# SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

## SCHEME OF TEACHING AND EXAMINATION (Effective from 2020-2021 Batch)

## B.Tech. (Computer Science & Engineering) Fourth Semester

**Computer Science and Eng. / Computer Science and Eng. (Artificial Intelligence) / Computer Science and Eng. (Artificial Intelligence and Machine Learning) / Computer Science and Eng. (Data Science) / Computer Science and Eng. (Big Data Analytics) / Computer Science and Eng. (Internet of Things) / Computer Science and Eng. (Gaming Technology) / Computer Science and Eng. Internet of Things and Cyber Security with Blockchain Technology)**

| S.N | Board of Studies (BOS) | Courses (Subject) | Course Code | Periods per week | | | Scheme of Exam | | | Total Marks | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Theory/Practical | | | | |
| | | | | L | T | P | ESE | CT | TA | | |
| 1 | Applied Mathematics | Discrete Structure | AM100401 | 3 | 1 | - | 100 | 20 | 30 | 150 | 4 |
| 2 | Comp. Sc. and Engineering | Computer System Architecture and Microprocessor | CS102401 | 2 | 1 | - | 100 | 20 | 30 | 150 | 3 |
| 3 | Comp. Sc. and Engineering | Java Programming | CS102402 | 3 | 0 | - | 100 | 20 | 30 | 150 | 3 |
| 4 | Comp. Sc. and Engineering | Analysis and Design of Algorithms | CS102403 | 3 | 0 | - | 100 | 20 | 30 | 150 | 3 |
| 5 | Comp. Sc. and Engineering | Database Management System | CS102404 | 3 | 0 | - | 100 | 20 | 30 | 150 | 3 |
| 6 | Comp. Sc. and Engineering | Java Programming Lab | CS102491 | - | | 2 | 25 | - | 25 | 50 | 1 |
| 7 | Comp. Sc. and Engineering | Python Lab | CS102492 | - | | 2 | 25 | - | 25 | 50 | 1 |
| 8 | Comp. Sc. and Engineering | Database Management System Lab | CS102493 | - | | 2 | 25 | - | 25 | 50 | 1 |
| 9 | Comp. Sc. and Engineering | Mini Project-II | CS102494 | - | | 2 | 50 | - | 25 | 75 | 1 |
| 10 | Applied Chemistry | Biology For Engineers | AC100495 | - | - | - | - | - | 25 | 25 | - |
| **Total** | | | | **14** | **2** | **8** | **625** | **100** | **275** | **1000** | **20** |

**Note:**

**(a) Abbreviations used : L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Exam, CT- Class Test, TA- Teacher's Assessment**

**(b) The duration of end semester examination of all theory papers will be of three hours.**

# SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

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**SYLLABUS**

**B.Tech. (Common to All Branches) Fourth Semester**

**Computer Science and Eng. / Computer Science and Eng. (Artificial Intelligence) / Computer Science and Eng. (Artificial Intelligence and Machine Learning) / Computer Science and Eng. (Data Science) / Computer Science and Eng. (Big Data Analytics) / Computer Science and Eng. (Internet of Things) / Computer Science and Eng. (Gaming Technology) / Computer Science and Eng. Internet of Things and Cyber Security with Blockchain Technology)**

| Subject Code AM100401 | Discrete Structure | L = 3 | T = 1 | P = 0 | Credits = 4 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 100 | 20 | 30 | 150 | 3 hours. |

| Course Objective | Course Outcomes |
|---|---|
| **The Objective of this course is:**<br>• To introduce a number of discrete mathematical structures found to be serving as tools in the development of theoretical computer science.<br>• Course focuses on how discrete structures actually helped computer engineers to solve problems occurred in the development of programming languages.<br>• Course highlights the importance of discrete structures towards simulation of a problem in computer science engineering. | **After completion of this course students will be:**<br>**CO1.** Able to apply mathematical logic and Boolean algebra in switching circuits & logiccircuits.<br>**CO2.** Familiar with set theory, relation and functions.<br>**CO3.** Familiar with algebraic structures, graphtheory and combinatorics.<br>**CO4**. Able to solve problems in various fields in computer science, especially networking.<br>**CO5**. To gain the basic knowledge of graphs. |

**UNIT-I MATHEMATICAL LOGIC & BOOLEAN ALGEBRA:** **CO1**

Basic concept of mathematical logic, Statements, Connectives, Conditional and biconditional statements, Logical equivalence, Logical implication & quantifiers, Basic concept of Boolean Algebra, Properties of Boolean Algebra, Boolean functions, Disjunctive & conjunctive normal forms of Boolean functions, Applications of Boolean Algebra in switching circuits & logic circuits**.** **[10 hrs.]**

**UNIT-II SET THEORY, RELATIONS, FUNCTIONS**: **CO2**

Basic concept of set theory, Relations, Properties of relation in a set, Equivalence relation, Composition of relations, Partial order & total order relations, Lattices &Hasse diagram, Introduction to function, Inverse, Identity, Injective, Surjective & Bijective functions, Composition of functions and some special functions. **[10 hrs.]**

**UNIT-III ALGEBRAIC STRUCTURES**: **CO3**

Groups, Subgroups, Cosets, Lagrange 's theorem, Isomorphism, Automorphism, Homomorphism, Codes & group codes, Rings, Integral domains and Fields. **[10 hrs]**

**UNIT-IV GRAPH THEORY:** **CO4**

Introduction to graph theory, Walks, Paths & Circuits, Types of graphs, shortest path problems, Eulerian and Hamiltonian graphs, Basic concept of tree: spanning tree,minimum spanning tree, search tree, rooted binary tree, cut sets, Network flow, Matrix representation of graphs**.** **[9 hrs]**

**UNIT-V COMBINATORICS:** **CO5**

Permutation and combination, pigeon-hole principle, Mathematical induction, Principle of inclusion & exclusion, Generating function, Recurrence relation. **[9 hrs.]**

**Text Books:**

| S.No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Elements of Discrete Mathematics | C.L Liu | Tata McGraw-Hill, publications. |
| 2 | Discrete Mathematical Structures | Bernard Kolman, Robert C. Busby and Sharon Cutler Ross | Pearson Education. |

**Reference Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | A Text Book of Discrete Mathematics | Swapan Kumar Sarkar, S. Chand & Compeny Ltd | Swapan Kumar Sarkar, S. Chand & Compeny Ltd |
| 2 | Graph theory with applications to engineering computer science | Narsingh Deo | Prentice Hall of India. |
| 3 | Discrete mathematics for computer scientists and mathematicians | J.L. Mott, A. Kandel and T.P. Baker | Prentice Hall of India. |
| 4 | Discrete Mathematical Structures with applications to computer science | J.P. Tremblay and R. Manohar | Tata McGraw-Hill. |

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| Subject Code CS102401 | Computer System Architecture and Microprocessor | L = 2 | T = 1 | P = 0 | Credits = 3 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 100 | 20 | 30 | 150 | 3 hours. |

| Course Objective | Course Outcomes |
|---|---|
| **The objective of this course is:**<br>• To understand the structure, function and characteristics of computer systems.<br>• To understand the design ofthe various functional units and components of computers.<br>• To identify the elements of modern instructions sets and their impact on processor design.<br>• To explain the function of each element of a memory hierarchy<br>• To identify and compare different methods for computer I/O. | **CO1.** Identify the basic hardware components of a computer system.<br>**CO2.** Familiarize themselves with binary and hexadecimal number systems including computer arithmetic.<br>**CO3.** Familiarize themselves with functional units of the processor such as the register file and arithmetic logical unit.<br>**CO4.** Understand basics functionality of systems: parallel, pipelined, superscalar and RISC/CISC architectures.<br>**CO5.** Represent system design in appropriate formats; addressing modes, an instruction sets as per the system configuration requirements. |

**UNIT-I Basic Building blocks of Computer** **CO1**

CPU structure and functions, processor organization, ALU, data paths, internal registers, status flags; micro-operations, instruction format, instruction cycle, hardwired control, micro programmed control, microinstruction sequencing and execution, addressing modes and formats, System bus structure: Data, address and control buses, bit slicing **[8 hrs.]**

**UNIT-II Data Representation** **CO2**

Number representations and their operations, Design of Fast Adders, signed multiplication, Booth 's Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding **[7hrs]**

**UNIT-III Memory and Peripheral devices** **CO3**

Memory system, internal and external memory, memory hierarchy, cache memory and itsworking, virtual memory concept. I/O organization; I/O techniques: interrupts, polling, DMA; Synchronous vs. asynchronous I/O. **[7hrs]**

**UNIT-IV Pipelining** **CO4**

Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, instruction pipelining, multiple execution units, performance considerations, Basic concepts in parallel processing: & classification of parallel architectures, Vector Processing, Array Processors. **[7hrs]**

**UNIT-V 8085 Microprocessor** **CO5**

8085 microprocessor architecture; Instruction set, instruction types and formats; Instruction execution, instruction cycles, different types of machine cycles and timing diagram.

**16-bit microprocessors families:** 8086 architecture, registers, memory segmentation andaddressing,

**32-bit Intel microprocessors families:** The Intel 80286, 80386, 80486,

**64-bit Intel microprocessors families:** The Intel 805xx, 806xx, 807xx. Recent Processors andtheir specifications. **[7hrs]**

**Text Books:**

| S. No. | Title | Author(s) | Publisher |
|---|---|---|---|
| 1 | Computer System Architecture | Mano, M.M | Prentice-Hall of India. 2004 |
| 2 | Computer organization Architecture | Rajaraman, V. and Radhakrishnan,T | Prentice-Hall ofIndia.2007 |
| 3 | Computer architecture & organization | Govindrajalu, B | Tata McGraw-Hill. 2004 |

**Reference Books:**

| S. No. | Title | Author(s) | Publisher |
|---|---|---|---|
| 1 | Computer Architecture and Design | A.J Wand Go & Addison Wisely | Wokingham UK 1989 |
| 2 | Computer Architecture and Organization | John P Hayes | Prentice-Hall of India. 2007 |

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| Subject Code CS102402 | Java Programming | L = 3 | T = 0 | P = 0 | Credits = 3 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 30 | 150 | 3 hours. |

| Course Objective | Course Outcomes |
|---|---|
| **The objective of this course is:**<br>• Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>• Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. | **CO1**. To construct Java programs using features of Object-oriented programming.<br>**CO2.** Able to explain object and package construction process.<br>**CO3.** To construct robust Java programs using exception handling and String class.<br>**CO4.** To develop java programs using multithreading and File Handling<br>**CO5.** To design and develop application programs using UI components and Database connectivity. |

**UNIT-I Introduction:** **CO1**

Introduction & Fundamentals of JAVA, basic concepts of object-oriented programming, About Java Technology, comparison between procedural programming paradigm and object-oriented programming paradigm, Java 's architecture, Fundamental Programming Structure: Data Types, variable, Arrays. **Control Flow:** Java 's Selection statements (if, switch, iteration, statement, while, do-while, for, Nested loop), Concept ofObjects and Classes, Reading console inputs, Constructor overloading, final, this, static keyword. **[8 hrs.]**

**UNIT-II Inheritance:** **CO2**

definition and advantages, super keyword, Method overriding, dynamic method dispatch, Abstract class, Inner classes, Interface. Aggregation, Method overriding. **Package**: Package, importing packages, sub package. Exception Handling: Fundamentals, Inbuilt, User defined, Checked and Unchecked exceptions, Using try & catch, Multiple catch, throw, throws, finally. **[7 hrs]**

**UNIT-III String class:** **CO3**

Strings: string constructor, string methods, String Buffer and methods. Wrapper classes (Integer, Boolean, Character, etc.). Multi-threading: Thread concept, Thread life cycle, Thread class, Runnable interface, synchronization, Thread class methods. Java I/O: Use of Input Stream, Output Stream, Reader and Writer classes for reading from and writing data into disk files. **[7 hrs.]**

**UNIT-IV Applets:** **CO4**

Basics, Architecture, The HTML APPLET Tag, Passing Parameters to Applets, Applet context and show documents (). Event Handing: Delegation Event model, Event Classes, Event Listener, Interfaces, Adapter classes. JDBC: Fundamentals, Type I, Type II, Type III, Type IV drivers. Networking: Basics, Socket overview, Networking classes, & interfaces, TCP/IP client sockets, URL format, URL connection, TCP/IP Server Sockets. **[7 hrs.]**

**UNIT-V AWT:** **CO5**

components, Button, Label, Text Field, Panel, Window, Frame, Canvas, Action Listener, Mouse Listener, Key Listener, Item Listener etc. Layout managers, Remote method invocation (RMI). SWING: JButton, JLabel, JTextField, JScrollBar, JComboBox, JTabbed Pane, JScroll Pane, JTree etc. Generics in Java: Creating instances of generic classes, generic types, declaring (and invoking) methods that take generic types. Creating and running executable JAR (Java Archives). **[7 hrs.]**

**Text Books:**

| S.No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Java - The Complete Reference | Herbert Scheldt | McGraw Hill Education |
| 2 | Programming with Java | Balagurusamy | McGraw Hill Education |
| 3 | Object Oriented Programming through JAVA | V. Vijaya Bhaskar, P. VenkataSubba Reddy | SCITECH |

**Reference Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Java: A Beginner ‘s Guide | Herbert Scheldt | McGraw-Hill Education |

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| Subject Code CS102403 | Analysis and Design of Algorithms | L = 3 | T = 0 | P = 0 | Credits = 3 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 100 | 20 | 30 | 150 | 3 hours. |

| Course Objective | Course Outcomes |
|---|---|
| **The Objective of this course is:**<br>• To understand and apply the algorithm analysis techniques.<br>• To critically analyze the efficiency of alternative algorithmic solutions for the same problem.<br>• To understand different algorithm design techniques.<br>• To understand the limitations of Algorithmic power. | **CO1.** Design algorithms for various computing problems.<br>**CO2.** Analyze the time and space complexity of algorithms.<br>**CO3.** Critically analyze the different algorithm design techniques for a given problem.<br>**CO4.** Modify existing algorithms to improve efficiency.<br>**CO5.** To Understand how to apply various algorithms. |

**UNIT-I Introduction:** **CO1**

Definitions and Application of notations, Asymptotic notations: big oh, small oh, omega and theta notations, worst case, best case and average case analysis. solving recurrence equations: General recurrence equation, Master Method, Recursive Tree Method, substitution method, analyzing control structures. Analysis of Sorting and Searching: Heap, insertion, selection and bubble sort; sequential, binary and Fibonacci search. **[7 hrs]**

**UNIT-II Divide-and-Conquer Technique of problem solving:** **CO2**

The Basic divide and conquer algorithm for matrix multiplication, Quicksort, Merge sort, heap sort, shell sort, radix sort, Dynamic sets and searching: Array doubling, Red Black trees, hashing high, priority queue **[8 hrs.]**

**UNIT-III Graphs:** **CO3**

Definitions and representations, traversal, DFS and BFS., DFS on undirected graphs. Greedy algorithms: Prim's algorithm, single source shortest paths, Kruskal's minimal spanning trees, Dijkstra shortest path Transitive closure, APSP problem, Fractional Knapsack problems**.** **[7 hrs]**

**UNIT-IV Dynamic Programming and String Matching:** **CO4**

Sum of Subset problem, Graphs and their traversal, Multiplying a sequence of matrices, Multi Stage Graph, longest common sub sequence, knapsack problem. String Matching: Knuth - Moore-Pratt Algorithm, Boyer- Moore Algorithm, The general string problem as a finite automaton **[7 hrs]**

**UNIT-V Backtracking and Branch and Bound:** **CO5**

Back tracking and Recursive back tracking, the general method, N-queens problem, sum of subsets, graph coloring, Hamiltonian cycle, Knapsack problem.

General method, applications (Branch and Bound): 15 puzzle problem, Travelling sales person problem, 0/1 knapsack problem, LC (Least-cost search), FIFO Branch and Bound solution**.** **[7 hrs]**

**Text Books:**

| S. No. | Title | Author(s) | Publisher |
|---|---|---|---|
| 1 | Introduction to the Design and Analysis of Algorithms. | Anany Levitin | Pearson Education |
| 2 | Computer Algorithms/ C++ | Ellis Horowitz, Sartaj Shani and Sagathevan Rajasekar an | Universities Press |

**Reference Books:**

| S. No. | Title | Author(s) | Publisher |
|---|---|---|---|
| 1 | Introduction to Algorithms. | Thomas Cormann, Charles Eliasson,Ronald L. Rivest and Clifford Stein | PHI Learning Private Limited |
| 2 | Data Structures and Algorithms. | Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman | Pearson Education, Reprint |
| 3 | Algorithms Design and Analysis. | Harsh Bhasin | Oxford university press |
| 4 | Design & Analysis of algorithms. | S. Sridhar | Oxford university press |

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| Subject Code CS102404 | Database Management System | L = 3 | T = 0 | P = 0 | Credits = 3 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 100 | 20 | 30 | 150 | 3 hours. |

| Course Objective | Course Outcomes |
|---|---|
| **The objective of this course is:**<br>• To understand the role of a database management system and its users in an organization.<br>• To understand database concepts, including the structure and operation of the relational data model<br>• Can successfully apply logical database design principles, including E-R diagrams and database normalization.<br>• Construct simple and moderately advanced database queries using Structured Query Language (SQL).<br>• To understand the concept of transaction, its properties and how to persist the data in complex concurrent users' environment. | **CO1.** Be familiar with basic concepts of RDBMS, Relational data model & be able to write relational algebra expressions for queries;<br>**CO2.** Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree and hashing;<br>**CO3.** Understand DML, DDL and will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications;<br>**CO4.** Utilize a database modeling technique for a single entity class, a one-to-one (1:1) relationship between entity classes, a one-to-many (1:M) relationship between entity classes, a many-to-many (M:M) relationship between entity classes, and recursive relationships;<br>**CO5.** Be familiar with the basic issues of transaction, its processing and concurrency control. |

**UNIT-I Introduction to Database & Indexing Techniques:** **CO1**

Advantages of DBMS, Type of Data Models, Schema and instances, DBMS Architecture and Data Independence.

Entity- Relationship Model: Attributes and Keys, Relationship Types, Weak Entity set, Strong Entity Set, Enhanced E–R Modeling, Specialization and Generalization.

**Indexing Techniques**: Indexes, Multi-level indexes, Dynamics Multilevel indexes using B trees and B+-Trees. **[8 hrs]**

**UNIT-II The Relational Data Model & SQL:** **CO2**

Types of data models, Relational data model: concepts, constraints, relational algebra, relational calculus, Tuple and Domain relational calculus,

**SQL:** DDL, DML, DCL, Types of constraints, defining different constraints on a table, Defining & Dropping integrity constraints in the alter table command, View, Index. **[7 hrs.]**

**UNIT-III Database Design**: **CO3**

Functional Dependencies and Normalization for Relational Databases: Informal design guidelines for relation schemes, Functional dependencies, Normal forms based on primary keys, General definitions of second and third normal forms, Boyce- Codd normal form, problem related with normal forms & solutions. Multi valued & Join Dependencies, 4th & 5th Normalization. **[7 hrs.]**

**UNIT-IV Query & Transaction Processing:** **CO4**

Query Processing: Query processing stages, Query interpretation, Query execution plan, Table scans, Fill factor, Multiple index access, Methods for join tables scans, Structure of a query optimizer.

**Transaction Processing:** Types of failures, ACID property, schedules and recoverability, satiability of schedules, Levels of transaction consistency, Deadlocks. **[7 hrs.]**

**UNIT-V Crash recovery and Concurrency Control:** **CO5**

Failure classification, Different type of Recovery techniques & their comparative analysis, deferred update, immediate update, Shadow paging, Check points, On-line backup during database updates.

Concurrency Control: Different type of concurrency control techniques & their comparative analysis, Locking techniques, Time- stamp ordering, multi-version techniques, Optimistic techniques, Multiple granularities.

**Database Security:** Authentication, Authorization and Access Control, DAC, MAC, RBAC models, Intrusion detection, SQL injection. **[7 hrs.]**

**Text Books:**

| S.No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Database system concept | Korte & Sudarshan | MH |
| 2 | Principles of Database Systems | Ullman, J. O | Golgotha Publications |
| 3 | Introduction to Database Systems | C.J. Date | Pearson Education |

**Reference Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Principles of Database and Knowledge – Base Systems‖, Vol 1 | J. D. Ullman | Computer Science Press |
| 2 | Foundations of Databases | Serge Abiteboul, Richard Hull, Victor Vianu | Addison-Wesley |

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| Subject Code CS102491 | Java Programming Lab | L = 0 | T = 0 | P = 2 | Credits = 1 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 25 | - | 25 | - | - |

| Course Objective | Course Outcomes |
|---|---|
| **The objective of this course is:**<br>• Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>• Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. | **CO1.** To develop java programs using constructors and destructors.<br>**CO2.** To utilize the concept of inheritance to develop java programs.<br>**CO3.** To demonstrate the use of exception handling and Strings in java programs.<br>**CO4.** To create multithreaded applications using java programming.<br>**CO5.** To design and develop interactive application programs using user Interfacing components, file handling etc. |

**List of Experiments:** **[12 hrs]**

1. Write a program to find the volume of a box having its side w, h, d means width, height anddepth. Its volume is v=w*h*d and also find the surface area given by the formula s=2(wh+hd+dw). use appropriate constructors for the above.
2. Develop a program to illustrate a copy constructor so that a string may be duplicated into another variable either by assignment or copying.
3. Create a base class called shape. Apart from Constructors, it contains two methods get xy564value () and show xyvalue () for accepting co-ordinates and to display the same. Create the sub class Called Rectangle which contains a method to display the length and breadth of the rectangle called showxyvalue (). Illustrate the concepts of Overriding and Constructor call sequence.
4. Write a program that creates an abstract class called dimension, create two subclasses, rectangle and triangle. Include appropriate methods for both the subclass that calculate and display the area of the rectangle and triangle.
5. Write a program, which throws Arithmetic Exception. Write another class (in a different file) that handles the Exception.
6. Create a user defined Exception class which throws Exception when the user inputs the marks greater than 100 Catch it and again rethrow it.
7. Write a program to illustrate various String class methods.
8. Write a program to illustrate various String Buffer methods.

9. Write a program in which a My thread class is created by extending the Thread class. In another class, create objects of the My thread class and run them. In the run method print CSVTU 10 times. Identify each thread by setting the name.
10. Write a program to illustrate various Thread methods.
11. Write a Program to implement Bank Account Class which illustrates the concept of Thread Synchronization.
12. To write a program to create a text file using Byte Stream class.
13. To write a program to copy contents of one file to another.
14. Write a program to find numbers of occurrence of vowels in a file.
15. Write a program, which illustrates capturing of Mouse Events. Use Applet for this.
16. Write a program using swing components which simulates simple calculator.
17. Write a JDBC program for Student Mark List Processing.

**Text Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Head first Java | Kathy Sierra & Bert Bates | Computer SciencePress |
| 2 | Beginning Programming with Java for Dummies | Barry Burd | Addison-Wesley |

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| Subject Code CS102492 | Python Lab | L = 0 | T = 0 | P = 2 | Credits = 1 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 25 | - | 25 | - | - |

| Course Objective | Course Outcomes |
|---|---|
| **The objectives of this lab are:**<br>The course is designed<br>• To develop logical understanding ofthe subject.<br>• To create the ability to model, solve and interpret physical and engineering problems.<br>• To provide an overview of functions of complex variable which helps in solving many engineering problems<br>• To provide Basic knowledge of Python. | **Course Outcome: At the end of the course, students will be able to,**<br>**CO1.** Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics, science, and games.<br>**CO2.** Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.<br>**CO3.** Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance<br>**CO4.** Discover the capabilities of Python regular expression for data verification and utilize matrices for building performance efficient Python programs. **CO5.** Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems. |

**List of Experiments: [12 hrs.] (Each student should perform, at least, 10 experiments.)**

**1.** Write programs to understand the use of Python Identifiers, Keywords, Indentations, Comments Python, Operators, Membership operator.

**2.** Write programs to understand the use of Python String, Tuple, List, Set, Dictionary, File input/output.

**3.** Write programs to understand the use of NumPy's Nd array, Basic Operations, Indexing, Slicing, and Iterating, Conditions and Boolean Arrays.

**4.** Write programs to understand the use of NumPy's Shape Manipulation, Array Manipulation, Vectorization.

**5.** Write programs to understand the use of NumPy's Structured Arrays, Reading and Writing Array Data on Files.

**6.** Write programs to understand the use of Pandas Series, Data Frame, Index Objects, Re-indexing, Dropping, Arithmetic and Data Alignment.

**7.** Write programs to understand the use of Pandas Functions by Element, Functions by Row or Column, Statistics Functions, Sorting and Ranking, Correlation and Covariance, –Not a Number Data.

8. Write programs to understand the use of Pandas for Reading and Writing Data using CSV and Textual Files, HTML Files, XML, Microsoft Excel Files.
9. Write programs to understand the use of Matplotlib for Simple Interactive Chart, Set theProperties of the Plot, matplotlib and NumPy.
10. Write programs to understand the use of Matplotlib for Working with Multiple Figures andAxes, Adding Text, adding a Grid, adding a Legend, Saving the Charts.
11. Write programs to understand the use of Matplotlib for Working with Line Chart, Histogram, Bar Chart, Pie Charts

**Text Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Python Data Analytics | Fabio Nelli | APress |
| 2 | Python for Data Analysis | Wes McKinney | O 'Reilly |

# SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

**SYLLABUS**

**B.Tech. (Common to All Branches) Fourth Semester**

**Computer Science and Eng. / Computer Science and Eng. (Artificial Intelligence) / Computer Science and Eng. (Artificial Intelligence and Machine Learning) / Computer Science and Eng. (Data Science) / Computer Science and Eng. (Big Data Analytics) / Computer Science and Eng. (Internet of Things) / Computer Science and Eng. (Gaming Technology) / Computer Science and Eng. Internet of Things and Cyber Security with Blockchain Technology**

| Subject Code CS102493 | Database Management System Lab | L = 0 | T = 0 | P = 2 | Credits = 1 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 25 | - | 25 | - | - |

| Course Objective | Course Outcomes |
|---|---|
| **The objectives of this lab are:**<br>• To explain basic database concepts, applications, data models, schemas and instances.<br>• To demonstrate the use of constraints and relational algebra operations. Describe the basics of SQL and construct queries using SQL.<br>• To emphasize the importance of normalization in databases.<br>• To facilitate students in Database design | **Course Outcome: At the end of the course, students will be able to:**<br>**CO1.** Apply the basic concepts of Database Systems and Applications.<br>**CO2.** Use the basics of SQL and construct queries using SQL in database creation and interaction.<br>**CO3.** Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.<br>**CO4.** Analyse and Select storage and recovery techniques of database system.<br>**CO5.** To familiarize issues of concurrency control and transaction management. |

**LIST OF EXPERIMENTS** **[12 hrs.]**

**1**.Database Schema for a customer-sale scenario Customer (Cust id: integer, Cust name: string) Item (item_id: integer, item name: string, price: integer)
Sale (bill no: integer, bill data: date, cystoid: integer, item_id: integer, qty_sold: integer) For the above schema, perform the following—
Create the tables with the appropriate integrity constraints
Insert around 10 records in each of the tables
(a) List all the bills for the current date with the customer names and item numbers.
(b) List the total Bill details with the quantity sold, price of the item and the final amount.
(c) List the details of the customer who have bought a product which has a price>200.
(d) Give a count of how many products have been bought by each customer.
(e) Give a list of products bought by a customer having cust_id as 5.
(f) List the item details which are sold as of today.
(g) Create a view which lists out the bill no, bill date, cust_id, item_id, price, qty_sold, amount.
(h) Create a view which lists the daily sales date wise for the last one week.
(i) Create a view which lists out the bill no, bill date, cust_id, item_id, price, qty_sold, amount.
(j) Create a view which lists the daily sales date wise for the last one week.

**2.** Database Schema for a Student Library scenario Student (Stud no: integer, Stud name: string) Membership (Mem_no: integer, Stud no: integer) Book(book no: integer, book_name:string, author: string) Iss_rec (iss_no: integer, iss_date: date, Mem_no: integer, book_no: integer)
For the above schema, perform the following—
(a) Create the tables with the appropriate integrity constraints.
(b) Insert around 10 records in each of the tables.
(c) List all the student names with their membership numbers.
(d) List all the issues for the current date with student and Book names.
(e) List the details of students who borrowed book whose author is CJ DATE.
(f) Give a count of how many books have been bought by each student.
(g) Give a list of books taken by student with stud_no as 5.
(h) List the book details which are issued as of today.
(I) Create a view which lists out the iss_no, iss _date, stud_name, book name.
(j) Create a view which lists the daily issues-date wise for the last one week.

**3.** Database Schema for a Employee-pay scenario employee (emp_id: integer, emp_name: string) department (dept_id: integer, emp_name: string)
pay details (emp_id: integer, dept_id: integer, basic: integer, deductions: integer, additions: integer, DOJ: date) payroll (emp_id: integer, pay_date: date)
For the above schema, perform the following:
(a) Create the tables with the appropriate integrity constraints
(b) Insert around 10 records in each of the tables
(c) List the employee details department wise
(d) List all the employee names who joined after particular date
(e) List the details of employees whose basic salary is between 10,000 and 20,000
(f) Give a count of how many employees are working in each department
(g) Give a name of the employees whose net salary>10,000
(h) List the details for an employee_id=5
(I) Create a view which lists out the emp_name, department, basic, deductions, net salary
(j) Create a view which lists the emp_name and his netsalary

**4.** Database Schema for a student-Lab scenario Student (stud_no: integer, stud_name: string, class: string) Class (class: string, descript: string) Lab (mach_no: integer, Lab_no: integer, description: String) Allotment (Stud_no: Integer, mach_no: integer, dayof week: string)
For the above schema, perform the following—
(a) Create the tables with the appropriate integrity constraints
(b) Insert around 10 records in each of the tables
(c) List all the machine allotments with the student names, lab and machine numbers
(d) List the total number of lab allotments day wise
(e) Give a count of how many machines have been allocated to the _CSIT 'class
(f) Give a machine allotment detail of the stud_no 5 with his personal and class details
(g) Count for how many machines have been allocated in Lab_no 1 for the day of the week as —Monday‖
(h) How many students class wise have allocated machines in the labs?
(i) Create a view which lists out the stud_no, stud_name, mach_no, lab_no, dayofweek
(j) Create a view which lists the machine allotment details for —Thursday

**5 (a)** Write and execute subprogram to find largest number from the given three numbers.
**(b)** Write and execute subprogram using loop, while and for iterative control statement.
**6 (a)** Write and execute subprogram to check whether the given number is Armstrong or not
**(b)** Write and execute subprogram to generate all prime numbers below 100.
**7 (a)** Write and execute subprogram to demonstrate the GOTO statement.
**(b)** Write a subprogram to demonstrate %type and % row type attributes
**8 (a)** Write and execute subprogram to demonstrate predefined exceptions
**(b)** Write and execute subprogram to demonstrate user defined exceptions
**9 (a)** Create a cursor, which displays all employee numbers and names from the EMP table.
**(b)** Create a cursor, which update the salaries of all employees as per the given data.
**10(a)** Create a cursor, which displays names of employees having salary > 50000.
**(b)** Create a procedure to find reverse of a given number
**11(a)** Create a procedure to update the salaries of all employees as per the given data
**(b)** Create a procedure to demonstrate IN, OUT and INOUT parameters
**12(a)** Create a function to check whether given string is palindrome or not.
**(b)** Create a function to find sum of salaries of all employees working in depart number 10.
**13(a)** Create a trigger before/after update on employee table for each row/statement.
**14** Create a trigger before/after delete on employee table for each row/statement.
**15** Create a trigger before/after insert on employee table for each row/statement.
**16(a)** Create a Form to display employee details using SQL
**(b)** Create a Report to generate all employee annual salaries….

**Additional Programs:**

1. Create a Master/details relationship form which perform Add New, Search, Delete, Save and Update on the records
2.Generate a report to calculate employee ‘s salaries department wise from employee table.
3.Create a Report to generate the details of employee table including sum and average salaries department wise.

**Text Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | Fundamentals of Database Systems | Elma Sri Nava the | Pearson Education |
| 2 | An Introduction to Database systems | C.J. Date, A. Kannan, S. Swami Nadhan, | Pearson, Eight Edition |

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| Subject Code CS102494 | Mini Project-II | L = 0 | T = 0 | P =2 | Credits = 1 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | - | ESE Duration |
| | 50 | - | 25 | - | - |

| Course Objective | Course Outcomes |
|---|---|
| **The objectives of this lab are:**<br>The objective of this course is to improve student's ability to analyze, design and solve complex engineering problems through pedagogies **(Project Based Learning)** that support them in developing these skills. The goal here is not to passively absorb and reiterate information; but rather to actively engage with the content, work through it with others, relate to it through an analysis, use modern tools and effectively solve problems with the corresponding knowledge gained. | **On successful completion of the course, the student will be able to:**<br>**CO1.** Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.<br>**CO2.** Reproduce, improve and refine technical aspects of engineering projects applying appropriate techniques, resources, and modern engineering and IT tools.<br>**CO3.** Work as an individual and as a member or leader in teams in development of technical projects.<br>**CO4.** Follow management principle and value health, safety and ethical practices during project.<br>**CO5.** Communicate and report effectively project related activities and findings. |

**The Process Followed to Maintain the Quality of Student Projects are: [12 Hrs.]**

(a) Allotments of Projects
(b) Project Identification
(c) Continuous Monitoring
(d) Evaluation

**(a) Allotment of Projects:**

**(i)** Students form their team (max four students) and submit their areas in which they would like to pursue their projects.

**(ii)** Through meeting and deliberations students are allotted guide depending on their preference and maximum number of groups under a faculty is limited to three.

**(b) Identification of projects:**

Students are asked to formulate problem statement and state objectives of their project in consultation with the project guide

**c) Continuous Monitoring**

**(i)** Progress is continuously monitored by guide and instructions are given how to proceed further during their project periods as per time table.

**(ii)** Students submit weekly progress report to the project in-charge after consultation with their project guide.

**(d) Evaluation**

**(i)** In order to evaluate projects two project seminars (assessment) are taken in which student 's team present their project through presentations and demonstrate their work.

**(ii)** Students are assessed on the basis of their technical skill implementation, use of modern tools, communication skill, team work, health, safety and ethical practices and relevance of the project.

**(iii)** At the end of the semesters a report is submitted by the students and student 's projects are finally evaluated by external examiner in end semester practical examination based

**Text Books:**

| S. No. | Title | Authors | Publisher |
|---|---|---|---|
| 1 | ESE 2022 - BASICS OF PROJECT MANAGEMENT | IES MASTER TEAM | IES MASTER PUBLICATION, January 2021 |
| 2 | Modern Systems Analysis and Design | Jeffrey A. Hoffer, Joey F. George, Joseph S. Valakati | Pearson Education; Third Edition; 2002. |

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| Subject Code (AC100495) | Biology for Engineers | L = 0 | T = 0 | P = 0 | Credits = 0 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | Workshop, Quiz, Seminar and By Organize Guest Lecture | - | 25 | 25 | - |

| Course Objectives | Course Outcomes |
|---|---|
| **The objective of this course is to impart an understanding of fundamentals of biological systems and its applications towards industries to solve the problems in the real life.**<br>• To convey that Biology is as important scientific discipline as Mathematics, Physics, Chemistry, and Engineering and technology.<br>• To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Discuss the concept human genetics.<br>• To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. The molecular basis of coding and decoding genetic information is universal<br>• How to analyses biological processes at the reductionist level. Concept of Energy change.<br>• The fundamental concept and principles of Microbiology | **On successful completion of the course, the student will be able to:**<br>**CO1:** Describe how biological observations of 18th Century that lead to major discoveries.<br>**CO2:** Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological. Highlight the concepts of genetic material and its segregation and independent assortment.<br>**CO3:** Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. Classify enzymes and distinguish between different mechanisms of enzyme action. Concept of genetic code. Universality and degeneracy of genetic code<br>**CO4:** Identify DNA as a genetic material in the molecular basis of information transfer. The fundamental principles of energy transactions in physical and biological world. Thermodynamics properties of different biological systems.<br>**CO5:** Apply thermodynamic principles to biological systems. Identify and classify microorganisms. A Brief Account of Evolution |

**UNIT I INTRODUCTION** **CO1**

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry. **[2 Hrs.]**

**UNIT II CLASSIFICATION &GENETICS** **CO2**

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy. Classification. Discuss based on (a) cellularity- Unicellular or multicellular (b) ultra structure- prokaryotes or eucaryotes. (c) Energy and Carbon utilization -Autotrophs, Heterotrophs, Lithotropes (d) Ammonia excretion – Aminotelic, Uricotelic, Ureotelic (e) Habitataacquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M.musculus.

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics **[3Hrs.]**

**UNIT III BIOMOLECULES &INFORMATION TRANSFER** **CO3**

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. **[4 Hrs.]**

**UNIT IV MACROMOLECULAR ANALYSIS & ITS METABOLISM** **CO4**

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2$ + $H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from $CO_2$ and $H_2O$ (Photosynthesis). Energy yielding and Energy consuming reactions. Concept of Energy change **[3 Hrs.]**

**UNIT V MICROBIOLOGY EVOLUTION** **CO5**

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics. Origin of Universe, Origin of Life, Evolution of Life Forms, Evidences of Evolution, Adaptive Radiation, Theories of Evolution Biological Evolution, Hardy–Weinberg Principle, **[3 Hrs.]**

**Text Books:**

| S. No. | Title | Author(s) | Publisher |
|---|---|---|---|
| 1. | Biology: A global approach | Campbell, N. A, Reece, J. B., Urry, Lisa, Cain, M, L., Wasserman, S. A., Miniorsky, P. V., Jackson, R. B. | Pearson Education Ltd |
| 2. | Outlines of Biochemistry | Conn, E.E, Stumpf, P.K., Bruening G., Doi R.H. | John Wiley and Sons |
| 3. | Principles of Biochemistry | Nelson D. L. and Cox M.M.W.H. | Freeman and Company |
| 4. | Molecular Genetics | Stent, G. S.; and Calendar, R.W.H. | Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher |
| 5. | Microbiology | Prescott, L.M J.P. Harley and C.A. Klein | W.M.C. Brown Publishers |
| 6 | Biology for engineers and other non-biologist. | Prof. Suraishkumar & Prof Madhulika Dixit | IIT madras |

**Reference Books:**

| S. No. | Title | Author(s) | Publisher |
|---|---|---|---|
| 1. | Biology For Engineers | Dr Tanu Allen, DrSohini Singh | Vayu Education of India, New Delhi |
| 2. | Biology For Engineers | Arthur T. Johnson | Taylor &Francis Group |
| 3. | Molecular. Cellular and tissue Engineering | Joseph D. Bronzino, Donal R. Peterson | CRC Press |
| 4. | Biology For Engineers | Rajiv Singal, GauravAgrawal,RituBir | CBS Publisher &distributors |
| 5. | Biology For Engineers | G, K,Suraish Kumar | OUP India |