



SRINIVASA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)

Approved by AICTE, New Delhi – Affiliated to JNTUA, Ananthapuramu Accredited by
NAAC with 'A' Grade

Chennai-Hyderabad Bypass Road, Ukkayapalli, Kadapa-516002

STRIVE FOR EXCELLENCE

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SEMESTER-I

S.No.	Course code	CourseName	Hoursperweek			Credits
			L	T	P	
1.	25MCA101	Mathematical Foundations of Computer Science	4	0	0	4
2.	25MCA102	Software Engineering	4	0	0	4
3.	25MC 103	Computer Organization & Architecture	4	0	0	4
4.	25MCA104	Data Structures	4	0	0	4
5.	25MCA105	Database Management Systems	4	0	0	4
7.	25MCA106	Software Engineering Laboratory	0	1	2	2
8.	25MCA107	Data Structures using C Laboratory	0	1	2	2
9.	25MCA108	Database Management Systems Laboratory	0	1	2	2
10	25MCA109	Research Methodology and IPR	2	0	0	2
		TOTAL	22	3	8	28

SEEMSTER-II

S.No.	Course code	CourseName	Hoursper			Credits
			L	T	P	
1.	25MCA201	OperatingSystems	4	0	0	4
2.	25MCA202	DataSciencewithPython	4	0	0	4
3.	25MCA203	ComputerNetworks	4	0	0	4
4.		Program Elective – I	4	0	0	3
	25MCA204a	SoftwareTestingMethodologies				
	25MCA204b	DataMiningandBusinessIntelligence				
	25MCA204c	ManagerialEconomicsandFinancialAccountancy				
5.		Open Elective – I	3	0	0	3
	25MCA205a	OperationsResearch				
	25MCA205b	Digital Marketing				
	25MCA205c	CloudComputing				
6.	25MCA206	OperatingSystemsLaboratory	0	1	2	2
7.	25MCA207	DataScienceLaboratory	0	1	2	2
8.	25MCA208	ComputerNetworksLaboratory	0	1	2	2
9.		Skill Oriented Course–I	1	0	2	2
	25MCA209	ExploratoryDataAnalyticswithPython				
10.	25MCA210	Seminar	0	0	4	2
		Total	20	3	10	28

SEMESTER– III

S.No.	Course code	CourseName	Hours per			Credits
			L	T	P	
1.	25MCA 301	WebTechnologies	4	0	0	4
2.	25MCA 302	BigDataTechnologies	4	0	0	4
3.	25MCA 303	DevOps& AgileProgramming	4	0	0	4
5.	25MCA 304a 25MCA 304b 25MCA 304c	ProgramElective – II SoftwareArchitecture&DesignPatterns Network Security MachineLearning	3	0	0	3
6.	25MCA 305a 25MCA 305b 25MCA 305c	ProgramElective– III MobileApplicationDevelopment Internet of things BlockchainTechnologies	3	0	0	3
7.	25MCA 306	WebTechnologiesLaboratory	0	1	2	2
8.	25MCA 307	BigDataTechnologiesLaboratory	0	1	2	2
9.	25MCA 308	DevOps&AgileProgrammingLaboratory	0	1	2	2
10.	25MCA 309	SummerInternship/IndustryOrientedMiniProject/ SkillDevelopmentCourse(Minimum6 weeks)	-	-	-	2
11.	25MCA 310	SkillorientedCourse–II MEANStackDevelopment	1	0	2	2
		TOTAL	18	4	8	28

SEMESTER-IV

S.No.	Course code	CourseName	Hours per			Credits
			L	T	P	
1.	25MCA 401a 25MCA 401b 25MCA 401c	ProgramElective–IV DeepLearning Social Media Analysis MultimediaSystemsandTools	3	0	0	3
2.	25MCA 402a 25MCA 402b 25MCA 402c	OpenElective–II Cyber Laws Entrepreneurship NoSQLDatabases	3	0	0	3
3.	25MCA 403	ProjectWork	0	0	20	10
4.	25MCA 404	ComprehensiveVivaVoce	-	-	-	2
		TOTAL	6		20	18

CourseCode	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
25MCA 101		4	0	0	4
Semester		I			
Course Objectives:					
- Introduce the elementary discrete mathematics for computer science and engineering. - Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions					
Course Outcomes (CO): Student will be able to					
- Demonstrate the ability to understand and construct precise mathematical proofs - Demonstrate the ability to use logic and set theory to formulate precise statements - Acquire the knowledge to analyse and solve counting problems on finite and discrete structures - Demonstrate the ability to describe and manipulate sequences - Demonstrate the ability to apply graph theory in solving computing problems					
UNIT – I		Lecture Hrs:			
The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.					
UNIT – II		Lecture Hrs:			
Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.					
UNIT - III		Lecture Hrs:			
Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness					
UNIT – IV		Lecture Hrs:			
Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance. Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.					
UNIT – V					
Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.					
TEXTBOOKS					
1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory - Kenneth H Rosen, 7 th Edition, TMH.					
REFERENCES					
- Discrete Mathematical Structures with Applications to Computer Science - J.P. Tremblay and R. Manohar, TMH, - Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Theodore P. Baker, 2nd ed., Pearson Education. - Discrete Mathematics - Richard Johnsonbaugh, 7th ed., Pearson Education. - Discrete Mathematics with Graph Theory - Edgar G. Goodaire, Michael M. Parmenter. - Discrete and Combinatorial Mathematics - an applied introduction: Ralph P. Grimald, 5th edition, Pearson Education.					

CourseCode	SOFTWAREENGINEERING		L	T	P	C
25MCA 102			4	0	0	4
Semester			I			
CourseObjectives:						
• To learn the basic concepts of software engineering and lifecycle models • To explore the issues in software requirements specification and enable to write SRS documents for software development problems • To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems • To understand the basic concepts of blackbox and whitebox software testing and enable to design test cases for unit, integration, and system testing • To reveal the basic concepts in software project management						
CourseOutcomes(CO): Student will be able to						
• Ability to apply software engineering principles and techniques. • Ability to develop, maintain and evaluate large-scale software systems. • To produce efficient, reliable, robust and cost-effective software solutions. • Ability to work as an effective member or leader of software engineering teams. • Ability to understand and meet ethical standards and legal responsibilities.						
UNIT-I			LectureHrs:			
Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.						
UNIT-II			LectureHrs:			
The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques. Axiomatic specification, algebraic specification.						
UNIT - III			LectureHrs:			
Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based Vs. Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.						
UNIT-IV			LectureHrs:			
Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.						
UNIT-V						
Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.						
TextBooks:						

1. RajibMall, “FundamentalsofSoftwareEngineering”, 5thEdition, PHI, 2018.
2. PressmanR, “SoftwareEngineering-PractionerApproach”, McGrawHill.



CourseCode	COMPUTER ORGANIZATION & ARCHITECTURE	L	T	P	C
25MCA 103		4	0	0	4
Semester		I			
Course Objectives:					
- Learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design - Understand the structure and behavior of various functional modules of a computer. - Discuss the techniques that computers use to communicate with I/O devices - Study the concepts of pipelining and the way it can speed up processing. - Describe the basic characteristics of multiprocessors					
Course Outcomes(CO): Student will be able to					
- Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os - Able to explore the hardware requirements for cache memory and virtual memory - Ability to design algorithms to exploit pipelining and multiprocessors - Ability to use memory and I/O devices effectively - Detect pipeline hazards and identify possible solutions to those hazards					
UNIT-I	Lecture Hrs:				
Basic Structure of Computer: Computer Types, Functional Units, Basic Operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer. Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations INTEL-8086: CPU Architecture, Addressing modes-generation of physical address-code segment registers, Zero, one, two, and three address instructions. INTEL 8086 ASSEMBLY LANGUAGE INSTRUCTIONS-Data transfer instructions, input-output instructions, arithmetic, logical, shift, and rotate instructions, Conditional and unconditional transfer.					
UNIT-II	Lecture Hrs:				
Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating- Point Numbers and Operations. Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Multi-programmed Control.					
UNIT - III	Lecture Hrs:				
The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.					
UNIT-IV	Lecture Hrs:				
Input/output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.					
UNIT-V					
Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets. Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General- Purpose multiprocessors, Interconnection Networks.					
TEXTBOOKS:					
1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, McGraw Hill Education, 5th Edition, 2013.					
2. Microprocessors and Interfacing, Douglas Hall, Tata McGraw-Hill.					

CourseCode	DATA STRUCTURES		L	T	P	C
25MCA 104			4	0	0	4
Semester			I			
CourseObjectives:						
- To illustrate the basic concepts of C programming language. - To discuss the concepts of Functions, Arrays, Pointers and Structures. - To familiarize with Stack, Queue and Linked lists data structures. - To explain the concepts of non-linear data structures like graphs and trees. - To learn the different types of searching and sorting techniques.						
CourseOutcomes(CO): Student will be able to						
- Use C basic concepts to write simple C programs - Explain the different notations of arithmetic expressions - Analyze various operations on linked list - Develop the representation of Trees - Design the different sorting techniques						
UNIT-I					LectureHrs:	
Introduction to C Language - C Language Elements, Variable Declarations and Data Types, Operators and Expressions, Decision Statements - If and Switch Statements, Loop Control Statements -while,for,do-while Statements. Introduction to Functions, Storage classes, Arrays, Structures, Unions, Pointers, Strings and Command line arguments.						
UNIT-II					LectureHrs:	
Data Structures, Stacks and Queues- Overview of Data Structure, Representation of a Stack, Stack Related Terms, Operations on a Stack, Implementation of a Stack, Evaluation of Arithmetic Expressions, Infix, Prefix, and Postfix Notations, Evaluation of Postfix Expression, Conversion of Expression from Infix to Postfix, Recursion, Queues- Various Positions of Queue, Representation of Queue, Insertion, Deletion, Searching Operations.						
UNIT - III					LectureHrs:	
Linked Lists-Pointers, Singly Linked List, Dynamically Linked Stacks and Queues, Polynomials Using Singly Linked Lists, Using Circularly Linked Lists, Insertion, Deletion and Searching Operations, Doubly linked lists and its operations, Circular linked lists and its operations.						
UNIT-IV					LectureHrs:	
Trees-Tree terminology, representation, Binary tree, representation, Binary tree traversals. Binary Tree Operations, Graphs-Graph terminology, Graph representation, Elementary Graph Operations, Breadth first search (BFS) and Depth first search (DFS), Connected Components, Spanning Trees.						
UNIT-V						
Searching and Sorting- Sequential, Binary, Exchange (Bubble) Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort. Searching- Linear and Binary Search Methods.						
TextBooks:						
- The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication. - Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Computer Science Press. - Programming in C and Data Structures, J.R. Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education. - B.A. Forouzan and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016. - Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.						

CourseCode	DATABASEMANAGEMENTSYSTEMS		L	T	P	C
25MCA 105			4	0	0	4
Semester			I			
CourseObjectives:						
• Traininthe fundamental concepts of databasemanagementsystems, database modeling and design, SQL, PL/SQL and system implementation techniques. • Enablestudentsto modelERdiagramforanycustomizedapplication • Inductingappropriatestrategiesforoptimizationofqueries. • Provideknowledgeonconcurrencytechniques • Demonstratetheorganizationof Databases						
CourseOutcomes(CO):Studentwillbeableto						
• Designadatabaseforarealworldinformationsystem • Definetransactionswhichpreservetheintegrityofthedatabase • Generatetablesfor adatabase • Organizethedatatopreventredundancy • Posequeries toretrieve theinformationfromdatabase						
UNIT-I			LectureHrs:			
Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators. Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Algebra						
UNIT-II			LectureHrs:			
Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Definition in SQL, Authorization. Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features.						
UNIT-III			LectureHrs:			
Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Complex Attributes, MappingCardinalities, PrimaryKey, RemovingRedundant Attributes inEntitySets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features, Entity- Relationship Design Issues, Alternative Notations for Modelling Data, Other Aspects of Database Design. RelationalDatabaseDesign: Features of Good Relational Designs, Decomposition Using Functional Dependencies, Normal Forms, Functional-DependencyTheory,AlgorithmsforDecompositionusingFunctionalDependencies, Decomposition Using Multivalued Dependencies, More Normal Forms, Atomic Domains and First Normal Form, Database-Design Process, Modelling Temporal Data, Indexing.						
UNIT-IV			LectureHrs:			
QueryProcessing:Overview,Measures ofQuerycost,SelectionOperation,Sorting,JoinOperation,Other Operations, Evaluation of Expressions, Query Processing in Memory. Queryoptimization:Overview,TransformationofRelationalExpressions,EstimatingStatisticsof ExpressionResults,ChoiceofEvaluationPlans,Materializedviews,AdvancedTopicsinQuery Optimization.						
UNIT-V						
TransactionManagement: Transactions:TransactionConcept,ASimpleTransactionalModel,StorageStructure,Transaction AtomicityandDurability,TransactionIsolation,Serializability,TransactionIsolationandAtomicity,						

Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Insert Operations. Delete Operations and Predicate Reads, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes, Snapshot Isolation, Weak Levels of Consistency in Practice, Advanced Topics in Concurrency. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-Volatile Storage, High Availability Using Remote Backup Systems, Early Lock Release and Logical Undo Operations, ARIES, Recovery in Main-Memory Databases.

TEXTBOOKS:

1. A. Silberschatz, H. F. Korth, S. Sudarshan, "Database System Concepts", 7/e, TMH 2020



CourseCode	SOFTWAREENGINEERINGLAB	L	T	P	C
25MCA 106		0	1	2	2
Semester		I			
CourseObjectives:					
To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.					
CourseOutcomes(CO):					
- Ability to translate end-user requirements into system and software requirements - Ability to generate a high-level design of the system from the software requirements - Will have experience and/or awareness of testing problems and will be able to develop a simple testing report					
List of Experiments:					
1) Development of problem statement. 2) Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents. 3) Preparation of Software Configuration Management and Risk Management related documents. 4) Study and usage of any Design phase CASE tool 5) Performing the Design by using any Design phase CASE tools. 6) Develop test cases for unit testing and integration testing 7) Develop test cases for various white box and black box testing techniques.					



CourseCode	DATASTRUCTURESUSINGCLABORATORY	L	T	P	C
25MCA 107		0	1	2	2
Semester		I			
CourseObjectives:					
- To get familiar with the basic concepts of C programming. - To design programs using arrays, strings, pointers and structures. - To illustrate the use of Stacks and Queues - To apply different operations on linked lists. - To demonstrate the Binary tree traversal techniques. - To design searching and sorting techniques					
CourseOutcomes(CO):					
- Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists. - Implement searching and sorting algorithms					
List of Experiments:					
Write C programs that use both recursive and non-recursive functions					
i) To find the factorial of a given integer.					
ii) To find the GCD (greatest common divisor) of two given integers.					
iii) To solve Towers of Hanoi problem.					
a) Write a C program to find both the largest and smallest number in a list of integers.					
b) Write a C program that uses functions to perform the following:					
i) Addition of Two Matrices ii) Multiplication of Two Matrices					
a) Write a C program that uses functions to perform the following operations:					
i) To insert a sub-string into a given main string from a given position.					
ii) To delete n Characters from a given position in a given string.					
a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.					
b) Write a C program to count the lines, words and characters in a given text.					
a) Write a C Program to perform various arithmetic operations on pointer variables.					
b) Write a C Program to demonstrate the following parameter passing mechanisms:					
i) call-by-value ii) call-by-reference.					
Write a C program that uses functions to perform the following operations:					
i) Reading a complex number					
ii) Writing a complex number					
iii) Addition of two complex numbers					
iv) Multiplication of two complex numbers (Note: represent complex number using a structure.)					
Write C programs that implement stack (its operations) using					

- i) Arrays
- ii) Pointers

Write C program that implement Queue (its operations) using

- i) Arrays
- ii) Pointers

Write a C program that uses Stack operation to perform the following:

- i) Converting infix expression into postfix expression
- ii) Evaluating the postfix expression

Write a C program that uses function to perform the following operations on singly linked list.

- i) Creation ii) Insertion iii) Deletion iv) Traversal

Write a C program that uses function to perform the following operations on Doubly linked list.

- i) Creation ii) Insertion iii) Deletion iv) Traversal

Write a C program that uses function to perform the following operations on Circular linked list.

- i) Creation ii) Insertion iii) Deletion iv) Traversal

Write a C program that uses function to perform the following:

- i) Creating a Binary Tree of integers
- ii) Traversing the above binary tree in preorder, inorder and postorder.

Write C program that use both recursive and non-recursive function to perform the following searching operations for a Key value in a given list of integers:

- i) Linear search
- ii) Binary search

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

- i) Bubblesort
- ii) Selectionsort

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

- i) Insertionsort
- ii) Merge sort
- iii) Quicksort

CourseCode	DATABASEMANAGEMENTSYSTEMS LABORATORY	L	T	P	C												
25MCA 108		0	1	2	2												
Semester		I															
CourseObjectives:																	
- ToimplementthebasicknowledgeofSQLqueriesandrelational algebra. - Toconstruct databasemodelsfordifferent databaseapplications. - Toapplynormalizationtechniquesforrefiningofdatabases. - Topracticevarioustriggers, procedures,andcursorsusing PL/SQL. - Todesignandimplementationofadatabaseforanorganization																	
CourseOutcomes(CO):																	
- Designdatabasefor anyrealworld problem - ImplementPL/SQLprograms - DefineSQLqueries - Decidetheconstraints - Investigatefordatainconsistency																	
ListofExperiments:																	
1. CreateatablecalledEmployeeewiththefollowingstructure.																	
<table><tr><td>Name</td><td>Type</td></tr><tr><td>Empno</td><td>Number</td></tr><tr><td>Ename</td><td>Varchar2(20)</td></tr><tr><td>Job</td><td>Varchar2(20)</td></tr><tr><td>Mgr</td><td>Number</td></tr><tr><td>Sal</td><td>Number</td></tr></table>						Name	Type	Empno	Number	Ename	Varchar2(20)	Job	Varchar2(20)	Mgr	Number	Sal	Number
Name	Type																
Empno	Number																
Ename	Varchar2(20)																
Job	Varchar2(20)																
Mgr	Number																
Sal	Number																
a. AddacolumncommissionwithdomaintotheEmployeeetable. b. Insert anyfiverecords intothetable. c. Updatethecolumnndetailsof job d. RenamethecolumnofEmploytableusingaltercommand. e. Deletetheemployeewhoseempnois19.																	
1. Createdepartmenttablewiththefollowingstructure.																	
<table><tr><td>Name</td><td>Type</td></tr><tr><td>Deptno</td><td>Number</td></tr></table>						Name	Type	Deptno	Number								
Name	Type																
Deptno	Number																

Deptname	Varchar2(20)
Location	Varchar2(20)

- Add column designation to the department table.
- Insert values into the table.
- List the records of emp table grouped by dept no.
- Update the record where dept no is 9.
- Delete any column data from the table

QUERIES USING DDL AND DML

- Create user and grant all permission to the user.
 - Insert the any three records in the employee table and user rollback. Check the result.
 - Add primary key constraint and not null constraint to the employee table.
 - Insert null values to the employee table and verify the result.
- Create user and grant all permission to the user.
 - Insert values in the department table and use commit.
 - Add constraints like unique and not null to the department table.
 - Insert repeated values and null values into the table.
- Create user and grant all permission to the user.
 - Insert values into the table and use commit.
 - Delete any three records in the department table and user rollback.
 - Add constraint primary key and foreign key to the table.
- Create user and grant all permission to the user.
 - Insert records in the sail table and use commit.
 - Add savepoint after insertion of records and verify savepoint.
 - Add constraints not null and primary key to the sail table.
- Create user and grant all permission to the user.
 - Use revoke command to remove user permissions.
 - Change password of the user created.
 - Add constraint foreign key and not null.
- Create user and grant all permission to the user.
 - Update the table reserves and use savepoint and rollback.
 - Add constraint primary key, foreign key and not null to the reserves table.
 - Delete constraint not null to the table column.

QUERIES USING AGGREGATE FUNCTIONS

- By using the group by clause, display the names who belongs to dept no 10 along with average salary.
 - Display lowest paid employee details under each department.
 - Display number of employees working in each department and their department number.
 - Using built-in functions, display number of employees working in each department and their department name from dept table. Insert dept name to dept table and insert dept name for each row, do the required thing specified above.
 - List all employees which start with either B or C.
 - Display only these ename of employees where the maximum salary is greater than or equal to 5000.
- Calculate the average salary for each different job.
 - Show the average salary of each job excluding manager.
 - Show the average salary for all departments employing more than three people.
 - Display employees who earn more than the lowest salary in department 30
 - Show that value returned by sign(n) function.

- f. How many days between day of birth to current date
3. a. Show that two substrings are single string.
- b. List all employee names, salary and 15% rise in salary.
- c. Display lowest paid emp details under each manager
- d. Display the average monthly salary bill for each dept no.
- e. Show the average salary for all departments employing more than two people.
- f. By using the group by clause, display the eid who belongs to dept no 05 along with average salary.
4. a. Count the number of employees in department 20
- b. Find the minimum salary earned by clerk.
- c. Find minimum, maximum, average salary of all employees.
- d. List the minimum and maximum salaries for each job type.
- e. List the employee names in descending order.
- f. List the employee id, names in ascending order by emp id.
5. a. Find the sids, names of sailors who have reserved all boats called "INTERLAKE"
Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
- b. Find the name, bid and reservation date for each reservation.
- c. Find the ages of sailors whose name begin and end with B and has at least 3 characters.
- d. List in alphabetical order all sailors who have reserved red boat.
- e. Find the age of youngest sailor for each rating level.
6. a. List the Vendors who have delivered products within 6 months.
- b. Display the Vendor details who have supplied both Assembled and Subparts.
- c. Display the Subparts by grouping the Vendor type (Local or NonLocal).

PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swap two numbers.
- b. Write a PL/SQL program to find the largest of three numbers.
2. a. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
- b. Write a PL/SQL program to find the sum of digits in a given number.
3. a. Write a PL/SQL program to display the number in reverse order.
- b. Write a PL/SQL program to check whether the given number is prime or not.
4. a. Write a PL/SQL program to find the factorial of a given number.
- b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius and area.
5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'hello' passed to the program it should display 'Hll' removing e and o from the word Hello).
- b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainder in words.

PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as a parameter and return Basic + HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a given year.
3. Create a function to find the factorial of a given number and hence find NCR.
4. Write a PL/SQL block to print prime Fibonacci series using local functions.
5. Create a procedure to find the lucky number of a given birthdate.
6. Create a function to return the reverse of a given number

PROCEDURES

1. Create the procedure for palindrome of given number.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD. If not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD is found.
3. Write the PL/SQL programs to create the procedure for factorial of given number.
4. Write the PL/SQL program to create the procedure to find sum of N natural number.
5. Write the PL/SQL program to create the procedure to find Fibonacci series.
6. Write the PL/SQL program to create the procedure to check the given number is perfect or not

CASE STUDY: BOOK PUBLISHING COMPANY

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications. A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with one editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA(Hons) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require prerequisite modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys wherever required.
5. Insert values into the tables created (Be vigilant about Master-Slave tables).
6. Display the Students who have taken M.Sc. course
7. Display the Module code and Number of Modules taught by each Lecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers 'English' module.

10. Retrieve the Prerequisite Courses offered by every Department (with Department names).
11. Present the Lecturer ID and Name who teaches 'Mathematics'.
12. Discover the number of years a Module is taught.
13. List out all the Faculties who work for 'Statistics' Department.
14. List out the number of Modules taught by each Module Leader.
15. List out the number of Modules taught by a particular Lecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and its name).
17. Update the credits of all the prerequisite courses to 5. Delete the Module 'History' from the Module table.



CourseCode	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2
25MCA 109					
Semester		I			
Course Objectives:					
- Identify an appropriate research problem in their interesting domain. - Understand ethical issues and the Preparation of a research project thesis report. - Understand the Preparation of a research project thesis report - Understand the law of patent and copyrights. - Understand the Adequate knowledge on IPR					
Course Outcomes (CO): Student will be able to					
- Analyze research related information - Follow research ethics - Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concept, and creativity. - Understanding that when IPR would take such an important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. - Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.					
UNIT - I		Lecture Hrs:			
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations					
UNIT - II		Lecture Hrs:			
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.					
UNIT - III		Lecture Hrs:			
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grant of patents, Patenting under PCT.					
UNIT - IV		Lecture Hrs:			
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.					
UNIT - V					
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.					
Text Books:					
- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students" - Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"					

CourseCode	OPERATINGSYSTEMS			L	T	P	C
25MCA 201				4	0	0	4
Semester				II			
CourseObjectives:							
- Understandbasicconceptsandfunctions ofoperatingsystems - Understandtheprocesses, threadsandschedulingalgorithms. - Providedgoodinsightonvariousmemorymanagementtechniques - Exposethestudentswithdifferenttechniquesofhandlingdeadlocks - Exploretheconcept offile-systemanditsimplementationissues - FamiliarizewiththebasicsofLinuxoperatingsystem - Implementvariousschemesforachievingssystemprotectionandsecurity							
CourseOutcomes(CO):Studentwillbeableto							
- Realizehowapplicationsinteractwiththeoperatingsystem - AnalyzethefunctioningofakernelinanOperatingssystem. - Summarizeresourcemanagementinoperatingsystems - Analyzevariousschedulingalgorithms - ExamineconcurrencymechanisminOperatingSystems							
UNIT - I					LectureHrs:		
OperatingSystemsOverview:Introduction,Operatingsystem functions,Operatingsystemsoperations, Computing environments, Open-Source Operating Systems SystemStructures:OperatingSystemServices,UserandOperating-SystemInterface,systemscalls, TypesofSystemCalls,systemprograms,OperatingsystemDesignandImplementation, Operating systemstructure,Operatingsystemdebugging, SystemBoot.							
UNIT - II					LectureHrs:		
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-processCommunication:Raceconditions,CriticalRegions,Mutualexclusionwithbusywaiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPCProblems - Dining philosophers problem, Readers and writers problem.							
UNIT - III					LectureHrs:		
Memory-ManagementStrategies:Introduction,Swapping,Contiguousmemoryallocation,Paging, Segmentation, Examples. VirtualMemoryManagement:Introduction,Demandpaging,Copyon-write,Pagereplacement,Frame allocation,Thrashing,Memory-mappedfiles,Kernelmemoryallocation,Examples.							
UNIT - IV					LectureHrs:		
Deadlocks:Resources,Conditionsforresourcedeadlocks,Ostrichalgorithm,DeadlockdetectionAnd recovery, Deadlock avoidance, Deadlock prevention. FileSystems:Files,Directories,Filesystemimplementation,managementandoptimization.Secondary- Storage Structure: Overview of disk structure, and attachment,Disk scheduling, RAID structure, Stablestorage implementation.							
UNIT - V							
SystemProtection:Goalsofprotection,Principlesanddomainofprotection,Accessmatrix,Access control, Revocation of access rights. SystemSecurity:Introduction,Programthreats,Systemandnetworkthreats,Cryptographyasa security, Userauthentication,implementingsecuritydefenses,firewallingtoprotectsystemsandnetworks.							

Computer security classification.
Case Studies: Linux, Microsoft Windows.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)



CourseCode	DATASCIENCEWITH PYTHON		L	T	P	C
25MCA 202			4	0	0	4
Semester			II			
CourseObjectives:						
Ideally for a student to understand Data Science, he/she should have exposure to the following. This will give a basic feel about Data Science. In the following, the topics highlighted in light blue is minimum needed and those highlighted in yellow will help to get a feel about the subject.						
Overallitcoversthefollowing:						
• Basicsofprobability • Basicsofstatistics • PatternRecognition • MachineLearning • IntroductiononDeepNeuralNetworks.						
CourseOutcomes(CO):Studentwillbeableto						
• Obtain, clean/process, andtransformdata • Analyzeandinterpretdata usinganethicallyresponsibleapproach • Use appropriate modelsof analysis, assessthe qualityof input, derive insightfrom results, and investigate potential issues • Applycomputingtheory, languages, andalgorithms, aswellasmathematicalandstatistical models, and the principles of optimization to appropriately formulate and use data analyses • Formulateanduseappropriatemodelsofdataanalysisistosolvehiddensolutionstobusiness- related challenges • Performwellinagroup						
UNIT-I			LectureHrs:			
Descriptive Statistics: Measures of central tendency—mean, median, mode, harmonic mean andgeometric mean; Measures of dispersion – mean deviation from mean, standard deviation and variance. Central moments. Linear and rank correlation. Covariance and correlation; Statistics and sampling distributions; Hypothesis testing of means, proportions, variances and correlations Definition of random variable and probability, (problems depending on counting –taught in MFCS), discrete probability distributions:Bernoulli,Binomial,Poisson;Continuousprobabilitydistributions:Gaussian,Exponential, Chisquare.DefinitionofBayesianprobability.						
UNIT - II			LectureHrs:			
ExploratoryDataAnalysis(EDA),DataSciencelifecycle,DescriptiveStatistics,Basictools(plots, graphs and summary statistics) of EDA, Philosophy of EDA.						
DataVisualization:Scatterplot,barchart,histogram,boxplot,heatmapsetc.						
UNIT - III			LectureHrs:			
Patterns, features, patterrepresentation, curseofdimensionality, dimensionalityreduction. Supervisedand Unsupervised learning. Classification—linear and non-linear. Bayesian, Perceptron, Nearest neighbour classifier, Support vector machine, use of kernels, Logistic regression, Naïve-bayes, decision trees and random forests; boosting and bagging. Clustering---partitional and hierarchical; k-means clustering. Regression. Leastsquares. Evaluationmetrics:RMSE,MAEandCoefficientofDetermination(R-square) Cost functions, training and testing a classifier. Cross-validation. Class-imbalance – ways of handling, Exploratorydataanalysis(EDA),evaluationmetrics—Precision,Recall,RoC,AUC;Confusionmatrix, Classificationaccuracy						
UNIT - IV			LectureHrs:			

Multilayer perceptron. Backpropagation. Loss functions. Epochs and Batch sizes. Hyperparameter tuning. Applications to classification, regression and unsupervised learning. Overview (introduction to the terms) of RNN, CNN and LSTM.

UNIT - V

Applications to text, images, videos: recommenders systems, image classification, Social network graphs

Textbooks:

- Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.
- Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
- Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
- Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.



CourseCode	COMPUTERNETWORKS		L	T	P	C
25MCA 203			4	0	0	4
Semester			II			
CourseObjectives:						
• Introduce the basic concepts of Computer Networks. • Introduce the layered approach for design of computer networks • Expose the network protocols used in Internet environment • Explain the format of headers of IP, TCP and UDP • Familiarize with the applications of Internet • Elucidate the design issues for a computer network						
CourseOutcomes(CO): Student will be able to						
• Identify the software and hardware components of a Computer network(L1) • Design software for a Computer network(L6) • Develop new routing, and congestion control algorithms(L3) • Critique the existing routing protocols(L5) • Explain the functionality of each layer of a computer network(L2) • Employ the appropriate transport protocol based on the application requirements(L3)						
UNIT-I						LectureHrs:
What is the Internet, The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and their Service Models, Networks under attack, History of Computer Networking and the Internet						
UNIT-II						LectureHrs:
Principles of Network Applications, The web and HTTP, File transfer: FTP, Electronic mail in the internet, DNS- The Internet's Directory Service, Peer-to-Peer Applications						
UNIT-III						LectureHrs:
Introduction and Transport-Layer Services, Multiplexing and De-multiplexing, Connectionless Transport: UDP, Principles of Reliable Data transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control						
UNIT-IV						LectureHrs:
Introduction, Virtual Circuit and Datagram Networks, The Internet Protocol(IP): Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing						
UNIT-V						
Introduction to the Link Layer, Error-Detection and Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Centre Networking, Retrospective: A Day in the Life of a Web Page Request						
TextBooks:						
1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.						

CourseCode	SOFTWARE TESTING METHODOLOGIES	L	T	P	C
25MCA 204a		4	0	0	3
Semester		II			
CourseObjectives:					
• Toprovideknowledge of theconcepts insoftwaretestingsuchastestingprocess, criteria,strategies, and methodologies. • Todevelopskillsinsoftwaretestautomationandmanagementusinglatest tools.					
CourseOutcomes(CO):Studentwillbeableto					
• Haveanabilitytoapplysoftwaretestingknowledgeandengineering methods. • Haveanabilitytodesignandconduct asoftwaretest process forasoftwaretestingproject. • Haveanabilitytoidentifytheneeds ofsoftwaretest automation, anddefineanddevelop a test tool to support test automation. • Havean ability understand and identify various softwaretesting problems, and solvethese problemsbydesigningandselectingsoftwaretest models,criteria,strategies,andmethods. • Haveanabilitytousevarious communicationmethods andskillstocommunicatewiththeir teammates to conduct their practice-oriented software testing projects					
UNIT - I		LectureHrs:			
Introduction:Purposeoftesting,Dichotomies,modelfortesting,consequencesofbugs,taxonomyof bugs FlowgraphsandPathtesting:Basicsconcepts ofpathtesting,predicates, pathpredicatesand Achievable paths, path sensitizing, path instrumentation, application of path testing..					
UNIT - II		LectureHrs:			
Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing:Basicsof dataflowtesting,strategiesindataflowtesting,applicationof dataflowtesting.DomainTesting: domains and paths, Nice & ugly domains, domain testing,domainsandinterfaces testing,domainandinterfacetesting,domainsandtestability					
UNIT - III		LectureHrs:			
Paths,PathproductsandRegular expressions:pathproducts&pathexpression,reductionprocedure, applications, regular expressions & flow anomaly detection. LogicBasedTesting:overview, decisiontables, pathexpressions, kvcharts,specifications.					
UNIT - IV		LectureHrs:			
State, StateGraphsandTransitiontesting:stategraphs,good& badstategraphs, statetesting, Testability tips.					
UNIT - V					
Graph Matrices and Application: Motivational overview,matrix of graph, relations, power of a matrix,nodereductionalgorithm,buildingtools.(StudentshouldbegivenanexposuretoatoollikeJMeteror Win-runner).					
TextBooks:					
1. SoftwareTestingtechniques-BarisBeizer,Dreamtech,secondedition. 2. SoftwareTestingTools—Dr.K.V. K.K.Prasad, Dreamtech.					

CourseCode	DATAMININGANDBUSINESSINTELLIGENCE		L	T	P	C
25MCA 204b			4	0	0	3
Semester			II			
CourseObjectives:						
Thestudentwilldefinetheimportanceofbusinessintelligenceby:						
- Describingkeybusinessintelligenceterms. - Determiningtherelevanceofdatatobusiness - Aligningbusinessintelligencetoorganizationalstrategy.						
CourseOutcomes(CO): Studentwillbeableto						
- Demonstrateanunderstandingoftheimportanceofdataminingandthe principlesofbusiness intelligence - OrganizeandPreparethedataneededfordataminingusingpreprocessingtechniques - Performexploratoryanalysisofthedatobeusedfor mining. - Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets. - Defineandapplymetricstomeasuretheperformanceofvariousdata miningalgorithms. - Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support.						
UNIT - I	Overview and concepts Data Warehousing and Business Intelligence				LectureHrs:	
Why reporting and Analysing data, Raw data to valuable information-Lifecycleof Data - What is Business Intelligence - BI and DW in today’s perspective - What is data warehousing - The building Blocks: Defining Features - Datawarehouses and data 1marts - Overview of the components - Metadata in thedata warehouse - Need for data warehousing - Basic elements of data warehousing-trendsindatawarehousing						
UNIT - II	TheArchitectureofBIand DW				LectureHrs:	
BIandDWarchitecturesanditstypes-RelationbetweenBIandDW-OLAP(Onlineanalytical processing)definitions-DifferencebetweenOLAPandOLTP-Dimensionalanalysis-Whatarecubes? Drill-down and roll-up - slice and dice orrotation - OLAPmodels- ROLAPversusMOLAP- defining schemas: Stars, snowflakes and fact constellations						
UNIT - III	Introductiontodata mining(DM)				LectureHrs:	
MotivationforDataMining-DataMining-DefinitionandFunctionalities-Classification ofDMSystems - DM task primitives - Integration of a Data Miningsystem witha Databaseor a Data Warehouse - Issues in DM – KDD Process						
UNIT - IV	DataPre-processing				LectureHrs:	
Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - NumerosityReduction-DataMiningPrimitives-LanguagesandSystemArchitectures:Taskrelevant data-KindofKnowledge tobemined-DiscretizationandConceptHierarchy.						
UNIT - V	ConceptDescriptionandAssociationRuleMining					
What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance-classcomparisonsAssociationRuleMining:Marketbasketanalysis-basicconcepts- Finding frequent itemsets: Apriori algorithm - generating rules – Improved Apriori algorithm – IncrementalARM – Associative Classification – Rule Mining						
TextBooks:						
1. J.Han,M.Kamber,“DataMiningConceptsandTechniques”,Morgan Kaufmann						
2. M.Kantardzic,“Datamining:Concepts,models,methodsandalgorithms,JohnWiley&SonsInc.						

3. Paulraj Ponnian, "Data Warehousing Fundamentals", John Wiley.
4. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
5. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XL Miner", Wiley India



CourseCode	MANAGERIALECONOMICSANDFINANCIAL	L	T	P	C
25MCA 204c	ACCOUNTANCY	4	0	0	3
Semester		II			
CourseObjectives:					
Toenablethestudent tounderstandandappreciate, witha practical insight, theimportanceof certain basicissues governingthebusiness operations namely: demandandsupply, productionfunction, cost analysis,markets,formsofbusinessorganizations,capitalbudgetingandfinancialaccountingand financialanalysis.					
CourseOutcomes(CO): Studentwillbeableto					
- Preparebalancesheetsofbudget. - Gettheskilltomanagefinancesofafirm/company					
UNIT - I		LectureHrs:			
.Introduction&DemandAnalysis Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of ElasticityofDemand.DemandForecasting,Factorsgoverningdemandforecasting,methodsofdemand forecasting.					
UNIT - II		LectureHrs:			
Production Function- Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts.Break-evenAnalysis(BEA)-Determination ofBreak-EvenPoint(simpleproblems)–Managerial Significance.					
UNIT - III		LectureHrs:			
Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Objectives and Policies of Pricing- Methods of Pricing: Cost Plus Pricing. Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing. Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.					
UNIT - IV		LectureHrs:			
Business&NewEconomicEnvironment:CharacteristicfeaturesofBusiness,Featuresandevaluationof SoleProprietorship,Partnership.JointStockCompany.PublicEnterprisesandtheirtypes,Changing Business Environment in Post-liberalization scenario.					
UNIT - V					
Introduction to Financial Accounting: Double-Entry Book Keeping, Journal. Ledger. Trial Balance- Final Accounts (Trading Account. Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysisisthrough ratios: Computation,Analysisand Interpretation of Liquidity Ratios(Current Ratio and quick ratio). Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio).					
TextBooks:					
1. Aryasri:ManagerialEconomicsandFinancialAnalysis,TMH,2009. 2. Varshney&Maheswari:ManagerialEconomics,SultanChand,2009.					

CourseCode	OPERATIONSRESEARCH		L	T	P	C
25MCA 205a			3	0	0	3
Semester			II			
Course Objectives:						
- To impart knowledge in concepts and tools of Operations Research - To understand mathematical models used in Operations Research - To apply these techniques constructively to make effective business decisions						
Course Outcomes (CO): Student will be able to						
- Solve Linear Programming Problems - Solve Transportation and Assignment Problems - Understand the usage of game theory and Simulation for Solving Business Problems						
UNIT-I					Lecture Hrs:	
Linear programming problems-Mathematical formulation, graphical method of solution, simplex method						
UNIT-II					Lecture Hrs:	
Duality in linear programming problems, dual simplex method, sensitivity analysis, transportation and assignment problems, Traveling salesman Problem.						
UNIT-III					Lecture Hrs:	
Game theory Introduction, two-person zero-sum games, some basic terms, the maxmin principle, games without saddle points-Mixed Strategies, graphic solution of $2 \times n$ and $m \times 2$ games, dominance property. CPM&PERT-projectscheduling, critical path calculations, Crashing.						
UNIT-IV					Lecture Hrs:	
Queuing theory-basic structure of queuing systems, roles of the Poisson and exponential distributions, classification of queues basic results of M/M/1: FIFO systems, Extension to multi-server queues.						
UNIT-V						
Simulation: simulation concepts, simulation of a queuing system using event list, pseudorandom numbers, multiplication congruential algorithm, inverse transformation method, basic ideas of Monte-Carlo simulation.						
Text Books:						

- Taha.H.A,operationResearch:AnIntroduction, McMilanpublishingCo., 1982. 7th ed. - RavindranA,PhilipsD.T&Solbery.J.J,OperationsResearch:Principlesand practice, John Wiley & Sons, New York, 1987. - Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of OperationsResearchforManagement.AllIndiaTravelerBookseller,Delhi. - Gillet.B.E.,IntroductiontoOperationsResearch-AComputeroriented algorithmic approach, McGraw Hill, 1987. - Joseph.G.Ecker&MichaelKupperSchimd,IntroductiontooperationsResearch, John Wiley & Sons, 1988. - Hillier.F.S&Liberman.G.J,operationResearch,SecondEdition,HoldenDay Inc, 1974. - KantiSwarup,Gupta.P.K.&ManMohan,operationsResearch,S.Chand&Sons.								
CourseCode	DIGITALMARKETING				L	T	P	C
25MCA 205b					3	0	0	3
Semester					II			
CourseObjectives:								
- Theprimaryobjectiveofthis moduleistoexamineand exploretheroleand importance of digital marketing in today’s rapidly changing business environment. - Italsofocuses onhowdigitalmarketingcanbeutilizedbyorganizationsandhowits effectiveness can measured.								
CourseOutcomes(CO): Studentwillbeableto								
- To examine and explore the role and importance of digital marketing in today’s rapidly changing business environment. - Tofocusesonhowdigitalmarketingcanbeutilizedbyorganizationsandhowitseffectiveness can measured. - To knowthekeyelementsofadigitalmarketingstrategy - Tostudyhowtheeffectiveness ofadigital marketingcampaigncanbemeasured - To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.								
UNIT - I					LectureHrs:			
OnlineMarketsspace-DigitalMarketingStrategy-Components-Opportunitiesfor buildingBrand- Website - Planning and Creation- Content Marketing.								
UNIT - II					LectureHrs:			
SearchEngineoptimisation-KeyWordStrategy-SEOStrategy-SEOsucccessfactors-On-Page Techniques-Off-PageTechniques.SearchEngineMarketing-HowSearchEngineworks-SEM components- PPC advertising -Display Advertisement								
UNIT - III					LectureHrs:			
E-MailMarketing-TypesofE-MailMarketing-EmailAutomation-LeadGeneration-Integrating EmailwithSocialMediaandMobile-Measuringandmaximisingemailcampaigneffectiveness.Mobile Marketing-MobileInventory/channels-Locationbased;Contextbased;Couponsandoffers,Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.								
UNIT - IV					LectureHrs:			
Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz.Successful/benchmarkSocialmediacampaigns.EngagementMarketing-BuildingCustomer relationships-CreatingLoyaltydrivers -InfluencerMarketing.								
UNIT - V								

.DigitalTransformation&Channel Attribution-Analytics-Ad-words,Email,Mobile,SocialMedia,Web Analytics-Changingyour strategybasedonanalysis- Recenttrends inDigitalmarketing.

TextBooks:

1. Fundamentals of DigitalMarketingbyPuneet SinghBhatiaPublisher:PearsonEducation; Firstedition(July 2017)
2. DigitalMarketingbyVandanaAhuja;Publisher:OxfordUniversityPress(April2015)



CourseCode	CLOUD COMPUTING			L	T	P	C
25MCA 205c				3	0	0	3
Semester				II			
CourseObjectives:							
• Tounderstandtheneed ofCloudComputing. • Todevelopcloudapplications. • Todemonstratedesignthearchitecturefornewcloudapplication. • Toteachhowtore-architecttheexistingapplicationforthecloud.							
CourseOutcomes(CO): Studentwillbeableto							
• OutlinetheprocedureforClouddeployment (L4) • Investigatedifferentcloudservicemodelsanddeployment models (L4) • Comparedifferentcloudservices. (L4) • Designapplicationsfor anorganizationwhichusecloudenvironment.(L6) • Understand the conceptand challenge of big data andwhy existing technology isinadequate to analyze the big data. (L2)							
UNIT-I				LectureHrs:			
Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications Cloudconcepts andTechnologies: Virtualization, Load balancing, ScalabilityandElasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing. CloudServicesandPlatforms:ComputeServices,StorageServices,DatabaseServices,Application services, Content delivery services, Analytics Services, Deployment and ManagementServices, Identity& and Access Management services, Open Source Private Cloud software							
UNIT-II				LectureHrs:			
Hadoop&MapReduce: Apache Hadoop, HadoopMapReduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup. CloudApplicationDesign:ReferenceArchitectureforCloudApplications,CloudApplicationDesign Methodologies, Data Storage Approaches. PythonBasics:Introduction,InstallingPython,PythondataTypes&DataStructures,Controlflow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.							
UNIT-III				LectureHrs:			
Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API. Cloud Application Development in Python: Design Approaches, Image Processing APP,Document Storage App, MapReduce App, Social Media Analytics App.							
UNIT-IV				LectureHrs:			
Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data, Recommendation of Systems. Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, caseStudy: Video Transcoding App. Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, DeploymentPrototyping,Load Testing &BottleneckDetection case Study,Hadoopbenchmarkingcase Study.							
UNIT-V				LectureHrs:			
CloudSecurity: Introduction,CSACloudSecurityArchitecture, Authentication,Authorization,Identity& Access Management, Data Security, Key Management, Auditing. CloudforIndustry,Healthcare&Education:CloudComputingforHealthcare,Cloudcomputingfor							

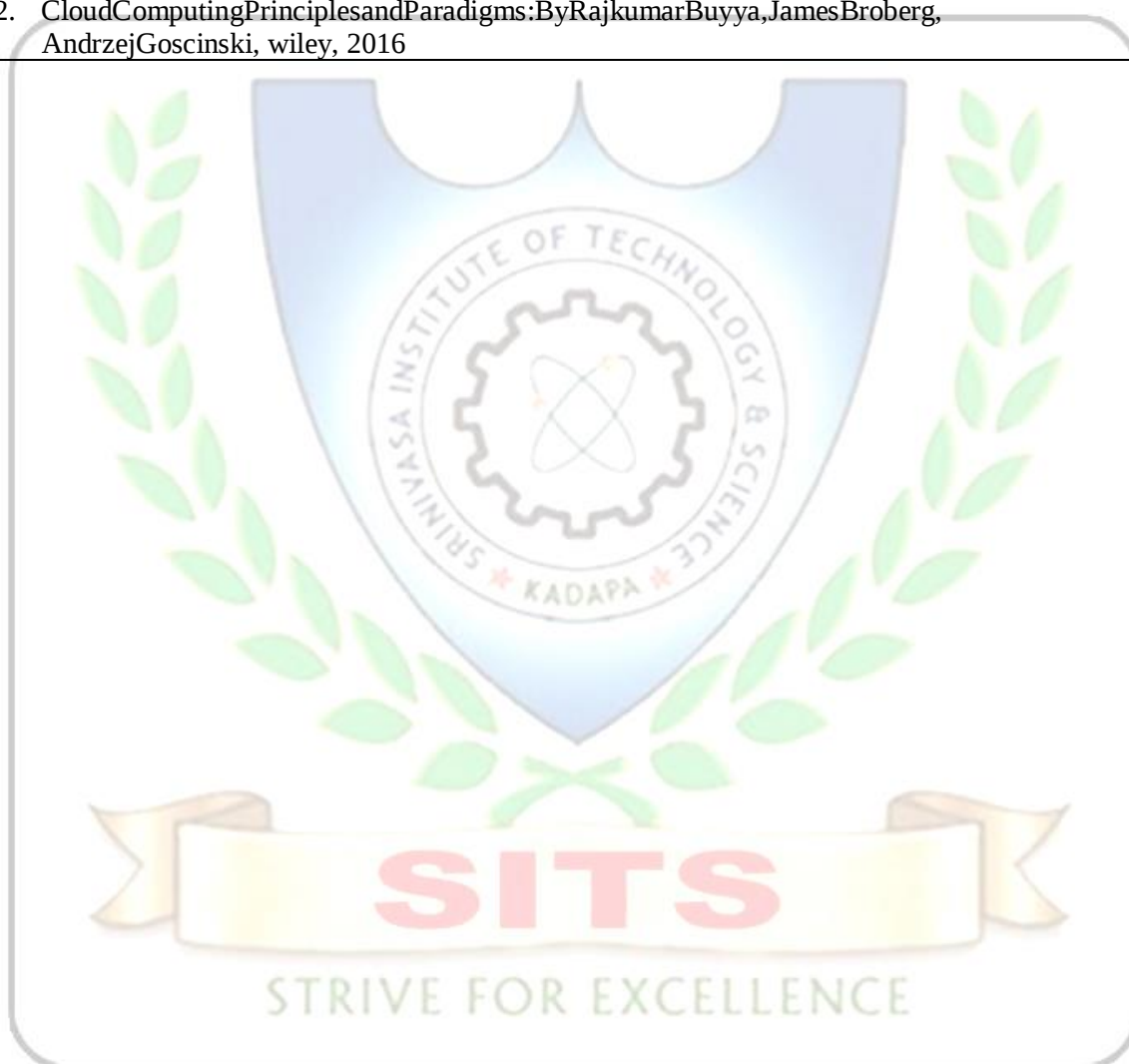
Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven-step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A framework to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Text Books:

1. Cloud computing A hands-on Approach | By Arshdeep Bahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016



CourseCode	OPERATING SYSTEMS LABORATORY	L	T	P	C
25MCA 206		0	0	4	2
Semester		II			
Course Objectives:					
• To understand the functionalities of various layers of OS model • To explain the difference between hardware, software; operating systems, programs and files. • Identify the purpose of different software applications.					
Course Outcomes (CO):					
• Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management. • Able to implement C programs using Unix system calls					
List of Experiments:					
Week 1: Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin d) Priority. Week 2: Write a C program to simulate producer-consumer problem using Semaphores Week 3: Write a C program to simulate the concept of Dining-philosophers problem. Week 4: Simulate MVT and MFT. Week 5: Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit. Week 6: Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL Week 7: Simulate all File Organization Techniques a) Single level directory b) Two level directory Week 8: Simulate all file allocation strategies a) Sequential b) Indexed c) Linked. Week 9: Simulate Bankers Algorithm for Dead Lock Avoidance. Week 10: Simulate Bankers Algorithm for Dead Lock Prevention. Week 11: Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN					



CourseCode	DATASCIENCELABORATORY	L	T	P	C
25MCA 207		0	1	2	2
Semester		II			
CourseObjectives:					
• To train the students in solving computational problems • To elucidate solving mathematical problems using Python programming language • To understand the fundamentals of Python programming concepts and its applications. • Practical understanding of building different types of models and their evaluation					
CourseOutcomes(CO):					
• Read, write, execute simple Python programs • Decompose a Python program into functions • Manipulate with 1-d, 2-d and multidimensional data using Python • Read and write data from/to files in Python programs					
List of Experiments:					
1. Write a program to demonstrate a) Different numeric data types and b) To perform different Arithmetic Operations on numbers in Python. 2. Write a program to create, append, and remove lists in Python. 3. Write a program to demonstrate working with tuples in Python. 4. Write a program to demonstrate working with dictionaries in Python. 5. Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy. 6. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data. 7. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file. 8. Write a program to demonstrate Regression analysis with residual plots on a given data set. 9. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 10. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 11. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions using Java/Python ML library classes. 12. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in CSV file. Compare the results of various “k” values for the quality of clustering. 13. Write a program to build Artificial Neural Network and test the same using appropriate data sets.					

STRIVE FOR EXCELLENCE

CourseCode	COMPUTER NETWORKS LABORATORY	L	T	P	C
25MCA 208		0	0	4	2
Semester		II			
Course Objectives:					
• To understand the working principle of various communication protocols. • To understand the network simulator environment and visualize a network topology and observe its performance • To analyze the traffic flow and the contents of protocol frames					
Course Outcomes (CO):					
• To understand the working principle of various communication protocols. • To understand the network simulator environment and visualize a network topology and observe its performance • To analyze the traffic flow and the contents of protocol frames					
List of Experiments:					
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing. 2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC-CCIP 3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism. 4. Implement Dijkstra's algorithm to compute the shortest path through a network 5. Take an example subnet of hosts and obtain a broadcast tree for the subnet. 6. Implement distance vector routing algorithm for obtaining routing tables at each node. 7. Implement data encryption and data decryption 8. Write a program for congestion control using Leaky bucket algorithm. 9. Write a program for frame sorting technique used in buffers. 10. Wireshark i. Packet Capture Using Wireshark ii. Starting Wireshark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters. 11. How to run Nmap scan 12. Operating System Detection using Nmap 13. Do the following using NS2 Simulator i. NS2 Simulator-Introduction ii. Simulate to Find the Number of Packets Dropped iii. Simulate to Find the Number of Packets Dropped by TCP/UDP iv. Simulate to Find the Number of Packets Dropped due to Congestion v. Simulate to Compare Data Rate & Throughput. vi. Simulate to Plot Congestion for Different Source/Destination vii. Simulate to Determine the Performance with respect to Transmission of Packets					

CourseCode	EXPLORATORY DATA ANALYTICS WITH PYTHON	L	T	P	C
25MCA 209		1	0	2	2
Semester		II			
Course Objectives:					
- This course is designed to teach students how to analyse different types of data using Python. - Students will learn how to prepare data for analysis, perform simple statistical analysis, create meaningful data visualizations and predict future trends from data.					
Course Outcomes (CO): Student will be able to					
- Understanding basics of python for performing data analysis - Understanding the data, performing preprocessing, processing and data visualization to get insights from data. - Used different python packages for mathematical, scientific applications and for web data analysis. - Develop the model for data analysis and evaluate the model performance.					
UNIT- I					Lecture Hrs:
Python Fundamentals for Data Analysis Python data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user-defined Modules and Package, File handling in python.					
UNIT- II					Lecture Hrs:
Introduction to Data Understanding and Preprocessing Knowledge domains of Data Analysis, Understanding structured and unstructured data, Data Analysis process, Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values.					
UNIT- III					Lecture Hrs:
Data Processing and Visualization Data Formatting, Exploratory Data Analysis, Filtering and hierarchical indexing using Pandas. Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps					
UNIT- IV					Lecture Hrs:
Mathematical and Scientific applications for Data Analysis Numpy and Scipy Package, Understanding and creating N-dimensional arrays, Basic indexing and slicing, Boolean indexing, Fancy indexing, Universal functions, Data processing using arrays, File input and output with arrays.					
UNIT- V					
Analysing Web Data wrangling, Web scrapping, Combining and merging datasets, Reshaping and pivoting, Data transformation, String Manipulation, case study for web scrapping					
Text Books:					
1. David Ascher and Mark Lutz, Learning Python, Publisher O'Reilly Media. 2. Reema Thareja, "Python Programming using Problem Solving approach", Oxford University press 3. Wes McKinney "Python for Data Analysis", First edition, Publisher O'Reilly Media.					
Reference Books					
1. Allen Downey, Jeffrey Elkner, Chris Meyers, Learning with Python, Dreamtech Press 2. David Taieb, "Data Analysis with Python: A Modern Approach" 1st Edition, Packt Publishing					

CourseCode	WEB TECHNOLOGIES		L	T	P	C
25MCA 301			4	0	0	4
Semester			III			
CourseObjectives:						
• TointroducePHPLanguageforserver-sidescripting • TointroduceXMLandprocessingofXMLDatawithJava • TointroduceServer-sideprogrammingwithJavaServletsandJSP • TointroduceClient-sidescriptingwithJavascriptandAJAX.						
CourseOutcomes(CO):Studentwillbeableto						
• Gainknowledgeofclient-sidescripting,validationofformsandAJAXprogramming • Understandserver-sidescriptingwithPHPLanguage • Understandwhatis XMLandhowtoparseanduseXML Datawith Java • TointroduceServer-sideprogrammingwithJavaServletsandJSP						
UNIT - I					LectureHrs:	
IntroductiontoPHP:Declaringvariables,datatypes,arrays,strings,operators,expressions,control structures, functions, Reading datafromweb formcontrols liketext boxes, radiobuttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies FileHandlinginPHP:Fileoperationslikeopening,closing,reading,writing,appending,deletingetc. on text and binary files, listing directories						
UNIT - II					LectureHrs:	
HTMLCommontags-List,Tables,images,forms,Frames;CascadingStylesheets; XML:IntroductiontoXML, DefiningXMLtags,their attributesandvalues, DocumentTypeDefinition, XMLSchemes,DocumentObjectModel,XHTMLParsingXMLData–DOMandSAXParsersinjava.						
UNIT - III					LectureHrs:	
IntroductiontoServlets:CommonGatewayInterface(CGt), LifecycloefaServlet, deployinga servlet,TheServletAPI,ReadingServletparameters,ReadingInitializationparameters,HandlingHttp Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.						
UNIT - IV					LectureHrs:	
IntroductiontoJSP:TheAnatomyofaJSPPage,JSPProcessing,Declarations, Directives, Expressions, CodeSnippets, implicitobjects, UsingBeansinJSPPages, UsingCookiesandsession for session tracking, connecting to database in JSP.						
UNIT - V						
Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope of variables,functions.eventhandlers(onclick,onsubmitetc.),DocumentObjectModel,Formvalidation.						
TextBooks:						
1. WebTechnologies,UttamKRoy,OxfordUniversityPress 2. TheCompleteReferencePHP—StevenHolzner, TataMcGraw-Hil						

CourseCode	BIGDATATECHNOLOGIES	L	T	P	C
25MCA 302		4	0	0	4
Semester		III			
CourseObjectives:					
• To understand the specialized aspects of big data including big data application, and big data analytics. • To study different types Case studies on the current research and applications of the Hadoop and big data in industry.					
CourseOutcomes(CO): Student will be able to					
• Discuss the challenges and their solutions in Big Data • Understand and work on Hadoop Framework and ecosystems. • Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework. • Demonstrate spark programming with different programming languages. • Demonstrate the graph algorithms and live streaming data in Spark					
UNIT-I	LectureHrs:				
What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowdsourcing analytics, inter and trans firewall analytics					
UNIT-II	LectureHrs:				
Introduction to NoSQL, aggregated data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map reduce calculations					
UNIT-III	LectureHrs:				
Data format, analysing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed filesystem (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures					
UNIT-IV	LectureHrs:				
MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.					
UNIT-V	LectureHrs:				
Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.					
TextBooks:					
1. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Rajkamal, Preeti Saxena, McGraw Hill, 2018. 2. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, John Wiley & Sons, 2013					

CourseCode	DEVOPS&AGILEPROGRAMMING	L	T	P	C
25MCA 303		4	0	0	4
Semester		III			
CourseObjectives:					
• Togivestrongknowledgeof Agilepractices • TogivestrongfoundationofapplicationsofDevOps • Togivestrongfoundationofdevelopmentanditsoperations • Togivestrongfoundation ofthesourcecodemanagement					
CourseOutcomes(CO):Studentwillbeableto					
• Understandthetraditionalsoftwaredevelopment. • Learntheriseof agile methodologies. • DefineanddesignpurposeofDevOps • UnderstandappliedDevOps. • Learnrealworldapplications ofDevOps. • Understanditspracticaexamples.					
UNIT- I		LectureHrs:			
Why Agile? , How to be Agile, Understanding XP, Values and Principles, Improve the Process, Eliminate Waste, Deliver Value. PracticingXP-Thinking,PairProgramming,EnergizedWork,InformativeWorkspace,Root-Cause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.					
UNIT- II		LectureHrs:			
Releasing-Done Done,No Bugs, Version Control,Ten-Minute Build,ContinuousIntegration,Collective Code Ownership, Documentation. Planning-Vision,ReleasePlanning,RiskManagement,IterationPlanning,Stories,Estimating.					
UNIT- III		LectureHrs:			
Developing-IncrementalRequirements,CustomerTests,Test-DrivenDevelopment,Refactoring, Incremental Design and Architecture, Spike Solutions, Performance Optimization.					
UNIT- IV		LectureHrs:			
DEIFINITION&PURPOSEOFDEVOPS:IntroductiontoDevOps-DevOps andAgile,MinimumViable Product-ApplicationDeployment-ContinuousIntegration-ContinuousDelivery					
UNIT- V					
CAMS(CULTURE,AUTOMATION,MEASUREMENTANDSHARING):CAMS–Culture- CAMS–Automation-CAMS–Measurement-CAMS–Sharing-Test-DrivenDevelopment- ConfigurationManagement-InfrastructureAutomation-RootCauseAnalysis–Blamelessness- Organizational Learning.					
TextBooks:					
1. JamesShoreandShaneWarden,“TheArtof AgileDevelopment”,O'REILLY, 2007. 2. RobertC.Martin,“AgileSoftwareDevelopment,Principles,Patterns,andPractices”,PHI,2002. 3. TheDevOpsHandbook-byGeneKim, JezHumble, PatrickDebois,andWillis Willis 4. WhatisDevOps?- byMike Loukides 5. TheDevOpsHandbook-byJohnWillis,PatrickDebois, JezHumble,GeneKim. 6. DevOps:ASoftwareArchitect’sPerspective-byLenBass,IngoWeber, LimingZhu.					

CourseCode	SOFTWAREARCHITECTUREANDDESIGNPATTERNS	L	T	P	C
25MCA 304a		3	0	0	3
Semester		III			
CourseObjectives:					
- LearnHowtoaddfunctionalitytodesignswhileminimizingcomplexity. - Whatcodequalitiesarerequiredtomaintaintokeepcodeflexible? - ToUnderstandthecommon designpatterns. - Toexploretheappropriatepatternsfordesignproblems					
CourseOutcomes(CO):Studentwillbeableto					
- Designandimplementcodeswithhigherperformanceandlowercomplexity - Experiencecoredesign principles and beableto assess thequality of a design with respect to these principles. - Capableofapplyingtheseprinciplesinthedesignofobjectoriented systems. - Demonstrate an understanding of a range of design patterns. Be capable ofcomprehending a design presented using this vocabulary. - Beabletoselectandappliesuitablepatterns inspecific contexts					
UNIT-I		LectureHrs:			
Envisioning Architecture The Architecture BusinessCycle,WhatisSoftware Architecture,Architectural patterns, reference models, reference architectures, architectural structures and views. CreatinganArchitectureQualityAttributes,Achievingqualities,Architecturalstylesandpatterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.					
UNIT-II		LectureHrs:			
AnalyzingArchitecturesArchitectureEvaluation,Architecturedesigndecisionmaking,ATAM,CBAM MovingfromOneSystemtoManySoftwareProductLines,Buildingsystemsfromofftheshelf components,Softwarearchitectureinfuture					
UNIT-III		LectureHrs:			
PatternsPatternDescription,Organizingcatalogs,roleinsolvingdesignproblems,Selectionandusage. CreationalandStructuralPatternsAbstractfactory,builder,factorymethod,prototype,singleton,adapter, bridge,composite,façade,flyweight.					
UNIT-IV		LectureHrs:			
Behavioral Patterns Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.					
UNIT-V					
Case Studies A-7E – A case study in utilizing architectural structures, The World Wide Web- a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development. A Case Study (Designing a Document Editor): Design Problems, DocumentStructure,Formatting,EmbellishingtheUserInterface,SupportingMultipleLook-and-Feel Standards,SupportingMultipleWindowSystems, UserOperations,SpellingCheckingandHyphenation.					
TEXTBOOKS:					
1. Software Architecture in Practice,secondedition,Len Bass,Paul Clements&Rick Kazman,Pearson Education, 2003.					
2. DesignPatterns,ErichGamma,PearsonEducation, 1995.					
REFERENCEBOOKS:					
1. BeyondSoftwarearchitecture,LukeHohmann,Addisonwesley, 2003.					
2. Softwarearchitecture,DavidM.Dikel,DavidKaneandJamesR. Wilson,PrenticeHallPTR,20013.					

3. SoftwareDesign,DavidBudgen,secondedition,Pearsoneducation, 2003
4. HeadFirstDesignpatterns,EricFreeman&ElisabethFreeman,O'REILLY, 2007.
5. DesignPatternsinJava,StevenJohnMetsker&WilliamC.Wake,Pearsoneducation,2006
6. J2EETPatterns,DeepakAlur,JohnCrupi&DanMalks,Pearsoneducation, 2003.
7. DesignPatternsinC#,StevenJohnmetsker,Pearsoneducation, 2004.
8. PatternOrientedSoftwareArchitecture,F.Buschmann&others,JohnWiley&Sons.



CourseCode	NETWORKSECURITY	L	T	P	C
25MCA 304b		3	0	0	3
Semester		III			
CourseObjectives:					
- Network security using various cryptographic algorithms. - Underlying network security applications. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.					
CourseOutcomes(CO): Student will be able to					
- Understand the most common type of cryptographic algorithm - Understand the Public-Key Infrastructure - Understand security protocols for protecting data on networks - Be able to digitally sign emails and files - Understand vulnerability assessments and the weakness of using passwords for authentication - Be able to perform simple vulnerability assessments and password audits					
UNIT- I		LectureHrs:			
Attacks, Services and Mechanisms, Security Attacks, Security Services, Integrity check, digital Signature, authentication, hash algorithms.					
UNIT- II		LectureHrs:			
Block Encryption, DES rounds, S-Boxes IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES					
UNIT- III		LectureHrs:			
Length of hash, uses, algorithms (MD2, MD4, MD5, SHA) MD2: Algorithm (Padding, checksum, passes.) MD4 and 5: algorithm (padding, stages, digest computation.) SHA: Overview, padding, stages. Algorithms, examples, Modular arithmetic (addition, multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption. Other Algorithms: PKCS, Diffie-Hellman, El-Gamal signatures, DSS, Zero-knowledge signatures.					
UNIT- IV		LectureHrs:			
Password Based, Address Based, Cryptographic Authentication. Passwords in distributed systems, on-line vs offline guessing, storing. Cryptographic Authentication: passwords as keys, protocols, KDC's Certification Revocation, Interdomain, groups, delegation. Authentication of People: Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics.					
UNIT- V					
What is security policy, high and low level policy, user issues? Protocol problems, assumptions, Shared secret protocols, public key protocols, mutual authentication, reflection attacks, use of timestamps, nonce and sequence numbers, session keys, one-and two-way public key based authentication.					
TextBooks:					
- Atul Kahate, Cryptography and Network Security, McGraw Hill. - Kaufman, c., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall PTR., 2002. - Stallings W. Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR., 2003 - Stallings, W. Network security Essentials: Applications and standards, Prentice Hall, 2000. - Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan. - Information Security Intelligence Cryptographic Principles and App. Calabres Thomson. - Securing A Wireless Network Chris Hurley SPD.					

CourseCode	MACHINELEARNING		L	T	P	C
25MCA 304c			3	0	0	3
Semester			III			
CourseObjectives:						
- Thiscourseexplains machinelearningtechniquessuchasdecisiontreelearning, Bayesian learning etc. - Tounderstandcomputationallearningtheory. - Tostudythepatterncomparisonontechiniques.						
CourseOutcomes(CO):Studentwillbeableto						
- Understandtheconceptsofcomputationalintelligencelikemachinelearning - Abilitytoget theskilltoapply machinelearningtechniques toaddress therealtimeproblems in different areas - UnderstandtheNeuralNetworksanditsusageinmachinelearningapplication.						
UNIT- I						LectureHrs:
.Introduction-Well-posedlearningproblems, designinga learningsystem,Perspectivesandissuesin machine learning Conceptlearningandthegeneraltoordering-introduction,a conceptlearningtask,concept learningas search, find-S:findinga maximallyspecific hypothesis, versionspaces andthecandidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias. DecisionTreeLearning-Introduction,decisiontreerepresentation,appropriateproblemsfor decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning,inductivebiasindecisiontreelearning, issuesindecisiontreelearning						
UNIT- II						LectureHrs:
ArtificialNeuralNetworks-1-Introduction,neuralnetworkrepresentation,appropriateproblemsfor neural network learning, perceptions, multilayer networks and the back-propagation algorithm. ArtificialNeuralNetworks-2-RemarksontheBack-Propagationalgorithm, Anillustrativeexample: face recognition, advanced topics in artificial neural networks. Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a generalapproachfor derivingconfidenceintervals, differenceinerror oftwohypotheses, comparing learningalgorithms.						
UNIT- III						LectureHrs:
Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm. Computationallearningtheory-Introduction,probablylearninganapproximatelycorrecthypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning. Instance-BasedLearning-Introduction,k-nearestneighbouralgorithm,locallyweightedregression, radial basis functions, case-based reasoning, remarks on lazy and eager learning						
UNIT- IV						LectureHrs:
Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms. LearningSets ofRules – Introduction, sequentialcoveringalgorithms, learningrulesets:summary, learningFirst-Orderrules, learningsetsofFirst-Order rules:FOIL,Inductionasinverteddeduction, inverting resolution. ReinforcementLearning-Introduction,thelearningtask,Q-learning,non-deterministic,rewards and actions,temporaldifferencelearning,generalizingfromexamples,relationship todynamic programming.						

UNIT- V		
Analytical Learning-1-Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge. Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators. Combining Inductive and Analytical Learning–Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis		
Text Books:		
1. Machine Learning–Tom M. Mitchell, -MGH		



CourseCode	MOBILEAPPLICATIONDEVELOPMENT	L	T	P	C
25MCA 305a		3	0	0	3
Semester		III			
CourseObjectives:					
• Todemonstratetheir understandingofthefundamentalsofAndroidoperatingsystems • ToimprovestheirskillsofusingAndroidsoftwaredevelopmenttools • Todemonstratetheir abilitytodevelopsoftwarewithreasonablecomplexityonmobileplatform • Todemonstratetheirabilitytodeploysoftwaretomobiledevices • Todemonstratetheir abilitytodebugprogramsrunningonmobiledevices					
CourseOutcomes(CO):Studentwillbeableto					
• StudentunderstandstheworkingofAndroidOS Practically. • StudentwillbeabletodevelopAndroiduserinterfaces • Studentwillbeabletodevelop, deployandmaintaintheAndroidApplications.					
UNIT-I	LectureHrs:				
Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Androidapplications,BestpracticesinAndroidprogramming,AndroidtoolsAndroidapplication components– AndroidManifestfile,Externalizingresourceslikevalues,themes, layouts,Menusetc, Resources for different devices and languages, Runtime Configuration Changes AndroidApplicationLifecycle– Activities,Activitylifecycle,activitystates,monitoringstatechanges.					
UNIT-II	LectureHrs:				
AndroidUser Interface:Measurements –Deviceandpixeldensityindependent measuringUNIT -s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creatingfragments, Lifecycle of fragments, Fragment states, Addingfragments toActivity, adding,removingandreplacingfragmentswithfragmenttransactions,interfacingbetween fragmentsandActivities,Multi-screenActivities					
UNIT-III	LectureHrs:				
Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passingdata toIntents, Gettingresultsfrom Activities, NativeActions, usingIntent todialanumber ortosendSMSBroadcastReceivers–UsingIntentfilters toserviceimplicitIntents,ResolvingIntentfilters, finding andusing Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts					
UNIT-IV	LectureHrs:				
PersistentStorage:Files–Usingapplicationspecific foldersandfiles,creatingfiles,readingdatafromfiles, listing contents of adirectory Shared Preferences– Creating shared preferences,saving andretrieving data using Shared Preference					
UNIT-V	LectureHrs:				
Database–IntroductiontoSQLiteDatabase,creatingandopeningadatabase,creatingtables,inserting retrievingandetindelgdata,RegisteringContentProviders,UsingcontentProviders(insert,delete,retrieve andupdate)					
TextBooks:					
1. ProfessionalAndroid4ApplicationDevelopment,RetoMeier,WileyIndia,(Wrox)2012 2. AndroidApplicationDevelopmentforJavaProgrammers,JamesCSheusi,CengageLearning,2013					

CourseCode	INTERNETOFTHINGS		L	T	P	C
25MCA 305b			3	0	0	3
Semester			III			
CourseObjectives:						
• Introduce the fundamental concepts of IoT and physical computing • Expose the student to a variety of embedded boards and IoT Platforms • Create a basic understanding of the communication protocols in IoT communications. • Familiarize the student with application program interfaces for IoT. • Enable students to create simple IoT applications.						
CourseOutcomes(CO): Student will be able to						
• Choose the sensors and actuators for an IoT Application • Select protocols for a specific IoT application • Utilize the cloud platform and APIs for IoT Applications • Experiment with embedded boards for creating IoT prototypes • Design a solution for a given IoT Application • Establish a startup						
UNIT-I					LectureHrs:	
.Overview of IoT: The Internet of Things: An Overview, The Flavor of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances. Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.						
UNIT-II					LectureHrs:	
Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things						
UNIT-III					LectureHrs:	
Communication in the IoT: Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol						
UNIT-IV					LectureHrs:	
Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups. Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.						
UNIT-V						
Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software. Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.						
TextBooks:						
Adrian McEwen, Hakim Cassimally-Designing the Internet of Things, Wiley Publications, 2012						

CourseCode	BLOCKCHAINTECHNOLOGIES	L	T	P	C
25MCA 305c		3	0	0	3
Semester		III			
CourseObjectives:					
Thiscourseisintended to study thebasicsofBlock chain technology.During thiscourselearner will explore various aspects of Block chain technology like application in variousdomains. By implementing learner will have idea about private and public Block chain, andsmart contract					
CourseOutcomes(CO):Studentwillbeableto					
- UnderstandandexploretheworkingofBlockchaintechnology(Understanding) - AnalyzetheworkingofSmartContracts(Analyze) - UnderstandandanalyzetheworkingofHyper ledger(Analyze). - Applythelearningofsolidityandde-centralizedappsonEthereum(Apply).					
UNIT -I					LectureHrs:
Introduction of Cryptography and Block chain: What is Block chain, Block chain Technology Mechanisms &Networks, Block chain Origins, Objective of Block chain,Block chain Challenges, TransactionsAndBlocks,P2PSystems,KeysAsIdentity,DigitalSignatures,Hashing,andpublickey cryptosystems,privatevs.publicBlockchain					
UNIT - II					LectureHrs:
Bit Coin and Crypto currency: What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM),MerkleTree,Double-SpendProblem,BlockchainAndDigitalCurrency,TransactionalBlocks, ImpactOfBlockchainTechnologyOnCryptocurrency.					
UNIT - III					LectureHrs:
Introduction to Ethereum: WhatisEthereum,Introduction to Ethereum,ConsensusMechanisms,How SmartContractsWork,MetamaskSetup,EthereumAccounts,ReceivingEther’sWhat'saTransaction?, SmartContracts.					
UNIT - IV					LectureHrs:
Introduction to Hyperledger: What is Hyperledger?Distributed LedgerTechnology & its Challenges, Hyper ledger & Distributed Ledger Technology, Hyper ledger Fabric, Hyper ledger Composer.					
UNIT - V					
BlockchainApplications:InternetofThings,MedicalRecordManagementSystem,DomainName ServiceandFutureofBlockchain,Alt Coins					
TextBooks:					
- ArvindNarayanan,JosephBonneau,EdwardFelten,AndrewMillerandSteven - Goldfeder,BitcoinandCryptocurrencyTechnologies:AComprehensive - Introduction,PrincetonUniversityPress(July19, 2016). - Antonopoulos,MasteringBitcoin. - AntonopoulosandG.Wood,MasteringEthereum. - D.Drescher,BlockchainBasics.Apress,2017.					

CourseCode	WEBTECHNOLOGIESLABORATORY	L	T	P	C
25MCA 306		0	0	4	2
Semester		III			
CourseObjectives:					
- Understand the web technologies to create adaptive web pages for web application. - Use CSS to implement a variety of presentation effects to the web application - Know the concept and implementation of cookies as well as related privacy concerns - Develop a sophisticated web application that employs the MVC architecture.					
CourseOutcomes(CO):					
- Integrate frontend and backend web technologies in distributed systems. - Facilitate interface between frontend and backend of a web application. - Debug, test and deploy web applications in different web servers. - Migrate the web application to the other platforms like .Net					
List of Experiments:					
- Write a PHP script to print prime numbers between 1 -50. - PHP script to - Find the length of a string. - Count no of words in a string. - Reverse a string. - Search for a specific string. - Write a PHP script to merge two arrays and sort them as numbers, in descending order. - Write a PHP script that reads data from one file and writes into another file. - Develop static pages (using Only HTML) of an online bookstore. The pages should resemble: www.amazon.com. The website should consist of the following pages: - Homepage - Registration and user Login - User Profile Page - Books catalog - Shopping Cart - Payment By credit card - Order Confirmation - Validate the Registration, user login, user profile and payment by credit card pages using JavaScript. - Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document. - Install TOMCAT webserver. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart. - Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogues should be dynamically loaded from the database. Follow the MVC architecture while doing the website					

CourseCode	BIGDATATECHNOLOGIESLABORATORY	L	T	P	C
25MCA 307		0	1	2	2
Semester		III			
CourseObjectives:					
• Apply quantitative modeling and data analysis techniques to the solution of real-world business problems, communicate findings, and effectively present results using data visualization techniques. • Apply principles of Data Science to the analysis of business problems.					
CourseOutcomes(CO):					
• Understand and implement the basics of data structures like Linked list, stack, queue, set and map in Java. • Demonstrate the knowledge of big data analytics and implement different file management task in Hadoop. • Understand MapReduce Paradigm and develop data applications using variety of systems. • Analyze and perform different operations on data using Pig Latin scripts. • Illustrate and apply different operations on relations and databases using Hive.					
List of Experiments:					
Week 1: Hadoop Installation on a) Single Node and SPARK Installation, Launch a cloud instance for AWS instance on Centos 7 Week 2: Design a distributed application using MapReduce which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform. Week 3: Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce. Week 4: Write an application using HBase and HiveQL for flight information system which will include 1) Creating, Dropping, and altering Database tables, 2) Creating an external Hive table to connect to the HBase for Customer Information Table, 3) Load table with data, insert new values and field in the table, Join tables with Hive, 4) Create index on Flight information Table, and 5) Find the average departure delay per day in 2008. Week 5: Display the hierarchical structure of your data by generating Trees, graphs and network visualization. Install and Run Pig then write Pig Latin scripts to sort, group, join, project and filter the data. Install and Run Hive then use Hive to Create, alter and drop databases, tables, views, functions and Indexes. Week 6: Input file contains a series of tweets made by few people. Do a word count on the text object value Hint: Json Parsing in python – this sample snippet can be used within Map to read the JSON Week 7: Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location. And Reading Excel, XML data sheets in R. Using with and without R objects on console, mathematical functions on console create R objects for calculator application and save in a specified location in disk. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets and to find subset of dataset by using subset (), aggregate () functions on dataset. Week 8: Implementing data visualization using R: Find the data distributions using box and scatter plot, Find the outliers using plot and Plot the histogram, bar chart and pie chart on sample data.					

CourseCode	DEVOPS&AGILEPROGRAMMINGLABORATORY	L	T	P	C
25MCA 308		0	0	4	2
Semester		III			
CourseObjectives:					
To understand the concept of DevOps with associated technologies and - methodologies. - To be familiarized with Jenkins, which is used to build & test software Applications & Continuous integration in Devops environment. To understand different Version Control tools like GIT, CVS or Mercurial - To understand Docker to build, ship and run containerized images - To use Docker to deploy and manage Software applications running on Container. - To be familiarized with concept of Software Configuration Management & provisioning using tools like Puppet, Chef, Ansible or Saltstack.					
CourseOutcomes(CO):					
- Understand and Implement the Integration and Continuous deployment. - Can implement anatomy of continuous delivery pipeline. - Understand and implement static code analysis.					
List of Experiments:					
Agile Laboratory Programs:					
1. Understand the background and driving forces for taking an Agile Approach to Software Development. 2. Understand the business value of adopting agile approach. 3. Understand agile development practices 4. Drive Development with Unit Test using Test Driven development. 5. Apply Design principle and Refactoring to achieve agility 6. To study automated build tool. 7. To study version control tool. 8. To study Continuous Integration tool. 9. Perform Testing activities within an agile project.					
Dev Ops Laboratory Programs:					
1. Build & Test Applications with Continuous Integration - To Install and Configure Jenkins to test, and deploy Java or Web Applications using NetBeans or eclipse. 2. Version Control- To Perform Version Control on websites/ Software using different Version control tools like RCS/ CVS/GIT/Mercurial (Any two) 3. Virtualization & Containerization - To Install and Configure Docker for creating Containers of different Operating System Images 4. Virtualization & Containerization- To Build, deploy and manage web or Java application on Docker 5. Software Configuration Management - To install and configure Software Configuration Management using Chef/Puppet/Ansible or Saltstack. 6. Provisioning - To Perform Software Configuration Management and provisioning using Chef/Puppet/Ansible or Saltstack.					

CourseCode	MEANSTACKDEVELOPMENT	L	T	P	C
25MCA 310		1	0	2	2
	Semester	III			
CourseObjectives:					
• TounderstandbasicconceptsofJAVASCRIPT. • ToimplementconceptsofHTML,CSS,andREACT indevelopingvariouswebsites. • TodesignsolutionstorealworldscenariosusingNODEandEXPRESSJS. • ToAnalyzeconceptsofMONGODB. • Toimplement socketprogramminginMERNstack.					
CourseOutcomes(CO):Studentwillbeableto					
• UnderstandbasicconceptsofJAVASCRIPT. • ImplementconceptsofHTML,CSS,andREACTindevelopingvariouswebsites. • DesignsolutionstorealworldscenariosusingNODEand EXPRESS JS. • AnalyzeconceptsofMONGODB. • ImplementsocketprogramminginMERNstack.					
UNIT- I		LectureHrs:10			
Introduction:datatypes,logicaloperations,functions,objectandclasses,promiseasync&await, modules and npm packages, error handling, Document Object module, JQuery.					
UNIT-II		LectureHrs:10			
HTML CSS and REACT : Basic structure of a webpage, Differenttypesof tags , HTML text fundamentals, Creating hyperlinks, Insertion of images and multimedia, Introduction CSS, CSS-selector –internal- external , CSS- inline class background font text colour, CSS-padding margin border,Installationofreact,REACT-virtualDOM,REACT-JSX,REACT-components, REACT-prop andstate,REACT–lifecycles.					
UNIT-III		LectureHrs:10			
NodeandExpressJS :IntroductionofNodeJS (Runtimeenvironment), NodeJS installation, Node JS web based example (import required modules ,create server,read request and return response), Node JS – npm,errors, crypto, Node JS – child process ,buffer, string, Node JS- string decoder ,query string , Node JS- callbacks , events, web modules, Introduction of APIs, Express JS – introduction,ExpressJS-installation,ExpressJS –GET,POST,REQUEST,RESPONSE,Express JS-Routing,fileupload,cookies,middleware.					
UNIT-IV		LectureHrs:10			
MongoDB :IntroductionofMongoDB,DifferencebetweenSQLandNoSQL,MongoDBdatatypes, MongoDB installation, Data modelling in MongoDB, Create database, Drop Database, Create collection,Insertdocument,Selectdocument,QueriesinMongoDB,Sortingdataindocument, Remove document.					
UNIT - V		LectureHrs:10			
SocketprogramminginMERNstack :Connectthereacttonodebyaxios,Import required module, Createserver innode, ConnecttheNodeJS toMongoDB, Createrequest,ReadResponse, Full Stack Project.					
Textbooks:					
1. GettingMEANwithMONGO, ExpressangularandnodebySimonHolmes, Dreamtech Publishers 2. ProMERNStack:FullStackWeb AppDevelopmentwithMongo, Express, React,and Node Paperback – 1 April 2017 by Vasanth Subramanian (Author) 3. BeginningMERNStack:BuildandDeploya FullStackMongoDB, Express, React, Node.js App by Greg Lim (Author)					

4.FullStackJavaScript Development withMEAN byCOLIN J IhrigandAdamJ bretz.Sitepoint publishers.



CourseCode	DEEPLARNING	L	T	P	C
25MCA 401a		3	0	0	3
Semester		IV			
CourseObjectives:					
• To present the mathematical, statistical and computational challenges of building neural networks. • To teach the concepts of deep learning. • To introduce dimensionality reduction techniques. • To enable the student to know deep learning techniques to support real-time applications. • To explain the case studies of deep learning techniques.					
CourseOutcomes(CO): Student will be able to					
• Identify Convolutional Neural Networks model to solve Supervised Learning Problems • Design Autoencoder to solve Unsupervised Learning problems • Apply Long Short Term Memory (LSTM) Networks for time series analysis classification problems. • Apply Classical Supervised Tasks for Image Denoising, Segmentation and Object detection problems.					
UNIT - I		LectureHrs:			
Introduction: Introduction to machine learning-Linear models (SVMs and Perceptron, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.					
UNIT - II		LectureHrs:			
Deep Networks: History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VCDimension and Neural Nets- Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.					
UNIT - III		LectureHrs:			
Dimensionality Reduction: Linear (PCA, LDA) and manifolds, metric learning- Autoencoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.					
UNIT - IV		LectureHrs:			
Optimization and Generalization: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM- Recurrent Neural Network Language Models- Word- Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.					
UNIT - V		LectureHrs:			
Case Study and Applications: ImageNet- Detection- Audio WaveNet- Natural Language Processing Word2Vec- Joint Detection Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions.					
TextBooks:					
1. Deep Learning”, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press 2016. 2. “Neural Networks and Deep Learning A Text Book”, Charu C Aggarwal, Springer International Publishing AG, Part of Springer Nature 2018.					

CourseCode	SOCIAL MEDIA ANALYSIS			L	T	P	C
25MCA 401b				3	0	0	3
				Semester IV			
Course Objectives:							
- To inspire the students with interest, excitement, and urge to learn the subject of Social network analysis. - To understand the fundamental concepts of Social network analysis. - To introduce the purpose of learning important aspects in Social network analysis.							
Course Outcomes (CO): Student will be able to							
- explain basic concepts and theories of network analysis in the social sciences, and understand how these concepts and theories can help explain different actors' micro behaviours as well as macro outcomes; - critically examine the ways in which networks can contribute to the explanation of social, political, economic and cultural phenomena; - use statistical software to visualize networks and analyse their properties, connecting these to network concepts and theories; - explain principles underlying statistical models for social networks; - use software to implement statistical models of social networks to analyse network formation and evolution; - use software to simulate the dynamics of networks based on social network models.							
UNIT-I				Lecture Hrs:10			
Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web - Network analysis -Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis -Electronic discussion networks, Blogs and online communities, Web-based networks - Applications of Social Network Analysis							
UNIT-II				Lecture Hrs:10			
Ontology and their role in the Semantic Web -Ontology-based Knowledge Representation-Ontology languages for the Semantic Web -RDF and OWL - Modelling and aggregating social network data – State-of-the-art in network data representation, Ontological representation of social individuals - Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations							
UNIT-III				Lecture Hrs:10			
Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Definition of Community - Evaluating Communities –Methods for Community Detection & Mining -Applications of Community Mining Algorithms- Tools for Detecting Communities Social Network Infrastructures and Communities-Applications -Case Studies -Real Time Sentiment Analysis, Stock Market Predictions							
UNIT-IV				Lecture Hrs:9			
Understanding and Predicting Human Behavior for Social Communities-User Data Management, Inference and Distribution-Enabling New Human Experiences-Reality Mining-Context-Awareness -Privacy in Online Social Networks							
UNIT-V				Lecture Hrs:9			
Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis -Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons - Attack Spectrum and Countermeasures							

Textbooks:

1. CharuC.Aggarwal, "SocialNetworkDataAnalytics", Springer, 2011.
2. GuandongXu, YanchunZhang and LinLi, "WebMiningandSocialNetworkingTechniquesand applications", Springer, first edition, 2011.

ReferenceBooks:

1. PeterMika, "Socialnetworks andtheSemanticWeb", Springer, firstedition2007.
2. BorkoFurht, "HandbookofSocialNetworkTechnologiesandApplications", Springer, first edition, 2010.
3. DionGohandSchubertFoo, "Socialinformationretrievalsystems:emergingtechnologiesand applications for searching the Web effectively", IGI Global snippet, 2008. 133
4. MaxChevalier, ChristineJulienandChantalSoulé-Dupuy, "Collaborativeandsocialinformation retrieval and access: techniques for improved user modelling", IGI Global snippet, 2004 .

OnlineLearningResources:

1. www.utdallas.edu
2. ibook.ics.uci.edu
3. www.ebmtools.org



CourseCode	MULTIMEDIASYSTEMS&TOOLS	L	T	P	C
25MCA 401c		3	0	0	3
Semester		IV			
CourseObjectives:					
- Formulate a working definition of interactive multimedia - Demonstrate competence in using the authoring program HyperStudio - Outline the use of animation, digitized sound, video control, and scanned images - Illustrate the use of Netscape to access the Course Home Page and Tips and Tricks;					
CourseOutcomes(CO): Student will be able to					
- Create a well-designed, interactive Website with respect to current standards and practices - Demonstrate in-depth knowledge in an industry-standard multimedia development tool and its associated scripting language - Determine the appropriate use of interactive versus standalone Web applications - Create time-based and interactive multimedia components - Identify issues and obstacles encountered by Web authors in deploying Web-based Applications					
UNIT-I	LectureHrs:				
Unit-I: Multimedia Overview, Definition Applications and Design, Authoring (HyperStudio), Introduction to HyperStudio, The Metaphor, The Basics (Cards, Buttons, Text), HyperStudio, Resources. Multimedia Authoring- Multimedia Authoring Metaphors, Multimedia Production, Multimedia Presentation, Automatic Authoring, Some Useful Editing and Authoring Tools, Adobe Premiere, Macromedia Director, Macromedia Flash, Dreamweaver.					
UNIT-II	LectureHrs:				
Unit-II: Instructional Design, Objectives, Content (print, graphics, sounds, etc.), Interaction, Assessment, Closure, Screen Design: Metaphors and Themes, Colors and Backgrounds, Text (size, color, placement), Navigation, Consistency.					
UNIT-III	LectureHrs:				
Unit-III: Transitions and Links, Use of Sound, HyperStudio Sounds, Recording Your Own, Internet Resources, Graphics, Integrating Web documents, HyperStudio Tips and Tricks, Animation, Launching other applications and documents					
UNIT-IV	LectureHrs:				
Unit-IV: Multimedia Portfolios, Designing a template, Adding elements, Choosing materials, Advanced Button Features, Hyperlinks, Drag-n-Drop, Advanced NBA's, Using Actions with other Objects.					
UNIT-V	LectureHrs:				
Incorporating Digital Media, QuickTime Movies, Laser disc and CD-ROM control, scanning.					
TextBooks:					
- Marcia Kuperberg, A Guide to Computer Animation: for TV, games, multimedia and web, Focal Press (Taylor and Francis Group), 2002. - Z.N. Li and M. S. Drew, "Fundamentals of Multimedia", Pearson Prentice Hall					

CourseCode	CYBERLAWS	L	T	P	C
25MCA 402a		3	0	0	3
Semester		IV			
CourseObjectives:					
- The objectives of this course are to enable the learner to understand, explore, and acquire a critical understanding of cyber laws. - Equip the learner with competencies for dealing with frauds and deceptions, and other cybercrimes that take place via the Internet					
CourseOutcomes:					
- Understand the social and intellectual property issues emerging from cyberspace. - Understand the policy regulation of cyber space employed by various countries - Understand the relationship between commerce and cyberspace. - Gain the knowledge of Information Technology Act					
UNIT- I					
Conceptual and theoretical perspective of Cyber Law, Computer and Web Technology, Development of Cyber Law, National and International Perspective Cyber Law, Legal issues and challenges in India, USA, Data Protection, Cyber Security.					
UNIT- II					
Jurisdiction issues in Transactional Crimes Cyber Law, International Perspective, Budapest Convention on Cybercrime. Hacking and Legal Issues, Privacy legal issues					
UNIT- III					
Cyber Law and IPR, Understanding Copyright in Information Technology, Software Copyrights Copyright in Internet & Multimedia, Software Piracy, Trademarks in Internet Domain Name registration, Domain Name disputes, Icaann's core principles and domain names, Net Neutrality, Databases in IT, Protection of databases, Position in USA, EU and India.					
UNIT- IV					
E-Commerce, UNCITRAL Model, Legal Aspects of E-Commerce, E-Taxation, E-Banking, Online Publishing and online credit card payment, Employment Contracts, Non-Disclosure Agreements.					
UNIT- V					
Information Technology Act 2000, Aims and Objectives, Overview of the Act, Jurisdiction, Electronic Governance, Electronic Evidence, Digital Signature Certificates, Digital Signatures, Duties of Subscribers, Role of Certifying Authorities, Regulations Appellate Tribunal, Internet Service Providers and their liabilities, Social Networking Sites.					
TextBooks:					
1. Law Relating to Computer, Internet and E-Commerce by Kamath Nandan, 5 th Edition, Universal Law Publishing.					

CourseCode	ENTREPRENEURSHIP		L	T	P	C
25MCA 402b			3	0	0	3
Semester			IV			
CourseObjectives:						
The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the fundamentals of Entrepreneurship.						
CourseOutcomes:						
Learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.						
UNIT- I						
Entrepreneurial Perspectives Introduction to Entrepreneurship – Evolution – Concept of Entrepreneurship – Types of Entrepreneurs - Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods -Entrepreneurial Motivations- Models for Entrepreneurial Development - The process of Entrepreneurial Development						
UNIT- II						
New Venture Creation Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.						
UNIT- III						
Management of MSMEs and Sick Enterprises Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units						
UNIT- IV						
Managing Marketing and Growth of Enterprises Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.						
UNIT- V						
Strategic perspectives in Entrepreneurship Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.						
TextBooks:						
- Entrepreneurship Development and Small Business Enterprises, Poornima M. Charanmath, 2nd edition, Pearson, 2014. - Entrepreneurship, a South-Asian Perspective, D.F. Kuratko and T.V. Rao, 3rd edition, Cengage, 2012. - Entrepreneurship, Arya Kumar, 4th edition, Pearson 2015.						

CourseCode	NOSQLDATABASES	L	T	P	C
25MCA 402c		3	0	0	3
Semester		IV			
CourseObjectives:					
Distinguish the different types of NoSQL databases. Understand the impact of the cluster on database design. State the CAP theorem and explain its main points					
CourseOutcomes:					
- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph). - Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases. - Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.					
UNIT-I					
Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph).					
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases. - Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.					
UNIT-II					
Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases					
UNIT-III					
Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. NoSQL Key/Value databases using MongoDB, Document Databases, What Is a Document Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.					
UNIT-IV					
Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, What Is a Column-Family Data Store? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage, When Not to Use.					
UNIT-V					
NoSQL Key/Value databases using Riak, Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, ShoppingCart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets.					
TextBooks:					
1.NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence Sadalage, P. & Fowler Pearson Education					