MCA I AND II SEMESTER SYLLABUS 2023-2024

	MCA I Semester		
23PCA101C		Credits:	03
Hrs/Week:L:T:P:S 3:0:0:0	Mathematical Foundations for	CIEMarks:50	
Total Hours/Week: 40 Hrs	Computer Applications	SEEMarks:50	
Set Theory: Sets and Subs	sets. Set Operations and the Laws of Set Theor	v. Counting an	d Venn
Diagrams. Principles of	Inclusion and Exclusion. Permutations and	Combination	s with
repetition. Fundamental	sof Logic :Basic Connectives and Truth Tables. I	Logic Equivaler	nce- the
laws of Logic. Logical Im	plications. Rules of Inference. The use of Qua	ntifiers. Quant	ifier
Definitions. Proofs of The	eorems.	,	_
	UNIT-II		10 Hrs.
Functions: Cartesian produ	ucts and Relations, Functions-Plain and One-to-	-One, Onto Fu	nctions,
Stirling Numbers of the	Second Kind, Special functions, The Pigeon-hc	ole principle, F	unction
composition and inverse	functions. Relations : Properties of Relations, C	computer recog	gnition-
Zero One Matrices and Di	irected graphs, Posets and Hasse Diagrams		
	UNIT-III		10 Hrs.
Linear Algebra: Introductio	on, types of matrices, elementary row operation	s, row echelon	matrix,
rank, consistency of a sys	tem of linear equations. Eigen values and eigen	vectors. Larges	st eigen
value using power meth	od. Cayley-Hamilton theorem (without proof)	 inverse of a 	matrix
using Cayley-Hamiltonian	theorem. Algorithms to solve system of linear	r algebraic equ	ations:
Gauss elimination, Gauss	seidel and Jacobi iterative procedures.		
	UNIT-IV		10 Hrs.
Statistics: Introduction, N	Measures of central tendency (Arithmetic me	ean,Geometric	mean,
Harmonic mean, Median	,Quartiles, Mode). Measures of dispersion (Rang	ge, Quartile de	viation,
mean deviation and st	andard deviation).Random variable and pro	obability distr	ribution
Concept of random va	ariable, discrete probability distributions, co	ontinuous pro	bability
distributions, Mean, vari	ance and co-variance and co-variance of rando	om variables. B	inomial
and normal distribution,	Exponential and normal distribution with me	an and variab	les and
problems.			
Reference Books *			
1. Ralph P. Grimaldi, Discre	ete and Combinatorial Mathematics And Applied	I Introduction,	4th

Edition, Pearson Education, 2003.

- 2. Richard A Johnson and C.B Gupta "Probability and statistics for engineers" Pearson Education.
- 3. Dr. K. S. Chandrashekhar, Engineering Mathematics- IV, Sudha Publications

Course Outcomes**

After completion of the course student will be able to

1. Apply the fundamentals of set theory and mathematical logic to perform various set operations and logic to the real world problems.

2. Apply the concept of relations and functions on sets to determine their types and compositions.

3. Acquire ability to work with matrices.

4. Acquire ability to represent the data and calculate the measures of central tendency and dispersion.

5. Identify and list the different applications of discrete mathematical concepts in computer science.

23PCA102C

Hrs/Week:L:T:P:S

4:0:0:0 Total Hours/Week: 52 Hrs

Python Programming

Credits: 04

CIEMarks:50

SEEMarks:50

UNIT-I	13 Hrs.
Basics of Python Programming: Features of python, writing and executing first python	program,
Literal constants, variables and identifiers, data types, input operation, comments,	reserved
words, indentation, operators and expressions, operations on strings. Decision	control
statements. Data Structures: Creating, accessing, cloning, add, updating of lists, list	methods.
Introduction to Tuples. Dictionary &Set methods.	
UNIT–II	13 Hrs.
Functions: Introduction, Function Definition, Function Call, Variable scope and lifet	ime, the
return statement, more on defining functions. Lambda functions . Modules: The from	nimport
statement, Name of Module, Making your own Modules, The dir() function.	Regular
Expressions: The match()function, The search() function, The sub() function, The finda	ll() <i>,</i>
finditer() functions, Meta characters in regular expressions, groups.	
UNIT–III	13 Hrs.
Classes and Objects: Introduction, Classes and Objects, class method and self argument	, The init
method, Class Variables and Object Variables, The del() method, Other special method	ls, Public
and Private data members, Private Methods, Calling a class method from another cla	SS
methods,	
Staticmethods. Operator Overloading: Introduction, Conceptof Operator Overloading, Rev	erse
adding.	
UNIT–IV	13 Hrs.
File Handling: Introduction, File Path, Types Of Files, Opening And Closing Files, Read	ding And
Writing Files, File Positions, Renaming And Deleting Files, Directory Methods, Metho	ods From
OS Module. Working with Database: Connecting to a SQLite database, execut	te select
statements, execute insert, update, and delete statements. Introduction to PySimpleGU	Ι.
Reference Books *	
1. ReemaThareja, "PythonProgrammingusingproblemsolvingapproach", OxfordUniver	sity
Press,2017.	
2. Paul Gries, Jennifer Campbell, Jason, Practical Programming, An introduction to Co	mputer
Science using Python3.6,3 rd Edition, Pragmetic Book shelf.	

3. Charles Dierbach,"Introduction to Computer Science using Python", Wiley India Edition.

Course Outcomes**

- 1. Demonstrate core elements of Python Programming
- 2. Apply the knowledge of functions in building the python programs
- 3. Understand the basic concepts of object oriented programming
- 4. Demonstrate the concepts of file handling
- 5. Apply the knowledge in real time applications

23PCA103C		Credits: 03
Hrs/Week:L:T:P:S 3:0:0:0	Web Programming	CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

Fundamentals of Web and XHTML: Internet, WWW, Web Browsers, and Web Servers; URLs;
MIME; HTTP; Security; The Web Programmers Toolbox. XHTML: Origins and evolution of HTML
and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup; Images;
Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML4,HTML 5
and XHTML, Introduction to HTML5.0 form elements and validations.

UNIT–II

UNIT-I

10 Hrs.

10 Hrs.

CSS Introduction: Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; The and <div> tags; Conflict resolution.

JavaScript: Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions; Errors in scripts; Examples.

UNIT–III

10 Hrs.

Dynamic Documents with JavaScript: The JavaScript execution environment; The Document Object Model; Element access in JavaScript. **Events and Event Handling:**Handling events from the Body elements, Button elements, Text box and Password elements. The DOM 2 event model. **Introduction to AJAX:** Overview of AJAX, The basics of AJAX, Rails with AJAX.

Introduction to PHP: Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files.

UNIT-IV

10 Hrs.

Session Handling with PHP: Tracking users, Cookies, Sessions.CRUD Operations using databaseand Handling XML.

Introduction to Ruby on Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching. **Introduction to Rails:** Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

Reference Books *

- 1. Robert W. Sebesta, Programming the World Wide Web, 4th Edition, Pearson Education, 2008.
- Chris Bates, Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.
- 3. Eric Ladd, Jim O' Donnel using HTML 4,XML and Java, Prentice Hall of India-QUE,1999.

Course Outcomes**

- 1. Illustrate the fundamentals of web programming.
- 2. Apply the mark-up and layout design to build web applications.
- **3.** Analyze appropriate content and scripting language concepts.
- 4. Design and implement user interactive web applications.
- 5. Apply the knowledge of web and can give solutions to the real world problems.

CIEMarks:50

UNIT-I10 Hrs.Introduction to Operating Systems: What Operating Systems do? Computer System organization;
Computer System architecture; Operating System structure; Operating System operations;
Process management; Memory management; Storage management; Protection and security;
Kernel data structures, Computing environments and Open source operating systems.System Structures: Operating System Services; User - Operating System interface; System calls;
Types of system calls; System programs; Operating System design and implementation; Operating
System structure; Operating System debugging, Operating System generation; System boot.UNIT-II10 Hrs.Process Management: Process concept; Process scheduling Multi-Threaded Programming:
Overview; Multi-core programming, Multithreading models; Thread Libraries; Implicit threading,
threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms;

Thread scheduling, Multiple-Processor scheduling; Real time CPU scheduling. **Process Synchronization**: The Critical section problem; Peterson's solution; Synchronization hardware; Mutex locks, Semaphores; Classical problems of synchronization; Monitors.

UNIT–III

Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection, recovery from deadlock.

Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Segmentation, Paging; Structure of page table.**Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

UNIT–IV

10 Hrs.

10 Hrs.

Essential UNIX/LINUX commands: User Names and Groups, Logging In, Correcting Typing Mistakes, Format of Linux Commands, Changing Your Password.**Unix files**: Naming files,Basic file types/categories, Organization of files, Hidden files, Standard directories, Parent child relationship, The home directory and the HOME variable, Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames.**Directory commands** – pwd, cd, mkdir, rmdir commands. The dot(.) and double dots (..) notations to represent presentand

parent directories and their usage in relative path names. **File related commands** – cat, mv, rm, cp, wc and od commands, File attributes and permissions and knowing them, The Is command with options. **Changing file permissions**: the relative and absolute permissions changing methods, Recursively changing file permissions, Directory permissions.

Reference Books *

- 1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 9thedition, Wiley-India, 2016.
- 2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 2ndEdition, Tata McGraw-Hill, 2002.
- 3. SumitabhaDas: Your UNIX The Ultimate Guide; TMH.

Course Outcomes**

- **1.** Explore the core structure and functionality of the Operating Systems.
- 2. Interpret the various process management and synchronization mechanisms.
- **3.** Analyze the knowledge of occurring deadlock concepts and apply wide range of problem solving methods to solve deadlocks.
- **4.** Identify and analyze the performance of different memory management techniques, page replacement and disk scheduling algorithms.
- 5. Demonstrate the basic UNIX commands.

CIEMarks:50

UNIT-I	10 Hrs.		
Introduction: Uses of Computer Networks, Network Hardware. Network Software: R	Protocol		
Hierarchies, Design Issues for the Layers. Reference Models: The OSI Reference Mod	del, The		
TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models. Physica	al Layer-		
Guided Transmission Media, Digital Modulation and Multiplexing.			
UNIT–II	10 Hrs.		
Data Link Layer-Data link Layer Design issues, Framing, Flow Control and Error Correct	ting and		
Detection codes, Sliding Window Protocols (Stop and Wait, Go-Back-N (GBN) and S	Selective		
Repetitive (SR)), Medium Access Control-The Channel Allocation Problem, Multiple	Access		
Protocols, and Ethernet. Data Link Layer Switching: Uses of bridges, repeaters, hubs, sy	witches,		
routers and gateways.			
UNIT–III	10 Hrs.		
The Network Layer: Network Layer Design issues, Routing algorithms- The Optimality P	rincipal,		
Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hier	rarchical		
routing, Congestion Control Algorithms, Quality of Service, Internetworking.			
The Network Layer in the Internet: The Network Layer in the internet- IP version 4 Protoc	ol(IPv4),		
The Main IPv6 Header, Extension Headers, Internet Control Protocols: ICMP, ARP, DHCP.			
UNIT–IV	10 Hrs.		
The Transport Layer -The Transport Service: Services Provided to the Upper Layers, E	Berkeley		
Sockets, Elements of Transport Protocols, Internet transport protocols- TCP: Introduction to TCP,			
The Service Model, Protocol, Segment Header, UDP.			
The Application Layer-The Domain Name System, Electronic Mail, The World-Wide-Web,			
Streaming Audio and Video.			

- 1. Andrew S. Tanenbaum, David J Wetherall, "Computer Networks", Pearson Education, Pearson Publication, 5th Edition, 2012.
- 2. Behrouz A Forouzan, Firouz Mosharraf, "Computer Networks A Top-Down Approach", Tata McGraw-Hill Education Pvt. Ltd, 2011.
- 3. William Stallings, "Data and Computer Communication" ,8th edition, Pearson Publications,2007.

LIST OF LABORATORY ASSIGNMENTS:

Simulate the following experiments using the NS2 simulators.

- 1. Three node point to point network with duplex link between them.
- 2. Four node point to point network using TCP/UDP.
- 3. Different types on internet traffic such as FTP, Telnet and Analyze throughput.
- 4. Transmission of ping messages over network topology consisting of six nodes.
- 5. Ethernet LAN using N nodes (6 to 10), change error rate and data rate and also compare throughput.

Implement the following programs using C/C++ language:

- 6. Error detection using CRC-CCITT(16-bits).
- 7. Bits stuffing and de-stuffing of Binary data.
- 8. Distance vector algorithm to find a suitable path for transmission.
- 9. Congestion control using leaky bucket algorithm.
- 10. Demonstrate converting normal text to cipher text using simple techniques.

Course Outcomes**

- 1. To comprehend basics of data communication system.
- 2. Enumerate the layers of the OSI, TCP/IP model and demonstrate functions of each layer and comprehend the concept of data link protocols.
- 3. To exhibit the ability to apply different error detection and correction technique to solve communication problem.
- 4. To exhibit the ability to understand issues related to transport layer and protocols.
- 5. Demonstrate the concept of internetworking, routing techniques of network layer.

CIEMarks:50

UNIT-I	10 Hrs.			
Research Methodology: Introduction, Meaning of Research, Objectives of Research, M	otivation			
in Research, Types of Research, Research Approaches, Significance of Research,	Research			
Methods versus Methodology, Research and Scientific Method, Importance of Knowing How				
Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by				
Researchers in India. Defining the Research Problem:Research Problem,Select	ting the			
Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem,	An			
Illustration.				

UNIT-II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to your research problem, improving research methodology, Broadening knowledgebase in research area, enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

UNIT-III

10 Hrs.

10 Hrs.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

UNIT–IV

10 Hrs.

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of 02.03.2021 updated 17/ 104Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. **Intellectual Property (IP) Acts:** Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970.Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999. **Reference Books ***

- 1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
- 2. Research Methodology a step-by- step guide for beginners. Ranjit Kumar SAGEPublications Ltd 3rd Edition, 2011 Study Material.
- 3. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

Course Outcomes**

- 1. Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.
- 2. Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- 3. Explain various research designs, sampling designs, measurement and scaling techniques.
- 4. Perform the data collection from various sources segregate the primary and secondary data.
- 5. Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions.

23PCA107C		Credits:NA
Hrs/Week:L:T:P:S	Introduction to Programming	CIEMarks:100
3:0:0:0		
Total Hours/Week:	Languages	SEEMarks: NA
40 Hrs		

UNIT-I	10 Hrs.		
Overview of C: Features of C, Structure of C program, process of compiling and exe	ecuting the C		
program. Constants, Variables and Data types: Introduction, Character set, C toker	ns, Keywords		
and Identifiers, Constants, Variables, Data types, Declaration of variables, Examp	le programs.		
Operators and Expressions: Overview of operators, Evaluation of expressions, Type	conversion in		
expressions. Managing Input and Output Operations: Formatted and Unformatted	ed input and		
output statements Decision making and Branching: Decision making with if, if-else,	Nesting of if-		
else statements, else-if ladders, switch statement, Conditional Operator ?:, goto stater	ment.		
UNIT–II	10 Hrs.		
Looping: while statement, do-while statement, for statement, jumps in loc	ops. Arrays:		
Introduction, One dimensional arrays, declaration and initialization of one-dimension	sional arrays,		
Two dimensional arrays, declaration and initialization of two-dimensional arrays. O	perations on		
arrays. Strings: Introduction, Declaring and initializing string variables, String-handlin	ng functions,		
Array of String.			
UNIT–III	10 Hrs.		
User defined functions: Introduction, Elements of user defined function, Category of	unctions:		
Based on call by value, call by reference, recursive functions. Structures: Defining a structure,			
Declaring structure variables, Accessing structure members, Initialization.			
UNIT–IV	10 Hrs.		
Pointers: Introduction, Accessing the address of a variable, Declaring and initialization of pointer			
variables, Pointers as function arguments. Classes and Object-Based Programn	ning in C++:		
Introductions to Object Oriented programming concepts (OOPS), Declaration, creation of class and			
	n of class and		
object using C++, Accessspecifiers of a Class, Constructors and Destructors in a C	n of class and Class, Nested		
object using C++, Accessspecifiers of a Class, Constructors and Destructors in a C Classes.	n of class and Class, Nested		

Reference Books *

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw Hill Publications, 2017.

- E. Balagurusamy,, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd, Fourth Edition 2010.
- 3. K R Venugopal, Rajkumar Buyya and T. Ravishankar, Mastering C++, Tata McGraw-Hill, 2006.

Course Outcomes**

- 1. Demonstrate the key concepts introduced in C programming by writing and executing the programs.
- 2. Demonstrate the concepts of structures and pointers for the given application/problem.
- 3. Implement the single/multi-dimensional array for the given problem.
- 4. Explore user-defined data structures like structures and pointers in implementing solutions like heterogeneous data processing.
- 5. Design and Develop Solutions to problems using modular/object oriented programming constructs using functions.

23PCA108L		Credits: 1.5
Hrs/Week:L:T:P:S		CIEMarks:50 SEEMarks:50
0:0:3:0	Python Programming Laboratory	
40 Hrs		
1. Program on Decis	ion Control Structure Statements.	
2. Program on List a	nd Dictionary of data.	
3. Program on User	Defined Functions.	
4. Program on Regu	lar Expressions.	
5. Program on Obje	ct Oriented Concepts.	
6. Program on Over	loading Operator.	
7. Program on File H	landling Mechanism.	
3. Program on Work	king with database.	
 Program on Except 	otion Handling.	
10. Creation of GUI a	pplication.	
Course Outcomes (CO	c).	

- 1. Understand the basic programming elements of Python.
- 2. Apply and analyze the different python data structures.
- 3. Understand the concepts of OOPS using Python.
- 4. Implement and debug the real world applications using GUI, file handling and Database.

Hrs/	3PCA109L /Week:L:T:P:S 0:0:3:0	Web Programming Laboratory	Credits: 1.5 CIEMarks:50	
Total Hours/Week: 40 Hrs			SEEMarks:50	
1.	Design and develo	op a static web page using basic HTML tags to	demonstrate use of	
2	different color, fo	nt, table format, bold, italic etc.		
2. 2	Design and develo	op a web page to demonstrate different types	of style sneets.	
3.	Design and develo	op external CSS style sneet to create a registra	ation form and validate	
Α	using JavaScript.		¢	
4.	considering gener	t to demonstrate use of alert, prompt and con cal feedback form	firm message box by	
5	Using HTML and	avaScript design a web page to calculate a pa	vroll of an employee	
5.	Note:	avaseript design a web page to calculate a pa	yron or an employee.	
	1 Read employee details such as employee id name designation dent DOI and basic			
	salary.			
	2. Read deduction in percentage such as PF (Employee side). LIC.			
 Keau deduction in percentage such as PF (Employee side), LIC. Read allowance in percentage such as PF (Employee side) DA and HRA 				
	4. Calculate gross	and net salary of an employee as output.	,	
6.	Demonstrate use	of hyperlink to pass parameters and validate	those parameters in	
	second page using	g JavaScript.	-	
7.	Design and develo	op a Registration and login page. Forward the	request to success and	
	failure page by va	lidating user credentials through AJAX.		
8.	Create an HTML f	Form with Student Name, USN, DOB, Branch,	Sem, Address and E-m	
fields, on submitt		ing the page store them in MySQL table. Retr	ieve and display the da	
	based on USN using PHP.			
9.	Using Rails and M	ySQL, develop a program to accept book Info	rmation viz. Accession	
	number, title, aut	hors, edition and Publisher from a web page a	and store the	
	information in a d	latabase And to search for a book with the titl	e specified by the user	
	and to Display the	e search results with proper headings.		
	Design and devel	on a responsive web site by considering any r	1	

Course Outcomes (COs):

- 1. Design and develop static web pages.
- 2. Demonstrate use of different types of CSS.
- 3. Apply the knowledge of JavaScript/AJAX to develop interactive web pages.
- 4. Design and develop dynamic web pages using PHP.

23PCA110S		Credits: 02
Hrs/Week:L:T:P:S 0:0:0:2	Seminar	CIEMarks:50
Total Hours/Week: 28 Hrs		SEEMarks:50

Seminars are used as a course delivery mode to gather current trends in technology, research literature and self learn topics of their interests. Student has to search a technicaltopic, make presentation and give a detailed document on their findings in consultation with theguide.

Course Outcomes (COs):

At the end of the course student should be able to:

- 1. Identify seminar topics based on contemporary technical, societal and environmental issues.
- 2. Conduct literature survey in the selected domain.
- 3. Explore advanced concepts and technologies.
- 4. Make oral and written technical presentation.

SEMINAR ASSESMENT:

CIE and SEE marks Award : The committee, constituted for the purpose by the Head of the Department, shall award the CIE and SEE marks for the seminar. The committee comprising of Guide/Co-Guide, Senior faculty of the department and HoD/HoD nominee.

CIE and SEE marks Evaluation: Based on technical papers, application development, emerging technology etc.

Presentation skill : 50% of Marks

Report Writing : 25% of Marks

Question and answering : 25% of Marks

MCA II SEMESTER SYLLABUS

40 Hrs

CIEMarks:50

UNIT-I

10 Hrs.

Introduction to data structures: Information and meaning Stack: Definition and examples Primitive operation,Example,Testing for exceptional conditions,implementing the push operation.Example:Infix,postfix and prefix,Basic definitions and examples. Evaluating a postfix expression,Program to evaluate a postfix expression,converting an expression from infix to postfix, Program to convert an expression from infix to postfix.Recursion: Recursive definition and processes, Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithms, Towers of Hanoi problem. Queue: The queue and its sequential representation,C implementation of queues,Priority queue,Array implementation of a priority queue, circular queue and its implementation, deque(doubly endedqueue)implementation.

UNIT–II

10 Hrs.

Lists: Linked lists, Inserting and removing nodes from a list, Linked implementation of stacks, Getnode and freenode operations, Linked implementation of queues, Linked list as a data structure, Exampleoflistoperation, Header nodes, Arrayimplementationoflists, Limitationsofarray Implementation, Allocating and freeing dynamic variables, Linked lists using dynamic variable, Non integer and non-homogeneous lists. Other list structures, Circular lists, Stack as a circular list, Queue ascircular list, Primitive operations on circular lists, doubly linked lists.

UNIT-III

Binary Trees: Binary trees, Operations on binary trees, Applications of binary trees. Binary treerepresentation,Noderepresentationofbinarytree,Internalandexternalnodes,implicitarrayrepr esentation of binary trees, choosing a binary tree representation, binary tree traversal using C,threaded binary trees. Tree traversals using a father field, heterogeneous binary tree, **Representinglist as binary tree:** finding the kth element, deleting an element, finding minimum and maximumelement in atree, evaluatinggeneral expressions using trees.

UNIT-IV

10 Hrs.

10 Hrs.

Sorting: Exchange sort: Bubble sort, Quick sort. Selection sort and Tree sorting: Straight selectionsort, Binary tree sorts, sorting using a heap. Insertion sorts: Simple Insertion, Shell sort, Merge andRadixsorts.
 Searching: Sequential searching, Indexed sequential search, Binary

search, Interpolation search.Tree Searching: Insertion into a Binary search tree, Deleting from a Binary search tree. Optimumsearchtrees, Balanced trees.

Reference Books *

- 1. Data structures using C by Yedidyah Langsam and Moshe J.Augenstein and Aaron M. Tenanbaum, PHI.
- 2. Mark Allen Weiss, data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
- 3. Anany Levitin, Introduction to design and analysis of algorithms, Pearson Education, 2003

Course Outcomes**

- 1. Understand the basic concepts of data structures like stack and queue
- 2. Analyze the logical representation of linked lists
- 3. Understand the working procedure of binary trees
- 4. Design and analyze sorting and searching techniques
- 5. Be able to compare functions and describe the relative merits of worst-, average-, and bestcase analysis.

UNIT-I	13 Hrs.		
An Overview of Java: The Java Class Libraries, Data Types, Variables, Introducing to Object			
Oriented programming concepts Encapsulation using Classes: Class Fundament	als, data		
members, Declaring Objects, Assigning Object Reference Variables, Introducing to			
Polymorphism using Constructors and Methods, Abstract Classes and methods.			
UNIT–II	13 Hrs.		

Inheritance: Types of Inheritance, Using overloading and overriding of constructors and methods, this and super keywords, Interfaces, Exception Handling.J2EE-Overview: Enterprise Architecture Types-Single tier, 2-tier,-3-tier, n-tier, objectives of Enterprise Applications, features of J2EE, introduction to servers-web servers vs Application servers. Working with Servlets 3.1: Exploring the features of servlet 3.1, request and response model, servlet with API-packages, web directory structure-packaging, deploying and running web applications, servlet-lifecycle, working with ServletConfig and ServletContext Objects, HttpServletRequest and HttpServletResponse Interfaces.

UNIT-III

13 Hrs.

Handling Sessions in Servlet 3.1: Describing the session, Introduction to session tracking, Exploring session tracking mechanisms – using cookies, Hidden Form Fields, URLRewriting, session creation and tracking. **Java Server Pages 2.3(JSP):** Introduction to JSP technology, advantages of JSP over servlet, architecture of JSP- Model-1,Model-2,life cycle of JSP, JSP Basic tags – scripting, directive, action tags, JSP implicit objects, Java Beans API, Bean properties, declaring beans in JSP Pages, bean components.

UNIT–IV

13 Hrs.

JDBC 4.0: Introducing JDBC- architecture, features, JDBC Driver Types, JDBC API- sql Packages, A Brief Overview of the JDBC process with java.sql packages- JDBC Database Connection; Associating the JDBC/ODBC Bridge with the Database, Describing Classes and Interfaces- Driver Manager class, Driver Interface, Connection Interface, Statement Interface, Prepared Statement ,Callable Statement Interface, Result Set, Batch Updates. Transaction Processing; Metadata, Data types; Exceptions. J2EE Design Patterns: Introducing Design Patterns, Role of design patterns, types of design patterns.Spring Framework: Introduction to Spring framework, Features and Spring framework architecture- core module, AOP module, ORM Module.

Reference Books *

- 1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2020.
- Kogent Learning Solutions Inc and Dreamtech Press: Java Server Programming Java EE 7 Black Book, 2020
- 3. Keogh, Jim (2002). J2EE: the complete reference. New Delhi : Tata McGraw-Hill.

Course Outcomes**

- Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs.
- 2. Understand J2EE framework and technologies (Servlet/JSP).
- 3. Work with Java.sql.* package to design, implement and debug database applications.
- 4. Develop reusable software components using Java patterns.
- 5. Understand Spring framework and Develop Web based applications successfully.

23PCA203C Hrs/Week:L:T:P:S

3:0:2:0

Total Hours/Week: 40 Hrs + 12 Hrs

Database Management System

CIEMarks:50

UNIT-I

10 Hrs.

Databases and Database Users: Introduction, An Example, Characteristics of the Database Approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS approach, A brief history of database applications, When not to use a DBMS, **Database System Concepts and Architecture**: Data models, schemas and instances, Three-schema architecture and data independence, Database language and interfaces, The database system environment. **Data Modeling Using the Entity-Relationship(ER) Model:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationships, Relationship Types, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues.

UNIT–II

10 Hrs.

10 Hrs.

The Relational Data Model and Relational Database Constraint: Relational Model Concepts, Relational Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations. Relational Algebra and Relational Calculus: Unary Relational Operations, Relational Algebra Operations from Set Theory, Binary Relational Operations, Additional Relational Operations; Examples of Queries in Relational Algebra. **Relational Database Design Using ER and EER to-Relational Mapping:** Relational Database Design Using ER to Relational Mapping. **SQL-99: Schema Definition, Constraints, Queries and Views:** SQL Data Definition and Data types, Specifying Constraints in SQL, Schema Change statement in SQL, Basic Queries in SQL, More Complex SQL Queries, Insert, Delete and Update Statements in SQL, Specifying Constraints as Assertion and Triggers, Views (Virtual Tables) in SQL, Additional Features of SQL.

Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. **Relational Database Design Algorithms and Further Dependencies:** Properties of Relational Decompositions, Algorithms for Relational Database Schema Design; Multi-valued Dependencies and fourth normal form, Join Dependencies and fifth normal form, Inclusion Dependencies; Other Dependencies and Normal Forms. **Overview of Query Evaluation** The System Catalog: Information in the Catalog;

UNIT-III

Introduction to Operator Evaluation: Three Common Techniques, Access Paths; Algorithms for Relational Operations: Selection, Projection, Join, Other Operations; Introduction to Query Optimization: Query Evaluation Plans, Multi-operator Queries, Pipelined Evaluation, The Iterator Interface; Alternative Plans: A Motivating Example: Pushing Selections, Using Indexes; What a Typical Optimizer Does: Alternative Plans Considered, Estimating the Cost of a Plan.

UNIT-IV

10 Hrs.

Overview of Transaction Management: The ACID Properties: Consistency and Isolation, Atomicity and Durability; Transactions and Schedules; Concurrent Execution of Transactions: Motivation for Concurrent Execution, Serializability, Anomalies due to Interleaved Execution, Schedules Involving Aborted Transactions; Lock- Based Concurrency Control: Strict Two-Phase Locking, Deadlocks; Performance of Locking; Transaction Support in SQL: Creating and Terminating Transactions, What Should We Lock? Transaction Characteristics in SQL: Introduction to Crash Recovery: Stealing Frames and Forcing Pages, Recovery - Related Steps during Normal Execution, Overview of ARIES recovery algorithm, Atomicity: Implementing Rollback. Database Security, Introduction to Database Security; Access Control; Discretionary Access Control: Grant and Revoke on Views and Integrity Constraints; Mandatory Access Control: Multilevel Relations and Poly instantiation, Covert Channels, DoD Security Levels.

Reference Books *

- 1. R. Elmasri and S. Navathe, Fundamentals of Database Systems, Fifht Edition, Pearson Education 2011.
- 2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill 2003.
- 3. Silberschatz,Korth and Sudarshan, Database System Concepts, Fourth Edition, McGraw-Hill.

Course Outcomes**

- **1.** Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
- **2.** Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
- **3.** Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
- 4. Develop application to interact with databases, relational algebra expression.
- 5. Develop applications using tuple and domain relation expression from queries.

DBMS Laboratory Assignments:

- 1. Demonstration of basic queries like create, update, drop and select (with aggregate and group functions)
- 2. Design and demonstration of ER Module.
- 3. Use of Intermediate SQL queries based on inner queries, working on constraints, different types of JOIN, filters etc.
- 4. Demonstrate use of subroutines
- 5. Demonstrate use of stored procedures.
- 6. Demonstrate use of triggers.
- 7. Database design and normalization.
- 8. Queries on database backup and Revoke.
- 9. User creation and authentication.
- 10. Use of advanced data types such as BLOG, Timestamp, Binary etc.

Course Outcomes (COs):

At the end of the course student should be able to:

- 1. Understand the fundamental concepts like data, information, DBMS, Data Models.
- 2. Design and Create Databases.
- 3. Implement and Manipulate the data.
- 4. Optimize query performance.

UNIT-I

10 Hrs.

Fundamentals of Technical Communication: Technical Communication: Features; Distinction between General and Technical Communication; **Levels of Communication:** Extrapersonal Communication, Intrapersonal Communication, Interpersonal Communication, Organizational Communication and Mass Communication. **The Flow of Communication:** Downward Communication, Upward Communication, Lateral or Horizontal Communication, Diagonal or Crosswise Communication, The Importance of Technical Communication.

UNIT-II

10 Hrs.

Listening Skills: Types of Listening, Traits of a Good Listener, and Barriers to Effective Listening.**Effective Presentation Strategies:** Introduction, Defining Purpose, Analyzing Audience and Locale, Organizing Contents, Introduction Main Body, Conclusions, Preparing an Outline, Kinesics, Personal Appearance: Posture, Gesture, Facial Expression, Eye Contact, Proxemics, Paralinguistics, Quality, Volume, Pace/Rate, Pitch, Articulation Pronunciation, Voice Modulation, Pauses, Chronemics.

UNIT-III

10 Hrs.

Letter Writing and Email: Business Letters, Significance, Purpose, Structure Layout, Principles, Types and Samples. Emails: Advantages and Limitations, Style, Structure, and Content.Technical Reports: Introduction, Importance of Reports, Objectives of Reports, Characteristics of a Report, Categories of Reports, Formats, Prewriting, Structure of Reports (Manuscript Format), Types of Reports, Writing the Report, Revising, Editing, and Proofreading.

UNIT-IV

10 Hrs.

Introduction to business ethics and values: Meaning, Nature of business ethics, Importance of business ethics, Factors influencing business ethics, Arguments for and against business ethics, Types of ethical dilemmas. Values: Meaning, Types of values. Introduction to Corporate Governance: Definition and Conceptual Framework of Corporate Governance, Business Ethics

 an important dimension to Corporate Governance, Fair and Unfair Business Practices.
 Theoretical Basis of Corporate Governance, Mechanism- Corporate Governance Systems, Indian Model of Governance, Good Corporate Governance.

Reference Books *

- 1. Meenakshi Raman, Technical Communication Oxford University Press, 2017.
- 2. C.S.V. Murthy, Business Ethics, Himalaya Publishing House; Mumbai, 2007.
- 3. Andrew Crane and Diark Matten, Business Ethics, Oxford Publication, New Delhi, 2007.

Course Outcomes**

- 1. Understand the fundamental principles of effective technical communications.
- 2. Understand the fundamental principles of good listening skills and effective presentation strategies.
- 3. Develop various types oftechnical reports/letters/emails and practice in their professional life.
- 4. Understand the Business Ethics and corporate governance.
- 5. Imbibe the ethical issues in corporate governance and to adhere to the ethical codes.

23PCA205L		Credits: 2
Hrs/Week:L:T:P:S 0:0:4:0	Data Structures Laboratory	CIEMarks:50
Total Hours/Week:25Hrs		SEEMarks:50

- 1. Write a C Program to demonstrate Stack operations using arrays.
- 2. Write a C Program to evaluate postfix expression, postfix expression contains single digit integers and the operators +,-,*and /.
- 3. Write a C Program to convert infix to postfix expression.
- 4. Write a C Program to demonstrate Queue operations using arrays.
- 5. Write a C Program to demonstrate different operations on singly linked list.
- 6. Write a C Program to demonstrate different operations on circular doubly linked list.
- 7. Write a C program to implement the following operation on binary treeusing array:
 - i. Insert
 - ii. Delete
 - iii. Tree traversal
- 8. Write a C program to demonstrate binary search using recursion.
- 9. Write a C Program to perform the Merge sort.
- 10. Write a C Program to perform the Quick sort.

Course Outcomes (COs):

At the end of the course student should be able to:

- 1. Evaluate the Expressions like postfix, prefix conversions.
- 2. Implementing various data structures viz. Stacks, Queues, Linked Lists, and Trees.
- 3. Implementing various searching techniques.
- 4. Implementing various sorting techniques.

23PCA206L		Credits: 2
Hrs/Week: L:T:P:S 0:0:4:0	Java and J2EE Laboratory	CIEMarks:50
Total Hours/Week: 25Hrs		SEEMarks:50

- 1. Write a JAVA program to demonstrate use of class members and object members.
- 2. Write a JAVA program to demonstrate polymorphismusing constructor and methods
- 3. a) Write a JAVA program to demonstrate abstract class concept.

b) Write a JAVA program to demonstrate the inheritance concept.

- 4. Write a Servlet program to demonstrate the basic servlet using doGet(), doPost() and service() methods.
- 5. Write a servlet program to demonstrate session tracking.
- 6. Write a JSP script to demonstrate scripting, directive and expression tags.
- 7. Write a JSP script to demonstrate bean concept.
- 8. Write a Servlet/JSP to demonstrate CRUD operations using JDBC.
- 9. Write a J2EE application to demonstrate complete login process.
- 10. Write a program to demonstrate spring framework.

Course Outcomes (COs):

At the end of the course student should be able to:

- 1. Demonstrate OOPS concepts.
- 2. Demonstrate simple web applications using servlet and JSP.
- 3. Design and develop web applications to solve real world problems.
- 4. Demonstrate the basic use of spring framework.

23PCA207P		Credits: 02
Hrs/Week: L:T:P:S		CIEMarks:50
0:0:4:0	Mini Project	
Total Hours/Week:`		SEEMarks:50
25 Hrs		
Students are expected to t	ake up mini project with a team size not excee	ding three. The
objective of this course is	to develop real time mini projects using latest t	echnologies.

Course Outcomes (COs):

At the end of the course student should be able to:

- 1. Apply the technical knowledge gained through different courses to solve the real world problems.
- 2. Exhibits the presentation and communication skills.
- 3. Prepare a technical report based on work carried out.
- 4. Exhibit the responsibilities in a team.

Mini Project Assessment:

CIE and SEE marks Award : The committee, constituted for the purpose by the Head of the Department, shall award the CIE and SEE marks for the Mini Project. The committee comprising of Guide/Co-Guide, Senior faculty of the department and HoD/HoD nominee.

CIE and SEE marks Evaluation :

Application development, Presentation skill : 50% of Marks Report Writing : 25% of Marks Question and answering : 25% of Marks

	Professional Elective-I	P	rofessional Elective-II
Subject Code	Subject	Subject Code	Subject
23PCC208E	Data Mining	23PCC212E	Introduction to AI
23PCC209E	Cloud Computing	23PCC213E	DevOps
23PCC210E	Mobile Application Development	23PCC214E	Android Programming Concepts
23PCC211E	Computer Vision	23PCC215E	Natural Language Processing

23PCC208E		Credits	: 03
Hrs/Week: L:T:P:S 3:0:0:0	Data Mining	CIEM	1arks:50
Total Hours/Week: 40Hrs]	SEEN	Aarks:50
	UNIT-I		10 Hrs.
Introduction to data mining	g: Definition of Data Mining, Motivating Challeng	es of DM, Data	a Mining
Tasks. Data: Data Attributes Similarity and Dissimilarity.	s, Types of Data, Quality of Data and Data Preproc	cessing, Measu	ures of
, ,	UNIT–II		10 Hrs.
Association Analysis: Def	inition of Association Analysis, Frequent Item	n Set Genera	tion, Rule
Generation, Compact Rep	resentation of Frequent Item Sets. Alternate Me	thod of Gener	rating Item
Sets, FP Growth Algorithm	s, Evaluation of Association Pattern.		
	UNIT-III		10 Hrs.
Classification: Preliminar	es, General Approach To Solving Classification	Problem, Deci	sion Tree
Based Classifier, Rule Bas	ed Classifier, Nearest Neighbor Classifier. Cluste	r Analysis: Ove	erview, K-
means, DBSCAN.			
	UNIT–IV		10 Hrs.
Descriptive Mining of Co Text Mining – Mining the Reference Books *	mplex Data Objects – Spatial Data Mining – Mu World Wide Web.	Itimedia Data	Mining –
			_ •
1. "Introduction to Data Min	ning", Pang-Ning Tan, Michael Steinbach, Vipin Ku	umar, Pearson	Education.
2. Data winning – Concept	s and rechniques , hawer han and Micheline Ka	amber, worga	in Kautman,
2000, 2110 Euition. 3. "Introduction to Data Mir	ning with Case Studies" GK Gunta PHI		
Course Outcomes**			
After completion of the co	rse student will be able to:		
1. Comprehend the fu	ndamentals of Data mining.		
2. Apply data preproce	ssing techniques.		
 Apply association ruusefulness of rules. 	Ile mining techniques like a priory, FP tree and	ECLAT and ar	nalyze the
4. Apply classification analysis, K-MEANS e	methods like decision tree, rule based and ne tc.	earest neighbo	or, cluster
5. Comprehend advan etc.,	ced mining applications and algorithms like web	mining, searc	ch engines

23PCC209E		Credits	s: 03
Hrs/Week: L:T:P:S		CIEMark	s:50
3:0:0:0 Total Hours/Week:	Cloud Computing	SEEMark	(s:50
40Hrs			
	UNIT-I		10 Hrs.
Introduction to Cloud Cor	mputing: Eras of computing, The vision of Cloud	d Computing,	Defining a
cloud, A closer look, Clo	ud computing reference model, Historical dev	velopments: [Distributed
systems, Virtualization,	Web 2.0; Service oriented computing; Utilit	cy oriented o	computing.
Architectures for parallel a	and distributed computing: Parallel Vs Distribute	ed computing,	Elements
of distributed computing,	Technologies for distributed computing.		
	UNIT–II		10 Hrs.
Virtualization: Introduction	n, Characteristics of virtualized environments, Ta	axonomy of v	irtualization
techniques, Virtualization a	and cloud computing, Pros and cons of virtual	lization, Techi	nology
examples: Xen: Para virtuali	ization, VmWare: Full virtualization, Microsoft Hy	yper – V.	
	UNIT–III		10 Hrs.
Cloud computing architect	UNIT–III ure: Introduction, Cloud reference model: Archi	itecture, IaaS,	10 Hrs. PaaS, SaaS,
Cloud computing architect Types of Clouds: Public, Priv	UNIT–III ure: Introduction, Cloud reference model: Archi vate, Hybrid and Community clouds, Economics	itecture, IaaS, of the cloud, (10 Hrs. PaaS, SaaS, Open
Cloud computing architect Types of Clouds: Public, Priv challenges.	UNIT–III ure: Introduction, Cloud reference model: Archi vate, Hybrid and Community clouds, Economics	itecture, laaS, of the cloud, (10 Hrs. PaaS, SaaS, Open
Cloud computing architect Types of Clouds: Public, Priv challenges.	UNIT–III ure: Introduction, Cloud reference model: Archivate, Hybrid and Community clouds, Economics UNIT–IV	itecture, IaaS, of the cloud, (10 Hrs. PaaS, SaaS, Open 10 Hrs.
Cloud computing architector Types of Clouds: Public, Priv challenges. Cloud Access: authenticati	UNIT–III ure: Introduction, Cloud reference model: Archivate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov	itecture, IaaS, of the cloud, (venance and	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data -
Cloud computing architector Types of Clouds: Public, Priv challenges. Cloud Access: authenticati Cloud Reliability and faul	UNIT–III ure: Introduction, Cloud reference model: Archi vate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov It-tolerance - Cloud Security, privacy, policy	itecture, IaaS, of the cloud, (venance and and complia	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data - ance- Cloud
Cloud computing architector Types of Clouds: Public, Priv challenges. Cloud Access: authenticati Cloud Reliability and faul federation, interoperability	UNIT–III ure: Introduction, Cloud reference model: Archi vate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov It-tolerance - Cloud Security, privacy, policy and standards.	itecture, IaaS, of the cloud, (venance and and complia	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data - ance- Cloud
Cloud computing architector Types of Clouds: Public, Priv challenges. Cloud Access: authenticati Cloud Reliability and faul federation, interoperability	UNIT–III ure: Introduction, Cloud reference model: Archivate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov It-tolerance - Cloud Security, privacy, policy and standards.	itecture, IaaS, of the cloud, C venance and and complia	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data - ance- Cloud
Cloud computing architect Types of Clouds: Public, Priv challenges. Cloud Access: authenticati Cloud Reliability and faul federation, interoperability Reference Books *	UNIT–III ure: Introduction, Cloud reference model: Archivate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov It-tolerance - Cloud Security, privacy, policy and standards.	itecture, IaaS, of the cloud, G venance and and complia	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data - ance- Cloud
Cloud computing architect Types of Clouds: Public, Privion challenges. Cloud Access: authenticati Cloud Reliability and faul federation, interoperability Reference Books * 1. Rajkumar Buyya, Ch	UNIT–III ure: Introduction, Cloud reference model: Archi vate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov It-tolerance - Cloud Security, privacy, policy and standards.	itecture, IaaS, of the cloud, C venance and and complia	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data - ance- Cloud
Cloud computing architector Types of Clouds: Public, Privion challenges. Cloud Access: authenticati Cloud Reliability and faul federation, interoperability Reference Books * 1. Rajkumar Buyya, Ch McGraw Hill, New D	UNIT–III ure: Introduction, Cloud reference model: Archivate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Prov It-tolerance - Cloud Security, privacy, policy and standards. pristian Vecchiola, and ThamaraiSelci, Mastering relhi, India, 2013. pud Computing Bible" John Wiley & Sons 2010	itecture, IaaS, of the cloud, C venance and and complia	10 Hrs. PaaS, SaaS, Dpen 10 Hrs. meta-data - ance- Cloud
Cloud computing architect Types of Clouds: Public, Privion challenges. Cloud Access: authenticati Cloud Reliability and faul federation, interoperability Reference Books * 1. Rajkumar Buyya, Ch McGraw Hill, New D 2. Barrie Sosinsky, " Clo 3. Kai Hwang, Geoffrey allel Processing to th	UNIT–III ure: Introduction, Cloud reference model: Archivate, Hybrid and Community clouds, Economics UNIT–IV ion, authorization and accounting - Cloud Provide It-tolerance - Cloud Security, privacy, policy and standards. pristian Vecchiola, and ThamaraiSelci, Mastering elhi, India, 2013. oud Computing Bible" John Wiley & Sons, 2010 y C. Fox and Jack J. Dongarra, "Distributed and come internet of Things", Morgan Kaufmann, Elsevie	itecture, IaaS, of the cloud, C venance and and complia Cloud Compu loud computir er – 2012	10 Hrs. PaaS, SaaS, Open 10 Hrs. meta-data - ance- Cloud uting, Tata

Course Outcomes**

- 1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
- 2. Understand and Identify the basic concepts of Virtualization and types.
- 3. Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
- 4. Explain the core issues of cloud computing such as security, privacy, and interoperability.
- 5. Provide the appropriate cloud computing solutions and recommendations according to the applications used.

23PCA210E		Credit	s: 03
Hrs/Week: L:T:P:S		CIEMark	s:50
3:0:0:0	Mobile Application Development		
Total Hours/Week:		SEEMark	ks:50
40Hrs			
	UNIT-I		10 Hrs.
Introduction: Preliminary Co	onsiderations – Cost of Development – Importa	nce of Mobile	Strategies in
Moh Prosonce - Mohilo Cou	e Development Today - Mobile Myths - Third-P	- Markoting	Nob Services
for Mobile Applications: W	hterit - Mobile Browsers - Mobile Applications - /hat is a Web Service? - Examples of Web Serv	vices - Advant	ages of Web
Services - Web Services Lan	guages (Formats) - eXtensible Markup Languag	e (XML) - Java	Script Object
Notation (JSON) - Transferr	ing Non-textual Data - Creating an Example W	eb Service - l	Jsing the Mi-
crosoft Stack - Using the Lir	nux Apache MySQL PHP (LAMP) Stack - Debuggi	ng Web Servi	ces - Tools -
Advanced Web Service Tech	niques.		
	UNIT–II		10 Hrs.
MOBILE USER INTERFACE D	ESIGN: Understanding Mobile Applications Use	rs – Understa	nding Mobile
Information Design – Under	rstanding Mobile Platforms – Using the Tools o	of Mobile Inte	rface Design.
Mobile Websites: Choosing	; a Mobile Web Option - Adaptive Mobile We	bsites - Dedi	cated Mobile
Websites - Mobile Web App	s with HTML5.		
MOBILE OPERATING SYSTE	MS: Getting Started with Android Programmin	ng: Why Targ	et Android? -
who Supports Android? - Al	ndroid as competition to itself - Multiple Marke	ets and Marke	t LOCKS - Get-
Google Play - Android Devel	onment Practices- Building the Derby App in App	hroid	cong to the
	UNIT-III		10 Hrs.
Getting Started With IoS :T	The iPhone Craze - Apple in Its Beauty - Apple I	Devices - Gett	ing the Tools
You Need - Hardware - xCo	ode and the iOS SDK - The iOS Human Interfac	e Guideline -	iOS Project -
Anatomy of an iOS App - G	etting to Know the xCode IDE - Debugging iOS	Apps - The iC	S Simulator -
Debugging Code - Instrume	ents - Objective-C Basics - Classes - Control Str	uctures - Try	Catch - Hello
World App - Creating the Pr	roject - Creating the User Interface - Building the	he Derby App	
Interface - Team Roster- De	etails - Leagues and Team Names - Other Usefu	I iOS Things -	in iOS - User
age – GPS.	0	0	in iOS - User Offline Stor-
		U	in iOS - User Offline Stor-
Getting Started with Windo	ows Phone : New Kid on the Block - Metro - App	olication Bar -	in iOS - User Offline Stor- Tiles - Tomb-
Getting Started with Windo stoning - Getting the Tools	ows Phone : New Kid on the Block - Metro - App You Need - Hardware - Visual Studio and Wind	blication Bar - ows Phone SE	in iOS - User Offline Stor- Tiles - Tomb- K - Windows
Getting Started with Windo stoning - Getting the Tools Phone 7 Project - Silverlight	Dws Phone : New Kid on the Block - Metro - App You Need - Hardware - Visual Studio and Wind t vs. Windows Phone 7 - Anatomy of a Window Wilding the Derby App in Windows Phone 7	blication Bar - ows Phone SC vs Phone 7 Ap	in iOS - User Offline Stor- Tiles - Tomb- K - Windows pp - The Win-
Getting Started with Windo stoning - Getting the Tools Phone 7 Project - Silverlight dows Phone 7 Emulator - B	Dws Phone : New Kid on the Block - Metro - App You Need - Hardware - Visual Studio and Windo t vs. Windows Phone 7 - Anatomy of a Window Building the Derby App in Windows Phone 7 - G	olication Bar - ows Phone SE vs Phone 7 Ap Creating the P	in iOS - User Offline Stor- Tiles - Tomb- K - Windows op - The Win- Project - User
Getting Started with Windo stoning - Getting the Tools Phone 7 Project - Silverlight dows Phone 7 Emulator - B Interface - Derby Names - L age - Notifi cations - GPS – A	Dws Phone : New Kid on the Block - Metro - App You Need - Hardware - Visual Studio and Wind t vs. Windows Phone 7 - Anatomy of a Window Building the Derby App in Windows Phone 7 - G eagues - Distribution - Other Useful Windows P Accelerometer - Web Services	blication Bar - ows Phone SE vs Phone 7 Ap Creating the P Phone Things -	in iOS - User Offline Stor- Tiles - Tomb- K - Windows p - The Win- Project - User Offline Stor-
Getting Started with Windo stoning - Getting the Tools Phone 7 Project - Silverlight dows Phone 7 Emulator - B Interface - Derby Names - L age - Notifi cations - GPS – A	ows Phone : New Kid on the Block - Metro - App You Need - Hardware - Visual Studio and Wind t vs. Windows Phone 7 - Anatomy of a Window Building the Derby App in Windows Phone 7 - O eagues - Distribution - Other Useful Windows P Accelerometer - Web Services UNIT-IV	blication Bar - ows Phone SE vs Phone 7 Ap Creating the P Phone Things -	in iOS - User Offline Stor- Tiles - Tomb- OK - Windows Op - The Win- Project - User Offline Stor- 10 Hrs.
Getting Started with Windo stoning - Getting the Tools Phone 7 Project - Silverlight dows Phone 7 Emulator - E Interface - Derby Names - L age - Notifi cations - GPS – A GETTING STARTED WITH	ws Phone : New Kid on the Block - Metro - App You Need - Hardware - Visual Studio and Winde t vs. Windows Phone 7 - Anatomy of a Windows Building the Derby App in Windows Phone 7 - G eagues - Distribution - Other Useful Windows P Accelerometer - Web Services UNIT-IV MONOTOUCH AND MONO FOR ANDROID:	Dication Bar - ows Phone SE vs Phone 7 Ap Creating the F Phone Things - The Mono F	in iOS - User Offline Stor- Tiles - Tomb- OK - Windows Op - The Win- Project - User Offline Stor- 10 Hrs. ramework -

Xamarin Mobile - Getting the Tools You Need - Mono Framework - MonoTouch - Mono for Android -Getting to Know MonoDevelop - Debugging - MonoTouch Specifics - Mono for Android Specifics -Mono Projects - Anatomy of a MonoTouch App - Anatomy of a Mono for Android App - Building the Derby App with Mono - MonoTouch - Mono for Android - Other Useful MonoTouch/Mono Features -Local Storage – GPS.

Reference Books *

- 1. Jeff & Scott, "Professional Mobile Application Development", Wrox Publications.
- 2. Wei-Meng Lee, "Beginning Android Application Development", Wiley.

Course Outcomes**

- 1. Understand Various Mobile Application Architectures. (Understand)
- 2. Develop applications using software development kits (SDKs), frameworks and toolkits.
- 3. Implement suitable platform for mobile devices
- 4. Design and develop open-source software based mobile application to the given problem.
- 5. Build and deploy competent mobile application to solve the societal/industrial problems.

	23PCA211E		Credits: 03
	Hrs/Week: L:T:P:S		CIEMarks:50
	3:0:0:0 Total Hours/Week: 40Hrs	COMPUTER VISION	SEEMarks:50
		UNIT-I	10 Hrs.
lr c h g	ntroduction & Fundamental components of an DIP syster ancement in special domain ram specification, image av	Is: Origin of DIP, examples of fields that use DIP, m, Image formation model, Spatial & Gray level n: Piecewise transformation functions, Histogram veraging, spatial filters- smoothing and sharpe	fundamentals of DIP, resolution, Image en- m equalization, Histo- ning, Laplacian filter,
C	anny edge detector., image	sampling and quantization, some basic relations	hips between pixels
		UNIT–II	10 Hrs.
E te q F	nhancement Using Arithme ers, Sharpening Spatial Filte uency Domain: Introductio requency-Domain Filters, Sh	tic/Logic Operations, Basics of Spatial Filtering, S rs, Combining Spatial Enhancement Methods. E In to the Fourier Transform and the Frequency Parpening Frequency Domain Filters, Homomorpl	Smoothing Spatial Fil- Enhancements in Fre- Domain, Smoothing nism Filtering.
		UNIT–III	10 Hrs.
ra m v n	ation in the Presence of No nain Filtering, Linear, Positi erse Filtering, Mean Square netric Mean Filter, Geometri	ise Only-Spatial Filtering, Periodic Noise Reduct on-Invariant Degradations, Estimating the Degr e Error (Wiener) Filtering, Constrained Least Sc ic Transformations.	ion by Frequency Do- adation Function, In- quares Filtering, Geo-
		UNIT–IV	10 Hrs.
N a D	Iorphological Image Proces nd Closing, The Hit-or-Miss iscontinuities, Edge Linking eference Books *	ssing and Segmentation: Preliminaries, Dilation Transformation. Some Basic Morphological Alg and Boundary Detection, Thresholding, RegionBa	and Erosion, Opening orithms, Detection of ased Segmentation.
1 2	. Rafael C. Gonzalez and Ric . Anil K. Jain, "Fundamentals	hard E. Woods, "Digital Image Processing", Pears s of Digital Image Processing", Pearson Educatior	son Education. n.
С	ourse Outcomes**		
A	 fter completion of the cour Understand the conception of in plays in perception of in Acquire an appreciation appearance of an image 	se student will be able to: ot of image formation, digitization and the role mage data. on for spatial and frequency-based techniques e duly applying them in different applications.	human visual system s for enhancing the

- **3.** Discern the difference between noise models, realize different spatial and frequency-based filtering techniques for reduction and removal of noise.
- **4.** Design and create practical solutions using morphological operators and segmentation techniques for common image processing problems.
- 5. Apply image processing knowledge in building real time applications.

23PCA212	2E		Cree	dits: 03
Hrs/Week:	L:T:P:S	Introduction to Artificial	CIEMa	arks:50
3:0:0:	0			
Total Hours,	'Week:	Intelligence	SEEM	arks:50
40 Hrs	5	Intemgence		
		UNIT-I		10 Hrs.
Introduction: Ove	erview of Art	ificial Intelligence- Problems of AI, AI Technique	e, Tic - Tac ·	- Toe Prob-
lem. Intelligent A	gents: Agent	ts & Environment, Nature of Environment, Stru	icture of Ag	gents, Goal
Based Agents, Uti	lity Based Ag	gents, Learning Agents. Problem Solving: Proble	ems, Proble	m Space &
Search: Defining	The Problem	As State Space Search, Production System, Pro	blem Chara	acteristics,
Issues In The Desi	gn Of Search	n Programs.		
		UNIT-II		10 Hrs.
Search Technique	es: Solving P	Problems by Searching, Problem Solving Agents	s, Searchin	g For Solu-
tions; Uniform Se	arch Strateg	gies: Breadth First Search, Depth First Search, I	Depth Limit	ed Search,
Bi-directional Sea	rch, Compa	ring Uniform Search Strategies. Heuristic Sear	ch Strategi	es: Greedy
Best-First Search,	A* Search,	Memory Bounded Heuristic Search: Local Search	ch Algorithi	ms & Opti-
mization Problem	s: Hill Climb	ing Search, Simulated Annealing Search, Local E	Beam Searc	h, Genetic
Algorithms; Const	raint Satista	ction Problems, Local Search For Constraint Sati	Istaction Pro	oblems.
		UNIT-III		10 Hrs.
Knowledge & Re	easoning: Ki	nowledge Representation Issues, Representat	tion & Ma	pping, Ap-
proaches to Know	ledge Repre	esentation, Issues in Knowledge Representation	. Using Pre	dicate Log-
IC: Representing :	Simple Fact I	In Logic, Representing Instant & ISA Relationsn	ip, Comput	
tions & Predicates	s, Resolution	n, and Natural Deduction. Representing Knowle	Backward (Rules: Pro-
Matching Contro	l Knowledge	iowiedge, Logic Programming, Forward verses	Dackwalu	veasoning,
Watering, contro	innowiedge	UNIT-IV		10 Hrs.
Prohabilistic Rea	soning: Ren	resenting Knowledge in an Uncertain Domain	Bayesian	Networks
Demoster-Shafer	Theory Plar	ning: Overview Components of A Planning Sys	tem Goal (Stack Plan-
ning Hierarchical	Planning I	earning: Forms of Learning Inductive Learning	ng Explanat	tion Based
Learning, Neural I	Vet Learning	& Genetic Learning.	5, Explana	
,				
Reference Books *				
1. Stuart J. Rus	ssell, Peter N	Norwig, Artificial Intelligence –A Modern approa	ach, 3 rd Ed	lition,
Pearson Edu	ucation, 201	6.		
2. Rich E. & Kn	ight K. "Artil	ficial Intelligence", 2nd Edition, TMH, New Delhi	i. • C	
3. Parag Kulka	rni, Prachi J	osni, Artificiai intelligence –Building Intelligen	t Systems,	ist ed., PHI
iearning, 20				
Course Outcomes*	*			

- 1. Understand the principles and approaches of artificial intelligence and different aspects of Intelligent agent.
- 2. Apply different search techniques for solving real world complex problems and select the most appropriate solution by comparative evaluation.
- 3. Design AI based systems and their components with reasoning even in the presence of incomplete and/or uncertain information.
- 4. Develop knowledge-based systems with proper representation schemes.
- 5. Analyze the pros and cons of different AI systems and their design.

	23PCA213E		Crea	dits: 04
	Hrs/Week: L:T:P:S		CIEMa	arks:50
	3:0:0:0	DevOps		
	I otal Hours/Week:	ľ	SEEIVI	arks:50
	40 113			
_		UNIT-I		10 Hrs.
W	hat is DevOps?, Why is Dev	Ops is needed? How is DevOps different from	traditiona	I IT? Why is
De	evops used?, Devops Lifecy	Cie, DevOps Work Flow, DevOps Vs Aglie, Dev	vOps Princ	ipies, Roles,
W	eh Computing Advantages	Types of Cloud Computing Amazon Overview S	Services Clo	ud Platform
Fe	atures of Elastic Compute C	loud (EC2), AWS Services, AWS Management Co	onsole, AW	S Command
Lir	ne Interface, Region, availab	ility Zone and edge location, Amazon EC2 root d	evice volur	ne, Creating
an	d Launching EC2 windows	and Linux Instances, Connecting to Linux an	d Window	s Instances,
M	anaging Security Group, Ide	ntity access Management (IAM), Create IAM us	sers and G	roup, Assign
ро	licy to IAM users and Group	s, Configure IAM roles to access AWS resources.		
		UNIT-II		10 Hrs.
0 0 0 0 0 0 0 0 0 0	lifference between Git and committed, Why Git for yo Vorking with Remote Reposi Container Technology - Inf Containers Work?, Virtual Ma of Container Architecture, Provisioning Containerized Se	I any other VCS, The Three States of Git - m ur organization, Install and Using Git, Commo itories troduction to Containers? Benefits of Contai achines vs Containers, brief intro to Container Te Installing Container engine tool, Creating Co ervices.	inerization, inerization, imerization, intainerized	aged, and nds in Git, How Do , Overview Services,
		UNIT–III		10 Hrs.
N () ()	Managing Containers - Wh Container management strat Containers, Attaching Persist mages - Accessing Registries	at is Container management, Benefits of Cor egy, Pull Docker images from Docker hub, Mana ent Storage to Containers, Accessing containers, (public and Private), Manipulating Container Ima	itainer ma iging the Li , Managing ages.	nagement, fe Cycle of Container
		UNIT–IV		10 Hrs.
S N a t	Security and Monitoring: Sec Monitoring Jenkins, Azure W and memory consumption, A ion monitoring, Azure web a	curity in Jenkins and VSTS, Monitoring Jenkins Veb Apps troubleshooting and monitoring, Azur zure App Services- Activity log, Azure Application pplication monitoring, Diagnostics logs.	and Micros re App Ser n Insights f	soft Azure, vices- CPU or applica-
Re	terence Books *			

- 1. DevOps For Dummies 2ndIBMLimitedEdition by Sanjeev Sharma and Bernie Coyne.
- 2. Deepak Gaikwad, Viral Thakkar, DevOps Tools: from practioner's point of view, Wiley, 1 st Edition, 2019.
- 3. Effective DevOps by Jennifer Davis & Katherine Daniels.

Course Outcomes**

- 1. Illustrate the importance and principles of DevOps
- 2. Utilize Principles and techniques of DevOps to solve problems
- 3. Demonstrate the usage of Application Lifecycle Management tools
- 4. Apply security tools used in DevOps to cloud applications
- 5. Effective use of DevOps tools like Git, Docker etc in various aspects of DevOps delivery model.

23PCA314E		Credi	ts:03
Hrs/Week: L:T:P:S	Android Drogramming Concents	CIEMar	ks:50
3:0:0:0 Total	Android Programming Concepts	SEEMar	ks:50
Hours/Week :40Hrs		SELIVIO	13.30
	UNIT-I		10Hrs.
Overview- BasicsofAndroid,MVC,GUI,C eenActivities, Transitions,F	omponents, Events, Layout Manager, MultipleA Persistent.	ctivities,PassingDa	itabetw
UNIT–II			10Hrs.
CreatingMenus,SQlite,Mana ndGaming	gingDeviceOrientation,TouchesandSwipe,Gra	phics,Animations,	Sounda
UNIT-III			10Hrs.
p	dtheirAPIs,UsingGPSandLocationServices,Usir	gAnotherAppwith	IntheAp
UNIT–IV			10Hrs.
XMLandContantApps,Andro	idWidget,In-AppAdvertising,SecurityandEncry	ption	
Reference Books*			
1. HerveFranceschi, "Androic	ApplicationDevelopment",JonesandBartlletLe	arning.	
2. TrishCornezand Richard Co	rnez, "AndroidProgrammingConcepts", Jonesa	ndBartlletLearning	
Course Outcomes**			
After completion of the cou	rse students will be able to:		
1. Demonstrate the Un	derstanding of fundamental of Android Pro	gramming.	
2. Buildtheirabilitytodev	elopsoftwarewithreasonablecomplexityonmo	bileplatform.	
3. Discover the lifecycle	es of Activities, Applications, intents and frag	gments.	
4. Design the Android a	ops by using Java Concepts.		
5. Build and deploy mo	bile application.		

23PCA215E		Credits: 03
Hrs/Week: L:T:P:S		CIEMarks:50
3:0:0:0	Natural Language Processing	
Total Hours/Week:	Mutur ur Lunguuge 11 occssnig	SEEMarks:50
40 Hrs		
	UNIT-I	10 Hrs.
Introduction to Natural La	anguage Processing: Overview, What is Natur	al Language Processing
Origins of NLP, Language	e and Knowledge, The Challenges of NLP, La	inguage and Gramma
Processing Indian Languag	es, NLP Applications, Some Successful Early N	P Systems, Informatio
Retrieval		
Language Modelling: Int	troduction, Various Grammar-based Langua	ge Models, Statistica
Language Model.	tor Overview Introduction Regular Expressions	Einito-Stato Automata
Mornhological Parsing Sne	elling Error Detection and Correction Words an	d Word Classes Part-of
Speech Tagging		
	UNIT-II	10 Hrs.
Syntactic Analysis: Introdu	uction, Context-Free Grammar, Constituency, F	arsing, Probabilistic
Parsing, Indian Languages.		
Semantic Analysis: Introdu	uction, Meaning Representation, Lexical Sema	ntics, Ambiguity, Word
Sense Disambiguation.		
Discourse Processing: Intr	oduction, Cohesion, Reference Resolution , Di	scourse Coherence and
Structure.		
	UNIT-III	10 Hrs.
Natural Language Generat	UNIT-III ion : Introduction, Architectures of NLG System	s, Generation Tasks an
Natural Language Generat Representations, Application	UNIT–III ion : Introduction, Architectures of NLG System ons of NLG	s, Generation Tasks an
Natural Language Generat Representations, Application Machine Translation: Intr	UNIT–III ion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C	10 Hrs. Is, Generation Tasks an Characteristics of India
Natural Language Generat Representations, Applicatio Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based	UNIT–III ion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation Machine Translation, Semantic or Knowled	10 Hrs. s, Generation Tasks an Characteristics of India on, Rule-based Machin
Natural Language Generat Representations, Application Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based Translation involving Indiar	UNIT-III ion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translatic Machine Translation, Semantic or Knowled on Languages.	10 Hrs. Is, Generation Tasks an Characteristics of India In, Rule-based Machin Ige-based MT systems
Natural Language Generat Representations, Applicatio Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval-	UNIT–III ion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation Machine Translation, Semantic or Knowlec Languages. ntanguages.	10 Hrs. Is, Generation Tasks an Characteristics of India In, Rule-based Machin Ige-based MT systems
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod	UNIT–III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translatio Machine Translation, Semantic or Knowled n Languages. ntroduction, Design Features of Informati- lels, Classical Information Retrieval Models, No	10 Hrs. Is, Generation Tasks an Characteristics of India on, Rule-based Machin Ige-based MT systems on Retrieval systems n-classical models of IF
Natural Language Generat Representations, Applicatio Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E	UNIT–III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation Machine Translation, Semantic or Knowled In Languages. Introduction, Design Features of Informati- lels, Classical Information Retrieval Models, No Evaluation of the IR System.	10 Hrs. Is, Generation Tasks an Characteristics of India In, Rule-based Machin Ige-based MT systems on Retrieval systems n-classical models of IF
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E	UNIT–III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation Machine Translation, Semantic or Knowled in Languages. Introduction, Design Features of Information lels, Classical Information Retrieval Models, No Evaluation of the IR System. UNIT–IV	10 Hrs. s, Generation Tasks an Characteristics of India on, Rule-based Machin Ige-based MT systems on Retrieval systems n-classical models of IF 10 Hrs.
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indian Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E	UNIT–III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation Machine Translation, Semantic or Knowled h Languages. Introduction, Design Features of Information lels, Classical Information Retrieval Models, No tvaluation of the IR System. UNIT–IV roduction, Natural Language Processing in IR,	10 Hrs. is, Generation Tasks an Characteristics of India in, Rule-based Machin Ige-based MT systems in Retrieval systems in classical models of IF 10 Hrs. Relation Matching,
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Inter Knowledge-based Approac	UNIT-III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation Machine Translation, Semantic or Knowled in Languages. Introduction, Design Features of Information lels, Classical Information Retrieval Models, No Evaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor	10 Hrs. Is, Generation Tasks and Characteristics of India
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indian Information Retrieval- Internative Models of IR, E Information Retrieval- Internative Models of IR, E Information Retrieval- Internative Models of IR, E	UNIT-III ion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Machine Translation, Semantic o	10 Hrs.Is, Generation Tasks and Characteristics of India on, Rule-based Machin lge-based MT systemsIge-based MT systemsIn Retrieval systems<
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Inter Knowledge-based Approact Other Applications: Introd Question-Answering System	UNIT-III ion : Introduction, Architectures of NLG System oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Languages. Introduction, Design Features of Information lels, Classical Information Retrieval Models, No ivaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor uction, Information Extraction, Automatic Text m.	10 Hrs. Is, Generation Tasks and Characteristics of India Indicator Indingretrieval I
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Inter Knowledge-based Approac Other Applications: Introd Question-Answering System Lexical Resources: Introduc	UNIT-III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Machine Translation, Semantic or Knowled I Languages. ntroduction, Design Features of Informati- lels, Classical Information Retrieval Models, No Evaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor- uction, Information Extraction, Automatic Text m. ction, WordNet, FrameNet, Stemmers, Part-of-S	10 Hrs.is, Generation Tasks ancharacteristics of Indiaon, Rule-based Machinlge-based MT systemson Retrieval systemson Retrieval systemsn-classical models of IF10 Hrs.Relation Matching,mation Retrieval.Summarization,peech Tagger, Research
Natural Language Generat Representations, Applicatio Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Intr Knowledge-based Approac Other Applications: Introd Question-Answering Syster Lexical Resources: Introduc	UNIT-III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Languages. Introduction, Design Features of Informati lels, Classical Information Retrieval Models, No Evaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor uction, Information Extraction, Automatic Text m. ction, WordNet, FrameNet, Stemmers, Part-of-S ferences in the Area.	10 Hrs.is, Generation Tasks andcharacteristics of Indiacharacteristics of Indiaon, Rule-based Machinlge-based MT systemson Retrieval systemsn-classical models of IF10 Hrs.Relation Matching,mation Retrieval.Summarization,peech Tagger, Research
Natural Language Generat Representations, Applicatio Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Intr Knowledge-based Approac Other Applications: Introd Question-Answering Syster Lexical Resources: Introduc Corpora, Journals and Conf	UNIT-III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Languages. Introduction, Design Features of Information lels, Classical Information Retrieval Models, No evaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor uction, Information Extraction, Automatic Text m. ction, WordNet, FrameNet, Stemmers, Part-of-S ferences in the Area.	10 Hrs. Is, Generation Tasks and Characteristics of India Indicator Indingretrieval I
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Inte Knowledge-based Approac Other Applications: Introd Question-Answering System Lexical Resources: Introduc Corpora, Journals and Confernation	UNIT-III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, C slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Machine Translation, Semantic or Knowled I Languages. Introduction, Design Features of Informatic lels, Classical Information Retrieval Models, No Evaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor uction, Information Extraction, Automatic Text m. ction, WordNet, FrameNet, Stemmers, Part-of-S ferences in the Area.	10 Hrs. Is, Generation Tasks an Is, Generation Tasks an Characteristics of India In, Rule-based Machin Ige-based MT systems Ige-based MT systems In Retrieval systems In Hrs. Relation Matching, In Hrs. Summarization, In Hers. In Hers. Summarization, In Hers.
Natural Language Generat Representations, Applicatio Machine Translation: Intr Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Intr Knowledge-based Approac Other Applications: Introd Question-Answering Syster Lexical Resources: Introduc Corpora, Journals and Conf Text Books * 1. Tanveer Siddiqui, U.S 2. DanielJurafsky and J	UNIT-III ion : Introduction, Architectures of NLG System oduction, Problems in Machine Translation, O slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Languages. ntroduction, Design Features of Informatic lels, Classical Information Retrieval Models, No ivaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Infor uction, Information Extraction, Automatic Text m. ction, WordNet, FrameNet, Stemmers, Part-of-S ferences in the Area. 5. Tiwary Natural Language Processing and Inform lames H Martin, "Speech and Language Processing and Inform	10 Hrs. Is, Generation Tasks and Is, Generation Tasks and Characteristics of India
Natural Language Generat Representations, Application Machine Translation: Intre Languages, Machine Trans Translation, Corpus-based Translation involving Indiar Information Retrieval- I Information Retrieval Mod Alternative Models of IR, E Information Retrieval- Inte Knowledge-based Approact Other Applications: Introd Question-Answering Syster Lexical Resources: Introduc Corpora, Journals and Conf Text Books * 1. Tanveer Siddiqui, U.S 2. DanielJurafsky and J Natural Language Pro	UNIT-III tion : Introduction, Architectures of NLG System ons of NLG oduction, Problems in Machine Translation, O slation Approaches, Direct Machine Translation I Machine Translation, Semantic or Knowled I Machine Translation, Semantic or Knowled Note: I Models, No Evaluation of the IR System. UNIT-IV roduction, Natural Language Processing in IR, hes, Conceptual Graphs in IR, Cross-lingual Inform uction, Information Extraction, Automatic Text m. ction, WordNet, FrameNet, Stemmers, Part-of-S Ferences in the Area. 5. Tiwary Natural Language Processing and Inform ames H Martin, "Speech and Language Processing, Computational Linguistics and Speech	10 Hrs. Is, Generation Tasks an Is, Generation Tasks an Characteristics of India In, Rule-based Machin Ige-based MT systems In Retrieval systems In Hrs. Relation Matching, mation Retrieval. Summarization, peech Tagger, Research Ination Retrieval. ssing: An introduction Recognition", 2nd Edition

3. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer Verlag London Limited 2007.

Course Outcomes**

- 1. Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.
- 2. Analyze the syntax, and semantic using computational methods.
- 3. Understand the concepts Text mining.
- 4. Illustrate information retrieval techniques.
- 5. Analyse and apply knowledge of NLP in designing real time applications and research.