Branch: Information Technology	**Year: III**	**Semester: ODD 2020-21**
Subject Code: KCS501	**Subject Name: Data Base Management Systems**	
Course Outcomes	Apply knowledge of database for real life applications.	
	Apply query processing techniques to automate the real time problems of databases.	
	Identify and solve the redundancy problem in database tables using normalization.	
	Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.	
	Design, develop and implement a small database project using database tools.	
Syllabus: As per AKTU		
Unit-I	Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	
Unit-II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in	

	SQL/PL SQL
Unit-III	Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design
Unit-IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.
Unit-V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle

Galgotias College of Engineering and Technology
Department of Information Technology,

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KIT501	**Subject Name: Web Technology**	
Course Outcomes	Apply the knowledge of the internet and related internet concepts that are vital in understanding web application development and analyze the insights of internet programming to implement complete application over the web.	
	Understand, analyze and apply the role of markup languages like HTML, DHTML, and XML in the workings of the web and web applications.	
	Use web application development software tools i.e., XML, Apache Tomcat etc. and identifies the environments currently available on the market to design web sites.	
	Understand, analyze and build dynamic web pages using client-side programming JavaScript and also develop the web application using servlet and JSP.	
	Understand the impact of web designing by database connectivity with JDBC in the current market place where everyone uses to prefer electronic medium for shopping, commerce, fund transfer and even social life also.	
Syllabus: As per AKTU		
Unit-I	Introduction: Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	
Unit-II	Web Page Designing: HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	
Unit-III	Scripting: Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX. Networking: Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.	
Unit-IV	Enterprise Java Bean: Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	

Unit-V	Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session. Java Server Pages (JSP): Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries.

Galgotias College of Engineering and Technology
Department of Information Technology,

<table>
<tr><td colspan="2">Branch: Information Technology</td><td colspan="2">Year: III</td><td>Semester: ODD 2020-21</td></tr>
<tr><td colspan="2">Subject Code: KCS503</td><td colspan="3">Subject Name: Design and Analysis of Algorithm</td></tr>
<tr><td colspan="2" rowspan="5">Course Outcomes</td><td colspan="3">Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands</td></tr>
<tr><td colspan="3">Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).</td></tr>
<tr><td colspan="3">Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.</td></tr>
<tr><td colspan="3">Apply classical sorting, searching, optimization and graph algorithms.</td></tr>
<tr><td colspan="3">Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.</td></tr>
<tr><td colspan="5">Syllabus: As per AKTU</td></tr>
<tr><td>Unit-I</td><td colspan="4">Introduction: Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.</td></tr>
<tr><td>Unit-II</td><td colspan="4">Advanced Data Structures: Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List</td></tr>
<tr><td>Unit-III</td><td colspan="4">Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching.
Greedy Methods with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim’s and Kruskal’s Algorithms, Single Source Shortest Paths - Dijkstra’s and Bellman Ford Algorithms.</td></tr>
<tr><td>Unit-IV</td><td colspan="4">Dynamic Programming with Examples Such as Knapsack. All Pair Shortest Paths – Warshal’s and Floyd’s Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.</td></tr>
<tr><td>Unit-V</td><td colspan="4">Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP Completeness, Approximation Algorithms and Randomized Algorithms</td></tr>
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Galgotias College of Engineering and Technology
Department of Information Technology,

<table>
<tr><td colspan="2">Branch: Information Technology</td><td>Year: III</td><td>Semester: ODD 2020-21</td></tr>
<tr><td colspan="2">Subject Code: KIT051</td><td colspan="2">Subject Name: Statistical Computing</td></tr>
<tr><td colspan="2" rowspan="5">Course Outcomes</td><td colspan="2">Understand and apply the probability distributions, random number generation and density estimations to perform analysis of various kinds of data</td></tr>
<tr><td colspan="2">Understand and manipulate data, design and perform simple Monte Carlo experiments, and be able to use resampling methods</td></tr>
<tr><td colspan="2">Perform statistical analysis on variety of data</td></tr>
<tr><td colspan="2">Perform appropriate statistical tests using R and visualize the outcome</td></tr>
<tr><td colspan="2">Discuss the results obtained from their analyses after creating customized graphical and numerical summaries</td></tr>
<tr><td colspan="4">Syllabus: As per AKTU</td></tr>
<tr><td>Unit-I</td><td colspan="3">Descriptive Statistics: Diagrammatic representation of data, measures of central tendency, measures of dispersion, measures of skewness and kurtosis, correlation, inference procedure for correlation coefficient, bivariate correlation, multiple correlations, linear regression and its inference procedure, multiple regression.
Probability: Measures of probability, conditional probability, independent event, Bayes’ theorem, random variable, discrete and continuous probability distributions, expectation and variance, markov inequality, chebyshev’s inequality, central limit theorem.</td></tr>
<tr><td>Unit-II</td><td colspan="3">Inferential Statistics: Sampling & Confidence Interval, Inference & Significance. Estimation and Hypothesis Testing, Goodness of fit, Test of Independence, Permutations and Randomization Test, ttest/z-test (one sample, independent, paired), ANOVA, chi-square.
Linear Methods for Regression Analysis: multiple regression analysis, orthogonalization by Householder transformations (QR); singular value decomposition (SVD); linear dimension reduction using principal component analysis (PCA).</td></tr>
<tr><td>Unit-III</td><td colspan="3">Pseudo-Random Numbers: Random number generation, Inverse-transform, acceptance-rejection, transformations, multivariate probability calculations.
Monte Carlo Integration: Simulation and Monte Carlo integration, variance reduction, Monte Carlo hypothesis testing, antithetic variables/control variates, importance sampling, stratified sampling Markov chain Monte Carlo (McMC): Markov chains; Metropolis-Hastings algorithm; Gibbs sampling; convergence</td></tr>
<tr><td>Unit-IV</td><td colspan="3">Resampling Methods: Cross-validation, Bootstrapping, Jackknife resampling, percentile confidence intervals, permutation tests.
Density Estimation: Univariate density estimation, kernel smoothing, multivariate density estimation.</td></tr>
</table>

	Numerical Methods: Root finding; more on numerical integration; numerical maximization/minimization; constrained and unconstrained optimization; EM (Expectation Maximization) algorithm; simplex algorithm
Unit-V	Introduction to R programming: History of R programming, starting and ending R, R as a scientific calculator, handling package, workspace, inspecting variables, operators and expressions in R, data objects and types, vectors, matrices and arrays, lists and data frames, built-in and user-defined functions, strings and factors, flow control and loops, advanced looping, date and times. Using R for statistical analysis: Importing data files, exporting data, outputting results, exporting graphs, graphics in R, interactively adding information of plot, performing data analysis tasks. R commands for descriptive statistics, data aggregation, representation of multivariate data, code factorization and optimization, statistical libraries in R.

<table>
<tr><td colspan="2">Branch: Information Technology</td><td>Year: III</td><td>Semester: EVEN 2020-21</td></tr>
<tr><td colspan="2">Subject Code: KIT052</td><td colspan="2">Subject Name: Compiler Design</td></tr>
<tr><td colspan="2" rowspan="5">Course Outcomes</td><td colspan="2">Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.</td></tr>
<tr><td colspan="2">Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.</td></tr>
<tr><td colspan="2">Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.</td></tr>
<tr><td colspan="2">Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.</td></tr>
<tr><td colspan="2">Understand the target machine’s run time environment, its instruction set for code generation and techniques used for code optimization.</td></tr>
<tr><td colspan="4">Syllabus: As per AKTU</td></tr>
<tr><td>Unit-I</td><td colspan="3">Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.</td></tr>
<tr><td>Unit-II</td><td colspan="3">Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.</td></tr>
<tr><td>Unit-III</td><td colspan="3">Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntaxdirected Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean</td></tr>
</table>

	expressions, statements that alter the flow of control, postfix translation, translation with a top-down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.
Unit-IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.
Unit-V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Branch: Information Technology	**Year: III**	**Semester: ODD 2020-21**
Subject Code: KCS055	**Subject Name: Machine Learning Techniques**	
Course Outcomes	To understand the need for machine learning for various problem solving.	
	To understand a wide variety of learning algorithms and how to evaluate models generated from data.	
	To understand the latest trends in machine learning.	
	To design appropriate machine learning algorithms and apply the algorithms to a real-world problem.	
	To optimize the models learned and report on the expected accuracy that can be achieved by applying the models.	
Syllabus: As per AKTU		
Unit-I	INTRODUCTION – Learning, Types of Learning, well defined learning problems, designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning.	
Unit-II	REGRESSION: Linear Regression and Logistic Regression BAYESIAN LEARNING - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. SUPPORT VECTOR MACHINE: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and Gaussian kernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.	
Unit-III	DECISION TREE LEARNING - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. INSTANCE-BASED LEARNING – k-Nearest Neighbor Learning, Locally Weighted Regression, Radial	

	basis function networks, Case-based learning.
Unit-IV	ARTIFICIAL NEURAL NETWORKS – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; DEEP LEARNING - Introduction, concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function, pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc.
Unit-V	REINFORCEMENT LEARNING–Introduction to Reinforcement Learning, Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process, Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning, Introduction to Deep Q Learning. GENETIC ALGORITHMS: Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications.

Branch: Information Technology	**Year: III**	**Semester: ODD 2020-21**
Subject Code: KCS056	**Subject Name: Application of Soft Computing**	
Course Outcomes	Recognize the feasibility of applying a soft computing methodology for a particular problem	
	Know the concepts and techniques of soft computing and foster their abilities in designing and implementing soft computing-based solutions for real-world and engineering problems.	
	Apply neural networks to pattern classification and regression problems and compare solutions by various soft computing approaches for a given problem.	
	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems	
	Apply genetic algorithms to combinatorial optimization problems.	
Syllabus: As per AKTU		
Unit-I	Neural Networks-I (Introduction & Architecture): Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	
Unit-II	Neural Networks-II (Back propagation networks): Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting backpropagation training, applications.	
Unit-III	Fuzzy Logic-I (Introduction): Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	
Unit-IV	Fuzzy Logic –II (Fuzzy Membership, Rules): Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications & Defuzzification's, Fuzzy Controller, Industrial applications	
Unit-V	Genetic Algorithm (GA): Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	

Galgotias College of Engineering and Technology
Department of Information Technology,

<table>
<tr><td colspan="2">Branch: Information Technology</td><td>Year: III</td><td>Semester: ODD 2020-21</td></tr>
<tr><td colspan="2">Subject Code: KCS551</td><td colspan="2">Subject Name: Database Management System Lab</td></tr>
<tr><td colspan="2" rowspan="5">Course Outcomes</td><td colspan="2">Understand and apply oracle 11 g products for creating tables, views, indexes, sequences and other database objects.</td></tr>
<tr><td colspan="2">Design and implement a database schema for company data base, banking data base, library information system, payroll processing system, student information system.</td></tr>
<tr><td colspan="2">Write and execute simple and complex queries using DDL, DML, DCL and TCL.</td></tr>
<tr><td colspan="2">Write and execute PL/SQL blocks, procedure functions, packages and triggers, cursors.</td></tr>
<tr><td colspan="2">Enforce entity integrity, referential integrity, key constraints, and domain constraints on database.</td></tr>
<tr><td colspan="4">Syllabus: As per AKTU</td></tr>
<tr><td>1</td><td colspan="3">Installing oracle/ MYSQL</td></tr>
<tr><td>2</td><td colspan="3">Creating Entity-Relationship Diagram using case tools.</td></tr>
<tr><td>3</td><td colspan="3">Writing SQL statements Using ORACLE /MYSQL:
a) Writing basic SQL SELECT statements.
b) Restricting and sorting data.
c) Displaying data from multiple tables.
d) Aggregating data using group function.
e) Manipulating data.
e) Creating and managing tables.</td></tr>
<tr><td>4</td><td colspan="3">Normalization</td></tr>
<tr><td>5</td><td colspan="3">Creating cursor</td></tr>
<tr><td>6</td><td colspan="3">Creating procedure and functions</td></tr>
<tr><td>7</td><td colspan="3">Creating packages and triggers</td></tr>
<tr><td>8</td><td colspan="3">Design and implementation of payroll processing system</td></tr>
<tr><td>9</td><td colspan="3">Design and implementation of Library Information System</td></tr>
<tr><td>10</td><td colspan="3">Design and implementation of Student Information System</td></tr>
<tr><td>11</td><td colspan="3">Automatic Backup of Files and Recovery of Files</td></tr>
</table>

Galgotias College of Engineering and Technology
Department of Information Technology,

Branch: Information Technology	**Year: III**	**Semester: ODD 2020-21**
Subject Code: KIT551	**Subject Name: Web Technology Lab**	
Course Outcomes	Understand fundamentals of web development and Java, including defining classes, invoking methods, using class libraries, Applet, AWT.	
	Understand, analyze and apply the role of scripts/languages like HTML, DHTML, CSS, XML, DOM, and SAX to solve real world problems.	
	Understand, analyze and design the role of JavaScript for dynamic web pages.	
	Design and deploy different components using EJB, and database tables using JDBC and produce various results based on given query.	
	Design and deploy a server-side java application called Servlet & JSP tools to catch form data sent from client, process it and store it on database.	

Syllabus: As per AKTU

1	Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2	Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
3	Write programs using Java script for Web Page to display browsers information.
4	Write a Java applet to display the Application Program screen i.e., calculator and other.
5	Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
6	Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, create on ODBC link, Compile & execute JAVA JDVC Socket.
7	Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed.
8	Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four-user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
9	Install a database (MySQL or Oracle). Create a table which should contain at least

	the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11	Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
12	Design and implement a simple shopping cart example with session tracking API.

Branch: Information Technology	**Year: III**	**Semester: ODD 2020-21**
Subject Code: KCS553	**Subject Name: Design and Analysis of Algorithm Lab**	
Course Outcomes	Understand and implement algorithm to solve problems by iterative approach.	
	Understand and implement algorithm to solve problems by divide and conquer approach.	
	Understand and implement algorithm to solve problems by Greedy algorithm approach.	
	Understand and analyze algorithm to solve problems by Dynamic programming, backtracking.	
	Understand and analyze the algorithm to solve problems by branch and bound approach.	

Syllabus: As per AKTU

1	Program for Recursive Binary & Linear Search.
2	Program for Heap Sort.
3	Program for Merge Sort.
4	Program for Selection Sort.
5	Program for Insertion Sort.
6	Program for Quick Sort.
7	Knapsack Problem using Greedy Solution
8	Perform Travelling Salesman Problem
9	Find Minimum Spanning Tree using Kruskal's Algorithm
10	Implement N Queen Problem using Backtracking
11	Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non-graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
12	Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non-graph sheet. The elements can be read from a file or can be

	generated using the random number generator. Demonstrate how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
13	Implement, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method
14	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
15	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
16	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
17	Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm. (b) Implement Travelling Sales Person problem using Dynamic programming.
18	Design and implement to find a subset of a given set S = {Sl, S2,….,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
19	Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KCS601	**Subject Name: Software Engineering**	
Course Outcomes	Explain various software characteristics and analyze different software Development Models	
	Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards	
	Compare and contrast various methods for software design.	
	Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing	
	Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis.	
Syllabus: As per AKTU		
Unit-I	Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	
Unit-II	Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	
Unit-III	Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	
Unit-IV	Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, TopDown and BottomUp Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test	

	Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.
Unit-V	Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KIT601	**Subject Name: Data Analytics**	
Course Outcomes	Discuss various concepts of data analytics pipeline	
	Apply classification and regression techniques	
	Explain and apply mining techniques on streaming data	
	Compare different clustering and frequent pattern mining algorithms	
	Describe the concept of R programming and implement analytics on Big data using R.	
Syllabus: As per AKTU		
Unit-I	Introduction to Data Analytics: Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.	
Unit-II	Data Analysis: Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalization, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.	
Unit-III	Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions.	
Unit-IV	Frequent Itemset and Clustering: Mining frequent item sets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	
Unit-V	Frame Works and Visualization: MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques,	

	interaction techniques, systems and applications. Introduction to R - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.

Galgotias College of Engineering and Technology
Department of Information Technology,

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KCS603	**Subject Name: Computer Networks**	
Course Outcomes	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission	
	Apply channel allocation, framing, error and flow control techniques.	
	Describe the functions of Network Layer i.e., Logical addressing, subnetting & Routing Mechanism.	
	Explain the different Transport Layer function i.e., Port addressing, Connection Management, Error control and Flow control mechanism	
	Explain the functions offered by session and presentation layer and their Implementation.	
	Explain the different protocols used at application layer i.e., HTTP, SNMP, SMTP, FTP, TELNET and VPN	
Syllabus: As per AKTU		
Unit-I	Introductory Concepts: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. Physical Layer: Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	
Unit-II	Link layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	
Unit-III	Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	
Unit-IV	Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	
Unit-V	Application Layer: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.	

Galgotias College of Engineering and Technology
Department of Information Technology,

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KIT062	**Subject Name: Blockchain Architecture Design**	
Course Outcomes	Describe the basic understanding of Blockchain architecture along with its primitive.	
	Explain the requirements for basic protocol along with scalability aspects.	
	Design and deploy the consensus process using frontend and backend.	
	Apply Blockchain techniques for different use cases like Finance, Trade/Supply and Government activities.	
Syllabus: As per AKTU		
Unit-I	Introduction to Blockchain: Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hash chain to Blockchain, Basic consensus mechanisms	
Unit-II	Consensus: Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols Permissioned Blockchains: Design goals, Consensus protocols for Permissioned Blockchains	
Unit-III	Hyperledger Fabric (A): Decomposing the consensus process, Hyperledger fabric components, Chain code Design and Implementation Hyperledger Fabric (B): Beyond Chain code: fabric SDK and Front End (b) Hyperledger composer tool	
Unit-IV	Use case 1: Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance Use case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc.	
Unit-V	Use case 3: Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain	

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KCS061	**Subject Name: Big Data**	
Course Outcomes	Demonstrate knowledge of Big Data Analytics concepts and its applications in business.	
	Demonstrate functions and components of Map Reduce Framework and HDFS.	
	Discuss Data Management concepts in NoSQL environment.	
	Explain process of developing Map Reduce based distributed processing applications.	
	Explain process of developing applications using HBASE, Hive, Pig etc.	
Syllabus: As per AKTU		
Unit-I	Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	
Unit-II	Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. Map Reduce: Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce	
Unit-III	HDFS (Hadoop Distributed File System): Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. Hadoop Environment: Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	
Unit-IV	Use case 1: Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance Use case 2: Blockchain in trade/supply chain: (i) Provenance of	

	goods, visibility, trade/supply chain finance, invoice management discounting, etc.Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. NoSQL Databases: Introduction to NoSQL MongoDB: Introduction, data types, creating, updating and deleing documents, querying, introduction to indexing, capped collections Spark: Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN SCALA: Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.
Unit-V	Hadoop Eco System Frameworks: Applications on Big Data using Pig, Hive and HBase Pig - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, Hive - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. HBase – HBase concepts, clients, example, HBase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, Big Insights and Big Sheets, introduction to Big SQL.

Galgotias College of Engineering and Technology
Department of Information Technology,

<table>
<tr><td colspan="2">Branch: Information Technology</td><td colspan="2">Year: III</td><td>Semester: EVEN 2020-21</td></tr>
<tr><td colspan="2">Subject Code: KCS651</td><td colspan="3">Subject Name: Software Engineering Lab</td></tr>
<tr><td colspan="2" rowspan="5">Course Outcomes</td><td colspan="3">Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement</td></tr>
<tr><td colspan="3">Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship</td></tr>
<tr><td colspan="3">Draw a class diagram after identifying classes and association among them</td></tr>
<tr><td colspan="3">Graphically represent various UML diagrams, and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially</td></tr>
<tr><td colspan="3">Able to use modern engineering tools for specification, design, implementation and testing</td></tr>
<tr><td colspan="5">Syllabus: As per AKTU</td></tr>
<tr><td>1</td><td colspan="4">Prepare a SRS document in line with the IEEE recommended standards.</td></tr>
<tr><td>2</td><td colspan="4">Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.</td></tr>
<tr><td>3</td><td colspan="4">Draw the activity diagram.</td></tr>
<tr><td>4</td><td colspan="4">Identify the classes. Classify them as weak and strong classes and draw the class diagram.</td></tr>
<tr><td>5</td><td colspan="4">Draw the sequence diagram for any two scenarios.</td></tr>
<tr><td>6</td><td colspan="4">Draw the collaboration diagram.</td></tr>
<tr><td>7</td><td colspan="4">Draw the state chart diagram.</td></tr>
<tr><td>8</td><td colspan="4">Draw the component diagram.</td></tr>
<tr><td>9</td><td colspan="4">Perform forward engineering in java. (Model to code conversion)</td></tr>
<tr><td>10</td><td colspan="4">Perform reverse engineering in java. (Code to Model conversion)</td></tr>
<tr><td>11</td><td colspan="4">Draw the deployment diagram.</td></tr>
</table>

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KIT 651	**Subject Name: Data Analytics Lab**	
Course Outcomes	Implement numerical and statistical analysis on various data sources	
	Apply data preprocessing and dimensionality reduction methods on raw data	
	Implement linear regression technique on numeric data for prediction	
	Execute clustering and association rule mining algorithms on different datasets	
	Implement and evaluate the performance of KNN algorithm on different datasets	

Syllabus: As per AKTU

1	To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in R.
2	To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in R
3	To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept in R.
4	To perform statistical operations (Mean, Median, Mode and Standard deviation) using R.
5	To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
6	To perform dimensionality reduction operation using PCA for Houses Data Set
7	To perform Simple Linear Regression with R.
8	To perform K-Means clustering operation and visualize for iris data set
9	Write R script to diagnose any disease using KNN classification and plot the results.
10	To perform market basket analysis using Association Rules (Apriori).

Branch: Information Technology	**Year: III**	**Semester: EVEN 2020-21**
Subject Code: KCS653	**Subject Name: Computer Networks Lab**	
Course Outcomes	Simulate different network topologies.	
	Implement various framing methods of Data Link Layer.	
	Implement various Error and flow control techniques.	
	Implement network routing and addressing techniques.	
	Implement transport and security mechanisms	

Syllabus: As per AKTU

1	Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2	Study of Socket Programming and Client – Server model
3	Write a code simulating ARP /RARP protocols.
4	Write a code simulating PING and TRACEROUTE commands
5	Create a socket for HTTP for web page upload and download.
6	Write a program to implement RPC (Remote Procedure Call)
7	Implementation of Subnetting
8	Applications using TCP Sockets like a. Echo client and echo server b. Chat c. File Transfer
9	Applications using TCP and UDP Sockets liked. DNS e. SNMP f. File Transfer
10	Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11	Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector
12	To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.

13	Configuration of router, hub, switch etc. (using real devices or simulators)
14	Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
15	Network packet analysis using tools like Wireshark, tcpdump, etc.
16	Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
17	Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)