



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

COMPUTER SCIENCE AND ENGINEERING (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 CS 2101	Mathematical Foundations of Computer Science	PC	4	3	1	--	25	75	100
B19 CS 2102	Software Engineering	PC	3	3	--	--	25	75	100
B19 CS 2103	Object Oriented Programming	PC	3	3	--	--	25	75	100
B19 CS 2104	Advanced Data Structures	PC	3	3	--	--	25	75	100
B19 CS 2105	Computer Organization	PC	3	3	--	--	25	75	100
B19 CS 2106	Object Oriented Programming Lab	PC	1.5	--	--	3	20	30	50
B19CS 2107	Advanced Data Structures Lab	PC	1.5	--	--	3	20	30	50
B19MC 2101	Professional Ethics and Human Values	MC	0	3	--	--	--	--	--
TOTAL			19	18	1	6	165	435	600

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2101	PC	3	1	--	4	25	75	3 Hrs.

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Course Objectives: Students are expected to

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 Out Comes: At the end of the course students will be able to

S. No	OUT COME	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

UNIT-I (12 Hrs.)	<p>Mathematical Logic: 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. Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus..</p>
UNIT-II (10 Hrs.)	<p>Combinatorics: 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>
UNIT-III (12 Hrs)	<p>Relations and Algebraic Structures: Relations: Definition of Relation, Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams. Algebraic Structures: Algebraic Systems, Semi Groups, Monoids, Groups, and Abelian Group, Homomorphism of Semi Groups, Monoids and Groups.</p>

UNIT-IV (10 Hrs.)	Recurrence Relations : 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
UNIT-V (12 Hrs.)	Graph Theory: Basic Concepts of Graphs, Sub graphs, Isomorphism of Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite graphs, Planar Graphs, Euler's Formula. Trees: Definition of Tree, properties of Trees, Different tree structures, Binary trees, Spanning trees, Minimal Spanning Trees, Kruskal's and Prim's Algorithms.
Text Books:	
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 nd Edition, Prentice Hall of India
Reference Books:	
1.	Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D.P. Mahopatra, 3 rd Edition, Tata McGraw Hill.
2.	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7 th 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.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2102	PC	3	--	--	3	25	75	3 Hrs.

SOFTWARE ENGINEERING

Course Objectives:

1. To know the fundamental concepts of software engineering.
2. To know various process models in software engineering.
3. To implement different phases of software development process.
4. To plan and manage the development of a software projects.

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Understand the different software process models and their significance.	K2
2.	Distinguish various requirements gathering procedures and architectural views.	K4
3.	Analyze various aspects of the system such as functionality, object and user interface.	K4
4.	Identify the testing strategies for conventional and object oriented applications.	K3
5.	Plan and implement various software project management activities.	K3

SYLLABUS

UNIT-I (10 Hrs)	<p>Software and Software Engineering: The nature of Software, Software Engineering, Software process, Software Engineering Practice, Software myths</p> <p>Process models: A Generic Process model, Process assessment and improvement, Prescriptive Process models, Specialized process models, The Unified Process</p> <p>Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process</p>
UNIT-II (11 Hrs)	<p>Software Requirement analysis and Specification: Software Requirements, Problem analysis, Requirements specification, Functional specification with use cases, validation.</p> <p>Software Architecture: Role of Software Architecture, Architecture views, Component and Constructor views, Architecture styles for C&C Views.</p>
UNIT-III (12 Hrs)	<p>Function Oriented Design: Design Principles, Module level concepts, Design notation and specifications, structure design methodology</p> <p>Object Oriented Design: Object Oriented Analysis and design, Object Oriented Concepts, Design Concepts, UML, A Design methodology</p> <p>User Interface Design: Interface analysis, Interface design steps.</p>

UNIT-IV (10 Hrs)	Testing Conventional applications: Software testing fundamentals, Internal and external views of testing, White Box testing, Basis path testing, Control structure testing, Black-Box testing, Model based testing Testing Object Oriented Applications: Testing OOA and OOD models, Object Oriented Testing strategies, Object Oriented Testing Methods, Testing methods applicable at class level.
UNIT-V (9 Hrs)	Planning a Software Project: Process Planning, Effort Estimation, Project Scheduling and Staffing Software Configuration Management Plan, Quality Plan, Risk Management, Project Monitoring Plan
Text Books:	
1.	Software Engineering: A Practitioner’s approach, Roger S Pressman, 7th edition
2.	An integrated Approach to Software Engineering, Pankaj Jalote, 3rd edition
Reference Books:	
1.	Fundamentals of Software Engineering, Rajibmall, 3rd edition
2.	Software Engineering, Ian Sommerville, 9th edition.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2103	PC	3	--	--	3	25	75	3 Hrs.

OBJECT ORIENTED PROGRAMMING

Course Objectives:

1.	To provide a learner Object Oriented concepts and basics of the C++ programming.
2.	To Make learners to write reusable and maintainable code in C++.
3.	To provide Expertise in C++ File Manipulation, Generic Modules and Exception handling features.
4.	To demonstrate the basics of Java including exception handling.
5.	To illustrate Java programs for multiple threads and manipulation of data in files.

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Illustrate Object Oriented Concepts (OOP) through C++	K2
2.	Apply Inheritance and polymorphism in C++	K3
3.	Apply C++ Programming on File Manipulation, Generic modules and Exception handling	K3
4.	Illustrate JAVA Programming basics and features	K2
5.	Implement JAVA Programming on File and thread management.	K3

SYLLABUS

UNIT-I (10 Hrs)	<p>Basics of Object Oriented Programming: Object Oriented Paradigm, Principles of OOP, benefits of OOP, data types, declarations, expressions and operator precedence, functions, scope of variables.</p> <p>C++ Basics: Classes and objects, Constructors & Destructors, constructor with dynamic allocation, Friend function, Friend Classes, Inline Function, Default Arguments, operator Overloading through Unary, Binary, Assignment and Stream operators & type conversions, Nested Classes, Local Classes, Static class members, Array of objects.</p>
UNIT-II (10 Hrs)	<p>Inheritance and Manipulating Strings: Derived classes, making private members inheritable, Inheritance and its Types, Virtual base Class, Creating String Objects, Manipulating String Objects, Relational Operations, and Accessing String Characteristics.</p> <p>Polymorphism: Pointers, pointers to objects, this pointer, pointers to derived classes, references, abstract classes, virtual and pure virtual functions, Dynamic polymorphism, Virtual destructor, Virtual Base Class, Dynamic Allocation Operators.</p>

UNIT-III (10 Hrs)	Templates, Exception handling: Generic Functions, Generic Classes, Member function templates, using Default arguments with Template Classes, Exception Handling Fundamentals, catching class types, using multiple catch statements, Handling Derived class Exceptions. Streams and Files in C++: Stream Classes, Formatted and Unformatted I/O operations, managing output with manipulators, working with files, C-Based I/O Functions.
UNIT-IV (12 Hrs)	JAVA Basics: Introduction, Classes and Objects, Method Overloading, Method Overriding, Final Keyword, Inheritance, Abstract Classes and Interfaces, Arrays (1D & 2D), Strings (String Class and String Buffer Class) and Vectors Exception Handling and Packages: Exception types, usage of try, catch, throw, throws and finally keywords, built in exceptions and creating our own exception, Packages: Defining, creating, accessing a package, access protection of packages, importing packages and static import.
UNIT-V (10 Hrs)	Multi threading: Introduction on Thread, Life cycle of a Thread, Thread Priorities, Synchronization, Implementing the Runnable interface. Managing I/O files in Java: Stream Classes, Byte and Character Oriented Classes, Using File Classes, Handling primitive data types
Text Books:	
1.	The Complete Reference, C++, Herbert Schildt, TMH
2.	Object Oriented Programming C++, Joyce Farrell, Cengage Learning.
3.	Introduction to JAVA PROGRAMMING by Y. Daniel Liang (PHI)
4.	JAVA 9.0- Complete Reference: Herbert Schildt & F. Naughton.
Reference Books:	
1.	Object oriented Programming using C++: E. Balagurusamy, PHI.
2.	A complete Guide to programming in C++, Ulla Kirch-Prinz, Peter Prinz, Jones and Bartlett Publishers.
3.	Programming in C++, Ashok N Kamthane, and Pearson.
4.	C++ Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
5.	Programming with JAVA-A primer: E. Balagurusamy, PHI
6.	Java: How to Program, Paul J. Deitel, Dr. Harvey M. Deitel, Prentice Hall
7.	Java Fundamentals: a Comprehensive Introduction, Herbert Schildt, and Dale Skrien, TMH
8.	Java for Programming, P.J. Dietel Pearson Education.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2104	PC	3	--	--	3	25	75	3 Hrs.

ADVANCED DATA STRUCTURES

Course Objectives:

1.	To explore the knowledge of advanced data structures (Lists, trees and Heaps) and their implementations.
2.	To learn various Graph applications.
3.	To discuss various hashing techniques.
4.	To understand the concept of pattern matching.

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Identify an appropriate data Structure to solve the given problem.	K2
2.	Apply the knowledge of trees to construct various types of tree structures for the given data.	K3
3.	Apply Graph algorithms to solve network problems.	K3
4.	Identify an appropriate collision resolution technique to handle collisions.	K2
5.	Apply pattern matching algorithms to find the patterns in the given data.	K3

SYLLABUS

UNIT-I (13 Hrs)	<p>Linked Lists: Definition and storage organization of Linked List, Singly Linked List and its Operations (Insert first, Insert end, Insert at a given position, Traversing, Reverse, Counting number of nodes, Searching for a particular element, Sort the elements in the list). Doubly Linked Lists and its Operations, Circular Linked Lists and its Operations, Representing polynomials using linked lists, Polynomial Addition and Polynomial Multiplication.</p>
UNIT-II (12 Hrs)	<p>Trees and Priority Queues: Definition of General Tree, Tree Terminology, Binary Tree Representation and Types of Binary Trees, Threaded Binary Tree, Binary Search Tree and its Operations (Insert, Delete, Search, Tree Traversals, Finding Height of a tree, Count number of nodes in the given tree). Priority Queue definition, Types of Priority Queue, Binary Heap, Implementation of Min Priority Queue using Binary heap, Operations (Insertion into Min Heap, Deletion from Min Heap, Search for an element), Heap Sort.</p>
UNIT-III (12 Hrs)	<p>Advanced Trees: Balanced Search Trees, AVL tree properties, implementation and its operations, Construction of red Black Trees, Splay Trees and 2-3 Trees. m-ary Search Trees, B-Tree Construction and its Operations, B+ Tree Construction and its Operations. Data Structures for Strings: Tries and Compressed Tries, Suffix Trees and Suffix Arrays.</p>

UNIT-IV (11 Hrs)	Graphs Graph ADT, Definition and Graph Terminology, Representation of Graphs, Elementary Graph Operations(Create, Insertion, Deletion), Graph Traversals- Depth First Search(DFS) and Breadth First Search(BFS). Spanning Tree, Minimum cost Spanning Tree- Prim's Algorithm, Kruskal's Algorithm. Topological Sort, Applications of DFS for finding-Bi Connectivity, Euler Circuits and Strong Components.
UNIT-V (10 Hrs)	Hashing, External Sorting and Pattern Matching: Hashing, Hash Table Structure, Hash Function, Collision, Collision Resolution Techniques, Separate Chaining, Open Addressing or Closed Hashing, Rehashing, Extendible hashing. Differences between Internal Sorting and External Sorting, External Sorting Algorithms: Simple Algorithm, Multi way Merge. Pattern Matching, Naive Pattern Matching algorithm, Knuth-Morris-Pratt(KMP) algorithm, Rabin Karp algorithm.
Text Books:	
1.	Fundamentals of Data Structures in C, 2nd edition, Horowitz, Sahni and Anderson-Freed, Universities Press, 2008.
2.	Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.
3.	Data Structures and Algorithm Analysis in C – Mark Allen Weiss, Pearson Edu Publishers.
Reference Books:	
1.	Data Structures using C by Aaron M. Tenenbaum, Y. Langsam and M.J. Augenstein, Pearson Education, 2009.
2.	Data Structures with C by Seymour lipschutz, Schaum Outline series, 2010.
3.	Data Structures using C by R. KrishnaMoorthy G. IndiraniKumaravel, TMH, New Delhi,2008.
4.	Data Structures and Algorithms: Concepts, Techniques and Applications – G.A.V.Pai, Tata Mc Graw Hill Publishers
5.	Advanced Data Structures – Peter Brass, Cambridge University Press, 2008
Reference Links:	
1.	https://www.tutorialspoint.com/advanced_data_structures/index.asp
2.	https://www.youtube.com/channel/UC0KRqUAifQcloKi1yyYtsiw
3.	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
4.	https://www.geeksforgeeks.org/data-structures

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2105	PC	3	--	--	3	25	75	3 Hrs.
COMPUTER ORGANIZATION								
Course Objectives:								
1.	Learn basic building blocks of a computer and their organisation.							
2.	Design a basic computer.							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1.	Identify basic building blocks of a computer.							K2
2.	Design of computer functional blocks.							K3
3.	Identify the parameters that enhance system performance.							K2
SYLLABUS								
UNIT-I (8 Hrs)	Digital Computers and Arithmetic: Historical perspective and von Neumann computers, Memory and Peripheral devices. Fixed and floating-point representation of numbers, Addition and Subtraction, Multiplication and Division algorithms, Floating-point arithmetic operations.							
UNIT-II (10 Hrs)	Instruction Set Architectures: Stack Organization, Instruction Formats, Addressing Modes. Computer Instructions, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Instruction Cycle, Input-Output and Interrupt, Complete Computer Description.							
UNIT-III (9 Hrs)	Basic Computer Organization and Design: General Register Organization and Bus system, Timing and Control, Micro Operations and ALU, Design of Basic computer. Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.							
UNIT-IV (10 Hrs)	Memory and I/O Organization: Memory Accessing techniques, Memory Hierarchy, Cache Memory, and Virtual memory. I/O interface and data transfer, Modes of transfer, Priority interrupt, Direct memory access and IOP.							
UNIT-V (8 Hrs)	Parallel Architectures: Parallel Processing, Pipelining, Arithmetic and Instruction Pipelines, RISC Pipeline, Vector Processing, Array Processors. Multiprocessors and Interconnection Networks, Symmetric multiprocessors, Cache coherence.							

Text Books:

1. Computer System Architecture, M. Morris Mano, Pearson India, Revised 3rd ed., 2017.

Reference Books:

1. Computer Organization and Architecture - Designing for Performance, William Stallings, Pearson, 9th ed., 2013
2. Essentials of Computer Organization and Architecture, Linda Null, Julia Lobur, NarosaPub., 3rd ed., 2003,
3. Computer Architecture and Organization, John. P. Hayes, 3rd ed., TMH, 1998
4. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Zvonko Vranesic, 5th ed., TMH, 2011
5. Computer Systems Organization & Architecture, John D. Carpinelli, Addison Wesley, 2001.
6. Computer Organization, Design, and Architecture, Sajjan G. Shiva, 4th ed., CRC Press, 2008.
7. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer-Verlag, 2003
8. Computer Architecture and organization: An Integrated Approach, Miles Murdocca and Vincent Heuring, Wiley, 2007.
9. Computer Organization and Architecture: Themes and Variations, Alan Clements, Cengage Learning, 2014.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2106	PC	--	--	3	1.5	20	30	3 Hrs.
OBJECT ORIENTED PROGRAMMING LAB								
Course Objectives:								
1.	To illustrate features of C++ programming including object orientation, exception handling and I/O features.							
2.	To demonstrate basic features, multi-threading and file manipulation in Java through applications.							
Course Outcomes								
S.No	Outcome							Knowledge Level
1.	Implement C++ programs for applying C++ object oriented features, File and exception handling. (K3)							K3
2.	Develop Java applications using basic features, multi-threading and file I/O.							K3
LIST OF EXPERIMENTS								
List of C++ Programs								
1.	Program that implements Stack operations using classes and objects.							
2.	Program for performing complex number addition using friend functions.							
3.	Program to implement Function Overloading.							
4.	Program to implement Constructor Overloading.							
5.	Program that illustrates how objects are destroyed							
6.	Program to overload increment and decrement operators using Unary Operator.							
7.	Program for complex number addition and subtraction using binary operator overloading(use member function and friend function).							
8.	Program to overload stream operators							
9.	Program for writing and reading a class object to a file							
10.	Program to perform string operations by overloading operators.							
11.	Program to implement get(), getline() member functions of Stream Input.							
12.	Program for copying one file to another file using streams							
13.	Program to implement single inheritance.							
14.	Program on hierarchical inheritance showing public, private and protected inheritances.							
15.	Program for computation of students results using hybrid inheritance.							
16.	Program implementing bubble-sort using function templates.							
17.	Program to find scalar product of two vectors using class templates.							
18.	Program to implement member function template.							
19.	Write a C++ program that illustrates how runtime polymorphism run is achieved using virtual functions.							
20.	Program to implement Stream Manipulators							
List of JAVA Programs								
1.	Program to implement Method overriding.							

2.	Program to implement Multiple Inheritance using Interfaces.
3.	Program on hierarchical inheritance..
4.	Program for Multiplication of TWO Matrices.
5.	Program to convert character array to string.
6.	Program to perform various vector operation
7.	Program to implement methods in a) String Comparison b) Searching Strings c) Modifying a Strings
8.	Program on packages.
9.	Program to import from various classes and methods from multiple packages
10.	Program for handling a) ArrayIndexOutOfBoundsException. b) Arithmetic Exception c) ClassNotFoundException d) NullPointerException e) IOException
.11.	Program for Custom Exception Creation.
12.	Program on multithreading showing how cpu time is shared among all threads.
13.	Program to implement Runnable Interface.
14.	Program to implement yield (), sleep(), stop() methods using Threads.
15.	Program to set Priorities for various Threads.
16.	Program to copy characters from one file to another file.
17.	Program to copy bytes from one file to another file.
18.	Program for WRAPPER Classes
Text Books:	
1.	The Complete Reference, C++, Herbert Schildt, TMH
2.	Object Oriented Programming C++, Joyce Farrell, Cengage Learning.
3.	Introduction to JAVA PROGRAMMING by Y. Daniel Liang (PHI)
4.	JAVA 9.0- Complete Reference: Herbert Schildt & F. Naughton.
Reference Books:	
1.	Object oriented Programming using C++: E. Balagurusamy, PHI.
2.	A complete Guide to programming in C++, Ulla Kirch-Prinz, Peter Prinz, Jones and Bartlett Publishers.
3.	Programming in C++, Ashok N Kamthane, and Pearson.
4.	C++ Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
5.	Programming with JAVA-A primer: E. Balagurusamy, PHI
6.	Java: How to Program, Paul J. Deitel, Dr. Harvey M. Deitel, Prentice Hall
7.	Java Fundamentals: a Comprehensive Introduction, Herbert Schildt, and Dale Skrien, TMH
8.	Java for Programming, P.J.Dietel Pearson Education.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2107	CS	--	--	3	1.5	20	30	3 Hrs.
ADVANCED DATA STRUCTURES LAB								
Course Objectives:								
1.	To develop skills to implement linked list, trees, graphs.							
2.	To gain experience with the implementation of basic Hash Tables and pattern matching algorithms.							
3.	To acquire comprehensive knowledge of advanced data structures and implement the same in different software applications.							
Course Outcomes								
S.No	Outcome							Knowledge Level
1.	Obtain linked list and Trees knowledge in practical applications using different languages.							K2
2.	Implement graph algorithms to solve various real time applications							K3
3.	Implement different Hash Tables and Pattern Matching Algorithms.							K3
LIST OF EXPERIMENTS								
1.	Implementation of singly linked list							
2.	Implementation of doubly linked list							
3.	Program to reverse the nodes in a circular linked list							
4.	Program to perform operations on two polynomials using linked list							
5.	Implement traversal techniques in binary tree							
6.	Beginning with an empty binary search tree, construct binary search tree by inserting the values in the order given. After constructing a binary tree - <ul style="list-style-type: none"> ● Insert new node ● Find number of nodes in longest path ● Minimum data value found in the tree ● Change a tree so that the roles of the left and right pointers are wrapped at every node. ● Search a value 							
7.	Write a program to perform the following operations <ul style="list-style-type: none"> ● Insertion into an AVL-tree ● Deletion from an AVL-tree 							
8.	Program to implement priority queue using Heap <ul style="list-style-type: none"> ● Inserting new element ● Deletion of minimum element 							
9.	Write a program to implement DFS and BFS traversals.							
10.	Write a program to find minimum spanning tree using Prim's Algorithm							
11.	Write a program to find minimum spanning tree using Kruskal's Algorithm							
12.	Write a program to implement topological sort							

13.	Write a program for creating an Open Addressing Hash Table with linear probing and quadratic probing.
14.	Write a program to implement Naive Pattern Matching algorithm
15.	Write a program to identify the desired patterns with Knuth-Morris-Pratt (KMP) algorithm
16.	Write a program to implement Rabin Karp pattern matching algorithm.
Reference Books :	
1.	Data Structures using C by Aaron M. Tenenbaum, Y. Langsam and M.J. Augenstein, Pearson Education, 2009.
2.	Data Structures with C by Seymour Lipschutz, Schaum Outline series, 2010.
3.	Data Structures using C by R. KrishnaMoorthy G. Indirani Kumaravel, TMH, New Delhi, 2008.
4.	Data Structures and Algorithms: Concepts, Techniques and Applications – G.A.V.Pai, Tata Mc Graw Hill Publishers
5.	Advanced Data Structures – Peter Brass, Cambridge University Press, 2008
Reference links :	
1.	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2.	http://cse01-iiith.vlabs.ac.in/List%20of%20experiments.html?domain=Computer%20Science

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC2101	MC	3	--	--	--	--	--	--
PROFESSIONAL ETHICS AND HUMAN VALUES								
(Common to CSE, IT & Mechanical)								
Course Objectives:								
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.							
Course Outcomes: Students will be able to:								Knowledge Level
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
SYLLABUS								
UNIT-I (8 Hrs)	Human Values: 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.							
UNIT-II (8 Hrs)	Engineering Ethics: 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.							
UNIT-III (8 Hrs)	Engineering as Social Experimentation: 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.							
UNIT-IV (8 Hrs)	Engineers Responsibility for Safety and Risk: 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).							

UNIT-V (8Hrs)	Global Issues: 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

COMPUTER SCIENCE AND ENGINEERING (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 CS 2201	Advanced Java Programming	PC	3	3	--	--	25	75	100
B19 CS 2202	Operating Systems	PC	3	3	--	--	25	75	100
B19 CS 2203	Data Base Management Systems	PC	3	3	--	--	25	75	100
B19 CS 2204	Design and Analysis of Algorithms	PC	3	3	--	--	25	75	100
B19 CS 2205	Advanced Java Programming Lab	PC	1.5	--	--	3	20	30	50
B19 CS 2206	UNIX Operating Systems Lab	PC	1	--	--	2	20	30	50
B19 CS 2207	Data Base Management Systems Lab	PC	1.5	--	--	3	20	30	50
B19 CS 2208	Socially Relevant Project (15Hr/Sem)	PR	1	--	--	2	20	30	50
B19 MC 2201	Essence of Indian Traditional Knowledge	MC	0	3	--	--	--	--	--
TOTAL			20	18	0	10	205	495	700

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

UNIT-I (12 Hrs)	<p>Descriptive statistics and methods for data science: 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>Correlation: Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient (without proofs).</p> <p>Regression Analysis: Regression Lines, Regression Coefficients and their properties (without proofs).</p> <p>Curve fitting: Method of least Squares, fitting of a Straight line, Fitting of a Parabola.</p>
UNIT-II (12 Hrs)	<p>Random Variables and Probability functions: Review of basic concepts of Probability (no questions will be set on review). 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>Mathematical Expectation: Mathematical Expectation of a Random Variable, Expected Value of function of a Random Variable, Addition Theorem and Multiplication Theorem of Expectation (without proofs), Statistical Measures like Mean, Variance, Moments and Covariance in terms of Expectations.</p> <p>Generating functions: Moment generating Function, Characteristic Function and Probability generating Function of a Random Variable.</p>
UNIT-III (12 Hrs)	<p>Discrete and Continuous Distributions:</p> <p>Discrete Distributions: Binomial distribution and Poisson distribution - Definition, Mean, Variance, moments, m.g.f., Characteristic function, p.g.f., Fitting of distributions.</p> <p>Continuous Distributions: 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>
UNIT-IV (12 Hrs)	<p>Sampling theory and Testing of Hypothesis:</p> <p>Sampling Theory: 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>Large Sample Theory: Test of significance of single sample proportion, Test of significance for difference of proportions.</p> <p>Small Sample Theory: 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>
UNIT-V (8 rs)	<p>Queuing Theory:</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 $\{M/M/1: \infty/FCFS\}$ Model and $\{M/M/1; N/FCFS\}$ Model.</p>
Text Books:	
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
Reference Books:	
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 th 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.
e-References:	
1.	http://www.swayam.gov.in

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2201	PC	3	--	--	3	25	75	3 Hrs.

ADVANCED JAVA PROGRAMMING

Course Objectives:

1. Learn about web based applications such as Applet and window based application such as AWT, SWING components.
2. Learn about Servlets concept related to real world scenarios.
3. Study about JSP and JDBC concepts related to real world scenarios.
4. Learn about network programming and applications development.

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Design and develop window based applications with AWT/SWING components.	K6
2.	Develop server side programs in the form of servlets.	K3
3.	Design and develop web based applications with database access using JSP and JDBC.	K6
4.	Develop client/server applications and TCP/IP socket programming.	K3

SYLLABUS

UNIT-I (8 Hrs)	<p>Applet Programming and Basic AWT Components: Introduction to Applet, Applet Life Cycle, Passing parameters to Applet. AWT: Basic AWT user interface controls: (Button, Checkbox, CheckboxGroup, Scrollbars, TextField, TextArea, Radiobutton and Listbox).</p>
UNIT-II (12 Hrs)	<p>Java Swings: Introduction to JSwings, Differences between AWT & Swings, Components and Containers, Exploring Swing (JFrame, JButtons, JTable, JPasswordField, JTabbedPane, JScrollPane, JTrees).</p> <p>Event-handling and Layout Managers: Handling events with classes and handling events by implementing interfaces, Organizing Windows with Layout Managers (Flow Layout, Border Layout, Card Layout, Grid Layout, GridBagLayout).</p>
UNIT-III (10 Hrs)	<p>SERVLETS: Introduction to Servlet, Servlet Life Cycle, Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, The Servlet API, The javax.servlet Package, Reading Servlet Parameters, The javax.servlet.http Package, Handling Client Request and Response, Handling Cookies, Session Tracking.</p>
UNIT-IV (14 Hrs)	<p>JSP: Introduction to JSP, JSP Elements(JSP Declaration, JSP Scripting, JSP Expression, JSP Comments), JSP Directives, implicit Objects, JSP Program for Database Access.</p>

	Database Access: Structure of JDBC, JDBC Drivers, JDBC Architecture, JDBC API (java.sql.package), Connecting to the Database, JAVA Database connection program for MS Access, Oracle, MySQL.
UNIT-V (8 Hrs)	Network Programming: The Networking Classes and Interfaces, InetAddress, TCP/IP Client Sockets, URLConnection, HttpURLConnection, TCP/IP Server Sockets, Datagram, Datagram Socket, DatagramPacket, Remote method invocation and MVC architecture.
Text Books:	
1.	The Complete Reference, Java Eleven Edition, Herbert Schildt, Oracle Press.
2.	Java Server Pages, Hans Bergstan, Oreilly, 3rd Edition, December 2003.
3.	Database Programming with JDBC and Java, George Reese, Second Edition, Published by O'Reilly & Associates.
Reference Books:	
1.	Programming with JAVA a Primer, Third Edition, E.Balagurusamy, Tata McGraw-Hill.
2.	Java server pages, Pekowsky, Pearson.
3.	Beginning Web Programming, Jon Duckett, Wrox, Wiley.
4.	Internet and Worldwide web- How to program, Dietel and Nieto, Pearson.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2202	PC	3	--	--	3	25	75	3 Hrs.
OPERATING SYSTEMS								
Course Objectives:								
1.	Understand basic and main components of Operating System and their working.							
2.	Study the operations performed by Operating System as a resource and process manager.							
3.	Understand and Analyze dead lock model characterization and its management.							
4.	Study different memory management process, models and techniques.							
5.	Understand and study the concepts of files, I/O & Security concepts and their working							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1.	Outline the OS evaluation, its structure, concepts and services.							K1
2.	Express process lifecycle, process scheduling, process synchronization and IPC.							K2
3.	Explain the deadlock model characterization, its detection, prevention and recovery.							K2
4.	Explain the memory hierarchy, allocation & de-allocation mechanism, virtual memory and segmentation concepts.							K2
5.	Learn about the file system design, I/O principles and disk management implementation.							K1
SYLLABUS								
UNIT-I (6 Hrs)	Evolution of OS, Overview of Operating Systems, Types of Operating Systems, Operating System Structures- Kernel, Shell, General Structure of MSDOS, Windows 2000, Linux., Operating System Services, System Calls, Virtual Machines, Introduction to Distributed Systems,							
UNIT-II (10 Hrs)	Processes: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication Threads: Overview, Multicore Programming, Multithreading Models CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling Process Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization, Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors							
UNIT-III (6 Hrs)	Dead lock system model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Deadlock Recover							
UNIT-IV (10 Hrs)	Logical versus Physical Address map, Swapping, contiguous memory allocation, segmentation, paging, structure of the page table, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files.							

UNIT-V (8 Hrs)	I/O Hardware, Application I/O Interface, File Concept, Access Methods, File-System Structure & Implementation, Disk Structure & Implementation, Disk Scheduling & Management Security & Protection: Principles of Protection, Domain of Protection, Access Matrix, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool Case Study of UNIX, MS-DOS and Windows
Text Books:	
1.	Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., Ninth Edition.
Reference Books:	
1.	Modern Operating Systems, Andrew S. Tanenbaum, 2nd edition, 1995, PHI.
2.	Operating Systems, William Stallings 5th Edition - PHI.
3.	Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Hill Co., 1998 edition.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2203	PC	3	--	--	3	25	75	3 Hrs.

DATA BASE MANAGEMENT SYSTEMS

Course Objectives:

1.	To Introduce basic concepts of DBMS and RDBMS.
2.	To Demonstrate database design using ER Diagrams.
3.	To Give good formal foundation on Relational model and Query Languages.
4.	To Introduce basic concepts of SQL and enhance the knowledge with additional topics.
5.	To Introduce basic concepts of storage strategies, Query Processing and Optimization
6.	To Demonstrate Normalization techniques for systematic database design
7.	To explore different techniques of Concurrency control and Crash Recovery.

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Describe the fundamental concepts of DBMS and RDBMS.	K2
2.	Design ER Models for simple application scenario.	K6
3.	Apply Relational Query Languages on Relations.	K3
4.	Apply SQL commands for defining, constructing and manipulating databases.	K3
5.	Apply normalization techniques to improve the database design.	K3
6.	Explain concurrency control and crash recovery techniques.	K2

SYLLABUS

UNIT-I (8 Hrs)	<p>Introduction: What is DBMS, Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators, History of Database Systems.</p> <p>ER Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Entity-Relationship Design Issues, Extended E-R Features.</p>
UNIT-II (10 Hrs)	<p>Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations.</p> <p>Relational Query Languages: The Relational Algebra, Tuple Relational Calculus, The Domain Relational Calculus</p>
UNIT-III (10 Hrs)	<p>SQL: Overview of the SQL, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Integrity Constraints, SQL Data Types and Schemas, Authorization, JDBC, ODBC, Embedded SQL, Functions and Procedures, Triggers.</p>

UNIT-IV (10 Hrs)	Storage strategies: Basics of Indexing and B+ trees, RAID Query processing and optimization: Measures of Query Cost, Transformation of Relational Expressions. Normalization: Introduction, Functional dependencies, Decomposition, First, Second, and third normal forms, Boyce/Codd normal form. Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form.
UNIT-V (10 Hrs)	Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions. Concurrency Control: Serializability and Recoverability, Two Phase Locking protocol, Dealing with Deadlocks and Timestamp Ordering Protocol. Crash Recovery: Shadow Paging, Log-based Recovery, The Log, The Write-Ahead Log Protocol, ARIES.
Text Books:	
1.	Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 6th Edition
2.	Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition.
Reference Books:	
1.	Fundamentals of Database Systems by RamezElmasri, Shamkant B. N avathe. 4th Edition.
2.	Database Systems: Design, Implementation, and Management, Carlos Coronel, Steven Morris and Peter Rob, Ninth Edition.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2204	PC	3	--	--	3	25	75	3 Hrs.

DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms design paradigms and data structures
4. Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Apply mathematical analysis methods to analyse the algorithm running times using asymptotic notations	K3
2.	Compare and understand how the choice of data structures impact the performance of various greedy algorithms	K4
3.	Design algorithms using advanced design techniques such as dynamic programming for various computationally intensive problems	K3
4.	Design algorithms using different paradigms like Divide and Conquer, Backtracking, Branch and Bound and explain the situations which call for usage of these paradigms	K3
5.	Infer lower bounds for common problems like searching, sorting, merging, selection, Understand the concepts of P, NP classes and String matching	K2

SYLLABUS

UNIT-I (14 Hrs)	<p>INTRODUCTION: Getting Started: Insertion sort, Analyzing algorithms, Designing algorithms, Growth of Functions: Asymptotic Notation, Standard notations and common functions, Master method for solving recurrences</p> <p>DIVIDE AND CONQUER: General method, Finding maximum and minimum, Merge sort, Quick sort, Performance Measurement, Selection Problem, A Worst-Case Optimal Algorithm, Strassen's matrix multiplication, Convex hull Problem- QuickHull Algorithm</p>
UNIT-II (10 Hrs)	<p>Sets and Disjoint set union, Union and Find Operations</p> <p>THE GREEDY METHOD: General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees- Prim's algorithm, Kruskal's algorithm, Optimal storage on tapes, Optimal merge patterns ,Huffman coding, Single source shortest paths.</p>
UNIT-III (13 Hrs)	<p>DYNAMIC PROGRAMMING: General method, Multistage graphs, All pairs shortest paths, Optimal binary search trees, String editing, 0/1Knapsack, The travelling salesperson problem</p>

UNIT-IV (10 Hrs)	BACKTRACKING: General method, 8-Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles BRANCH AND BOUND: The method, Least Cost(LC) Search, The15-puzzle problem, Control abstractions for LC-Search, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem: LC Branch and Bound, FIFO Branch-and-Bound, Travelling sales person problem : LC Branch and Bound
UNIT-V (8 Hrs)	LOWER BOUND THEORY: The method, Comparison trees, Ordered Searching, Sorting, Selection, Oracles and adversary arguments, Merging, Largest and Second largest NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, Nondeterministic Algorithms, The Classes NP-hard and NP-complete Modular Arithmetic.
Text Books:	
1.	Fundamentals of Computer Algorithms 2nd edition by Ellis Horowitz, Sartaj Sahni, S. Rajasekharan
2.	Introduction to Algorithms 3rd edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
Reference Books:	
1.	Introduction to the Design and Analysis of Algorithms, Anany Levitin, PEA, 3rd Edition.
2.	Foundations of Algorithms, R. Neapolitan and K. Naimipour, Jones and Bartlett, Student edition.
3.	Algorithm Design, John Kleinberg, Eva Tardos, 1st Edition, Pearson Education

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2205	PC	--	--	3	1.5	20	30	3 Hrs.

ADVANCED JAVA PROGRAMMING LAB

Course Objectives:

1.	To implement programs on Applets.
2.	To implement programs on Event Listeners, Layouts and create GUI using different types of Layouts.
3.	To implement programs on Swing component
4.	To create dynamic web pages using Servlets by establishing data base connection using JDBC
5.	To create dynamic web pages using JSP by establishing data base connection using JDBC
6.	To implement Networking Programs using Java

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Apply knowledge to improve exposure in applet programming and network programming.	K3
2.	Design and develop desktop/window based applications with different AWT and SWING components.	K6
3.	Design and develop web-based applications with database access using Servlets and JDBC.	K6
4.	Design and develop web-based applications with database access using JSP and JDBC.	K6

LIST OF EXPERIMENTS

CYCLE-1 Programs

1.	Write an applet program to Pass a parameters to Applet
2.	Write a java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes
3.	Write a java program to demonstrate the key event handlers.
4.	Write a java program to display the table using labels in grid layout and Flow layout.
5.	Write a program to implement an application using AWT Components
6.	Write a java program to implement JTree.
7.	Write a java program to implement JTabbedPane
8.	Write a java program to implement Jscrollpane
9.	Write a Servlet Program to insert data into the database.
10.	Write a Servlet Program to delete data from the database.
11.	Write a Servlet Program to update data into the database.
12.	Write a Servlet Program to retrieve data from the database.
13.	Write JSP Program to validate user name and password on server side?
14.	Write an online book purchase application using JSP. Consider a login validation page and one billing page for bill payment process. Assume any information if required.

15.	Write JSP Program for Database Access.
16.	Write a java program by using JDBC to execute a SQL query for a database and display the results.
17.	Write a java program to display the Header information of the given URL
18.	Write a java program to split the given URL.
19.	Implementing one-one chat Application without thread
20.	Write a java program for Datagram server and Client interaction as per given below. i). A program to create Datagram server to send a message to client. ii). A program to create Datagram client to receive the message sent by the server
	CYCLE-2
Each batch (only two members) should develop one project out of this list. Project has to develop by using HTML, CSS, JS, JSP, PHP and MYSQL	
1.	Design Airlines Ticket Reservation System
2.	Online Shopping
3.	Design Library Information system.
4.	Design Gram Panchayat Information system for House tax, water tax, wealth tax, Library tax collection, phone bill, Electricity bill collection.
5.	Design student information system portal which maintain attendance, marks etc.
6.	Design online examination system.
7.	Event management System.
8.	Car Rental System.
9.	Cinema Booking System.
10.	Hotel Management System
11.	Complaint management System.
12.	Online voting system.
13.	Student Result System.
14.	Car Comparison System Project
15.	Selling your old stuff.
16.	Aquaculture Updates
17.	Timesheet using PHP
18.	Online Help Desk using PHP
19.	Online marriage beuro system
20.	EAMCET web counseling
	Final copy of Documentation has to submit by the batch as following:
	1. Abstract
	2. Modules
	3. Software Requirement Specifications
	4. Database Connectivity
	5. Output
	6. Code

Reference Books:

1.	P. J. Deitel, H. M. Deitel, —Java for Programmers, Pearson Education, PHI, 4th Edition, 2007.
2.	P. Radha Krishna, —Object Oriented Programming through Java, Universities Press, 2nd Edition, 2007
3.	Bruce Eckel, —Thinking in Java, Pearson Education, 4th Edition, 2006.
4.	Sachin Malhotra, Saurabh Chaudhary, —Programming in Java, Oxford University Press, 5th Edition, 2010.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2206	PC	--	--	2	1	20	30	3 Hrs.
UNIX OPERATING SYSTEMS LAB								
Course Objectives:								
1.	To learn about UNIX/LINUX operating system, its intervals.							
2.	To learn system programming for UNIX/LINUX Operating System.							
3.	To understand UNIX/LINUX shell programming.							
4.	To understand resource management policies, mechanisms and their performance evaluation							
Course Outcomes								
S.No	Outcome							Knowledge Level
1.	The student practices UNIX commands, Vi editor, shell commands.							K1
2.	The student develops skill in writing C programs using system calls for process management; inter process communication and memory management aspects.							K2
3.	The student learns shell programming and develops skill for writing scripts for batch level tasks.							K2
LIST OF EXPERIMENTS								
Module-1:								
OS lab familiarization: Home Assignment on Unix commands, Vi editor								
1.	Simple C programs using command line arguments, system calls, library function calls, make utility							
2.	C programs using fork system call to create process and study parent, child process mechanism							
3.	C programs to create process chaining, spawning							
4.	C programs to handle errors using errno, perror() function							
5.	C programs to use pipe system call for inter process communication							
Module II								
Familiarization of Unix shell programming:								
1.	Simple shell programming exercises							
2.	Shell programming using decision making constructs							
3.	Shell programming using loop constructs							
4.	Shell programming for file and directory manipulation							
Module III								
1.	C programs to study process scheduling: FCFS, Shortest Job First, and Round Robin							
2.	C programs to study page replacement: FIFO, Optimal, and LRU page replacement							
3.	C programs to study deadlock avoidance and detection							
4.	C Programs to simulate free space management							

Reference Books:

1.	Unix concepts and applications by Sumitabha Das, TMH Publications.
2.	Unix programming by Stevens, Pearson Education.
3.	Shell programming by YashwanthKanetkar.
4.	Operating System Concepts by Silberschatz, and Peter Galvin

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2207	PC	--	--	3	1.5	20	30	3 Hrs.
DATA BASE MANAGEMENT SYSYTEMS LAB								
Course Objectives:								
1.	To introduce to a commercial DBMS such as ORACLE.							
2.	To learn and practice SQL commands for schema creation, data manipulation.							
3.	To learn and practice PL/SQL programming.							
4.	To learn database design stages for application development.							
Course Outcomes								
S.No	Outcome							Knowledge Level
1.	Write SQL commands for defining, constructing and manipulating databases.							K3
2.	Write PL/SQL programs.							K3
3.	Develop application for the given problem.							K6
LIST OF EXPERIMENTS								
Structured Query Language (SQL) used with the RDBMS including Features of two commercial RDBMS packages such as ORACLE, DB2, MS Access, MYSQL								
I.	SQL <ol style="list-style-type: none"> a. Query-structure b. DDL-create, alter, drop, rename and Truncate c. DML-select, insert, update, delete and lock d. DCL-grant and revoke e. TCL- Commit, save point, rollback and set transaction. f. Single line functions g. Set operations- union, intersection and except; h. Joins i. Aggregate Operations, group-by and having j. Nested sub-queries and views k. Indexes, Sequence and Synonyms l. Use of Forms and Reports 							
II.	PL/SQL <ol style="list-style-type: none"> a. Block structure, variables, operators, data types, control structures b. Cursors - Implicit and Explicit c. Exception handling- Predefined and user-defined d. Stored procedures and functions e. Triggers- Data manipulation triggers 							
III.	Some sample application development as a group project.							

Reference Books:

1.	Oracle Database 11g The Complete Reference, McGraw Hill Professional, 2008.
2.	Database Systems Using Oracle, Nilesh Shah, Pearson Education India, 2016.
3.	Introduction to SQL, Rick F Vander Lans, Fourth Edition, Pearson Education, 2007.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS2208	PR	--	--	2	1	20	30	3 Hrs.
SOCIALLY RELEVANT PROJECT								
Course Objectives:								
1.	The aim of Socially Relevant Project is to encourage students							
2.	To express their ideas, to solve real-world problems and to complete projects							
3.	Using human experience to gather ideas from a wide range of problems in society by observation or pooling information							
4.	Using scientific, social-scientific, humanistic, cultural reasoning to analyze global problems							
Course Outcomes								
S.No	Outcome							Knowledge Level
1.	Use scientific reasoning to gather, evaluate, and interpret ideas							K3
2.	Analyze and design solutions to solve the ideas							K6
3.	Use one or more creative tools to complete the projects							K2
LIST OF EXPERIMENTS								
The 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	--	--	--	--	--	--
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE								
(Common to CSE & IT)								
Course Objectives:								
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							
Course Outcomes: 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
SYLLABUS								
UNIT-I (8 Hrs)	Introduction to traditional knowledge -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							
UNIT-II (8 Hrs)	Protection of traditional knowledge - 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.							
UNIT-III (8 Hrs)	Legal frame work and TK - 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); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.							
UNIT-IV (8 Hrs)	Traditional knowledge and intellectual property - 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.							

UNIT-V (8 Hrs)	Traditional knowledge in different sectors: 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.
Text Books:	
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.
Reference Books:	
1	Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2	"Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.