



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)  
Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA  
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

### INFORMATION TECHNOLOGY (Accredited by NBA)

#### SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

**II/IV B.TECH**

**I-SEMESTER**

(With effect from 2019-2020 Admitted Batch onwards)

| Subject Code | Name of the Subject                         | Category | Cr        | L         | T        | P        | Internal Marks | External Marks | Total Marks |
|--------------|---|----------|-----------|-----------|----------|----------|----------------|----------------|-------------|
| B19 IT 2101  | Discrete Mathematical Structures            | PC       | 3         | 3         | --       | --       | 25             | 75             | 100         |
| B19 IT 2102  | Principles of Software Engineering          | PC       | 3         | 3         | --       | --       | 25             | 75             | 100         |
| B19 IT 2103  | Micro Processor                             | PC       | 3         | 3         | --       | --       | 25             | 75             | 100         |
| B19 IT 2104  | Advanced Data Structures                    | PC       | 3         | 3         | --       | --       | 25             | 75             | 100         |
| B19 IT 2105  | Computer Organization                       | PC       | 3         | 3         | --       | --       | 25             | 75             | 100         |
| B19 IT 2106  | Object Oriented Programming through C++     | PC       | 3         | 3         | --       | --       | 25             | 75             | 100         |
| B19 IT 2107  | Advanced Data Structures Lab                | PC       | 1.5       | --        | --       | 3        | 20             | 30             | 50          |
| B19 IT 2108  | Object Oriented Programming through C++ Lab | PC       | 1.5       | --        | --       | 3        | 20             | 30             | 50          |
| B19 MC 2101  | Professional Ethics & Human Values          | MC       | 0         | 3         | --       | --       | --             | --             | --          |
| <b>TOTAL</b> |   |          | <b>21</b> | <b>21</b> | <b>0</b> | <b>6</b> | <b>190</b>     | <b>510</b>     | <b>700</b>  |

| Subject Code | Category | L | T  | P  | C | I.M | E.M | Exam   |
|--------------|----------|---|----|----|---|-----|-----|--------|
| B19 IT 2101  | PC       | 3 | -- | -- | 3 | 25  | 75  | 3 Hrs. |

### DISCRETE MATHEMATICAL STRUCTURES

#### Course Objectives:

|    |  |
|----|--|
| 1. | To understand the propositional and predicate calculus.                        |
| 2. | To know about the concepts of counting techniques.                             |
| 3. | To identify various types of relations and discuss their properties.           |
| 4. | To learn about different binary operations and Algebraic structures            |
| 5. | To know about generating functions and methods of solving recurrence relations |
| 6. | To have an idea on the concepts of Graph theory & Tree structures              |

#### Course Outcomes: At the end of this course, the student should be able to

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Write and verify the arguments for their validity using propositional and predicate logic. | K2              |
| 2.   | Observe different counting methods and apply in their fields of study.                     | K3              |
| 3.   | Identify various types of relations and utilize their properties.                          | K2              |
| 4.   | Understand different Algebraic structures and their properties.                            | K2              |
| 5.   | Formulate and solve the recurrence relations.  | K3              |
| 6.   | Utilize the concepts in graphs and trees to understand different data structures.          | K3              |

### SYLLABUS

|                              |   |
|------------------------------|---|
| <b>UNIT-I<br/>(10 Hrs)</b>   | <p><b>Mathematical Logic:</b><br/>Propositional Calculus: Statements and Notations, Connectives, Well-formed Formulae, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises.<br/>Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus..</p> |
| <b>UNIT-II<br/>(10 Hrs)</b>  | <p><b>Combinatorics:</b><br/>Basics of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Theorems, Binomial and Multinomial Coefficients, Principles of Inclusion–Exclusion.</p>  |
| <b>UNIT-III<br/>(10 Hrs)</b> | <p><b>Relations and Algebraic Structures:</b><br/><b>Relations:</b> Definition of Relation, Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams.<br/><b>Algebraic Structures:</b> Algebraic Systems, Semi Groups, Monoids, Groups, and Abelian Group, Homomorphism of Semi Groups, Monoids and Groups.</p>    |

|                            |  |
|----------------------------|--|
| <b>UNIT-IV<br/>(8 Hrs)</b> | <b>Recurrence Relations :</b><br>Generating Functions, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations  |
| <b>UNIT-V<br/>(12 Hrs)</b> | <b>Graph Theory:</b><br>Basic Concepts of Graphs, Sub graphs, Isomorphism of Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite graphs, Planar Graphs, Euler's Formula.<br><b>Trees:</b> Definition of Tree, properties of Trees, Different tree structures, Binary trees, Spanning trees, Minimal Spanning Trees, Kruskal's and Prim's Algorithms. |
|                            |  |
| <b>Text Books:</b>         |  |
| 1.                         | Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.   |
| 2.                         | Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2 <sup>nd</sup> Edition, Prentice Hall of India  |
|                            |  |
| <b>Reference Books:</b>    |  |
| 1.                         | Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D.P. Mahopatra, 3 <sup>rd</sup> Edition, Tata McGraw Hill.  |
| 2.                         | Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7 <sup>th</sup> Edition, Tata McGraw Hill.   |
| 3.                         | Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.   |
| 4.                         | Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.   |

| Subject Code | Category | L | T  | P  | C | I.M | E.M | Exam   |
|--------------|----------|---|----|----|---|-----|-----|--------|
| B19 IT 2102  | PC       | 3 | -- | -- | 3 | 25  | 75  | 3 Hrs. |

### PRINCIPLES OF SOFTWARE ENGINEERING

**Course Objectives:** This course is designed to:

1. Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
2. Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
3. Give exposure to Software Design techniques

**Course Outcomes:** Students taking this subject will gain software engineering skills in the following areas:

| S.No | Outcome   | Knowledge Level |
|------|---|-----------------|
| 1.   | Apply software engineering concepts to define a problem and perform requirements engineering. | K3              |
| 2.   | Design UML diagrams for the requirements gathered   | K4              |
| 3.   | Implement the designed problem in object oriented programming language                        | K4              |
| 4.   | Test whether all the requirements specified have been achieved or not                         | K5              |

### SYLLABUS

|                              |  |
|------------------------------|--|
| <b>UNIT-I<br/>(10 Hrs)</b>   | The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.   |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge , Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.                      |
| <b>UNIT-III<br/>(10 Hrs)</b> | Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.  |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development. |

|                            |   |
|----------------------------|---|
| <b>UNIT-V<br/>(12 Hrs)</b> | The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Quality Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing |
|                            |   |
| <b>Text Books:</b>         |   |
| 1.                         | Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.   |
| 2.                         | Software Engineering, Ian Sommerville, Ninth Edition, Pearson.  |
|                            |   |
| <b>Reference Books:</b>    |   |
| 1.                         | Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.  |
| 2.                         | Software Engineering, UgrasenSuman, Cengage.  |
|                            |   |
| <b>e-Resources</b>         |   |
| 1.                         | <a href="https://nptel.ac.in/courses/106/105/106105182/">https://nptel.ac.in/courses/106/105/106105182/</a>   |
|                            |   |

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| <b>Subject Code</b> | <b>Category</b> | <b>L</b> | <b>T</b>  | <b>P</b>  | <b>C</b> | <b>I.M</b> | <b>E.M</b> | <b>Exam</b>   |
| <b>B19 IT 2103</b>  | <b>PC</b>       | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b> | <b>25</b>  | <b>75</b>  | <b>3 Hrs.</b> |

### MICRO PROCESSOR

**Course Objectives:** This course is designed to:

- |    |   |
|----|---|
| 1. | To discuss about 8085 architecture, signal description and instruction set. |
| 2. | To study different programming techniques to implement in assembly language |
| 3. | To discuss about 8086 architecture, signal description and instruction set. |
| 4. | To study different peripheral devices and learn to interface with 8085.     |
| 5. | To study different programming techniques to implement in MASM.             |

**Course Outcomes:** Students taking this subject will gain software engineering skills in the following areas:

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Student will be able to apply the knowledge of 8085 architecture and instruction set.                              | K3              |
| 2.   | Student will be able to apply the knowledge of microprocessor for counter designing and interrupts signaling.      | K3              |
| 3.   | Students will be able to design interfacing circuits between 8085 with different peripheral and memory components. | K3              |
| 4.   | Student will be able to apply the knowledge of 8086 architecture and instruction set.                              | K3              |

### SYLLABUS

|                             |   |
|-----------------------------|---|
| <b>UNIT-I<br/>(12 Hrs)</b>  | <b>Introduction to 8085 microprocessor</b><br>Internal Architecture functional/signal description of 8085 microprocessor, Instruction set, Addressing modes and programming in 8085.  |
| <b>UNIT-II<br/>(10 Hrs)</b> | <b>Programming techniques</b><br>Timing diagram, counters and delays, stacks and subroutines and Interrupts in 8085   |
| <b>UNIT-III<br/>(12Hrs)</b> | <b>Memory and I/O</b><br>Classification and interfacing semiconductor memories with 8085 MPU. Interfacing characteristics of IO devices, IO device addressing methods.  |
| <b>UNIT-IV<br/>(10 Hrs)</b> | <b>Peripheral devices and interfacing with 8085</b><br>Interfacing peripherals to INTEL 8085: Parallel IO interface-8255-Block diagram and its control word, Timer Interface-8253-Block diagram and programming of 8253/54.<br>Interfacing peripherals to INTEL 8085: Block diagram of programmable Interrupt controller Interface-8259A Its functions and interrupt operation. |
| <b>UNIT-V<br/>(12 Hrs)</b>  | <b>Introduction to 8086 microprocessor and programming</b><br>The 8086 Microprocessor architecture, Internal Architecture & functional /signal  |

|                         |  |
|-------------------------|--|
|                         | description of 8086, segmented memory, Maximum 7 Minimum mode of 8086.<br>Introduction set and programming the 8086: Addressing modes, Instruction set.                                  |
| <b>Text Books:</b>      |  |
| 1.                      | Microprocessor Architecture and Applications with the 8085 , Ramesh S. gaonkar, 4 <sup>th</sup> Edition, Penram International, 1999  |
| 2.                      | Advanced Microprocessors and Peripherals, A K RAY & K M Bhurchandi , 2 <sup>nd</sup> Edition, The Mcgraw-Hill companies.   |
| <b>Reference Books:</b> |  |
| 1.                      | The 80X86 Family , Design, Programming and Interfacing, John E. Uffenbeck, 3 <sup>rd</sup> Edition, Pearson Education Inc., 2002.  |
| 2.                      | Walter A . tribal and Avatar Singh. The 8088 and 8086 Microprocessors, Programming interfaing, software, hardware and Applications, 4 <sup>th</sup> Edition Pearson education Inc., 2003 |
| 3.                      | Microprocessors and Interfacing. Programming and hardware, 2ne Edition, Douglass V. Hall. MH Edition , 1999.   |

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|---------------------|-----------------|----------|-----------|-----------|----------|------------|------------|---------------|
| <b>Subject Code</b> | <b>Category</b> | <b>L</b> | <b>T</b>  | <b>P</b>  | <b>C</b> | <b>I.M</b> | <b>E.M</b> | <b>Exam</b>   |
| <b>B19 IT 2104</b>  | <b>PC</b>       | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b> | <b>25</b>  | <b>75</b>  | <b>3 Hrs.</b> |

### ADVANCED DATA STRUCTURES

**Course Objectives:** This course is designed to:

|    |  |
|----|--|
| 1. | To be familiar with solve problems using variety of data structures such as linked lists, Trees, Graphs and hash tables. |
| 2. | To be familiar with how arrays, linked Structures, tress and graphs are represented In memory and used by algorithms     |
| 3. | To be familiar with advanced data structures such as balanced search trees, AVL Trees, and Red-Black Trees               |

**Course Outcomes:** Students taking this subject will gain software engineering skills in the following areas:

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Student will be able to Implement data structures like linked lists for given problems.  | K3              |
| 2.   | Student will be able to Construct various types of tree structures and apply graph algorithms for the given data                               | K3              |
| 3.   | Student will be able to Implement advanced data structures into the applications such as balanced search trees, AVL Trees, and Red-Black Trees | K3              |
| 4.   | Student will be able Describe the hash function and concepts of collision and its resolution methods   | K2              |

### SYLLABUS

|                              |  |
|------------------------------|--|
| <b>UNIT-I<br/>(10 Hrs)</b>   | Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion. |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort.   |
| <b>UNIT-III<br/>(10 Hrs)</b> | Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees-rotations, insertion, deletion operations, Red-Black Trees, Definition, Representation of a Red-Black Tree, Searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red-Black Tree, Joining Red-Black Trees, Splitting a Red-Black tree.   |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure. Warshall's Algorithm,  |



|                            |  |
|----------------------------|--|
| <b>UNIT-V<br/>(12 Hrs)</b> | <p>Sorting: Medians and order statistics, External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.</p> <p>Hashing: Introduction, Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis), Double Hashing</p> |
| <b>Text Books:</b>         |  |
| 1.                         | Data Structures Using C. 2 <sup>nd</sup> Edition. Reema Thareja, Oxford.   |
| 2.                         | Data Structures and algorithm analysis in C, 2 <sup>nd</sup> ed, Mark Allen Weiss.   |
| 3.                         | Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.  |
| 4.                         | Data Structures: A PseudoCode Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzon, Cengage.   |
| <b>Reference Books:</b>    |  |
| 1.                         | Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson  |
| 2.                         | “Introduction to Algorithms”, T. Cormen, R. Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.   |
| 3.                         | Data Structures with C, Seymour Lipschutz TMH  |
| <b>e-Resources</b>         |  |
| 1.                         | <a href="http://algs4.cs.princeton.edu/home/">http://algs4.cs.princeton.edu/home/</a>  |
| 2.                         | <a href="https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf">https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf</a>  |
| 3.                         | <a href="http://lcm.csa.iisc.ernet.in/dsa/dsa.html">http://lcm.csa.iisc.ernet.in/dsa/dsa.html</a>  |
| 4.                         | <a href="http://utubersity.com/?page_id=878">http://utubersity.com/?page_id=878</a>  |
| 5.                         | <a href="http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures">http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures</a>  |
| 6.                         | <a href="http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms">http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms</a>  |

| Subject Code   | Category  | L | T  | P  | C | I.M | E.M | Exam            |
|--|---|---|----|----|---|-----|-----|-----------------|
| B19 IT 2105  | PC  | 3 | -- | -- | 3 | 25  | 75  | 3 Hrs.          |
| <b>COMPUTER ORGANIZATION</b>   |   |   |    |    |   |     |     |                 |
| <b>Course Objectives:</b> The course objectives of Computer Organization are to discuss and make student familiar with the |   |   |    |    |   |     |     |                 |
| 1.   | Principles and the Implementation of Computer Arithmetic  |   |    |    |   |     |     |                 |
| 2.   | Operation of CPUs including RTL, ALU, Instruction Cycle and Busses  |   |    |    |   |     |     |                 |
| 3.   | Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design  |   |    |    |   |     |     |                 |
| 4.   | Memory System and I/O Organization  |   |    |    |   |     |     |                 |
| 5.   | Principles of Operation of Multiprocessor Systems and Pipelining  |   |    |    |   |     |     |                 |
| <b>Course Outcomes:</b> By the end of the course, the student will   |   |   |    |    |   |     |     |                 |
| S.No   | Outcome   |   |    |    |   |     |     | Knowledge Level |
| 1.   | Illustrate the concepts of of data representation, Arithmetic procedures and various micro operations   |   |    |    |   |     |     | K2              |
| 2.   | Develop a detailed understanding of architectures and functionalities of control unit and central processing unit   |   |    |    |   |     |     | K2              |
| 3.   | Describe and analysis of input output system, different types of Memories and evaluate memory requirement in basic computer   |   |    |    |   |     |     | K3              |
| 4.   | Illustrate the concepts of multiprocessing and pipelining systems   |   |    |    |   |     |     | K2              |
| <b>SYLLABUS</b>  |   |   |    |    |   |     |     |                 |
| <b>UNIT-I<br/>(10 Hrs)</b>   | Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating – Point Representation. Other Binary Codes, Error Detection Codes. Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.   |   |    |    |   |     |     |                 |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.<br>Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description, |   |    |    |   |     |     |                 |
| <b>UNIT-III<br/>(10 Hrs)</b>   | Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.<br>Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit   |   |    |    |   |     |     |                 |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Input-Output Organization: Peripheral Devices,  |   |    |    |   |     |     |                 |

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|----------------------------|--|
|                            | Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.  |
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| <b>UNIT-V<br/>(12 Hrs)</b> | Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.<br>Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor. |
|                            |  |
| <b>Text Books:</b>         |  |
| 1.                         | Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.  |
| 2.                         | Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.  |
|                            |  |
| <b>Reference Books:</b>    |  |
| 1.                         | Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.   |
| 2.                         | Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.   |
| 3.                         | Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006  |
|                            |  |
| <b>e-Resources</b>         |  |
| 1.                         | <a href="https://nptel.ac.in/courses/106/105/106105163/">https://nptel.ac.in/courses/106/105/106105163/</a>  |
| 2.                         | <a href="http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf">http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf</a>  |
|                            |  |

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|---------------------|-----------------|----------|-----------|-----------|----------|-----------|------------|---------------|
| <b>Subject Code</b> | <b>Category</b> | <b>L</b> | <b>T</b>  | <b>P</b>  | <b>C</b> | <b>LM</b> | <b>E.M</b> | <b>Exam</b>   |
| <b>B19 IT2106</b>   | <b>IT</b>       | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b> | <b>25</b> | <b>75</b>  | <b>3 Hrs.</b> |

### OBJECT ORIENTED PROGRAMMING THROUGH C++

#### Course Objectives:

|    |   |
|----|---|
| 1. | Describe the procedural and object oriented paradigm.   |
| 2. | Understand dynamic memory management techniques using pointers, constructors, destructors, etc.   |
| 3. | Describe the concepts of streams, classes, functions, data and object function overloading, operator overloading, virtual functions and polymorphism. |
| 4. | Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.                              |
| 5. | Demonstrate the use of various OOPs concepts with the help of programs.   |

#### Course Outcomes: By the end of the course, the student will

| S.No | Outcome   | Knowledge Level |
|------|---|-----------------|
| 1    | Analyze the procedural and object oriented paradigm.  | K4              |
| 2    | Apply object oriented concepts to applications using dynamic memory management techniques and overloading concepts. | K3              |
| 3    | Apply inheritance, pointer, polymorphism and virtual functions concepts.  | K3              |
| 4    | Understand generic programming, Exception handling.   | K2              |

### SYLLABUS

|                              |  |
|------------------------------|--|
| <b>UNIT-I<br/>(10 Hrs)</b>   | Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming-, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.   |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Classes and Objects & Constructors and Destructor: Classes in C++-Declaring Objects, Access Specifiers and their Scope, Defining Member Function-Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor- Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments (parameterized Constructor, Destructors- Anonymous Objects. |
| <b>UNIT-III<br/>(10 Hrs)</b> | Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes, Object as a Class Member, Abstract Classes, Advantages of Inheritance-Disadvantages of Inheritance.  |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived   |

|                            |  |
|----------------------------|--|
|                            | Classes and Base Class, Binding Polymorphisms and Virtual Functions, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.  |
|                            |  |
| <b>UNIT-V<br/>(12 Hrs)</b> | Generic Programming with Templates, Need for Templates, Definition of class Templates, Normal Function Templates, Overloading of Template Function, Bubble Sort Using Function Templates, Difference Between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements – Specifying Exceptions. |
|                            |  |
| <b>Text Books:</b>         |  |
| 1.                         | A First Book of C++, Gary Bronson, Cengage Learning.   |
| 2.                         | The Complete Reference C++, Herbert Schildt, TMH.  |
|                            |  |
| <b>Reference Books:</b>    |  |
| 1.                         | Object Oriented Programming C++, Joyce Farrell, Cengage.   |
| 2.                         | C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning.  |
| 3.                         | Programming in C++, Ashok N Kamthane, Pearson 2nd Edition.   |
|                            |  |
| <b>e-Resources</b>         |  |
| 1.                         | <a href="https://nptel.ac.in/courses/106/105/106105151/">https://nptel.ac.in/courses/106/105/106105151/</a>  |
| 2.                         | <a href="https://github.com/topics/object-oriented-programming">https://github.com/topics/object-oriented-programming</a>  |
|                            |  |

| Code       | Category | L  | T  | P | C   | I.M | E.M | Exam   |
|------------|----------|----|----|---|-----|-----|-----|--------|
| B19 IT2107 | PC       | -- | -- | 3 | 1.5 | 20  | 30  | 3 Hrs. |

### ADVANCED DATA STRUCTURES LAB

#### Course Objectives:

|    |  |
|----|--|
| 1. | To be familiar with solve problems using variety of data structures such as linked lists, Trees, Graphs and hash tables. |
| 2. | To be familiar with how arrays, linked Structures, tress and graphs are represented In memory and used by algorithms     |
| 3. | To be familiar with advanced data structures such as balanced search trees, AVL Trees, and Red-Black Trees               |

#### Course Outcomes

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Student will be able to Implement data structures like linked lists for given problems.  | K3              |
| 2.   | Student will be able to Construct various types of tree structures and apply graph algorithms for the given data                               | K3              |
| 3.   | Student will be able to Implement advanced data structures into the applications such as balanced search trees, AVL Trees, and Red-Black Trees | K3              |
| 4.   | Student will be able Describe the hash function and concepts of collision and its resolution methods   | K2              |

### LIST OF EXPERIMENTS

|     |  |
|-----|--|
| 1.  | Write a program to implement the Single Linked List operations (Insertion, Deletion, searching, reverse).                        |
| 2.  | Write a program to implement the operations on stacks using Linked List.   |
| 3.  | Write a program to implement the operations on Queue using Linked List.  |
| 4.  | Write a program to add two Polynomials using Linked List.  |
| 5.  | Write a program to implement the Circular Single Linked List operations (Insertion, Deletion, searching, reverse).               |
| 6.  | Write a program to implement the Double Linked List operations (Insertion, Deletion, searching).                                 |
| 7.  | Write a program to sort list of array elements using Heap Sort.  |
| 8.  | Write a program to create a binary search tree and for implementing the in order, preorder, post order traversal using recursion |
| 9.  | Write a program to perform various operations i.e., insertions and deletions on AVL trees.                                       |
| 10. | Write a program to implement Dijkstra's algorithm to find shortest path in the graph.  |
| 11. | Write a program Implementation of Breadth First Search Techniques  |
| 12. | Write a program Implementation of Depth First Search Techniques.   |
| 13. | Write a program to implement Prim's algorithm to generate a min-cost spanning tree.  |
| 14. | Write a program to implement Krushkal's algorithm to generate a min-cost spanning tree.  |
| 15. | Write a program to implementation of Static Hashing (Use Linear probing for collision resolution)                                |

**Reference Books:**

|    |   |
|----|---|
| 1. | Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson   |
| 2. | “Introduction to Algorithms”, T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3. |

| Code   | Category  | L  | T  | P | C   | I.M | E.M | Exam            |
|--|---|----|----|---|-----|-----|-----|-----------------|
| B19 IT2108   | PC  | -- | -- | 3 | 1.5 | 20  | 30  | 3 Hrs.          |
| <b>OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB</b> |   |    |    |   |     |     |     |                 |
| <b>Course Objectives:</b>                          |   |    |    |   |     |     |     |                 |
| 1.   | To Exploit object oriented procedure of solving problems the basic principles and benefits of object-oriented procedure of solving problems in the context of C++ language.   |    |    |   |     |     |     |                 |
| 2.   | To aware and write program using the linear and non linear data structures  |    |    |   |     |     |     |                 |
| <b>Course Outcomes</b>                             |   |    |    |   |     |     |     |                 |
| S.No   | Outcome   |    |    |   |     |     |     | Knowledge Level |
| 1  | Apply the basic concepts in C++ like Class and objects  |    |    |   |     |     |     | K3              |
| 2  | Analyze memory management techniques like constructor, destructor and overloading mechanisms  |    |    |   |     |     |     | K4              |
| 3  | Apply reusability of code and usage of exception handling and generic programming   |    |    |   |     |     |     | K3              |
| <b>LIST OF EXPERIMENTS</b>                         |   |    |    |   |     |     |     |                 |
| 1.   | Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array. |    |    |   |     |     |     |                 |
| 2.   | Write a C++ program to declare Struct. Initialize and display contents of member variables.   |    |    |   |     |     |     |                 |
| 3.   | Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.  |    |    |   |     |     |     |                 |
| 4.   | Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.  |    |    |   |     |     |     |                 |
| 5.   | Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).  |    |    |   |     |     |     |                 |
| 6.   | Write a C++ to illustrate the concepts of console I/O operations.   |    |    |   |     |     |     |                 |
| 7.   | Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.  |    |    |   |     |     |     |                 |
| 8.   | Write a C++ program to allocate memory using new operator.  |    |    |   |     |     |     |                 |
| 9.   | Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)  |    |    |   |     |     |     |                 |
| 10.  | Write a C++ program to create an array of pointers. Invoke functions using array objects.   |    |    |   |     |     |     |                 |
| 11.  | Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword  |    |    |   |     |     |     |                 |
| <b>Reference Books:</b>                            |   |    |    |   |     |     |     |                 |
| 1.   | A First Book of C++, Gary Bronson, Cengage Learning.  |    |    |   |     |     |     |                 |
| 2.   | The Complete Reference C++, Herbert Schildt, TMH.   |    |    |   |     |     |     |                 |



| Code  | Category   | L | T  | P  | C  | I.M | E.M | Exam                   |
|---|--|---|----|----|----|-----|-----|------------------------|
| B19MC2101   | MC   | 3 | -- | -- | -- | --  | --  | --                     |
| <b>PROFESSIONAL ETHICS AND HUMAN VALUES</b>       |  |   |    |    |    |     |     |                        |
| <b>(Common to CSE, IT &amp; Mechanical)</b>       |  |   |    |    |    |     |     |                        |
| <b>Course Objectives:</b>                         |  |   |    |    |    |     |     |                        |
| 1.  | To create an awareness on Engineering Ethics and Human Values.   |   |    |    |    |     |     |                        |
| 2.  | To instill Moral and Social Values and Loyalty.  |   |    |    |    |     |     |                        |
| 3.  | To appreciate the rights of others.  |   |    |    |    |     |     |                        |
| 4.  | To create awareness on assessment of safety and risk.  |   |    |    |    |     |     |                        |
| <b>Course Outcomes:</b> Students will be able to: |  |   |    |    |    |     |     | <b>Knowledge Level</b> |
| 1.  | Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field. Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships and field work.   |   |    |    |    |     |     | K1&K2                  |
| 2.  | Identify the multiple ethical interests at stake in a real-world situation or practice and Articulate what makes a particular course of action ethically defensible.   |   |    |    |    |     |     | K1&K2                  |
| 3.  | Assess their own ethical values and the social context of problems.  |   |    |    |    |     |     | K3                     |
| 4.  | Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.   |   |    |    |    |     |     | K3                     |
| 5.  | Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.   |   |    |    |    |     |     | K4                     |
| <b>SYLLABUS</b>                                   |  |   |    |    |    |     |     |                        |
| <b>UNIT-I<br/>(8 Hrs)</b>                         | <b>Human Values:</b><br>Morals, Values and Ethics-Integrity-Work Ethic-Service learning Civic Virtue Respect for others Living Peacefully Caring Sharing Honesty -Courage-Cooperation Commitment Empathy Self Confidence Character Spirituality.   |   |    |    |    |     |     |                        |
| <b>UNIT-II<br/>(8 Hrs)</b>                        | <b>Engineering Ethics:</b><br>Senses of 'Engineering Ethics-Variety of moral issued- Types of inquiry Moral dilemmas Moral autonomy- Kohlberg's theory- Gilligan's theory-Consensus and controversy Models of professional roles-Theories about right action-Self-interest -Customs and religion Uses of Ethical theories Valuing time Cooperation Commitment. |   |    |    |    |     |     |                        |
| <b>UNIT-III<br/>(8 Hrs)</b>                       | <b>Engineering as Social Experimentation:</b><br>Engineering As Social Experimentation- Framing the problem- Determining the facts codes of Ethics- Clarifying Concepts- Application issues Common Ground -General Principles- Utilitarian thinking respect for persons.   |   |    |    |    |     |     |                        |
| <b>UNIT-IV<br/>(8 Hrs)</b>                        | <b>Engineers Responsibility for Safety and Risk:</b><br>Safety and risk Assessment of safety and risk. Risk benefit analysis and reducing risk- Safety and the Engineer-Designing for the safety- Intellectual Property rights (IPR).  |   |    |    |    |     |     |                        |

|                          |   |
|--------------------------|---|
|                          |   |
| <b>UNIT-V<br/>(8Hrs)</b> | <b>Global Issues:</b> Globalization- Cross-culture issues-Environmental Ethics- Computer Ethics Computers as the instrument of Unethical behavior Computers as the object of Unethical acts Autonomous Computers-Computer codes of Ethics- Weapons Development -Ethics and Research Analyzing Ethical Problems in research. |
|                          |   |
| 1.                       | "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan- and, V.S.Senthil Kumar-PHI Learning Pvt Ltd-2009.  |
| 2.                       | "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.  |
| 3.                       | "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill-2003.   |
| 4.                       | "Professional Ethics and Morals" by Prof.A.R.Aryasri, DhanikotaSuyodhana-Maruthi Publications.  |
| 5.                       | "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications.   |
| 6.                       | "Professional Ethics and Human Values" by Prof.D.R.Kiran-   |
| 7.                       | "Indian Culture, Values and Professional Ethics" by PSR Murthy- BS Publication.   |
| 8.                       | Professional Ethics by R.Subramaniam - Oxford publications, New Delhi.  |
|                          |   |



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)  
Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA  
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

### INFORMATION TECHNOLOGY (Accredited by NBA)

**SCHEME OF INSTRUCTION & EXAMINATION**  
(Regulation R19)  
**II/IV B.TECH**  
**II-SEMESTER**  
(With effect from **2019-2020** Admitted Batch onwards)

| Subject Code | Name of the Subject                     | Category | Cr        | L         | T        | P         | Internal Marks | External Marks | Total Marks |
|--------------|---|----------|-----------|-----------|----------|-----------|----------------|----------------|-------------|
| B19 BS 2202  | Probability and Statistics              | BS       | 3         | 3         | --       | --        | 25             | 75             | 100         |
| B19 IT 2201  | Java Programming                        | PC       | 3         | 2         | 1        | --        | 25             | 75             | 100         |
| B19 IT 2202  | Operating Systems                       | PC       | 3         | 3         | --       | --        | 25             | 75             | 100         |
| B19 IT 2203  | Database Management Systems             | PC       | 3         | 3         | --       | --        | 25             | 75             | 100         |
| B19 IT 2204  | Theory of Computation                   | PC       | 3         | 3         | --       | --        | 25             | 75             | 100         |
| B19 IT 2205  | Java Programming Lab                    | PC       | 1.5       | --        | --       | 3         | 20             | 30             | 50          |
| B19 IT 2206  | UNIX Operating Systems Lab              | PC       | 1         | --        | --       | 2         | 20             | 30             | 50          |
| B19 IT 2207  | Data Base Management Systems Lab        | PC       | 1.5       | --        | --       | 3         | 20             | 30             | 50          |
| B19 IT 2208  | Socially Relevant Project               | PR       | 1         | --        | --       | 2         | 20             | 30             | 50          |
| B19 MC 2201  | Essence of Indian Traditional Knowledge | MC       | 0         | 3         | --       | --        | --             | --             | --          |
| <b>TOTAL</b> |   |          | <b>20</b> | <b>17</b> | <b>1</b> | <b>10</b> | <b>205</b>     | <b>495</b>     | <b>700</b>  |

| Subject Code | Category | L | T  | P  | C | I.M | E.M | Exam   |
|--------------|----------|---|----|----|---|-----|-----|--------|
| B19 BS 2202  | BS       | 3 | -- | -- | 3 | 25  | 75  | 3 Hrs. |

## PROBABILITY AND STATISTICS

(Common to CSE & IT)

**Course Objectives:** Students are expected to learn

1. Have an idea on data science and to fit a linear or nonlinear curve using method of least squares
2. Illustrate the concept of a random variable, generating functions and their properties
3. Analyse various statistical measures of a few discrete distributions.
4. Analyse various statistical measures of a few continuous distributions
5. Develop a framework for testing of hypothesis in giving inferences about Population Parameters.
6. Study Queuing models and their Characteristics.

**Course Outcomes:** Upon successful completion of this course, the student should be able to

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Understand the concepts of data science and fit a best suitable curve for the given data   | K2              |
| 2.   | Identify the random variable as discrete/continuous and analyse it.  | K3              |
| 3.   | Predict the discrete distribution suitable for the given data from its moments.  | K2              |
| 4.   | Predict the continuous distribution suitable for the given data from its moments   | K2              |
| 5.   | Decide the test applicable for giving inference about Population Parameter based on Sample statistic.  | K3              |
| 6.   | Make business decisions about the resources needed to provide a service in day-to-day life applications including telecommunication, traffic engineering, computing and the design of factories, shops, offices and hospitals. | K3              |

## SYLLABUS

|                             |  |
|-----------------------------|--|
| <b>UNIT-I<br/>(12 Hrs)</b>  | <p><b>Descriptive statistics and methods for data science:</b><br/>Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variables: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance), Skewness, Kurtosis</p> <p><b>Correlation:</b> Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient (without proofs).</p> <p><b>Regression Analysis:</b> Regression Lines, Regression Coefficients and their properties (without proofs).</p> <p><b>Curve fitting:</b> Method of least Squares, fitting of a Straight line, Fitting of a Parabola.</p> |
| <b>UNIT-II<br/>(12 Hrs)</b> | <p><b>Random Variables and Probability functions:</b><br/>Review of basic concepts of Probability (<b>no questions will be set on review</b>).<br/>Definition of a random variable, Distribution function, Properties of Distribution Function,</p>  |

|                              |   |
|------------------------------|---|
|                              | <p>Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function, Continuous Distribution Function. Introduction to Joint random variable and its Probability functions.</p> <p><b>Mathematical Expectation:</b> Mathematical Expectation of a Random Variable, Expected Value of function of a Random Variable, Addition Theorem and Multiplication Theorem of Expectation (<b>without proofs</b>), Statistical Measures like Mean, Variance, Moments and Covariance in terms of Expectations.</p> <p><b>Generating functions:</b> Moment generating Function, Characteristic Function and Probability generating Function of a Random Variable.</p>   |
|                              |   |
| <b>UNIT-III<br/>(12 Hrs)</b> | <p><b>Discrete and Continuous Distributions:</b></p> <p><b>Discrete Distributions:</b> Binomial distribution and Poisson distribution - Definition, Mean, Variance, moments, m.g.f., Characteristic function, p.g.f., Fitting of distributions.</p> <p><b>Continuous Distributions:</b> Normal Distribution - Definition, Standard Normal Variate, Mean, Variance, m.g.f., Characteristic function, Applications of Normal Distribution, Importance of Normal distribution. Exponential Distribution, Definition, Mean, Variance and Memory less property of Exponential distribution.</p>  |
|                              |   |
| <b>UNIT-IV<br/>(12 Hrs)</b>  | <p><b>Sampling theory and Testing of Hypothesis:</b></p> <p><b>Sampling Theory:</b> Sample, population, statistic, parameter, Sampling distribution, standard error, point and interval estimation. Testing of Hypothesis: Formulation of Null hypothesis, Alternative hypothesis, Critical region, level of significance, Errors in sampling- Type-I-error, Type-II-error, One-tailed and Two-tailed tests Degrees of freedom.</p> <p><b>Large Sample Theory:</b> Test of significance of single sample proportion, Test of significance for difference of proportions.</p> <p><b>Small Sample Theory:</b> Student's-t-distribution: definition, t-test for single mean, t-test for difference of means, Paired t-test for difference of means.</p> <p>F-distribution: definition, F-test for equality of two population variances.</p> <p>Chi-square distribution: definition, Chi-square test for goodness of fit.</p> |
|                              |   |
| <b>UNIT-V<br/>(8 rs)</b>     | <p><b>Queuing Theory:</b></p> <p>Queue description, Birth and Death Process, Distribution of Inter-arrival times, Distribution of service times, Kendall's representation of a queuing model, Operating characteristics of a queuing model, steady-state solutions of <math>\{M/M/1: \infty/FCFS\}</math> Model and <math>\{M/M/1 ; N/FCFS\}</math> Model.</p>  |
|                              |   |
| <b>Text Books:</b>           |   |
| 1.                           | Fundamentals of Mathematical Statistics by S.C.Gupta and V.K.Kapoor, Sultan Chand & Sons Publishers.  |
| 2.                           | Probability, Statistics and Random Processes by T.Veerarajan, Tata Mc Graw Hill Pub.  |
| 3.                           | Operations Research by S D Sharma, Khanna publications  |
| <b>Reference Books:</b>      |   |
| 1.                           | Probability & Statistics with Reliability, Queueing and Computer Applications by Kishore.S.Trivedi,Prentice Hall of India, 1999.  |
| 2.                           | Probability and statistics for Engineers, Miller and Freund, 7 <sup>th</sup> edition, Prentice-Hall India.  |

|                      |   |
|----------------------|---|
| 3.                   | Probability and statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Eighth edition, Pearson Education. |
|                      |   |
| <b>e-References:</b> |   |
| 1.                   | <a href="http://www.swayam.gov.in">http://www.swayam.gov.in</a>   |
|                      |   |

| Subject Code | Category | L | T | P  | C | I.M | E.M | Exam   |
|--------------|----------|---|---|----|---|-----|-----|--------|
| B19 IT 2201  | PC       | 2 | 1 | -- | 3 | 25  | 75  | 3 Hrs. |

## JAVA PROGRAMMING

### Course Objectives:

|    |  |
|----|--|
| 1. | Implementing programs for application development with user interface by using core java principles          |
| 2. | Focus on object oriented concepts and java program structure and its installation                            |
| 3. | Comprehension of java programming constructs, control structures in Java Programming Constructs              |
| 4. | Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling |
| 5. | Understanding of Thread concepts and I/O in Java   |

### Course Outcomes: Upon successful completion of this course, the student should be able to

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Develop applications using basic java concepts   | <b>K3</b>       |
| 2.   | Develop applications using object oriented programming concepts  | <b>K3</b>       |
| 3.   | Develop error free applications using exception handling mechanisms and multi tasking applications using multithreading concepts | <b>K3</b>       |
| 4.   | Develop interactive Jdbc applications with database connectivity   | <b>K3</b>       |

## SYLLABUS

|                             |  |
|-----------------------------|--|
| <b>UNIT-I<br/>(10 Hrs)</b>  | <p>Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.</p> <p>Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement ( - - ) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.</p> <p>Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.</p> |
| <b>UNIT-II<br/>(10 Hrs)</b> | Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class   |

|                              |   |
|------------------------------|---|
|                              | <p>Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.</p> <p>Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.</p>  |
|                              |   |
| <b>UNIT-III<br/>(10 Hrs)</b> | <p>Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two- dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.</p> <p>Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.</p> <p>Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.</p> |
|                              |   |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | <p>Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.</p> <p>Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.</p>   |
|                              |   |
| <b>UNIT-V<br/>(12 Hrs)</b>   | <p>String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.</p> <p>Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.</p> <p>Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management</p>  |
|                              |   |



| <b>Text Books:</b>      |   |
|-------------------------|---|
| 1.                      | JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.   |
| 2.                      | The complete Reference Java, 8th edition, Herbert Schildt, TMH.   |
| <b>Reference Books:</b> |   |
| 1.                      | Introduction to java programming, 7th edition by Y Daniel Liang, Pearson  |
| 2.                      | Murach's Java Programming, Joel Murach  |
| <b>e-Resources</b>      |   |
| 1.                      | <a href="https://nptel.ac.in/courses/106/105/106105191/">https://nptel.ac.in/courses/106/105/106105191/</a>         |
| 2.                      | <a href="https://www.w3schools.com/java/java_data_types.asp">https://www.w3schools.com/java/java_data_types.asp</a> |
|                         |   |

| Subject Code | Category | L | T  | P  | C | I.M | E.M | Exam   |
|--------------|----------|---|----|----|---|-----|-----|--------|
| B19 IT2202   | PC       | 3 | -- | -- | 3 | 25  | 75  | 3 Hrs. |

### OPERATING SYSTEMS

#### Course Objectives:

1. Introduce to the internal operation of modern operating systems
2. Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
3. Understand File Systems in Operating System like UNIX/Linux and Windows
4. Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
5. Analyze Security and Protection Mechanism in Operating System

**Course Outcomes:** Upon successful completion of this course, the student should be able to

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | <b>Describe</b> basic concepts, Generations, Functions, Services and Structures of different Operating Systems.                          | <b>K2</b>       |
| 2.   | <b>Describe</b> the concept of Process, Thread and also <b>Utilize</b> different algorithms for Scheduling multiple Processes & Threads. | <b>K3</b>       |
| 3.   | <b>Apply</b> different Mechanisms to implement Inter Process Communication without occurring dead lock                                   | <b>K3</b>       |
| 4.   | <b>Classify</b> Memory Management Schemes and <b>Apply and Compare</b> various Page Replacement Techniques for better allocation         | <b>K3</b>       |

### SYLLABUS

|                              |  |
|------------------------------|--|
| <b>UNIT-I<br/>(10 Hrs)</b>   | Operating Systems (OS) Overview: OS Concepts, OS functions, Evaluation of Operating systems. OS Services, OS structures: Monolithic structure, Layered structure, Micro Kernel structure, Modular structure, Virtual Machines, Interrupts, Systems calls- Types of System Calls, OS debugging, OS generations.   |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Process Concept: Basic concepts, Process states, process control block, Operations on processes, Process Scheduling: Scheduling Criteria, Scheduling Algorithms. Multiple Processor Scheduling, Thread Scheduling, Examples. Multithreaded Programming: Multithreading Models, Thread Libraries, Threading Issues, Examples.   |
| <b>UNIT-III<br/>(10 Hrs)</b> | Process Concurrency and Synchronization: Introduction, Race Condition, Critical Region, Mutual Exclusion, Peterson's Solution, Hardware Support, Operating System Support, Semaphores, Monitors, Classic Synchronization problem: Reader's-Writer's Problem, Barber problem, Producer –Consumer problem, Dining philosopher's problem. Deadlocks: Resources, Conditions for resource deadlocks, Graph models of deadlocks, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention. |

|                            |   |
|----------------------------|---|
| <b>UNIT-IV<br/>(8 Hrs)</b> | Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Free space Management Techniques, Paging, Virtual Memory Management: Introduction, Demand paging ,Copy on-write, Page replacement, Page replacement algorithms, Frame allocation, Inverted paging, Pre-Paging, Segmentation, Paged Segmentation, Thrashing, Memory-mapped files.  |
| <b>UNIT-V<br/>(12 Hrs)</b> | File Systems: Files, Directories, File system implementation, management and optimization.<br>Secondary-Storage Structure: Overview of Disk structure, Disk scheduling, RAID structure.<br>System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control List (ACLs), Revocation of access rights, Capabilities List (c-List) .<br><b>Case Studies:</b> Study of Operating System Functionalities in various operating Systems like Windows, Unix, Linux and Mobile Operating Systems. |
| <b>Text Books:</b>         |   |
| 1.                         | Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.   |
| 2.                         | Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.  |
| <b>Reference Books:</b>    |   |
| 1.                         | Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.   |
| 2.                         | Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Inter process Communication and File systems.)  |
| 3.                         | Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.  |
| <b>e-Resources</b>         |   |
| 1.                         | <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a>   |

|                     |                 |          |           |           |          |            |            |               |
|---------------------|-----------------|----------|-----------|-----------|----------|------------|------------|---------------|
| <b>Subject Code</b> | <b>Category</b> | <b>L</b> | <b>T</b>  | <b>P</b>  | <b>C</b> | <b>I.M</b> | <b>E.M</b> | <b>Exam</b>   |
| <b>B19 IT2203</b>   | <b>PC</b>       | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b> | <b>25</b>  | <b>75</b>  | <b>3 Hrs.</b> |

### DATABASE MANAGEMENT SYSTEMS

#### Course Objectives:

|    |   |
|----|---|
| 1. | To introduce about database management systems.   |
| 2. | To give a good formal foundation on the E R Model and relational model of data.   |
| 3. | To introduce the concepts of basic SQL as a universal Database language.  |
| 4. | To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization. |
| 5. | To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.              |

#### Course Outcomes: Upon successful completion of this course, the student should be able to

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | <b>Analyze</b> requirements of an organization and develop a database schema in terms of E R model and Relational model.   | K4              |
| 2.   | <b>Analyze</b> a query and formulate solution using the knowledge of query languages like SQL.                             | K4              |
| 3.   | <b>Design</b> well structured relations by applying normalization to remove anomalies in relations.                        | K4              |
| 4.   | <b>Examine</b> issues in transaction execution, data storage and query processing and can formulate appropriate solutions. | K2              |

### SYLLABUS

|                              |  |
|------------------------------|--|
| <b>UNIT-I<br/>(10 Hrs)</b>   | Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Data base systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.   |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion). |
| <b>UNIT-III<br/>(10 Hrs)</b> | Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship,   |

|                            |  |
|----------------------------|--|
|                            | implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.   |
| <b>UNIT-IV<br/>(8 Hrs)</b> | Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).   |
| <b>UNIT-V<br/>(12 Hrs)</b> | Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.<br>Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning. |
| <b>Text Books:</b>         |  |
| 1.                         | Data base Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH.   |
| 2.                         | Data base System Concepts,5/e, Silberschatz, Korth, TMH.   |
| <b>Reference Books:</b>    |  |
| 1.                         | Introduction to Database Systems, 8/e C J Date, PEA.   |
| 2.                         | Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA.   |
| 3.                         | Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.   |
| <b>e-Resources</b>         |  |
| 1.                         | <a href="https://nptel.ac.in/courses/106/105/106105175/">https://nptel.ac.in/courses/106/105/106105175/</a>  |
| 2.                         | <a href="https://www.geeksforgeeks.org/introduction-to-nosql/">https://www.geeksforgeeks.org/introduction-to-nosql/</a>  |

| Subject Code | Category | L | T  | P  | C | I.M | E.M | Exam   |
|--------------|----------|---|----|----|---|-----|-----|--------|
| B19 IT2204   | PC       | 3 | -- | -- | 3 | 25  | 75  | 3 Hrs. |

### THEORY OF COMPUTATION

#### Course Objectives:

|    |  |
|----|--|
| 1. | To learn fundamentals of Regular and Context Free Grammars and Languages               |
| 2. | To understand the relation between Regular Language and Finite Automata and machines   |
| 3. | To learn how to design Automata's and machines as Acceptors, Verifiers and Translators |
| 4. | To understand the relation between Contexts free Languages, PDA and TM                 |
| 5. | To learn how to design PDA as acceptor and TM as Calculators                           |

#### Course Outcomes: Upon successful completion of this course, the student should be able to

| S.No | Outcome  | Knowledge Level |
|------|--|-----------------|
| 1.   | Analyze and construct Finite Automata from a regular expression, regular grammar or regular language | K4              |
| 2.   | Analyze and construct a PDA from CFG or CFL  | K4              |
| 3.   | Analyze and construct a TM from REL or Unrestricted Language.  | K4              |

### SYLLABUS

|                              |   |
|------------------------------|---|
| <b>UNIT-I<br/>(10 Hrs)</b>   | Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with $\epsilon$ -Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata. |
| <b>UNIT-II<br/>(10 Hrs)</b>  | Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.                        |
| <b>UNIT-III<br/>(10 Hrs)</b> | Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, $\epsilon$ -Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.   |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Application of Pushdown Automata.  |

|                            |   |
|----------------------------|---|
| <b>UNIT-V<br/>(12 Hrs)</b> | Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP. Formal languages and Chomsky Hierarchy. |
| <b>Text Books:</b>         |   |
| 1.                         | Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3 <sup>rd</sup> Edition, Pearson, 2008.  |
| 2.                         | Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3 <sup>rd</sup> Edition, PHI, 2007.   |
| <b>Reference Books:</b>    |   |
| 1.                         | Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI.  |
| 2.                         | Theory of Computation, V. Kulkarni, Oxford University Press, 2013.  |
| 3.                         | Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.   |
| <b>e-Resources</b>         |   |
| 1.                         | <a href="https://nptel.ac.in/courses/106/104/106104028/">https://nptel.ac.in/courses/106/104/106104028/</a>   |

| Code  | Category  | L  | T  | P | C   | I.M | E.M | Exam            |
|---|---|----|----|---|-----|-----|-----|-----------------|
| B19IT2205   | PC  | -- | -- | 3 | 1.5 | 20  | 30  | 3 Hrs.          |
| <b>JAVA PROGRAMMING LAB</b>   |   |    |    |   |     |     |     |                 |
| <b>Course Objectives:</b> The aim of this lab is to   |   |    |    |   |     |     |     |                 |
| 1.  | Practice programming in the Java  |    |    |   |     |     |     |                 |
| 2.  | Gain knowledge of object-oriented paradigm in the Java programming language   |    |    |   |     |     |     |                 |
| 3.  | Learn use of Java in a variety of technologies and on different platforms   |    |    |   |     |     |     |                 |
| <b>Course Outcomes:</b> By the end of the course student will be able to write java program for |   |    |    |   |     |     |     |                 |
| S.No  | Outcome   |    |    |   |     |     |     | Knowledge Level |
| 1.  | Apply primitive data types, Operations, Expressions, Control-flow, Strings in java programming  |    |    |   |     |     |     | K3              |
| 2.  | Examine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism  |    |    |   |     |     |     | K4              |
| 3.  | Analyzing simple inheritance, multi-level inheritance, Exception handling mechanism   |    |    |   |     |     |     | K4              |
| 4.  | Analyze and Construct Threads, Event Handling, implement packages, developing applets   |    |    |   |     |     |     | K4              |
| <b>LIST OF EXPERIMENTS</b>  |   |    |    |   |     |     |     |                 |
| <b>Exercise - 1 (Basics)</b>  |   |    |    |   |     |     |     |                 |
| 1.  | Write a JAVA program to display default value of all primitive data type of JAVA  |    |    |   |     |     |     |                 |
| 2.  | Write a java program that display the roots of a quadratic equation $ax^2+bx=0$ . Calculate the discriminate D and basing on value of D, describe the nature of root.   |    |    |   |     |     |     |                 |
| 3.  | Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers. |    |    |   |     |     |     |                 |
| <b>Exercise - 2 (Operations, Expressions, Control-flow, Strings)</b>                            |   |    |    |   |     |     |     |                 |
| 1.  | Write a JAVA program to search for an element in a given list of elements using binary search mechanism.  |    |    |   |     |     |     |                 |
| 2.  | Write a JAVA program to sort for an element in a given list of elements using bubble sort   |    |    |   |     |     |     |                 |
| 3.  | Write a JAVA program to sort for an element in a given list of elements using merge sort.   |    |    |   |     |     |     |                 |
| 4.  | Write a JAVA program using StringBuffer to delete, remove character.  |    |    |   |     |     |     |                 |
| <b>Exercise - 3 (Class, Objects)</b>  |   |    |    |   |     |     |     |                 |
| 1.  | Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.  |    |    |   |     |     |     |                 |
| 2.  | Write a JAVA program to implement constructor.  |    |    |   |     |     |     |                 |
| <b>Exercise - 4 (Methods)</b>   |   |    |    |   |     |     |     |                 |
| 1.  | Write a JAVA program to implement constructor overloading.  |    |    |   |     |     |     |                 |
| 2.  | Write a JAVA program implement method overloading.  |    |    |   |     |     |     |                 |



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| <b>Exercise - 5 (Inheritance)</b>             |  |
| 1.  | Write a JAVA program to implement Single Inheritance   |
| 2.  | Write a JAVA program to implement multi level Inheritance  |
| 3.  | Write a java program for abstract class to find areas of different shapes  |
| <b>Exercise - 6 (Inheritance - Continued)</b> |  |
| 1.  | Write a JAVA program give example for “super” keyword.   |
| 2.  | Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?   |
| <b>Exercise - 7 (Exception)</b>               |  |
| 1.  | Write a JAVA program that describes exception handling mechanism   |
| 2.  | Write a JAVA program Illustrating Multiple catch clauses   |
| <b>Exercise – 8 (Runtime Polymorphism)</b>    |  |
| 1.  | Write a JAVA program that implements Runtime polymorphism  |
| 2.  | Write a Case study on run time polymorphism, inheritance that implements in above problem  |
| <b>Exercise – 9 (User defined Exception)</b>  |  |
| 1.  | Write a JAVA program for creation of Illustrating throw  |
| 2.  | Write a JAVA program for creation of Illustrating finally  |
| 3.  | Write a JAVA program for creation of Java Built-in Exceptions  |
| 4.  | Write a JAVA program for creation of User Defined Exception  |
| <b>Exercise – 10 (Threads)</b>                |  |
| 1.  | Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds ,(Repeat the same by implementing Runnable) |
| 2.  | Write a program illustrating <b>isAlive</b> and <b>join ()</b>   |
| <b>Exercise – 11 (Packages)</b>               |  |
| 1.  | Write a JAVA program illustrate class path   |
| 2.  | Write a case study on including in class path in your os environment of your package.  |
| 3.  | Write a JAVA program that import and use the defined your package in the previous Problem  |
| <b>Exercise - 12(Applet)</b>                  |  |
| 1.  | Write a JAVA program to paint like paint brush in applet.  |
| 2.  | Write a JAVA program to display analog clock using Applet.   |
| 3.  | Write a JAVA program to create different shapes and fill colors using Applet.  |
| <b>Exercise - 13 (Event Handling)</b>         |  |
| 1.  | Write a JAVA program that display the x and y position of the cursor movement using Mouse.   |
| 2.  | Write a JAVA program that identifies key-up key-down event user entering text in a Applet.   |
| <b>Reference Books:</b>                       |  |
| 1.  | JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.  |
| 2.  | The complete Reference Java, 8th edition, Herbert Schildt, TMH.  |

| Code                             | Category  | L  | T  | P | C | I.M | E.M | Exam            |
|----------------------------------|---|--|----|---|---|-----|-----|-----------------|
| B19IT2206                        | PC  | --   | -- | 2 | 1 | 20  | 30  | 3 Hrs.          |
| <b>UNIX OPERATING SYSTEM LAB</b> |   |  |    |   |   |     |     |                 |
| <b>Course Objectives:</b>        |   |  |    |   |   |     |     |                 |
| 1.                               | To understand the design aspects of operating system  |  |    |   |   |     |     |                 |
| 2.                               | To study the process management concepts & Techniques   |  |    |   |   |     |     |                 |
| 3.                               | To study the storage management concepts  |  |    |   |   |     |     |                 |
| 4.                               | To familiarize students with the Linux environment  |  |    |   |   |     |     |                 |
| 5.                               | To learn the fundamentals of shell scripting/programming  |  |    |   |   |     |     |                 |
| <b>Course Outcomes</b>           |   |  |    |   |   |     |     |                 |
| S.No                             | Outcome   |  |    |   |   |     |     | Knowledge Level |
| 1.                               | To use Unix utilities and perform basic shell control of the utilities  |  |    |   |   |     |     | K1              |
| 2.                               | To use the Unix file system and file access control   |  |    |   |   |     |     | K1              |
| 3.                               | To use of an operating system to develop software   |  |    |   |   |     |     | K1              |
| 4.                               | Students will be able to use Linux environment efficiently  |  |    |   |   |     |     | K2              |
| 5.                               | Solve problems using bash for shell scripting   |  |    |   |   |     |     | K3              |
| 6.                               |   |  |    |   |   |     |     |                 |
| <b>LIST OF EXPERIMENTS</b>       |   |  |    |   |   |     |     |                 |
| 1.                               | a.  | Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown |    |   |   |     |     |                 |
|                                  | b.  | Study of vi editor   |    |   |   |     |     |                 |
|                                  | c.  | Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system   |    |   |   |     |     |                 |
|                                  | d.  | Study of Unix/Linux file system (tree structure)   |    |   |   |     |     |                 |
|                                  | e.  | Study of .bashrc, /etc/bashrc and Environment variables.   |    |   |   |     |     |                 |
| 2.                               | Write a C program that makes a copy of a file using standard I/O, and system calls  |  |    |   |   |     |     |                 |
| 3.                               | Write a C program to emulate the UNIX ls -l command.  |  |    |   |   |     |     |                 |
| 4.                               | Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l   sort                             |  |    |   |   |     |     |                 |
| 5.                               | Simulate the following CPU scheduling algorithms:<br>Round Robin (b) SJF (c) FCFS (d) Priority  |  |    |   |   |     |     |                 |
| 6.                               | Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls   |  |    |   |   |     |     |                 |
| 7.                               | Simulate the following:<br>i. Multiprogramming with a fixed number of tasks (MFT)<br>ii. Multiprogramming with a variable number of tasks (MVT) |  |    |   |   |     |     |                 |
| 8.                               | Simulate Bankers Algorithm for Dead Lock Avoidance  |  |    |   |   |     |     |                 |
| 9.                               | Simulate Bankers Algorithm for Dead Lock Prevention.  |  |    |   |   |     |     |                 |
| 10.                              | Simulate the following page replacement algorithms:<br>FIFO b) LRU c) LFU   |  |    |   |   |     |     |                 |

|                         |  |
|-------------------------|--|
| 11.                     | Simulate the following File allocation strategies<br>Sequenced (b) Indexed (c) Linked                  |
| 12.                     | Write a C program that illustrates two processes communicating using shared memory                     |
| 13.                     | Write a C program to simulate producer and consumer problem using semaphores                           |
| 14.                     | Write C program to create a thread using <i>pthread</i> library and let it run its function.           |
| 15.                     | Write a C program to illustrate concurrent execution of threads using <i>pthread</i> library.          |
| <b>Reference Books:</b> |  |
| 1.                      | Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.          |
| 2.                      | Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009. |

| Code   | Category  | L   | T  | P | C   | I.M | E.M | Exam            |
|--|---|---|----|---|-----|-----|-----|-----------------|
| B19IT2207  | PC  | --  | -- | 3 | 1.5 | 20  | 30  | 3 Hrs.          |
| <b>DATABASE MANAGEMENT SYSTEMS LAB</b>   |   |   |    |   |     |     |     |                 |
| <b>Course Objectives:</b> This Course will enable students to                  |   |   |    |   |     |     |     |                 |
| 1.   | Populate and query a database using SQL DDL/DML Commands  |   |    |   |     |     |     |                 |
| 2.   | Declare and enforce integrity constraints on a database   |   |    |   |     |     |     |                 |
| 3.   | Writing Queries using advanced concepts of SQL  |   |    |   |     |     |     |                 |
| 4.   | Programming PL/SQL including procedures, functions, cursors and triggers  |   |    |   |     |     |     |                 |
| 5.   |   |   |    |   |     |     |     |                 |
| <b>Course Outcomes :</b> At the end of the course the student will be able to: |   |   |    |   |     |     |     |                 |
| S.No   | Outcome   |   |    |   |     |     |     | Knowledge Level |
| 1.   | Utilize SQL to execute queries for creating database and performing data manipulation operations  |   |    |   |     |     |     | K2              |
| 2.   | Examine integrity constraints to build efficient databases  |   |    |   |     |     |     | K1              |
| 3.   | Apply Queries using Advanced Concepts of SQL  |   |    |   |     |     |     | K3              |
| 4.   | Build PL/SQL programs including stored procedures, functions, cursors and triggers  |   |    |   |     |     |     | K2              |
| <b>LIST OF EXPERIMENTS</b>   |   |   |    |   |     |     |     |                 |
| 1.   | Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.  |   |    |   |     |     |     |                 |
| 2.   | Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.  |   |    |   |     |     |     |                 |
| 3.   | Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.  |   |    |   |     |     |     |                 |
| 4.   | Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date) |   |    |   |     |     |     |                 |
| 5.   | a.  | Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found) |    |   |     |     |     |                 |
|  | b.  | Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.  |    |   |     |     |     |                 |
| 6.   | Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.  |   |    |   |     |     |     |                 |
| 7.   | Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.  |   |    |   |     |     |     |                 |
| 8.   | Programs development using creation of procedures, passing parameters IN and OUT of   |   |    |   |     |     |     |                 |

|                         |  |
|-------------------------|--|
|                         | <b>PROCEDURES.</b>   |
| 9.                      | Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.  |
| 10.                     | Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables. |
| 11.                     | Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers                     |
| 12.                     | Create a table and perform the search operation on table using indexing and non-indexing techniques.                     |
| <b>Reference Books:</b> |  |
| 1.                      | Oracle: The Complete Reference by Oracle Press   |
| 2.                      | Nilesh Shah, "Database Systems Using Oracle", PHI, 2007  |
| 3.                      | Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007                                       |

| Subject Code  | Category  | L  | T  | P | C | I.M | E.M | Exam            |
|---|---|----|----|---|---|-----|-----|-----------------|
| B19 IT2208  | PR  | -- | -- | 2 | 1 | 20  | 30  | 3Hrs.           |
| <b>SOCIALLY RELEVANT PROJECT</b>  |   |    |    |   |   |     |     |                 |
| <b>Course Objectives: The aim of Socially Relevant Project is to encourage students</b>   |   |    |    |   |   |     |     |                 |
| 1.  | To express their ideas, to solve real-world problems and to complete projects   |    |    |   |   |     |     |                 |
| 2.  | Using human experience to gather ideas from a wide range of problems in society by observation or pooling information |    |    |   |   |     |     |                 |
| 3.  | Using scientific, social-scientific, humanistic, cultural reasoning to analyze global problems                        |    |    |   |   |     |     |                 |
| <b>Course Outcomes: The student learns to</b>   |   |    |    |   |   |     |     |                 |
| S.No  | Outcome   |    |    |   |   |     |     | Knowledge Level |
| 1.  | Use scientific reasoning to gather, evaluate, and interpret ideas   |    |    |   |   |     |     | K4              |
| 2.  | Analyze and design solutions to solve the ideas   |    |    |   |   |     |     | K4              |
| 3.  | Use one or more creative tools to complete the projects   |    |    |   |   |     |     | K4              |
| <b>SYLLABUS</b>   |   |    |    |   |   |     |     |                 |
| Student can choose any one of the given below / any other socially relevant problem and work on it to produce a project document. |   |    |    |   |   |     |     |                 |
| 1.  | Water Conservation Related Works  |    |    |   |   |     |     |                 |
| 2.  | Swatch Bharath (Internal External)  |    |    |   |   |     |     |                 |
| 3.  | Helping police  |    |    |   |   |     |     |                 |
| 4.  | Traffic monitoring  |    |    |   |   |     |     |                 |
| 5.  | Teaching Rural Kids (Sarva siksha Abhiyan)  |    |    |   |   |     |     |                 |
| 6.  | Street light monitoring   |    |    |   |   |     |     |                 |
| 7.  | Electricity Conservation  |    |    |   |   |     |     |                 |
| 8.  | Solar panel utilization   |    |    |   |   |     |     |                 |
| 9.  | E- policing & cyber solution  |    |    |   |   |     |     |                 |
| 10.   | Pollution   |    |    |   |   |     |     |                 |
| 11.   | Any social related  |    |    |   |   |     |     |                 |

| Code   | Category  | L | T  | P  | C  | I.M | E.M | Exam            |
|--|---|---|----|----|----|-----|-----|-----------------|
| B19MC2201  | MC  | 3 | -- | -- | -- | --  | --  | --              |
| <b>ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE</b>                                   |   |   |    |    |    |     |     |                 |
| <b>(Common to CSE and IT)</b>  |   |   |    |    |    |     |     |                 |
| <b>Course Objectives:</b>  |   |   |    |    |    |     |     |                 |
| 1.   | To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of knowledge system   |   |    |    |    |     |     |                 |
| 2.   | To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003  |   |    |    |    |     |     |                 |
| 3.   | To focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection   |   |    |    |    |     |     |                 |
| 4.   | To know the student traditional knowledge in different sector   |   |    |    |    |     |     |                 |
| <b>Course Outcomes:</b> After completion of the course, students will be able to |   |   |    |    |    |     |     |                 |
| S.No   | Outcome   |   |    |    |    |     |     | Knowledge Level |
| 1.   | Understand the concept of Traditional knowledge and its importance  |   |    |    |    |     |     | K1 & K2         |
| 2.   | Know the need and importance of protecting traditional knowledge  |   |    |    |    |     |     | K2              |
| 3.   | Know the various enactments related to the protection of traditional knowledge  |   |    |    |    |     |     | K2              |
| 4.   | Understand the concepts of Intellectual property to protect the traditional knowledge   |   |    |    |    |     |     | K2              |
| <b>SYLLABUS</b>  |   |   |    |    |    |     |     |                 |
| <b>UNIT-I<br/>(8 Hrs)</b>  | <b>Introduction to traditional knowledge</b> -Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge |   |    |    |    |     |     |                 |
| <b>UNIT-II<br/>(8 Hrs)</b>   | <b>Protection of traditional knowledge</b> - Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.   |   |    |    |    |     |     |                 |
| <b>UNIT-III<br/>(8 Hrs)</b>  | <b>Legal frame work and TK</b> - A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);<br>B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.  |   |    |    |    |     |     |                 |
| <b>UNIT-IV<br/>(8 Hrs)</b>   | <b>Traditional knowledge and intellectual property</b> - Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.   |   |    |    |    |     |     |                 |

|                           |   |
|---------------------------|---|
| <b>UNIT-V<br/>(8 Hrs)</b> | <b>Traditional knowledge in different sectors:</b> Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. |
|                           |   |
| <b>Text Books:</b>        |   |
| 1                         | Traditional Knowledge System in India, by Amit Jha, 2009.   |
| 2                         | Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.   |
| <b>Reference Books:</b>   |   |
| 1                         | Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.  |
| 2                         | "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.  |