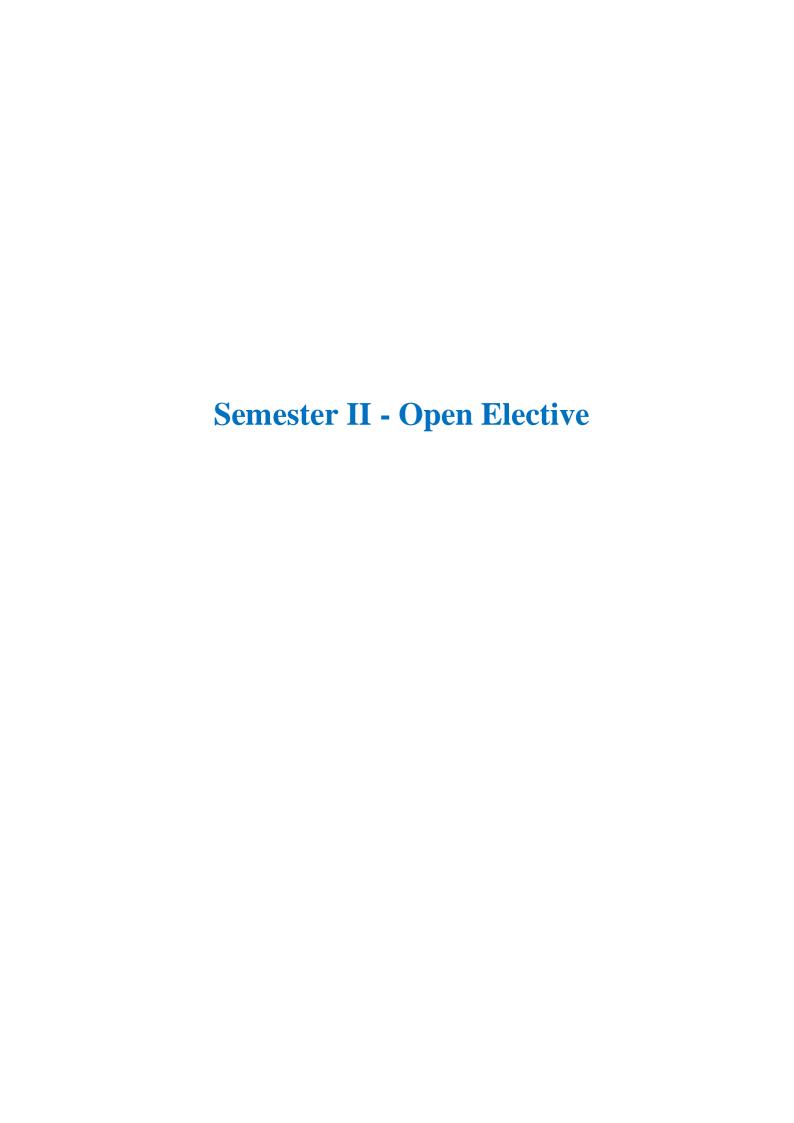4) understand statistical representation

| Credits=2 | SEMESTER-I<br>BCSEP 126- Lab V- Computational Electronics II and Computational Statistics | No. of hours per unit/ credits (60) |
|---|---|---|
| **Group A** | **Computational Electronics II** | |
| | 1. Study of Logic Gates.<br>2. Basic gates using NAND gate.<br>3. Basic gates using NOR gate.<br>4. Study and Verify De-Morgan's Theorem.<br>5. Study of Half Adder.<br>6. Study of Full Adder.<br>7. Study of Multiplexer using IC 74153.<br>8. Study of RS Flip-Flop.<br>9. Study of JK Flip-Flop.<br>10. Study of CPU and I/O devices. | |
| **Group B** | **Computational Statistics** | |
| | 1) Construction of Discrete Frequency distribution<br>2) Construction of Continuous Frequency distribution<br>3) Graphical Representation<br>4) Diagrammatic Representation<br>5) Measures of Central Tendancy (Ungrouped Data)<br>6) Measures of Central Tendancy (Grouped Data) | |

| | 7) Measures of Dispersion (Ungrouped Data)<br>8) Measures of Dispersion (Grouped Data)<br>9) Correlation<br>10) Regression | |

**Course Outcomes:** Student will able to...

1) design and analyze sequential logic circuits.

2) design and analyze combinational logic circuits.

3) Construct and understand frequency distribution

4) Draw various graphs and Diagrams and interpret

5) Compute various measures of Central tendancy, Dispersion and moments

6) Compute the correlation coefficients and identify the relation between bivariate data.

7) Estimate unknown values by regression equations.

**Reference Books:**
1. Jain R.P., Sarawddekar Kishore, Modern Digital Electronics, India, Mc Graw Hill, July 2022
2. Rishabh Anand, Digital Electronics, India, Khanna Publisher,2021
3. Dr. Mishra K.P., Digital Electronics-I, India,Vayu education, 2020
4. Jain R.P., Modern Digital Electronics [4th Edition], India, McGraw Hill Education, July 2009.
**Books Recommended:-**

1. Gupta S. P.. Statistical Methods, 48th Edition, New Delhi, Sultan Chand and Sons, 2022.

2. Gupta S.C. and V.K.Kapoor Fundamental of Mathematical Statistics, 12th Edition, New Delhi, Sultan Chand and Sons Publication, 2020.

3. Gupta S. C.. Fundamental of Statistics, 7th Edition, Mumbai, Himalaya Publishing House, 2018.

4. Mood A.M., Graybill F.A. and D.C.Boes, Introduction to the Theory of Statistics, Third Edition, New Delhi, Tata McGraw-Hill Pub. Co. Ltd., 2017.

5. Goon A. M., Gupta M. K., Gupta B. Das. Fundamentals of Statistics, 9th Edition, Calcutta, The World Press Private Ltd., 2017.

6. Agarwal B. L. Basic Statistics, 6th Edition, New Delhi, New Age International Private Ltd. 2013.

7. Spiegel Murray R., Larry J. Stephens, Statistics, 4th Edition, New Delhi, Tata MacGraw-Hill Publishing Company Ltd., 2010.

8. Aczel Amir D., Jayavel Sounderpandian. Complete Business Statistics, 6th Edition, New Delhi, Tata MacGraw-Hill Publishing Company Ltd., 2006.

# Semester II - Open Elective

**Course Objectives:** Student should be able to …

1.explain the challenges and considerations related to data collection, storage, and processing in IoT systems.

2.learn about different data management techniques and approaches specific to IoT applications.

3.explore IoT data analytics and visualization methods to derive meaningful insights from collected data

| Credits=2 | SEMESTER-II<br>BCSET 127: Data Management | No. of hours per unit/ credits |
|---|---|---|
| **UNIT I** | **Introduction to IoT Data Management** | **(9)** |
| | Overview of IoT and its data management challenges, Characteristics of IoT data (volume, velocity, variety, veracity), Data lifecycle in IoT applications. | |
| **UNIT II** | **Data collection and Storage** | **(9)** |
| | Data collection, storage, and processing in IoT systems, Cloud computing and IoT platforms, Storage architectures for IoT data (cloud, edge, fog), Data storage models (relational, NoSQL, time-series), Data retrieval techniques and protocols (RESTful APIs, MQTT, CoAP). | |
| **UNIT III** | **Data Quality and Pre-processing** | **(9)** |
| | Data quality issues in IoT data (noise, outliers, missing values), Data cleaning and pre-processing techniques, Data aggregation and summarization for IoT analytics. | |
| **UNIT IV** | **Data Analytics for IoT** | **(9)** |
| | Overview of IoT analytics techniques (descriptive, diagnostic, predictive, prescriptive)<br>Real-time analytics for IoT data streams, Machine learning algorithms for IoT data analysis, Visualization techniques for IoT analytics. | |

**Course Out comes:-** Student will be able to …

1.explain data collection techniques and sensing technologies in IoT systems.

2.understand the principles of data storage, processing, and analytics in IoT applications.

3.demonstrate the ability to integrate IoT devices with cloud platforms for data management.

4.identify and analyze common security threats and vulnerabilities in IoT deployments.

5.implement security measures such as authentication, encryption, and access control in IoT systems.

6.understand the importance of privacy protection and ethical considerations in IoT applications.

**Reference Books**

1. Kranz Maciej, Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry,2016
2. Uckelmann Dieter, Harrison Mark, and Michahelles Florian, Architecting the Internet of Things ,2011
3. Hanes David, Salgueiro Gonzalo, Grossetete Patrick ,2017IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things,

# BCSET 128: Data Security

**Course Objectives:-** Student should be able to …

1.build upon foundational knowledge to develop a deeper understanding of IoT architecture, protocols, and technologies.

2.explore advanced security measures for IoT systems, including secure device provisioning, secure communication, and secure firmware updates.

3.explore IoT applications and use cases in various industries such as healthcare, smart cities, agriculture, manufacturing, and transportation.

4.stay updated with the latest advancements and trends in the field of IoT

| Credits=2 | SEMESTER-I<br>BCSET 128: Data Security | No. of hours per unit/ credits |
|---|---|---|
| **UNIT I** | **Introduction to IoT Data Security** | **(9)** |
| | Overview of IoT and its security challenges, Importance of data security in IoT ecosystems, Key principles, and concepts of IoT data security. | |
| **UNIT II** | **Privacy in IoT** | **(9)** |
| | IoT privacy threats and vulnerabilities. Authentication and access control mechanisms.<br>Privacy challenges in IoT data collection and usage, Privacy-enhancing technologies and techniques for IoT, Authentication and encryption techniques for IoT devices. Encryption and data integrity in IoT systems. | |
| **UNIT III** | **Cryptography for IoT Data Security** | **(9)** |
| | Symmetric and asymmetric encryption algorithms, Cryptographic protocols for secure data transmission, Key management, and secure key exchange in IoT | |
| **UNIT IV** | **Emerging Trends and Future Directions** | **(9)** |
| | Blockchain for IoT data security, Machine learning-based security approaches for IoT, Edge-based security solutions for IoT devices | |

**Couse Outcomes:** Student will be able to …

1. demonstrate an in-depth understanding of advanced IoT concepts, architectures, and technologies.

2.identify and evaluate appropriate IoT protocols, platforms, and connectivity options for specific use cases.

3.apply privacy-preserving techniques to handle sensitive data in compliance with regulations and ethical considerations.

4.design and develop IoT applications for specific industry domains, such as healthcare, smart cities, agriculture, manufacturing, or transportation.

**Reference books**

1. Brian Russell, Drew Van Duren, and John Sammons ,Practical Internet of Things Security,2018
2. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations Fei Hu ,2016
3. Chehri Abdellah, Zekri Ahmed, and Amr M. Youssef ,Internet of Things Security: Advances, Challenges and Performance Improvement , 2020

# BCSEP 129: Lab VI

## (Data Management and Data Security Lab-II)

**Course Objectives:** Student should be able to…

1) understand concepts of Data Management

2) study the Data Acquisition concepts

3) study the Data Cleaning and Pre-processing concepts

| Credits=2 | SEMESTER-II<br>BCSEP 129: Lab VI- (Data Management and Data Security) | No. of hours per unit/ credits (60) |
|---|---|---|
| Group A | **Data Management** | |
| | Data Acquisition: Collecting data from various sources such as<br>  1) Databases,<br>  2) APIs,<br>  3) Web scraping, or<br>  4) file systems.<br>This may involve writing scripts or using specialized tools to retrieve data.<br><br>Data Cleaning and Pre-processing: Performing data cleaning tasks to handle missing values, outliers, and inconsistencies in the dataset. This may involve techniques like<br>  5) Data imputation,<br>  6) Outlier detection, and<br>  7) Data transformation.<br>  8) Case study 1<br>  9) Case Study 2<br>  10) Case Study 3 | |
| Group B | **Data Security** | |
| | 1) Case Study on Security in IoT<br>2) Case Study on Privacy in IoT<br>3) Case Study on Cryptography in IoT<br>4) Case Study on Emerging trends in Data Security | |

**Course Outcomes: -**Student will be able to…

1) implement the concepts of Data Management

2) apply the Data Acquisition concepts

3) use Data Cleaning and Pre-processing concepts for applications

**Reference Books:**

1. Brian Russell, Drew Van Duren, and John Sammons ,Practical Internet of Things Security ,2018
2. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, Fei Hu ,2016
3. Chehri Abdellah, Ahmed Zekri, and Amr M. Youssef ,Internet of Things Security: Advances, Challenges and Performance Improvement, 2020

# SEC

### SEC 103: PC Assembling and Maintenance

**Course Objectives:- S**tudent should be able to …

1. understanding PC Components
2. learn how to install an operating system
3. learn about software maintenance
4. learn about Hardware maintenance
5. develop the skills to assemble a PC from scratch

| Credits=2 | SEC 103: PC Assembling and Maintenance | No. of hours per unit/ credits |
|---|---|---|
| **UNIT I** | **Introduction to PC Hardware:** | **(9)** |
| | Study of basic I/O systems, Types of Memories- Static RAM and Dynamic RAM, ROM, PROM, EPROM, EEPROM, CPU (Central Processing Unit)- ALU and control unit. | |
| **UNIT II** | **Installation of OS (Operating Software), Drivers and Configuration of External devices** | **(9)** |
| | Windows, Linux Ubuntu, Formatting of Hard disk, Disk defragmentation, Disk clean up, Scan disk etc,. Different types of Motherboard drivers, LAN, Audio, and Video. Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc. | |

**Course Outcomes:-** Student will be able to …

1. demonstrate a comprehensive understanding of PC components, their functions, and how they interact with each other to form a working computer system.
2. demonstrate a comprehensive understanding of PC components, their functions, and how they interact with each other to form a working computer system.
3. demonstrate a comprehensive understanding of PC components, their functions, and how they interact with each other to form a working computer system.
4. optimize PC performance by managing startup programs, optimizing storage devices

**Reference Books**

1. "Upgrading and Repairing PCs"Scott Mueller
2. "CompTIA A+ Certification All-in-One Exam Guide, Tenth Edition" by Mike Meyers
3. "PC Hardware in a Nutshell" by Robert Bruce Thompson and Barbara Fritchman Thompson
4. "Build Your Own Gaming PC: The step-by-step manual to building the ultimate computer" by Russell Barnes
5. "The Complete PC Upgrade and Maintenance Guide" by Mark Minasi
6. "PCs For Dummies" by Dan Gookin
7. "Computer Repair with Diagnostic Flowcharts" by Morris Rosenthal
8. "PC Technician's Troubleshooting Pocket Reference" by Stephen J. Bigelow
9. "PC Hardware: The Complete Reference" by Craig Zacker
10. "The Ultimate Guide to PC Gaming" by Hayley Scott

**Practical Set**

1. Demonstrate Input, Output Devices
2. Demonstrate Memory and its types: RAM, ROM
3. Demonstrate Hard Disk
4. Demonstrate Windows Operating System
5. Demonstrate Linux Ubuntu Operating System
6. Demonstrate Motherboard drivers, LAN, Audio, and Video drivers
7. Demonstrate Physical Setup of Printers, Scanners
8. Demonstrate Printing of document
9. Demonstrate Webcam, Bluetooth device
10. Demonstrate PC Assembly

**VES**

# Value Education Course

## VEC 104: Environmental Sociology

**Course objectives: -** Students should be able to...

1. have a sound conceptual, theoretical and empirical background to the issues of environment,
2. understand the concept of sustainable development and resource management
3. prepare for further research in the area.

| Credits(2) | VEC 104: Environmental Sociology | No. of hours per unit |
|---|---|---|
| Credit – Unit I: | **Environment and Sociology** | (6) |
| | 1.1 Introduction to Sociology and Environment<br>1.2 Environment in Classical Sociological Tradition<br>1.3 Sociology's response to environmental issues | |
| Credit – Unit II | **Environmental Sociology in India** | (8) |
| | 2.1 Environmental Sociology in India.<br>2.2 Environmentalism and Environmental Movement in India<br>2.3 Ideological Trends in Indian Environmentalism<br>2.4 Environmental movements in local perspective | |
| Credit – Unit III | **Environmental Sociology around the world** | (8) |
| | 3.1 Environmentalism around the world: Past and Present<br>3.2 Contemporary Environmental Movements<br>3.3 Environmental Movements in Global Perspectives | |
| Credit – Unit IV | **Sustainable Development and Sociology** | (8) |
| | 4.1 The Concept of Sustainability<br>4.2 Environment and Sustainable Development<br>4.3 Resource, Property and Resource Governance Regimes<br>4.4 Environmental Democracy and Climate Change | |

**Course Outcomes:** students will be able to...

1. explain the main concepts, theories, debates and empirical practices on the interaction between environment and society.
2. describe current theoretical and empirical debate on environmental movements and sustainable resource management practices
3. evaluate policies and practices concerning environmental governance and sustainable development.
4. appropriately apply different theories and methodologies of research in different contexts relevant to environment and sustainable development

**References:**

1.  Bell, Mayerfeld Michael.. An Invitation to Environmental Sociology. Thousand Oaks, California: Pine Forge Press. 2004

2.  Gould, Kenneth Alan and Tammy L Lewis. Twenty Lessons in Environmental Sociology. New York: Oxford University Press. . 2009

3.  Dunlap, R.; Frederick H. Buttel, Dickens Peter and Gijswijt August. (Ed.) Sociological Theory and the Environment: Classical Foundations, Contemporary Insights. Boston: Rowman& Littlefield. 2002.

4.  Hanningan, John. 1. Environmental Sociology. Oxan: Routledge. 996

5.  Hanningan, John.. Environmental Sociology: A Social Constructionist Perspective. Oxan: Routledge. 2006

6.  Barry, John.. Environment and Social Theory1999

*******************End of Semester II***********************

******* End of BSc I Computer Science(Entire)**************