### **`KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION**

(Under Section 3 of the UGC Act 1956)

#### Anand Nagar, Krishnankoil-626126

Srivilliputtur(via); Virudhunagar(Dt.), Tamil Nadu, INDIA

(www.kalasalingam.ac.in)



#### **BCA (HONS) CURRICULUM**

2021

#### **VISION**

To be Centre of Excellence of International Repute in Education and Research.

#### **MISSION**

To produce Technically Competent Socially Committed Technocrats and Administrators through Quality Education and Research

#### DEPARTMENT OF COMPUTER APPLICATIONS

#### **VISION**

To be a Center of Excellence in education and research in the field of Computer Applications to produce high quality competitive software professionals for the national growth.

#### **MISSION**

To produce socially committed technocrats to meet the Industrial challenges or an administrator in the field of Information Technology with adequate technical knowledge and skills through quality education and research.

#### PROGRAMME EDUCATION OBJECTIVES (PEO)

**PEO1:** To equip the students to meet the requirement of Corporate world and Industry standard.

**PEO2:** To engage in professional development and to pursue post graduate education in the fields of Information Technology and Computer Applications.

**PEO3:** To provide the students about computing principles and business practices in software solutions, outsourcing services, public and private sectors.

#### PROGRAMME OUTCOMES (PO)

- **PO1:** Understand the concepts of key areas in computer science.
- **PO2:** Analyze and apply latest technologies to solve problems in the areas of computer applications.
- **PO3:** Analyze and synthesis computing systems through quantitative and qualitative techniques.
- **PO4:** Apply technical and professional skills to excel in business.
- **PO5:** Communicate effectively in both verbal and written form.
- PO6: Develop practical skills to provide solutions to industry, society and business.

#### **Curriculum Credit Distribution**

S No	Course Cotogory	Credits	
5.110	Course Category	(Proposed)	
Ι	Foundation Core	30	
II	Programme Core	70	
	Program Elective		
II	Discipline specific elective	28	
	Skill Enhancement Courses		
IV	Experimental Elective		12
	140		

Subject Code	Subject Name	L	Т	Р	X	С	Η	Category
211CHY1101	Environmental Studies	3	0	0	0	3	3	FC
211ENG1306	Communicative English		0	2	1	5	6	FC
211BCA1301	Digital Skills [IC-T]	3	0	2	1	5	6	FC
212BCA1301	Python Programming [IC-T]	4	0	2	1	6	7	PC
212BCA1201	Introduction to Worksheet (TCS)	0	0	3	0	2	3	PC
211ENG1303/ 211TAM1301 /211HIN1301	English II/ MIL	3	0	0	1	4	4	FC
211ENG1302	English I	4	0	0	1	5	5	FC
211MAT1304	Basic Statistics	2	0	0	1	3	3	FC
212BCA1302	Data Structures and Algorithms [IC-T]	4	0	2	0	5	6	PC
212BCA1303	Programming Methodologies [IC T]	4	0	2	1	6	7	PC
213BCA3216/ 213BCA3230/ 213BCA3201	DSE – 1 [IC-T] Practical Approach to Data Mining and Analytics/ Information Security- Practioner's Perspective/ Artificial Intelligence for real world application	4	0	2	0	5	0	PE
215BCA4201	Experimental Elective -1	0	0	0	0	2	0	EE
211MAT2301	Linear Algebra and Calculus	4	0	0	0	4	4	PC
211ENG1304	Human Values	2	0	0	1	3	3	FC
212BCA2301	Operating Systems [IC]	4	0	2	0	5	6	PC
212BCA2303	JAVA Programming [IC]	4	0	2	3	6	9	PC

213BCA3219/ 213BCA3233/ 213BCA3204	DSE-2 [IC - T] Data modeling and visualization/ Practical Approach to Cyber Security/ Machine Learning for Real world Applications	4	0	2	0	5	0	PE
212BCA2202	Web Programming Lab (TCS)	0	0	3	0	2	3	PC
211ENG1305	Professional Skills	1	0	0	1	2	2	FC
212BCA2304	DBMS[IC T] (TCS)	4	0	2	1	6	7	PC
212BCA2101	Process Management[IC T] (TCS)	3	0	2	0	4	5	PC
212BCA2306	Computer Networks [IC T] (TCS)	4	0	2	0	5	6	PC
212BCA1203	Multimedia and Desktop Publishing Laboratory	0	0	3	0	2	3	PC
214BCAXXXX	SEC -1	0	0	2	0	2	2	PE
213BCA3222/ 213BCA3236/ 213BCA3207	DSE-3 [IC T] Data Analytics and Reporting/ Applied Cloud Computing/ Application of Deep Learning & Neural Networks	4	0	2	0	5	0	PE
212BCA2308	Virtualization and Cloud (TCS)[TP]	2	0	2	1	3	5	PC
212BCA2104	Introduction to Digital Technologies( <b>TCS</b> )	4	0	0	0	4	4	PC
212BCA2103	Computer Graphics	4	0	0	0	4	4	PC
212BCA2102	Software Engineering	4	0	0	0	4	4	PC
212BCA2204	Campus to Corporate (TCS)[TP]	1	0	2	1	2	4	PC
213BCA3213	DSE-5: Design Thinking	3	0	2	0	4	5	PE
213BCA3225/ 213BCA3239/ 213BCA3210	DSE 4 [TP] Big data analytics- Advanced / Advanced Cyber security - an advanced Approach/	4	0	2	0	5	0	PE

	Conversational Experiences							
214BCAXXXX	SEC -2	0	0	2	0	2	2	PE
215BCA4202	Internship	0	0	0	0	4	4	EE
215BCA4203	Project Work	0	0	0	0	6	6	EE

## DISCIPLINE SPECIFIC ELECTIVES

#### (Artificial Intelligence Stream)

S.No	Code	Subject Name
1	213BCA3201	Artificial Intelligence for real world application
2	213BCA3202	Computational Intelligence
3	213BCA3203	Natural Language Processing
4	213BCA3204	Machine Learning for Real world Applications
5	213BCA3205	Virtual Reality
6	213BCA3206	Bio Inspired Intelligence Techniques
7	213BCA3207	Application of Deep Learning & Neural Networks
8	213BCA3208	Introduction to Robotics
9	213BCA3209	Internet of Things
10	213BCA3210	Conversational Experiences
11	213BCA3211	Soft Computing
12	213BCA3212	Big Data Analytics
13	213BCA3213	Design Thinking
14	213BCA3214	Human Computer Interaction
15	213BCA3215	Data Analytics and Reporting

## (Data Mining and Analytics Stream)

S.No	Code	Subject Name
1	213BCA3216	Practical Approach to Data Mining and Analytics
2	213BCA3217	Data Mining
3	213BCA3218	Big Data Analytics And Visualization
4	213BCA3219	Data modeling and visualization
5	213BCA3220	Digital Marketing Analytics
6	213BCA3221	Data Analysis Using Bio Inspired Algorithms
7	213BCA3222	Data Analytics and Reporting
8	213BCA3223	High Dimensional Data Analysis
9	213BCA3224	Image Analytics
10	213BCA3225	Big data analytics-Advanced
11	213BCA3226	Computer Essentials and Data Science
12	213BCA3227	Exploratory data Analysis using python
13	213BCA3213	Design Thinking
14	213BCA3228	R Programming for Data Science
15	213BCA3229	Introduction to Data Science

# (Information Security Stream)

S.No	Code	Subject Name
1	213BCA3230	Information Security-Practioner's Perspective
2	213BCA3231	Biometric Systems
3	213BCA3232	Biometric Image Processing
4	213BCA3233	Practical Approach to Cyber Security
5	213BCA3234	Cyber Crime Investigations And Digital Forensics
6	213BCA3235	Context Aware Computing
7	213BCA3236	Applied Cloud Computing
8	213BCA3237	Operating Systems Security
9	213BCA3238	Trust Management In E-Commerce
10	213BCA3239	Advanced Cyber security - an advanced Approach
11	213BCA3240	Biometric Security
12	213BCA3241	AI Enhanced Cyber Threats
13	213BCA3213	Design Thinking
14	213BCA3242	Network And Wireless Security
15	213BCA3243	Cyber Laws And Security Policies

S.No	Code	Subject Name	Credit
1	214BCA3201	Software Testing Laboratory	2
2	214BCA3202	Android Programming Laboratory	2
3	214BCA3203	.NET Programming Laboratory	2
4	214BCA3204	R Programming Laboratory	2
5	214BCA3205	Computer Forensics Laboratory	2
6	214BCA3206	Human Computer Interaction Laboratory	2

#### SKILL ENHANCEMENT COURSES

BCA21R101	DIGITAL SKILLS	L	Τ	Р	X	С
		3	0	2	3	4
Course Category	7: Foundation Core					
Course Type: Th	eory with Practical					

#### **COURSE OBJECTIVE(S)**

To make students aware of fundamentals of Computers, online file handling, Various application areas of Computers.

#### **COURSE OUTCOMES**

At the end of the course the students will be able to

CO1: Create and manipulate files and folders in windows and also in Google Drive

CO2: Apply various formatting features in Word, apply the skills to gather knowledge from internet.

CO3: Apply the various Operations on Electronic Spread sheets

CO4: Apply the various Operations on Power point presentations

CO5: Analyze the security issues in networks before using them

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	М				S	
CO2		S				L
CO3			S	S	L	
<b>CO4</b>	L			Μ	S	
CO5		S	М			S

#### MAPPING OF COURSE OUTCOME(S):

#### UNIT I

**Introduction to Computer & Basic Concepts** - What is Computer-Concept of Hardware and Software-**Basics of Operating System**- Operating System Simple Setting: Changing System Date and Time, Changing Display Properties, To Add or Remove a Windows Component, Keyboarding features - Changing Mouse Properties, Adding and removing Printers – **Drive File Organization**- Types of files, What is a file, Naming conventions, File Extensions, File Pathway, Windows Explorer, Viewing files, File property dialogue box, Explain file size (bytes, kilo, mega, giga, tera), Create a Folder, Move a file (multiple files)into a folder, Delete files and folders, Recovering deleted files, Renaming files, Searching for files, Creating and deleting shortcuts on desktop- How programs may save files in specific location by default- How to find where file is being saved – **Google Apps** – Drive, Docs, sheet, forms and Meet.

#### UNIT II

**Digital communication** - Digital Footprint Management, Online Communication and Collaboration, Public and Mass Communication **Various applications of Internet -** e-mail, information gathering, retailing etc - Methods of connecting to the Internet- Dial up, ISDN and broadband- Brief introduction to Internet addressing, Internet protocols (TCP/IP, FTP and HTTP,IPV4,IPV6) - Using Instant messaging, - Use of Social Networking Sites viz. Facebook, Twitter etc.. **Word Processing Basics**- Opening and closing Documents- Text Creation and manipulation- Formatting the Text - Formatting a document - Table Manipulation - Inserting Graphic Elements-Mail Merge.

#### **UNIT III**

**Networking & Troubleshooting** - Basic of Computer Networks- LAN, WAN, Wi-Fi, Broadband, Bluetooth-**Internet** -Concept of Internet, Applications of Internet, Connecting to the Internet, Troubleshooting- WWW, TCP/IP, DNS, ISP,URL, Search Engine - Key web browser features, Brief about switch, router, gateway - **Elements of Electronic Spread Sheet** -Manipulation of Cells - Formulas and Function Definition of e-Governance - Infrastructure for eGovernance - eGovernance project life cycle, electronically delivery of services - Railway Reservation, Passport, eHospital. **Digital Rights -** Privacy Management, Intellectual Property Rights Management, Participatory Rights Management.

#### UNIT IV

**Application of Digital Financial Services** - Why savings are needed, Why save in a bank, Banking products-ATM card, Rupay Card, Banking Instruments-Cheque, Demand Draft (DD), Currency Notes, Banking Services Delivery Channels, Know Your Customer (KYC), Opening of bank account and documents required, Types of bank accounts, Bank's services including remittances, loan, mobile banking, Overdraft, Pension, NEFT, RTGS, IMPS etc., Types of Insurance, password security and ATM withdrawal - how digital signature works- **Basic Concepts of PowerPoint presentation** - Creation of Presentation - Preparation of Slides -Presentation of Slides- Slide Show. **Digital Emotional Intelligence -** Digital Empathy, Self-Awareness and Management, Relationship Management

#### UNIT V

**Cyber Security** -Basic concepts of threats, security policies- security mechanisms- Data Security and protection- concept, creating strong passwords- how to stay safe when surfing on internet - identifying secure website, clear cookies - **identifying a secure web site**- https, lock symbol- Security Considerations- Know about security threats from web sites like: viruses, worms, Trojan horses, spyware. Understand the term malware- Netiquettes- Be aware of the possibility of receiving fraudulent and unsolicited e-mail; phishing, Recognize attempted phishing -Basics of Software Licensing. **Digital Safety** - Behavioral Cyber-Risk Management, Content Cyber- Risk Management, Commercial and Community Cyber-Risk Management.

#### **Text Books:**

- 1. Joan Lambert Curtis Frye, Microsoft Office 2016 Step by Step, Microsoft Press, 2015.
- Alexis Leon & Mathews Leon, Fundamentals of Information Technology, 2<sup>nd</sup> Edition, Vikas Publishing, 2009.
- 3. Kutub Thakur, Al Sakib Khan Pathan, Cyber security Fundamentals A Real-World Perspective, CRC Press, 2020.
- Priti Sinha, Pradeep Sinha, Computer Fundamentals, BPB Publications, 6<sup>th</sup> Edition, 2003.

 e-Governance Policy Initiatives under Digital India - eBook , Department of Electronics and Information Technology, Ministry of Communications and Information Technology, Government of India.

		L	Т	Р	X	С
BCA21R102	BCA21R102 PYTHON PROGRAMMING		0	2	3	6
Course Catego	ory: Program Core					
Course Type :	Integrated Course					

#### PREREQUISITE

Basic knowledge in Computer Science.

#### **COURSE OBJECTIVES**

This course aims to describe the core syntax and semantics of Python programming language, working with the strings and functions, to illustrate the process of structuring the data using lists, dictionaries, tuples and sets and to give insight into usage of packages and Dictionaries.

#### COURSE OUTCOME(S)

CO1: To Understand the principles of Python and acquire skills in programming in python

**CO2:** Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.

**CO3**: To understand functions and graphics usage

CO4: To know modules and exception handling feature

CO5: To know concepts of object oriented programming in Python

CO6: Implementing object oriented concepts

**CO7:** Implementing inheritance and multithreading

CO/P	PO	PO	PO	PO	PO	PO
0	1	2	3	4	5	6
CO1	S			М		L
CO2		М	М			

#### MAPPING OF COURSE OUTCOME(S):

CO3	Μ			S		
CO4			S		L	
CO5	М		М		S	S
CO6		М		S		
CO7			S		L	

#### **UNIT-I: Introduction to Python**

Introduction-Python, Overview—Python, Identifiers-Reserved, Keywords-Operators-Control Statements. Functions: Introduction-Built-in Functions-User Defined Functions-Function Calls-Python Recursive Function-Writing Python scripts.

#### **UNIT-II: Lists, Tuples and Dictionaries**

Lists, Tuples and Dictionaries-Strings and Lists– Strings-Lists-Tuples and Dictionaries- Tuples-Dictionaries - Files and Exceptions - Text Files-Directories-Exceptions-Exception with Arguments-User Defined Exceptions.

#### **UNIT-III: Classes and Objects**

Overview of OOP-Class Definition-Creating Objects-Built in Class Attributes-Inheritance-Method Overriding-Data Encapsulation-Data Hiding. Thread: Single Tasking-Multitasking-Differences between a process and a Thread-Concurrent programming and GIL-Uses of Threads-Creating Thread in Python-Creating a Thread without using a class thread by creating a sub class to thread class- creating a thread without creating sub class to thread class-thread class methodssingle tasking using a thread-multitasking using multiple threads.

#### **UNIT-IV: Graphical User Interface**

The Root Window-Fonts and Colors-Working with Containers-Canvas-Frame-Widgets-Button Widget-Arranging Widgets in the Frame-Label Widget-Message Widget-Text Widget-Scrollbar Widget-Check button Widget-Radio button Widget-Entry Widget-Spin box Widget-List box Widget-Spin box widget-List box Widget-Menu Widget-creating Tables-Points to Remember.

#### **UNIT-V: Networking in python**

#### 15 Hours

#### **15 Hours**

15 Hours

## 15 Hours

**15 Hours** 

Protocol-TCP/IP Protocol-User Datagram Protocol(UDP)-Sockets-Knowing IP Address-URL-Reading the Source Code of a Web page-Downloading a Web Page from Internet-Downloading an Image from Internet-A TCP/IP Server-A TCP/IP Client-A UDP Server-A UDP Client-File Server-File Client-Two-Way Communication Between Server and Client-Sending a Simple mail-points to Remember. Packages – NumPy, Plot.

#### **Text Book:**

 Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem solving Focus", 3<sup>rd</sup> Edition, Wiley India Edition, 2015.

#### **Reference Books:**

- Mark Lutz, "Learning Python Powerful Object Oriented Programming", 5<sup>th</sup> Edition, O'reilly Media 2018.
- Timothy A. Budd, "Exploring Python", 1<sup>st</sup> Edition, Tata MCGraw Hill Education Private Limited 2011.
- Ch Satyanarayana M Radhika Mani, B N Jagadesh, "Python programming", 1<sup>st</sup> Edition, Universities Press 2018

#### LIST OF EXPERIMENTS:

- 1. Python program to find factorial for a given number.
- 2. Python program to generate Fibonacci series.
- 3. Python program to implement classes and objects.
- 4. Python program to implement the concept of constructors.
- 5. Python program to implement the various types of Inheritance.
- 6. Python program to demonstrate method overriding.
- 7. Python program to demonstrate Exception.
- 8. Python program to demonstrate Multithreading.
- 9. Python program to demonstrate font and color.

10. Python program to demonstrate GUI widgets.

		L	Т	Р	X	С		
BCA21R181	INTRODUCTION TO WORK SHEETS	0	0	2	3	2		
Course Category: Pr	ogram Core							
Course Type : Labor	Course Type : Laboratory							

#### **COURSE OBJECTIVES**

This course helps the students to perform all sorts of tasks like budgeting, sales analysis, forecasting, charting, graphing.

#### COURSE OUTCOME(S)

**CO1 :** Develop applications using workbook and worksheet object

CO2: Implement worksheets using control statements and range function.

**CO3 :** Develop interactive applications using User form

**CO4:** Implement applications using functions and sub procedures

**CO5:** Handle worksheets using mathematical and financial functions.

	PO1	PO2	PO3	PO4	PO5	PO6
C01		S		М	S	S
CO2		L		S		
CO3	М				L	
CO4			L			М
CO5	S	S	М		S	М

#### MAPPING OF COURSE OUTCOME(S):

#### LIST OF PROGRAMS

#### **36 Hours**

- 1. Program to demonstrate Built in Dialog boxes.
- 2. Program to calculate total sales value of each employee over a period of three years in workbook and worksheet object.

- 3. Program to show print preview of all the possible cricket matches from a list of items using range function.
- 4. Program to compare randomly selected ranges and highlight cells that are unique using range function.
- 5. Program to calculate the tax on income

Income	Tax on this income
0 to Rs.2,00,000	Nil
Rs.2,00,000 to 4,00,000	10%
Rs,4,00,000 to 8,00,000	20%
Above Rs.8,00,000	30%

6. Program to create user form that converts any amount from one currency into another.

- 7. Program to demonstrate interactive user form.
- 8. Program to create a sub procedure to generate Fibonacci series up to 1000.
- 9. Program to demonstrate financial functions.
- 10. Program to demonstrate mathematical functions.

		L	Т	Р	X	C
BCA21R103	DATA STRUCTURES &ALGORITHMS	4	0	2	0	5
Course Category: Pro	ogram Core			•		•
Course Type : Theor	У					

#### **COURSE OBJECTIVES**

The course elaborates on basic data structure concepts with different ways of organizing data and developing algorithms for various operations and applications on data structures.

#### COURSE OUTCOME(S)

**CO1:** Apply the basic data structures and its operations and also calculate time and space complexity

**CO2:** Understand stack and queue data structure and their practical application

CO3: Apply Linked list real time applications like memory management

**CO4:** Apply the concept of nonlinear data structures like trees and graphs to design algorithms for various applications

**CO5:** Understand the concepts of search and sort algorithms using data structures given specific user requirements.

#### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S		S	М		S
CO2		S				L
CO3	S		М			
CO4	М				L	S
CO5		S		М		

#### UNIT – I: INTRODUCTION AND OVERVIEW:

#### **12 Hours**

Introduction - Basic Terminology; Elementary Data Organization - Data structures - Data

structure operations - Algorithms: Complexity, Time-Space Trade-off. Preliminaries: Algorithmic Notation - Control Structures-Variables, Data Types. Arrays, Records and Pointers: Introduction - Linear Arrays - Representation of Linear Arrays in Memory -Traversing Linear array - Inserting and Deleting - Multidimensional Array

#### UNIT – II: **STACK, QUEUES, And RECURSION: 12 Hours**

Introduction - Stacks - Array Representation of Stacks - Linked Representation of Stacks -Arithmetic Expressions - Polish Notation - Recursion-Towers of Hanoi - Implementation of Recursive Procedures by Stacks - Queues - Linked Representation of Queues - Dequeue -**Priority Queues** 

#### **UNIT – III: LINKED LISTS**

Introduction - Linked Lists - Representation of Linked Lists in Memory-Traversing a Linked List - Memory Allocation-Garbage Collection –Insertion into a Linked List- Deletion from a Linked List - Header Linked Lists

#### UNIT – IV: TREES

Introduction - Binary Trees - Representing Binary Trees in Memory-traversing binary trees-Graphs: Terminology and Representations –Sequential Representation of Graphs-Adjacency Matrix, Path Matrix

#### SORTING AND SEARCHING UNIT – V:

Introduction - Sorting - Insertion Sort - Selection Sort - Merging -Merge Sort - Radix Sort -Bubble Sort- Quick Sort. Searching and Data Modification - Hashing- Linear Search - Binary Search

#### **TEXT BOOK:**

1. Seymour Lipschutz, Data Structures, TataMcGraw Hill Company, 5th Edition 2009, Reprinted, 2014

#### **REFERENCE(S):**

#### **12 Hours**

**12Hours** 

**12 Hours** 

1. E. Horowitz & Sahni, Fundamentals of Data Structure, 4<sup>th</sup> Edition, Galgotia Book Source, 1983.

2. A. Tannenbaum, Data Structure Using C, 2<sup>nd</sup> Edition, Pearson Education, 2003.

		L	Τ	Р	X	С
BCA21R104	PROGRAMMING METHODOLOGIES	4	0	2	3	6
Course Category: Pro	ogram Core					
Course Type : Integra	ated Course					

#### **PREREQUISITE:**

Basic knowledge of computers.

#### **COURSE OBJECTIVE(S):**

This course is designed to provide adequate knowledge on the need of programming languages and problem solving techniques. It provides the skills to develop programming skills using the fundamentals and basics of C Language. It enables the effective usage of arrays, structures, functions, pointers and to implement the memory management concepts. It teaches the issues in file organization and the usage of file systems.

#### COURSE OUTCOME(S)

- CO1: Understand the basic terminology used in computer programming
- CO2: Develop programs using the basic elements like control statements.
- CO3: Apply the concepts like functions, Arrays.
- CO4: Understand the concepts of Strings.
- CO5: Apply basics of structures and union to develop an application.
- CO6: Implementation for basic data type, operators and function
- CO7: Implementation for structure operations

#### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	М			S		М
CO2		М		L		
CO3		L	S		М	
CO4	S			S		М
CO5			М		S	
CO6	L				S	
C07				M		S

#### UNIT I

Introduction to Programming, Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Design, Flowcharts, Types of Programming Methodologies, Introduction to Programming C - Basic Program Structure In C, Variables, data types and Operators, Input and Output, Selection and Looping Statements.

#### UNIT II

Top-Down Design, Predefined Functions, Programmer -defined Function, Local Variable, Call-By-Value and Call-By-Reference Parameters, Recursion. Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

#### UNIT III

Introduction to Arrays, Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays. Arrays in Functions, Multi-Dimensional Arrays. Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose)

#### Unit IV

Reading and Writing Strings, Arrays of Strings, String and Function, Standard String Library Functions.

#### Unit V

Structure – Nested structures — Pointer and Structures — Array of structures — Example Program using structures and pointers — Self referential structures .

#### **Text Books**

- 1. J. R. Hanly and E. B. Koffman, Problem Solving and Program Design in C, 3<sup>rd</sup> Edition, Pearson, 2015.
- Schaum Series, Gottfried B.S., Tata McGraw Hill, Programming with C, 3<sup>rd</sup> Edition, 2005.
- Asok N Kamthane, Pearson, Programming in C, 2<sup>nd</sup> Edition, Pearson Education India, 2011.
- 2. Anita Goel, Computer Fundamentals, 4<sup>th</sup> Edition, Pearson, 2012.

#### **Reference Books**

 Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C, 2018.

 Brian W. Kernighan and Dennis M. Ritchie, C Programming Language, 2<sup>nd</sup> Edition, Pearson, 2015

#### **Practical Components**

- 1. Write a C program to check whether a number is even or odd using ternary operator.
- 2. Write a C program to perform the addition of two numbers without using + operator.
- Write a C program to evaluate the arithmetic expression ((a + b / c \* d e) \* (f g)). Read the values a, b, c, d, e, f, g from the standard input device.
- 4. Write a C program to find the sum of individual digits of a 3 digit number.
- 5. Write a C program to read the values of x and y and print the results of the following expressions in one line: i. (x + y) / (x y) ii. (x + y)(x y)
- 6. Write a C program to find the sum of individual digits of a positive integer.
- 7. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
- 8. Write a C program to generate the first n terms of the sequence. c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- 9. Write a C program to calculate the following sum: sum = 1 x 2/2! + x4/4! x 6/6! + x8/8! x 10/10!
- 10. Write a C program to find the roots of a quadratic equation. d. Write a C program to check whether a given 3 digit number is Armstrong number or not.
- 11. Write a C program to find the second largest integer in a list of integers.
- 12. Write a C program to perform the following: i. Addition of two matrices ii. Multiplication of two matrices

- 13. Write a C program to count and display positive, negative, odd and even numbers in an array.
- 14. 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. b. Write a C program to determine if the given string is a palindrome or not. c. Write a C program to find a string within a sentence and replace it with another string.
- 15. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the basic pay. Gross-salary (basic pay + DA). Print the employees name and gross salary. c. Create a Book structure containing book\_id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details

		L	Т	Р	X	С
BCA21R201	OPERATING SYSTEMS	4	0	2	0	5
Course Category: P	rogram Core					
Course Type: Integ	rated Course					

#### **COURSE OBJECTIVES**

This course aims to provide the fundamental concepts and role of Operating System, Process Management and Scheduling Algorithms in Operating Systems, the Memory Management policies, and to give insight on I/O and File management techniques

#### COURSE OUTCOME(S)

CO1: Analyze the need of operating system, its components and evolution.

CO2: Apply the concept of Window Server.

CO3: Apply backup and restoring techniques.

CO4: To Understand their knowledge in memory management concept and management techniques.

CO5: Understand files systems and Windows XP Concepts.

CO6: Implementation of basic operating systems operations.

CO7: Implementation of advanced operating systems operations.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1		М			S	М
CO2	М		L			
CO3		S		М	S	

#### MAPPING OF COURSE OUTCOME(S):

CO4			S		L	S
CO5		L		М		
CO6			S			L
CO7	М				S	

#### UNIT - I

Operating System overview- Hardware Basics- Windows 10: Installing, configuring, and deploying Windows 10 -System Maintenance: Hardware-Managing Disks and drives-Automating tasks and activities.

#### UNIT - II

Windows Server 2012-Overview-Working with Windows servers-Preparing networking-Navigating Management options- Managing Servers remotely-Managing roles and features.

#### UNIT - III

Configuring server settings: Server Naming-Managing Processor Scheduling-allocating virtual memory- Active Directory-understanding-managing -maintaining- AD FS-FSMO Roles-Backup and storage.

#### UNIT - IV

Deploying Windows Server 2012-preparing-managing disk partitions-implementing TCP/IP networking-Data storage- partitioning and optimizing drives-RAID-implementing file sharingmanaging permissions and auditing.

#### UNIT - V

Group policy management- Group policy for administration-Print services-DHCP: Implementing, Managing and Maintaining-DNS: Implementing, Managing and Maintaining.

#### **Text Book:**

1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, "Operating System Concepts", Wiley India Pvt. Ltd, 10<sup>th</sup> Edition, 2018.

#### **12 Hours**

#### **12Hours**

**12Hours** 

**12Hours** 

## **12Hours**

#### **Reference Books:**

- William Stallings, "Operating Systems Internals and Design Principles", 9<sup>th</sup> Edition, Pearson, 2018.
- Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems", 4<sup>th</sup> Edition, Pearson, 2017.
- 3. Achyut S Godbole, Operating systems, 3<sup>rd</sup> Edition, McGraw-Hill, 2010

#### **Practical Component**

- 1. Installation of client and server OS
- 2. Create server and play roles
- 3. Zone creation and DHCP
- 4. File and print services
- 5. Devices and printers
- 6. Group policy
- 7. Server storage management
- 8. Server scenario
- 9. ADS Scenario based
- 10. DNS and DHCP

		L	Т	Р	X	С			
BCA21R202	JAVA PROGRAMMING	4	0	2	3	6			
Course Category: Pr	ogram Core								
Course Type : Theory									
PREREQUISITE									

Basic programming knowledge of C and OOPS concepts.

#### **COURSE OBJECTIVES**

This course is designed to create programs that influence the object-oriented features of the Java language, such as encapsulation, inheritance, polymorphism, Decision making using branching and looping, Classes, objects, methods, Arrays, Packages, Interfaces, Multithreading, Synchronization, Applets and managing input/output files in java.

#### COURSE OUTCOME(S)

After completing this course, the student will be able to

- **CO1:** Analyze the principles of object oriented programming.
- **CO2:** Create Java programs comprising more than one class to address a particular software problem.
- CO3: Apply knowledge about arrays, interfaces and packages.
- CO4: Understand the concept of multithreading and applets in java.
- CO5: Familiarize with the concepts of file handling in Java

#### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S			L		

CO2		S			М	L
CO3			М	S		
CO4				S		
CO5	М		L			S

#### **UNIT-I: OVERVIEW OF JAVA LANGUAGE**

## Introduction - Object Oriented paradigm - Basic concepts of object oriented programming -Benefits of OOP - Applications of OOP - Java Features - How Java differs from C and C++ -Java and Internet – Java and www – simple Java program – Structure – Java Tokens – Statement.

**UNIT-II: BRANCHING, LOOPING, CLASSES, OBJECTS AND METHODS 12 Hours** 

Constants - Variables - Data Types - Operators and Expressions - Decision Making and Branching: if - if...else - nested if -, Else if Ladder - switch - ? Operator - Decision Making and Looping: while – do - for –Jumps in Loops - Labeled Loops – Classes - Objects and Methods.

#### **UNIT-III: ARRAYS, INTERFACE AND PACKAGES 12 Hours**

Arrays- Introduction-One dimensional arrays –Two dimensional arrays-Strings-Vectors-Enumerated types- Inheritance - Interfaces- Defining, Extending and implementing interfaces-Packages –JAVA API packages- creating packages-Accessing packages-Adding a class to a package-Hiding classes.

## **UNIT-IV: MULTITHREADING, MANAGING ERRORS AND EXCEPTIONS, APPLETS**

Multithreaded Programming-creating threads- extending thread class- stopping and blocking a thread-life cycle of a thread-synchronization- Implementing a Runnable interface- Managing

12 Hours

#### **12 Hours**

Errors and Exceptions. Applets- How Applet Differs from Applications- Applet Life Cycle -Creating and Executing Applet- Graphics Class - Drawing Shapes

#### UNIT-V: MANAGING INPUT/OUTPUT FILES IN JAVA 12 Hours

Managing Input/output Files in Java : Concepts of Streams- Stream Classes – Byte Stream classes – Character stream classes – Using streams – I/O Classes – File Class – I/O exceptions – Creation of files – Reading / Writing characters, Byte-Handling Primitive data Types – Random Access Files. JDBC: JDBC Architecture - JDBC Drivers- Database connectivity in Java.

#### Text book(s):

 Patrick Naughton & Hebert Schildt, The Complete Reference Java 2, TMH publications 3<sup>rd</sup> Edition, 2016.

#### **Reference Books:**

- 1. E. Balagurusamy, Programming with JAVA A PRIMER, Tata McGraw-Hill, 4<sup>th</sup> Edition, 2010.
- S.Ramkumar, K.Sathesh Kumar, P.Sumathi, "JAVA FOR BEGINNERS", 1<sup>st</sup> Edition, Scitech Publisher, 2018.
- 3. John R. Hubbard, Programming With Java, TMH publications 2<sup>nd</sup> Edition, 2020
- 4. Debasish Jana, JAVA and Object-Oriented Programming Paradigm, PHI publications, 2009.

#### LIST OF PROGRAMS

- 1. Programs using classes and methods
- 2. Programs using one dimensional and two dimensional arrays
- 3. Programs using Strings
- 4. Programs using vectors
- 5. Programs using Inheritance
- 6. Generate the program using interfaces
- 7. Programs to implement the exception handling mechanism
- 8. Programs to implement packages.
- 9. Programs using multithreading
- 10. Programs using Applets
- 11. Programs using Files

BCA21B281	WER PROCEAMMING LABORATORY	L	Т	Р	X	С			
BCAZIK201	WED I KOOKAIMIMINO LADOKATOKI	0	0	2	3	2			
Course Category: Pr	Course Category: Program Core								
Course Type : Practical									

### **COURSE OBJECTIVE(S):**

Design web pages using elements and attributes, creating web pages using javaScript. Building dynamic web pages using JavaScript, build interactive web applications using JDBC and JSP.

### COURSE OUTCOME(S):

After completing this course, the student will be able to

CO1: Apply basic HTML tags to format text in a web page

CO2. Use forms and frames in HTML to design interactive web pages.

CO3. Create a basic website using HTML and Cascading Style Sheets.

CO4. Learn to use JavaScript inside HTML to create web pages.

CO5. Apply Validation user input using JavaScript objects and Events.

### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S			М		
CO2			S		L	
CO3		S				L
CO4		М		S		
CO5	М				L	S

### HTML

1. Using Formatting Tag

2. Implementation of Table Tags

#### 3. Using List Tags

- 4. Implementation of frames and frame sets
- 5. Display contents sunig CSS

#### **VB SCRIPT & JAVASCRIPT**

- 1. Write a program outputs the squares, roots, cubes and complements of integers between 1 and 100.
- 2. Create a calculator.
- 3. Write a script to Sort numbers and strings
- 4. Create a program to generate a hit counter
- 5. Create a program to verify whether email address provided by user is valid or invalid.
- 6. Write a program to scroll the text on status bar.
- 7. The form consists of two multiple choice list and one single choice list
  - a. The first multiple choice list displays the major dishes available.
  - b. The second multiple choice list display the stocks available.
  - c. The single choice list display the miscellaneous(Milkshakes, soft drinks, softy available etc.)
- 8. Write a script to create a digital clock.
- 9. Create a web page using two image file which switch black and white one another as the mouse pointer moves over the image. Use the On Mouse over and On Mouse event, on Dblclick handler

- 10. Build a WWW page with an image and 3 buttons., Pick three favorite graphics, Label the buttons and make each one swap in the graphic you have chosen
- 11. Create a frameset that has two frames, side by side. Make the left-hand frame contain a form with 3 radio buttons The buttons should be for three search engines:
  - i. Yahoo (http://www.yahoo.com)
  - ii. Altavista (http://www.altavista.com)
  - iii. Infoseek (http://www.infoseek.com) When the user clicks on of the option buttons, the frame on the right hand side should be loaded with the right search engine.
- 12. Write a program to implement Employee database with all validation

		L	Τ	Р	X	С			
BCA21R203	DATABASE MANAGEMENT SYSTEMS	4	0	2	3	6			
Course Catego	Course Category: program Core								
Course Type : Integrated Course									

### **COURSE OBJECTIVES**

This course is designed to educate students with fundamental concepts of Data Base Management System, Data Models, and Different Data Base Languages.

### COURSE OUTCOME(S)

**CO1**: Analyze the basic concepts of database design.

**CO2:** Acquire knowledge in relational models.

CO3: Ability to create efficient SQL queries for retrieving the data

**CO4:** Ability to create intermediate SQL queries.

**CO5:** Building programs using Advanced SQL.

**CO6:** Implement the basic SQL operations

CO7: Implement the advanced PL/SQL operations

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S		М			S
CO2		S			S	
CO3			М			L
CO4	S			М		S
CO5		L	S		М	
CO6	L					М
CO7				S		S

#### MAPPING OF COURSE OUTCOME(S):

#### **UNIT – I: INTRODUCTION**

Database-System Applications-Purpose of Database Systems-View of Data-Database Languages - Database Design-Database Engine -Database and Application Architecture - Database Users and Administrators

#### **UNIT – II: Introduction to the Relational Model**

Structure of Relational Databases - Database Schema - Keys - Schema Diagrams -Relational Query Languages - The Relational Algebra

#### **UNIT – III: 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 Subqueries -Modification of the Database

### **UNIT – IV: Intermediate SQL**

# 12 Hours

#### **12 Hours**

#### 12 Hours

#### **12 Hours**

Join Expressions - Views - Transactions - Integrity Constraints - SQL Data Types and Schemas - Index - Definition in SQL - Authorization

### UNIT – V: Advanced SQL

Accessing SQL from a Programming Language - PL/SQL - Functions and Procedures – Triggers -Recursive Queries - Advanced Aggregation Features – cursors - exceptions

#### **Text Book:**

- Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 7E, McGraw Hill education, 2019.
- 2. Nilesh Shah, "Database Systems Using ORACLE", PHI, 2<sup>nd</sup> Edition, 2011

#### **Reference Books:**

- 1. Fundamentals of Database Systems, 6/e, Ramez Elamassri and Shankant B–Navathe, Pearson Education Delhi, 2010.
- 2. Database System Concepts, Peter Rob, Carlos Coronel, Cengage Learning, 2008.
- 3. Database Development and Management, Lee Chao, Auerbach Publications, 2010.

#### **Practical:**

- 1. Using Different operators
- 2. using Control Structures
- 3. implement Built-in functions
- 4. implement update and Alter table
- 5. implementing PL/SQL Block
- 6. implement PL/SQL table and record
- 7. using Functions
- 8. using Cursors
- 9. using Triggers

#### 12 Hours

		L	Т	Р	X	С	
BCA21R204	PROCESS MANAGEMENT	3	0	2	0	4	
Course Category: Pro	gram Elective/DSE						
Course Type : Theory							

### **COURSE OBJECTIVES**

To provide students with a theoretical as well as practical understanding of software development practices and process models

- To understand Agile development and testing in Scrum.
- To acquire knowledge about Devops principles
- To learn to use Lean UX.
- To learn the basics of Sprint
- To understand Design Thinking principles

### COURSE OUTCOMES

**CO1**: To provide students with a theoretical as well as practical understanding of software development practices and process models

CO2:To understand Agile development and testing in Scrum.

CO3: To acquire knowledge about Devops principles

- **CO4**: To learn to use Lean UX.
- **CO5**: To learn the basics of Sprint, To understand Design Thinking principles

### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	М			М		
CO2		S				L

CO3			М		М	
CO4	L	М		М		М
CO5			S			S

### **UNIT I - SOFTWARE AND SOFTWARE ENGINEERING**

The Nature of Software –The Unique Nature of WebApps-Software Engineering- Software Process-Software Engineering Practice-Software Myths. Software Process Model: A Generic Process Model- Process Assessment and Improvement –Perspective Process Models-Specialized Process Model-The Unified Process.

### UNIT II -AGILE

Agile Methodology-Manifesto-Principles of Agile-Agile Methodologies-Challenges with Agile. Scrum: Overview of Scrum-Scrum Roles-Scrum Ceremonies-Scrum Artifacts-Extreme programming vs Scrum.

### **UNIT III – DEVOPS**

Introduction to Devops-Principles-Automation-Performance Measurement through KPIS and Metrics-Agile and Devops-Agile Infrastructure-Velocity-Lean Startup UPS.

### UNIT IV - LEAN UX AND AGILE ANTI-PATTERNS

Sprint -Staggered sprints -Sprint zero and design sprints- Dual-track Agile- Listening to Scrum's rhythms- Listening to Scrum's rhythms- Participation- Design is a team sport- Coordinating multiple Lean UX teams- Managing up and out – Agile anti-patterns.

### **UNIT V- DESIGN THINKING**

Introduction to Design Thinking – Lean thinking - Actionable Strategy- The Problem with Complexity - Vision and Strategy - Defining Actionable Strategy Act to Learn - Leading Teams to Win.

### **Text Books**

- 1. Roger S Pressman, "Software Engineering APractioners Approach", 7th Edition 2010.
- 2. KalloriVikraman, "Introduction to Devops", 1st Edition, 2016.
- 3. Stephen Haunts, "Essential of Scrum" Addison-Wesley Professional; 1st Edition, 2012

#### **References Books**

1. Jeff Gothelf, Josh Seiden, "Lean UX", 2nd Edition, 2016.

 Jonny Schneider, "Understanding Design Thinking, Lean, and Agile" O'Reilly Media 2017.

3. Jeff Gothelf, "Lean vs. Agile vs. Design Thinking", Sense and Respond Press, 2017.

DC 4 01 D 005	VIDTUALIZATION AND CLOUD		Т	Р	X	С	
BCA21R205	VIRTUALIZATION AND CLOUD	3	0	0	0	3	
Course Category: Pr	ogram Core	ı					
Course Type : Integrated Course							

### **COURSE OBJECTIVES**

This course gives students an insight into the basics of virtualization, Types of virtualization, solutions for various virtual machines. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

### COURSE OUTCOME(S)

- **CO1**: Understand what is Cloud Computing.
- **CO2**: Apply the architecture of the cloud and the usage of clouds.
- **CO3:** Secure their data from the security issues.
- CO4 Analyze what is Virtualization
- CO5: Create Cloud Types and Cloud Service Deployment Models (IaaS\*, PaaS\*, SaaS\*).
- **CO6:** Understand the structure of cloud architecture
- **CO7:** Implementation on CloudSim and VMWare

### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S			L		
CO2		М				

CO3			S		L	
CO4	L			М	S	
CO5		S				S
CO6	S		М			
CO7		S			L	

#### **UNIT I - DISTRIBUTED SYSTEMS**

Distribute a system - Distributed algorithm - Distributed Data Stores - Distributed Computing -File Systems - Distributed Messaging - Distributed Applications – Distributed Transaction -Parallel and distributed computing - Applications.

### **UNIT II - CLOUD CONCEPTS**

Introduction Cloud Computing - Advantages of Cloud - Public Cloud - five essential characteristics - three service models - Four deployment models - Benefits of Cloud Computing - Cloud Vendors - Traditional Infrastructure setup and Challenges – AWS.

#### **UNIT III - VIRTUALIZATION**

Introduction to vSphere and the Software - Defined Data Center Creating Virtual Machines -VCenter Server - Configuring and Managing - Virtual Networks Configuring and Managing Virtual Storage - Virtual Machine Management - Resource Management and Monitoring.

### **UNIT IV - VIRTUAL MACHINES**

vSphere HA - vSphere Fault Tolerance - Protecting Data vSphere DRS - Network Scalability - vSphere Update Manager and Host Maintenance - Storage Scalability - Securing Virtual Machines.

### **UNIT V- DATACENTER**

Data center overview -Components - Provisions - Need of Data Center - Data Center Architecture - Different Racks - Data center architecture for cloud computing - role of data center in cloud computing.

#### **Text Books:**

1. Jean Dollimore formerly of Queen Mary, Tim Kindberg, "Distributed Systems Concepts and Design", 5th Edition, Cambridge University, University of London, 2012

#### **Reference Books:**

- VenkataJosyula , Malcolm Orr , Greg Page, "Cloud Computing: Automating the Virtualized Data Center", 1<sup>st</sup> Edition, Cisco Press, 2011.
- Brian J.S. Chee, Curtis Franklin Jr., "Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center", 1<sup>st</sup> Edition, CRC press, 2019.

#### **Practical Components**

- 1. Working with hypervisors
- 2. Creating account in AWS
- 2. Exploring AWS services like storage, machine image, pricing models, data base
- 3. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
- 4. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
- 5. Install Google App Engine. Create hello world app and other simple web applications using python/java.
- 6. Use GAE launcher to launch the web applications.
- Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
- 8. Find a procedure to transfer the files from one virtual machine to another virtual machine.

9. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

BCA21R203

CAMPUS TO CORPORATE

L	Т	Р	X	С
1	0	2	0	2

Course Category: Program Core

Course Type : Theory with Practical

### **Course Objectives**

To make the students understand the corporate life. Prepare them to face corporate life from campus life

### **Course Outcome(s)**

- CO1: Understand the Corporate and Business Process
- CO2: Understand the difference between campus and corporate life and prepare
- CO3: Understand Corporate Etiquettes
- CO4: Understand Grammar
- **CO5:** Apply Social Conversation Skills

**MAPPING OF COURSE OUTCOME(S):** 

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S		S		L	
CO2		S				M
CO3			М			
CO4		L			S	
CO5	М			S		S

### UNIT I

Overview of Corporate Ice breaker - What is Corporate? - History of Corporate - Overview of BPS Industry - What is BPS? - History of BPS - Benefits of BPS - BPS Industry in World - BPS Industry in India - TCS BPS

### UNIT II

Difference between Campus and Corporate - Change Management(Understand the difference between campus and corporate life and prepare

#### **UNIT III**

Corporate Etiquettes - Dressing & Grooming Skills - Workplace etiquette - Business etiquette -E-Mail etiquette - Telephone etiquette - Meeting etiquette - Presentation Skills. Professional Competencies - Analytical Thinking - Listening Skills - Time management-Team Skills – Assertiveness - Stress Management - Interview facing – Ownership - Attention to Detail

#### UNIT IV

Grammar - Phonetics - One on one basic conversation skill practice

#### UNIT V

Reading Comprehension - Listening Comprehension - Improving Vocabulary - Improving Writing Skills - Comprehension while interacting face to face - Recitation of short stories -Interview Skills - Group Discussion - Social Conversation Skills – Presentation - One Act Plays

#### **Practical Components**

#### **1. ORAL PRESENTATION**

- ✓ TV violence.
- ✓ Is the Fast-Food Industry Accountable Legally for poor health?
- $\checkmark$  Intelligence depends more on the environment than genetic factors.
- ✓ Environment vs. technology Impact of technology on learning
- ✓ Learning does not eradicate ignorance
- ✓ How WiFi improved your life?

#### 2. GROUP DISCUSSION

- ✓ NGOs Do they serve peoples' interests or are they pressure groups?
- ✓ Role of women in development.
- $\checkmark$  Kids today are not what they used to be.
- ✓ Repeated elections Should taxpayers pay for it?
- $\checkmark$  In India, the whole is less than the parts Do we lack in team spirit?

- ✓ "Dot.com" companies Is there room for everyone?
- ✓ Artificial Intelligence Will man be ever replaced by machines?

### **3.INTERVIEW SKILLS**

- ✓ How to make a good impression
- ✓ Basic Interview Questions
- ✓ Behavioral Interview Questions

BCA21R301	SOFTWARE ENGINEERING		Т	Р	X	С			
		4	0	0	0	4			
Course Category: Program Elective /DSE									
Course Type : Theory									

### **COURSEOBJECTIVE(S):**

The aim of the course is to assist the student in understanding the basic theory of software engineering, and to apply these basic theoretical principles to a group software development project.

### COURSEOUTCOME(S):

CO1: Apply Basic knowledge and understanding of the analysis and design of complex systems.

CO2: Ability to apply software engineering principles and techniques

CO3: To produce efficient, reliable, robust and cost-effective software solutions.

**CO4**: Ability to work as an effective member or leader of software engineering teams.

**CO5**: To manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	М		S		
CO2		L			S	
CO3	М		S			М

### MAPPING OF COURSE OUTCOME(S):

CO4		L	S		
CO5	М			М	М

#### UNIT I

Software Development Approaches: Introduction; Evolving Role of Software; Software Characteristics; Software Applications. Software Design Processes: Introduction; What is Meant by Software Engineering?, Definitions of Software Engineering; The Serial or Linear Sequential Development Model; IterativeDevelopment Model; The incremental Development Model

#### UNIT II

Software Design Principles: Introduction, System Models: Data-flow Models, Semantic Data Models, Object Models, Inheritance Models, Object Aggregation, Service Usage Models, Data Dictionaries; Software Design: The Design Process, Design Methods, Design description, Design Strategies, Design Quality; Architectural Design: System Structuring, The Repository Model, The Client–Server Model, The Abstract Machine Model, Control Models, Modular Decomposition, Domain-Specific Architectures.

#### UNIT III

Object Oriented Design: Introduction; Object Oriented Design: Objects, Object Classes & Inheritance, Inheritance, Object Identification, An Object –Oriented Design Example, Object Aggregation; Service Usage; Object Interface Design: Design Evolution, Function Oriented Design, Data–Flow Design; Structural Decomposition: Detailed Design

#### UNIT IV

An Assessment of Process Life-Cycle Models: Introduction; Overview of the Assessment of Process; The Dimension of Time; The Need for a Business Model in Software Engineering; Classic Invalid Assumptions: First Assumption: Internal or External Drivers, Second

Assumption: Software or Business Processes, Third Assumption: Processes or Projects, Fourth Assumption: Process Centered or Architecture Centered; Implications of the New Business Model; Role of the Problem - Solving Process in this Approach: Data, Problem Definition, Tools and Capabilities; Redefining the Software Engineering Process: Round-Trip Problem-Solving Approach, Activities, Goals, Interdisciplinary Resources, Time.

#### UNIT V

Software Reliability: Introduction; Software Reliability Metrics; Programming for Reliability: Fault Avoidance, Fault Tolerance, Software Reuse.

#### **Text Books**

- 1. R. G. Pressman Software Engineering, 7th Edition, M McGraw Hill Education, 2009.
- 2. Sommerville, Ian, Software Engineering, 10<sup>th</sup> Edition, Pearson Education, 2017.

#### **Reference Books**

- Pfleeger, Shari Lawrence, Software Engineering Theory and Practice, 2<sup>nd</sup> Edition. Prentice- Hallm 2001.
- 2. Object Oriented & Classical Software Engineering, 5<sup>th</sup> Edition, SCHACH, TMH.

BCA21R302 COMPLITER NETWORKS		L	Τ	Р	X	C	
BCA21R302	COMPUTER NETWORKS	4 0	2	0	5		
Course Catego	ry: Program Core						
Course Type : Integrated Course							

### **COURSE OBJECTIVES**

To master the fundamentals of data communications networks by gaining a working knowledge of data transmission concepts. • To study the basic taxonomy and terminology of the computer

networking and enumerate the layers of OSI model and TCP/IP model. • To read the fundamentals and basics concepts of Physical layer with real time examples

#### COURSE OUTCOME(S)

- **CO1**: Understand the functions of each layer in OSI and TCP/IP model.
- **CO2**: Apply the multiplexing, switching concept and types of transmission media with real time examples
- **CO3**: Understand the error detection and correction methods and can implement the data link layer protocols
- CO4: Understand channel error detection and correction, MAC protocols, Ethernet and WLAN
- **CO5**: Analyze the basic functionalities of transport layer and application layer.
- **CO6:** Discuss the key technological components of the Network.
- CO7: Evaluate the challenges in building networks and solutions to those

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S		М			L
CO2		М			L	
CO3	S		L			М
CO4	М			S		М
CO5	S		М		М	
CO6		S		М		М
CO7	S		М			М

#### MAPPING OF COURSE OUTCOME(S):

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

#### UNIT – II: DATA-LINK LAYER & MEDIA ACCESS

Introduction – Layer Addressing – DLC Services – Data-Link Layer Protocols – Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

#### UNIT – III: NETWORK LAYER

Introduction – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets -Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol- – Subnetting Advanced VLSM - Switch Basic -VLAN - VTP / CDP - Subnetting Basic Version 4 - Network Quiz - Routing Static

#### **UNIT – IV: ROUTING ALGORITHM**

Routing algorithms – Congestion Control Algorithms - CISCO IOS / Managing / Password recovery - Routing Dynamic Routing protocols OSPF RIP EIGRP - Network Advanced Routing Dynamic Routing protocols - OSPF RIP EIGRP

#### **UNIT - V: MONITORING**

Monitoring Network Devices – Purpose of Access Control List( ACL)-Types of ACL-Creating ACLs-Managing ACLs\NAT-Purpose of NAT-Operational Flow of NAT, Introduction to WAN, - Introduction to Wireless.

#### **Text Book:**

- 1. Behrouz A. Forouzan, Data Communications and Networking, 5<sup>th</sup> Edition TMH, 2018.
- 2. David J.Wetherall, Andrew S.Tanenbaum, "Computer Networks", 5<sup>th</sup> Edition, Pearson Education, 2017.

#### **Reference Books :**

### 9 Hours

9 Hours

# 9 Hours

### 9 Hours

- Kurose and Rose "Computer Networking -A top down approach featuring the internet" Pearson Education, 2018.
- 2. Leon, Garica, Widjaja "Communication Networks" TMH, 2017.
- 3. Walrand "Communication Networks" TMH. 2018.
- 4. Comer "Internetworking with TCP/IP, 4th Edition, Pearson Education/PHI,2017

### **Practical Components:**

- 2. Modes in Switches
- 3. Switch Authentication
- 4. Switching in Half-duplex mode
- 5. Connecting PCs and assigning IP Address
- 6. Telnet
- 7. Port Security
- 8. Virtual LAN (VLAN)
- 9. VLAN Trunking Protocol (VTP)
- 10. Spanning Tree Protocol (STP)
- 11. Static /Dynamic Routing Protocols

BCA21R303	INTRODUCTION TO DIGITAL	L	Т	Р	X	С			
BCA21R303	TECHNOLOGY		0	0	0	4			
Course Category: Program Core									
Course Type : Theory									

### **COURSE OBJECTIVES**

To understand the fundamental concepts of digital technology ,To introduce the concept s of cloud , big data, digital marketing ,To introduce the principles of Artificial Intelligence, Block chain technology, To recognize the use of Digital technology in various Industries , To understand the principles of Automatix, Automation Anywhere , To understand and create Bot

#### **COURSE OUTCOMES**

**CO1**: Understand the fundamental concepts of digital technology

**CO2**: Analyze the concepts of cloud, big data, digital marketing

CO3: Familiarize the principles of Artificial Intelligence, Block chain technology

CO4: Recognize the use of Digital technology in various Industries

**CO5**: Understand the principles of Automatix, Automation Anywhere, Create bots and understand its various types

### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					L
CO2			L	М		
CO3		S	М			
<b>CO4</b>		L			М	

CO5	М	М		S

#### **UNIT: I DIGITAL PRIMER**

Digital Primer - Why is Digital Different? Digital Metaphors - On Cloud 9 - A Small Intro to Big Data - Social Media & Digital Marketing- Artificial Intelligence - Unchain the Blockchain -Internet of Everything Immersive Technology

#### **UNIT: II DIGITAL FOR INDUSTRIES**

Manufacturing and HiTech - Banking and Financial Services - Insurance and Healthcare – Retail - Travel & Hospitality - Communications, Media & Information Services - Government

#### **UNIT: III AUTOMATIX**

Automatix – Art of RPA - Introduction - Setting the Context - RPA Prelude - RPA Demystified -RPA vs BPM - RPA Implementations - RPA in Industries - RPA Tools - Automatix - Art of RPA - Course Conclusion

#### **UNIT: IV AUTOMATION ANYWHERE**

Automation Anywhere - Getting Started with AA Enterprise - Exploring AA Enterprise - AA Enterprise – Architecture - Knowing the Bots.

#### **UNIT: V KNOWING BOTS**

More About TaskBots - AA Enterprise - Assess your Learning - All About Recorders – Designers – MetaBots - Cognitive RPA - AA Enterprise - Closure Note

#### **Text Books**

 Richard Murdoch, "Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant", 1<sup>st</sup> Edition, Pack Publishing, 2020.

#### **Reference Books**

 Kelly Wibbenmeyer, "The Simple Implementation Guide to Robotic Process Automation (RPA): How to Best Implement RPA in an Organization", 1<sup>st</sup> Edition, iUniverse publishing, 2018.

### **Practical Component**

- 1. 1.Creating bots for automatic software installation
- 2. Creating bots for automatic software patch installation
- 3. Creating bots for file transfer
- 4. Creating bots for automatic file backup

	COMPUTER GRAPHICS	L	Т	Р	X	С			
BCA21R305		4 0 0			0	4			
Course Category: P	Course Category: Program Elective /DSE								
Course Type : Theory									

### **OBJECTIVE(S)**

To make the students know OpenGL Programming interfaces, Various Input methods, Transformations on objects, how to do various graphical operations such as clipping.

### COURSE OUTCOME(S)

**CO1**: Understand and imaging and graphics programming

CO2: Create interactive models, animated input models

CO3: Apply Geometric transformations, openGL transformation matrix formation

CO4: Apply Viewing, various shading models

CO5: Create clipping and rasterizing of graphics objects

### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S				М	
CO2		М	L			S
CO3	S			М	L	
CO4			S		M	
CO5		M		L		M

**UNIT I: INTRODUCTION** 

Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics. Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications. The OpenGL API; Primitives and a6ributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plo8ng implicit functions.

#### **UNIT II: INPUT AND INTERACTION**

Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; A simple CAD program; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations

#### UNIT III: GEOMETRIC OBJECTS AND TRANSFORMATIONS

Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications; Quaternions.

#### **UNIT IV: VIEWING:**

Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows. Light and ma6er; Light sources; The Phong lighting model; Computation of vectors; Polygonal shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global illumination

#### **UNIT V: IMPLEMENTATION:**

Basic implementation strategies; The major tasks; Clipping; Line segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's

algorithm; Polygon rasterization; Hidden-surface removal; Antialiasing; Display considerations.

#### **Text Books**

 Interactive Computer Graphics A Top-Down Approach with OpenGL -Edward Angel, 5<sup>th</sup> Edition, Addison-Wesley, 2008

#### **Reference Books**

- 1. Computer Graphics Using OpenGL F.S. Hill, 2<sup>nd</sup> Edition, Pearson 1. Education, 2001.
- Computer Graphics James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Addison-wesley 1997.
- Computer Graphics OpenGL Version Donald Hearn and Pauline Baker, 2<sup>nd</sup> Edition, Pearson Education, 2003.

DCA 21D201	MULTIMEDIA AND DESKTOP	L	Т	Р	X	С		
BCA21R381	PUBLISHING LABORATORY		0	2	3	2		
Course Category	Course Category: Program Core							
Course Type: Practical								

#### **COURSEOBJECTIVE(S):**

This course is designed to design, create, build, and debug attractive multimedia applications.

#### COURSEOUTCOME(S):

After completing this course, the student will be able to

- CO1: Understand the components of multimedia.
- CO2: Analyze the different hardware devices used in multimedia project development.
- CO3: Work with different font styles and design tools.
- CO4: Develop projects using drawing techniques.
- CO5: Implement effective real time multimedia application by including audio and video.

MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S				L	
CO2		S		М		
CO3		S	М			L
CO4					S	S
CO5	M			S		S

#### LIST OF EXPERIMENTS:

- 1. Design Newspaper article in Multiple Columns in ADOBEPAGEMAKER.
- 2. Design a classified advertisement in ADOBE PAGEMAKER.
- 3. Perform experiments with the use of Master Pages in ADOBE PAGEMAKER.
- 4. Perform experiments with the use of import and export command in ADOBE PAGEMAKER.
- 5. Design Invitation Card in CORELDRAW.
- 6. Design a Logo in CORELDRAW
- 7. Design Greeting Card in CORELDRAW.
- 8. Design a Broacher in CORELDRAW

- 9. Design a Magazine Front Page in CORELDRAW.
- 10. Scan a BLACK& WHITE PHOTO and convert it into COLOR PHOTO in PHOTOSHOP.
- 11. Change dress color of a scanned photo using PHOTOSHOP.
- 12. Scan a PASSPORT SIZE PHOTO and apply various tools for finishing the photo in PHOTOSHOP.
- 13. Basic audio editing operations using Audacity tool
- 14. Basic video editing operations

### **DISCIPLINE SPECIFIC ELECTIVES**

#### (Data Science Stream)

	PRACTICAL APPROACH TO DATA MINING	L	Т	Р	Х	С		
BCA17R151	AND ANALYTICS	2	0	2	3	4		
Course Category: Program Elective/DSE								
Course Type : Theory with Practical								

#### PREREQUISITE

Knowledge in Mathematics-Linear Algebra, Calculus, Differentiation, Partial Derivatives and Gradient Statistics: Normal Distribution, Probability, Basic Programming in Python

#### **COURSE OBJECTIVES**

This course aims to make the students understand the concepts of Data mining and analytics

### COURSE OUTCOME(S)

**CO1**: Fundamentals of data mining

- CO2: Demonstrate the concepts of Data Mining techniques Data Preprocessing
- CO3: Demonstrate the concepts of Data Mining Algorithms
- CO4: Design of Data Analytics using Tools
- **CO5:**.Ability to create programs on Analytics.

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		S			М	
CO3	М			S		
CO4		L				
CO5			L		S	

#### UNIT – I:

Introduction to Data Mining - Basic concepts of Data Mining, Data Mining techniques, Related technologies

### UNIT – II:

Data Preprocessing ,Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies

### UNIT – III:

Data Mining Algorithms & Data Analytics Using Programming Tools Association rules,

Classification, Prediction, Clustering

### UNIT – IV:

Topics in Analytics - Association and correlation analysis - regression models, Predictive analytics, Exploratory analysis

### UNIT - V:

Case Studies, Image analytics, Text analytics

### **Text Books:**

- Micheline Kamber Jian Pei, Data Mining Concepts and Techniques Third Edition Jiawei Han University of Illinois at Urbana–Champaign
- [2] Andrea Ahlemeyer-Stubbe, Shirley Coleman, A Practical Guide to Data Mining for Business and Industry, Wiley, ISBN: 978-1-119-97713-1, 2014
- [3] Ian Witten, Eibe Frank, and Mark.A Hall, Christopher J. Pal, Data Mining:
  Practical Machine Learning Tools and Techniques, 4<sup>th</sup> Edition, Morgan Kaufmann

BCA21R152	DATA MINING	L	Т	Р	X	С		
		4	0	0	0	4		
Course Category: Program Elective/DSE								
Course Type : Theory								

### PREREQUISITE

#### DBMS/RDBMS

#### **COURSE OBJECTIVE(S)**

To interpret the contribution of data mining to the decision support level of organizations, categorize and differentiate between situations for applying different data mining techniques, mining frequent pattern, association, correlation, classification, prediction, cluster and outlier analysis.

#### COURSE OUTCOME(S)

- CO1: Familiar with basic concepts of data mining Applying
- CO2: Knowledge using association rule mining algorithms
- CO3: Apply classification techniques and prediction methods in real life applications
- CO4: Knowledge using cluster analysis
- CO5: Understanding the outlier analysis

### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
C01	S					L
CO2	М	S				
CO3		М	S			

CO4	М	S		М
CO5		М	L	S

#### **UNIT I: Data Mining**

Data mining tasks-Data mining vs KDD- Issues in data mining, Data Mining metrics, Data mining architecture - Data cleaning- Data transformation- Data reduction – Data mining primitives.

#### **UNIT II: Association Rule Mining**

Introduction - Mining single dimensional Boolean association rules from transactional databases - Mining multi-dimensional association rules.

#### **UNIT III: Classification and Prediction**

Classification Techniques Issues regarding classification and prediction - decision tree -Bayesian classification –Classifier accuracy – Clustering – Clustering Methods - Outlier analysis. Applications and Other Data Mining Methods: Distributed and parallel Data Mining Algorithms, Text mining- Web mining.

#### **UNIT IV: Cluster Analysis**

Requirements for Cluster Analysis -Overview of Basic Clustering Methods - Partitioning Methods: k-Means: A Centroid-Based Technique - k-Medoids: A Representative Object-Based Technique - Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering - Distance Measures in Algorithmic Methods - BIRCH: Multiphase Hierarchical Clustering Using Clustering Feature Trees -Chameleon: Multiphase Hierarchical Clustering Using Dynamic Modeling - Probabilistic Hierarchical Clustering.

#### **UNIT V: Outlier Detection**

Types of Outliers - Challenges of Outlier Detection - **Outlier Detection Methods: Supervised**, Semi-Supervised, and Unsupervised Methods -Statistical Methods, Proximity-Based Methods,
and Clustering-Based Methods - Statistical Approaches: Parametric Methods -Nonparametric Methods

### **Text Books**

- Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 2<sup>nd</sup> Edition, Morgan Kaufmann Publishers USA- 2006.
- Margaret H.Dunham Data mining Introductory and advanced Topics, 2<sup>nd</sup> Edition, Person Education, 2008.

#### **Reference Books**

 Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, 3<sup>rd</sup> Edition, Pearson Education.

	<b>BIG DATA ANALYTICS AND</b>	L	Τ	Р	X	С			
BCA21R153	VISUALIZATION	4	0	0	0	4			
Course Category: Program Elective/DSE									
Course Type : Theory									

### **COURSE OBJECTIVES**

- 1. Understand the basic concepts in Big Data Analytics and gain the ability to choose the right solution for a task involving big data, including databases, architectures and cloud services.
- 2. Understand the different methods to analyze and visualize the big data.
- 3. Develop the skill set to build effective solutions for Big Data issues using Hadoop and its Eco-System.
- 4. Get insights into different data visualization techniques and standard tools.
- 5. Understanding of real life issues faced by different organizations and its effective solutions through case studies.

## COURSE OUTCOME(S)

**CO1:** Analyze the basic concepts of Big Data Analytics and gain the knowledge to choose the right solution for a task involving big data

**CO2:** Apply the visualization tools to identify the data

CO3: Understand the Hadoop and its Eco-System.

CO4: learn different data visualization techniques and standard tools

**CO5:** Analyze some case studies related to the field

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2		Μ	S			
CO3				Μ	S	
CO4						

CO5 W				
	CO5			W

#### UNIT 1

Introduction to Big Data, Types of Digital Data, Characteristics of Big Data, Evolution of Big Data, Definition of Big Data, Data Appliance, Challenges with Big Data, Big data sources, Best practices in Big Data Analytics, Introduction to Data Modelling

#### UNIT 2

Introduction to elementary data analysis: Measures of center: Mean, Median, Mode, Variance, Standard deviation, Range, Normal Distribution : Center, Spread, Skewed Left, Skewed Right, Outlier, Correlation Patterns, Magnitude and Direction in relationship, Introduction to Bayesian Model

#### UNIT 3

History of Visualization, Goals of Visualization, Types of Data Visualization: Scientific Visualization, Information Visualization, Visual Analytics, Impact of visualization, Big Data Visualization Tools: Tableau, Google Chart

#### UNIT 4

Introduction to Big Data Processing and Apache Hadoop, Installation and Configuration of Hadoop in Ubuntu, HDFS Concepts, MapReduce Framework, Anatomy of a Map Reduce Job Run, Job Scheduling, Shuffle and Sort, Task Execution

#### UNIT 5

Introduction to Hadoop Eco System, Apache Hive, Apache Mahout, Apache Pig, Case studies: Analyzing big data with twitter, Big data for Ecommerce, Big data for blogs.

#### **TEXT BOOKS:**

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics", Wiley, 2015

2. Frank J Ohlhorst, —Big Data and Analytics: Turning Big Data into Big Moneyl, Wiley and SAS Business Series, 2012.

3. Tom White, — Hadoop: The Definitive Guidel Third Edition, O'reily Media, 2012.

# **REFERENCE BOOKS:**

1. Michael C. Reingruber, William W. Gregory — The Data Modeling Handbook: A BestPractice Approach to Building Quality Data Models, Wiley QED publications, First Edition.

2. Philip Bobko, -Correlation and Regression: Applications for Industrial Organizational

	DATA MODELING	L	Τ	Р	Х	С			
BCA21R154	AND VISUALIZATION	3	0	2	3	5			
Course Category: Program Elective/DSE									
Course Type : Theory with Practical									
D									

Psychology and Management<sup>I</sup>, First Edition

## PREREQUISITE

Basic knowledge of programming fundamentals

## **COURSE OBJECTIVES**

This course aims to make the students understand the advance concepts of data modeling and visualization

## COURSE OUTCOME(S)

CO1: Fundamentals of data modeling

CO2: Demonstrate the concepts of R Programming

**CO3:** Demonstrate the concepts of Data clustering

CO4: Design of Data Analytics using visualization

**CO5:**.Ability to create programs on Analytics.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		М	S			М
CO3	М	S			S	
CO4			L			
CO5		S		L		S

Mapping of Course Outcome(s):

#### UNIT – I:

Data-Analytic Thinking - Knowing your data - Data preprocessing - Storytelling with data

#### UNIT – II:

Data Visualization using R -Introduction to R programming - Visualization using R -Transformation using R -Exploratory data analysis

#### UNIT – III:

Data Modeling - Linear regression, Logistic regression, K-nearest neighbors, K-means clustering, Performance measure, Implementation of some modeling algorithms using R

#### UNIT – IV:

Data Visualization using Tableau - Introduction to Tableau, data import and management, data type and Operations - Different types of data visualizations, dashboards, storytelling Understanding the concepts of dynamic/interactive data visualization and report generation

#### UNIT - V:

Data Modeling from Different Data Sources for Visualization - Understanding structured, unstructured and semi-structured data sources, Data modeling and creating visualization charts/dashboards from structured data like databases (SQL and NoSQL),

Data modeling and creating visualization charts/dashboards from semi-structured data like CSV files, XML, JSON and others, Data modeling and creating visualization charts/dashboards from live streaming data

#### **TEXT BOOKS:**

- 1. Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.
- Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 3<sup>rd</sup> Edition, Morgan Kaufmann Publishers USA- 2012.
- 3. Narayan S. Umanath (Author), Richard W. Scamell, Data Modeling and Database Design 2nd Edition, 2014
- 4. Ted Hills, NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and Software First Edition, 2016.
- 5. Thomas Rahlf, Data Visualisation with R, Springer, 2017.

	DIGITAL MARKETING ANALYTICS	L	Т	Р	X	С			
BCA21R155		5	0	0	0	5			
Course Category: Program Elective/DSE									
Course Type : Theory									

## **COURSE OBJECTIVES:**

Marketing analytics is the study of data garnered through marketing campaigns in order to discern patterns between such things as how a campaign contributed to conversions, consumer behavior, regional preferences, creative preferences and much more. The goal of marketing analytics as a practice is to use these patterns and findings to optimize future campaigns based on what was successful.

## **COURSE OUTCOMES:**

CO1: Relate to digital media marketing and the need for analytics on the data captured.

CO2: Choose the appropriate tools for performing different digital analytics on the digital marketing data.

CO3: Analyze and appraise the outcomes of digital influence and listening.

CO4: Formulate a research plan and perform search analysis on the digital marketing data.

CO5: Summarize the strategies for Mobile analytics and Business Intelligence

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	Μ					
CO2		S				
CO3			Μ	S	S	
CO4						W
C05			Μ		W	

#### **UNIT I DIGITAL MEDIA AND ANALYTICS**

Digital media types – Owned and earned social metrics – Paid searches and Organic Searches – Aligning Digital and Traditional Analytics – Identifying social media listening tools – Understanding social media engagement software – Social media engagement tools

#### **UNIT II TOOLS FOR DIGITAL ANALYTICS**

Social Media Listening Tools - Evolution, Social analytics life cycle, Social media monitoring software: Sysomos, Radian6, Visible Technologies, Zoho social and others. Search Analytics Tools – Basics ofsearch, Search analytics use cases, Search data, Google trends, YouTube trends, Google Adwords keyword, Yahoo clues, Collecting insights through search data. Audience Analysis Tools – Audience Analysis Use Cases, Audience analysis tool types – Audience analysis Techniques, Event Triggers. Content Analysis Tools - Content Audits-Optimizing Content Distribution, Analysing Content Consumption. Engagement Analysis Tools – Social Media Engagement Software (SMES), using SMES, study of different SMES in the market.

#### UNIT III DIGITAL INFLUENCE AND LISTENING

Reality of Digital Influence - Media List - Klout, PeerIndex - Online Versus Offline Influence -Using the Influencer List - Developing Social Media Listening Program - Using Listening Data for Program Planning- Implementing Listening Program - Conversation Audit - Online Influencers - Conducting Social brand benchmarking - Use of Online data for crisis anticipation -Identifying known issues - Crisis day monitoring and ongoing reporting - Corrections after crisis - Improving customer service – Social customer service conflict - Social customer service models

#### UNIT IV RESEARCH PLAN AND SEARCH ANALYSIS

Launching new product – Product life cycle – Introduction Phase – Growth Phase – Maturity Phase. Formulating research plan – Developing source list – Research methods – Constructing reports – Delivering reports – Report use cases – Building central repository of information –

Search analytics for digital strategy – Search analytics for content strategy and planning – Search analytics for paid advertising.

#### UNIT V ROI, MOBILE ANAYTICS AND BUSINESS INTELLIGENCE

Return on Investment (ROI) – Return on Engagement, Influence, Experience – Tracking ROI – Understanding measurement fundamentals – Measurement reporting cadence - Mobile Analytics –Mobile market landscape – Mobile marketing measurement – Marketing activities – Audience/visitor metric – Mobile app performance - Social CRM – Social CRM initiative – Social CRM Initiative – Future of Digital Data – Business Intelligence

#### **TEXT BOOKS:**

1. Chuck Hemann and Ken Burbary, "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World", Que Publishing, 1 edition, ISBN-13: 978-0789750303, 2013.

#### **REFERENCE BOOKS:**

 Simon Kingsnorth, "Digital Marketing Strategy: An Integrated Approach to Online Marketing", Kogan Page Publisher, First edition, ISBN-13: 978-0749474706, 2016.
Dave Chaffey, Fiona Ellis-Chadwick, "Digital Marketing – Strategy, Implementation and Practice", Pearson Education, Sixth edition, ISBN-13: 978-1292077611, 2016.

	DATA ANALYSIS USING BIO INSPIRED	L	Т	Р	X	С				
BCA21R156	ALGORITHMS	5	0	0	0	5				
Course Category:	Course Category: Program Elective/DSE									
Course Type : Theory										

## **COURSE OBJECTIVES**:

To introduce students various schemes for classification, search, learn and optimization based on bio-inspired mechanisms to determine the data.

## **COURSE OUTCOMES :**

CO1:Explore the benefits and limitations of bio-inspired approaches.

CO2:Extract basic principles from intelligent systems in nature that can be applied to engineering.

CO3:Critically analyze the use of cellular systems

CO4:Differentiate the different models of immune systems

CO5: Apply bio-inspired AI to engineer solutions for real world applications.

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
C01	S				Μ	
CO2		Μ				
CO3			S			
CO4				Μ	L	
CO5		L				S

## UNIT I EVOLUTIONARY SYSTEMS

Evolutionary Systems – Artificial Evolution - Genetic Representations - Evolutionary Measures -Types of Evolutionary Algorithms - Schema Theory - Evolutionary Computation-Representation - Selection - Reproduction - Genetic Algorithms - Canonical Genetic Algorithm – Crossover - Mutation - Control Parameters – Applications - Genetic Programming - Tree-Based Representation – Building Block - Genetic Programming – Applications. Evolutionary Programming – Basics –Operators – Strategy Parameters - Evolutionary Programming Implementations

#### **UNIT II NEURAL AND FUZZY SYSTEMS**

Neural Networks - Biological Nervous Systems - Artificial Neural Learning - Architecture. Unsupervised Learning - Self-Organizing Feature Maps. Supervised Learning – Types- Learning Rules. Radial Basis Function Networks. Reinforcement Learning – Model Free - Neural Networks and Reinforcement Learning. Fuzzy Systems- Fuzzy Sets – Logic and Reasoning – Controllers- Rough Sets.

#### UNIT III CELLULAR AND DEVELOPMENT SYSTEMS

Cellular Systems - The Basic Ingredients - Cellular Automata -Modeling - Classic Cellular Automata – Other Cellular Systems – Computation - Artificial Life - Complex Systems -Analysis and Synthesis of Cellular Systems. Developmental Systems - Potential Advantages of a Developmental Representation -Rewriting Systems - Synthesis of Developmental Systems -Evolution and Development – Defining Artificial Evolutionary Developmental Systems -Evolutionary Rewriting Systems – Developmental Programs and Processes

#### UNIT IV IMMUNE SYSTEMS AND COLLECTIVE SYSTEMS

Natural Immune systems - Classical View -Working -Constituents of Biological Immune Systems - Immunity Types - Learning the Antigen Structure - The Network Theory - The Danger Theory –Artificial Immune Systems - Algorithms - Classical View Models - Clonal Selection Theory Models – Network Theory Models - Danger Theory Models - Applications and Other AIS models Applications- Biological Self-Organization - Particle Swarm Optimization - Basics -Social Network Structures – Variations - Basic PSO Parameters - Optimization - Applications.

Ant Colony Optimization – Cemetery Organization and Brood Care - Division of Labor – Applications

### **UNIT V BEHAVIORAL SYSTEMS**

Behavioral Systems - Behavior in Cognitive Science - Behavior in Artificial Intelligence – Behavioral Systems – Behavior Based Robots –Evolution - Co-evolution - Learning and Self Reproduction of Behavioral Systems. Cultural Algorithms - Culture and Artificial Culture -Cultural Algorithm – Belief Space – Fuzzy Cultural Algorithms – Applications. Co-evolution – Types - Competitive and Cooperative Co-evolution.

### **TEXT BOOK**:

1.Claudio Mattiussi, Dario Floreano "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies" (Intelligent Robotics and Autonomous Agents series), MIT Press, 2008

### **REFERENCE BOOK**:

Andries P. Engelbrecht, "Computational Intelligence: An Introduction", 2nd Edition, Wiley;
2007

		L	Т	Р	X	С			
BCA21R251 DATA ANALYTICS AND REPORTIN	DATA ANALYTICS AND REPORTING	5	0	0	0	5			
Course Category: Program Elective/DSE									
Course Type : Theory									

### UNIT I

Introduction to Data Science and Analytics Data, features, Preprocessing on data, Cleaning of data, Feature selection techniques like Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Components of Analytics - reporting and analysis

#### UNIT II

Handling Data Sources Different types of data sources: structured, unstructured and semistructured data, Relational databases: normal forms, transactional data, Structured Query Language (SQL), NoSQL databases and its types, Handling semi-structured data with JSON, CSV files, XML and more

## UNIT III

Exploratory Data Analysis (EDA), Models and Techniques : Working with trend detection, outlier detection, summarization, association rule mining, missing distribution and imputation technique, spurious relationship or spurious correlation, concept of performance window, missing trends or percentile distribution from time perspective and concept of winsorization or flooring, Regression models: linear and non-linear, logistic, variable transformation, spinning of variables, population stability index and characteristic analysis, Regularization, overfitting and underfitting, mean square error, root mean square error, mean absolute percentage error , Decision tree classification, support vector machine, k-means clustering, usage of clustering techniques in variable selection

#### UNIT IV

Reporting Fundamentals : Anatomy and types of reports, Top-down approach: Drill down reports and dashboards, Bottom-up approach: analysis and prediction with ad-hoc queries, Strategies and techniques for effective reporting: best practices

#### UNIT V

Reports for Data Analysis & Data Reporting Tools Descriptive analysis and its reports: Key Performance Indicator (KPI) dashboards and periodic reports Diagnostic analysis and detailed drill down reports, Predictive analysis and reports based on predictive models,Prescriptive analysis and reports based on AI/ML models

Graphs and Charts: types and implementation, Tables: varieties and its usage in standard reports, Dashboards and drill down reports, Interactive reports, Report generation best practices based on case studies.

	HICH DIMENSIONAL DATA ANALVSIS		Т	Р	Х	С				
BCA21R252 HIGH DIMENSIONAL DATA ANALYSIS		5	0	0	0	5				
Course Category:	Course Category: Program Elective/DSE									
Course Type : Theo	Course Type : Theory									

### **COURSE OBJECTIVES:**

High-dimensional statistics focuses on data sets in which the number of features is of comparable size, or larger than the number of observations. Data sets of this type present a variety of new challenges, since classical theory and methodology can break down in surprising and unexpected ways.

## **COURSE OUTCOMES:**

- CO1: Analyze the classical High Dimensional problems.
- CO2: Evaluate the Principal component analysis and canonical correlation
- CO3: Apply the Factors and grouping techniques..
- CO4: Determine the non Gaussian analysis.
- CO5: Outline the Feature selection and principal component analysis

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	Μ					
CO2		S				
CO3			S	S	S	
<b>CO4</b>						W
<b>CO5</b>						

## UNIT I CLASSICAL METHODS

Classical method- Multi variant and High dimensional problems – Visualization – Multi variant Random vector and data- Multi dimensional data

#### UNIT II FACTORS AND GROUPING

Visualizing principal component analysis – Properties of principal component - Standardized data and high dimensional data - Asymptotic results - Number of components and regression – Canonical correlation analysis -Population - sample and properties of canonical correlation, Asymptotic consideration - Canonical correlation and regression

#### **UNIT III VECTOR AND CLUTERING**

Norms proximities, features, and dualities - Vectors and matrix norms, measure of proximity -Features and feature maps, dualities of X and X Transpose - Cluster analysis - Hierarchal agglomerative clusters - 3k means clustering, -Principal component and cluster analysis- Factor Analysis, population k factor model - Sample k factor model - Multidimensional scaling, classical scaling, metric scaling and nonmetric scaling.

#### UNIT IV NON-GUASSIAN ANALYSIS

Factor Analysis - Population k factor model – Sample k factor model - Multidimensional scaling – Towards non Gaussianity - Independent component Analysis -Projection pursuit -Kernal and more independent component methods.

#### UNIT V FEATURE SELECTION

Introduction-Independent component and feature selection -Variable Ranking and statistical learning - Sparse principle component analysis – Consistency of principle component analysis as dimension grows.

#### **TEXT BOOK:**

 Inge Koch , Analysis of Multivariate and High-Dimensional Data", Cambridge University Press ,2014

### **REFERENCE BOOKS:**

1.Fatemeh Emdad, SeyedZekavat, "High Dimensional Data Analysis: Overview, Analysis, and Applications, VDM Verlag, 2008, E-BOOK

2.https://www.cambridge.org/core/books/analysis-of-multivariate-and-highdimensionald ata/2BF8DE949E18E3A68001976784087816

BCA21R253	IMAGE ANALVTICS	L	Т	Р	X	С				
	IMAGE ANALYTICS	5 0	0	0	0	5				
Course Category:	Course Category: Program Elective/DSE									
Course Type : Theory										

## **COURSE OBJECTIVES:**

This course will cover the fundamentals of image and video processing. We will provide a mathematical framework to describe and analyze images and videos as two- and threedimensional signals in the spatial, spatio-temporal, and frequency domains. In this class not only will you learn the theory behind fundamental processing tasks including image/video enhancement, recovery, and compression - but you will also learn how to perform these key processing tasks in practice using state-of-the-art techniques and tools.

#### **COURSE OUTCOMES:**

CO1: Analyze the various techniques for intensity transformations functions and Implement Color image Smoothing and Sharpening.

CO2: Apply Some Basic Morphological Algorithms.

CO3: Understand the image segmentation techniques such as Optimum Global Thresholding using Otsu's Method, Active Contours: Snakes and Level Sets for various real-time applications.

CO4: Analysis various Feature Extraction methods and Implement for various real-time applications.

CO5: Apply and Analysis various Image Pattern Classification methods such as Minimum-Distance Classification, Optimum (Bayes) Statistical Classification, and Deep Convolutional Neural Network.

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2		Μ				
CO3			S	W	S	
CO4						S
CO5	S					

#### **UNIT 1 DIGITAL IMAGE FUNDAMENTALS**

Introduction – Fundamental steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Mathematical Tools Used in Digital Image Processing. Some Basic Intensity Transformation Functions: Image Negatives, Log Transformations, Power-Law Transformations -Histogram Processing. Color Fundamentals - Fundamentals of Spatial Filtering - Smoothing Spatial Filters - Sharpening Spatial Filters.

#### **UNIT 2: MORPHOLOGICAL IMAGE PROCESSING**

Morphological Image Processing: Fundamentals - Erosion and Dilation - Opening and Closing – Hit or Miss Transform - Some Basic Morphological Algorithms – Morphological Reconstruction

- Grayscale Morphology

#### **UNIT 3: IMAGE SEGMENTATION**

Introduction - Point, Line, and Edge Detection – Thresholding: Foundation, Basic Global thresholding, Optimum Global Thresholding using Otsu's Method, Multiple Thresholds, Variable Thresholding – Segmentation by Region Growing and by Region Splitting and Merging – Image Segmentation: Active Contours: Snakes and Level Sets.

#### **UNIT 4: FEATURE EXTRACTION**

Background - Representation – Boundary Preprocessing – Boundary Feature Descriptors: Some Basic Boundary Descriptors, Shape Numbers, Fourier Descriptors, Statistical Moments -Regional Feature Descriptors: Some Basic Descriptors, Topological and Texture Descriptors, Moment Invariants – Principal Components as Feature Descriptors – Whole-image Features Object – Scale-Invariant Feature Transform (SIFT).

#### **UNIT 5: IMAGE PATTERN CLASSIFICATION**

Background -Patterns and Pattern Classes – Pattern Classification by Prototype Matching: MinimumDistance Classifier, Using Correlation for 2-D prototype matching, Matching SIFT Features, Matching Structural Prototypes - Optimum (Bayes) Statistical Classifiers - Neural Networks and Deep Learning: Background - The Perceptron - Multilayer Feedforward Neural Networks - Deep Convolutional Neural Networks

#### **TEXT BOOK:**

 Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 4th Edition, Pearson, 2018.

#### **REFERENCE BOOKS:**

- 1. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
- 2. Anil K.Jain, "Fundamentals of Digital Image Processing", Person Education, 2000

BCA21R254	BCA21R254 SOCIAL MEDIA AND TEXT ANALYTICS	L	Т	Р	X	С			
SOCIAL MEDIA AND TEXT ANALYTICS	3	0	2	3	5				
Course Category: Program Elective/DSE									
Course Type : Theory									

# **COURSE OBJECTIVES:**

The main objective of the course is to utilize various Application Programming Interface services to collect data from different social media sources, process the collected data, analyze unstructured data, use different tools for collecting, analyzing, and exploring social media data for research and development purposes.

Course Outcome:

**Co1:** Utilize various Application Programming Interface (API) services to collect data from different social media sources such as YouTube, Twitter, and Flickr

CO2: Process the collected data - primarily structured - using methods involving correlation, regression

CO3: Analyze unstructured data - primarily textual comments - for sentiments expressed in them.

**CO4**: Use different tools for collecting, analyzing, and exploring social media data for research and development purposes.

CO5: classification to derive insights about the sources and people who generated that data.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М

CO2		S	М			L
CO3		S		L		
CO4			М	S	S	
CO5	М			L		S

### UNIT-1

Introduction to Course, Introduction to information retrieval, Inverted indices and Boolean queries, Processing unstructured and semi-structured data. Example queries using Apache Solr

## UNIT-II

# **10 Hours**

**10 Hours** 

# Text Processing - I

Text encoding, tokenization, lemmatization and stop words, Proximity and phrase queries, Positional indices, Examples using common Python libraries, Index compression, lexicon compressing and posting list compression,

Gap encoding, gamma codes, Zipf's law

Text Processing - II

Query expansion, Query processing fundamentals, Automatic thesaurus generation, Spelling correction and synonyms, N-gram, Edit distance, Practical experiments with query expansion

# UNIT-III

Text Analytics-Text classification techniques, Topic model fundamentals, Document-term matrix, Latent Dirichlet Allocation (LDA), Latent Semantic Indexing (LSI), Other topic modeling algorithms, Practical aspects of topic model tuning

# UNIT-IV

#### **10 Hours**

**10 Hours** 

Social Media Data Processing Social media data basics, Classification of social data, Modeling of social data, How to collect data - with case studies

Social media as big data, Database for modeling

# UNIT-V

## **10 Hours**

Social Media Analytics Fact finding from social data, Sentiment and opinion analysis, Sampling data using database, Sample case study with publicly available data, Python tools for text classification, Summary of the course

	COMPUTER ESSENTIALS FOR DATA		Τ	Р	X	С			
BCA21R255 SCIENCE		4	0	0	0	4			
Course Category:	Course Category: Program Elective/DSE								
Course Type : Theory									

## **COURSE OBJECTIVES**

The main objective is to teach Computational thinking using Python.

- To know the basics of Programming
- To convert an algorithm into a Python program
- To construct Python programs with control structures.
- To structure a Python Program as a set of functions

#### COURSE OUTCOME(S)

#### On completion of the course, students will be able to:

**CO1:** Understand the fundamental concepts of electronic communication and their use in computer applications, the basic structure and operation of a digital computer, identify the logic gates and their functionality, perform Number Conversions from one System to another System, Design basic electronic Circuits (combinational circuits), and understand the Construction of Memory.

**CO2:** Understand the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components and understand contemporary microprocessor designs and identify various design techniques employed

**CO3**: Understand the role of a database management system in an organization, use of Structured Query Language (SQL) and learn SQL syntax, needs of database processing and learn techniques for controlling the consequences of concurrent data access.

**CO4:** Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, locking and related protocols. Importance of modeling in the software development life, the UML notation and symbols. Identify classes/entities of data, their attributes, and relationships. Design the logical and physical structure of a relational database for efficient data storage

**CO5:** Understanding the flow of a data science process, and the skill sets needed to be a data scientist, significance of exploratory data analysis in data science

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2						
CO3						
CO4						
C05						

#### Mapping of Course Outcome(s):

#### Unit I

Digital Fundamentals: Number Systems-Binary, Hexadecimal, Octal, Conversion, Data encoding, Operations on Binary number system, representation of positive and negative integer, compliment operations, real number system, Boolean Algebra, Logic Gates, SOP and POS – K map Simple arithmetic circuits, Combinational circuits- Sequential circuits.

#### Unit II

Basic Computer Organization: Registers, Instruction Formats, Types of instructions, Execution of a Complete Instruction, Bus Organization, Control Unit Organizations-Hard-wired Control, Micro programmed Control. – Input Out organizations Central processing units and different CPU organizations – Subroutines -Memory – Memory Hierarchy- Types

#### Unit-3

Introduction to Database Management Systems-Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL

#### Unit-4

Data representation, Data organization, Data models using UML, Types of Data, structured, unstructured, semi structured, examples of real world data, data collection techniques, data interpretation mechanisms. Data storage mechanisms, Hierarchy of storage, Characteristics of storage, Storage media, storage related technologies, online and offline storage mechanisms

#### Unit 5

Introduction to Data Science - Steps – Skills – Data – Datasets – Existing data sources – data models, Applications

### **TEXT BOOKS:**

- 1. J. Glenn Brookshear, Computer Science: An Overview, Addision-Wesley, Twelfth Edition, 2014.
- 2. Fundamentals of Database Systems, 7th Edition, Ramez Elmasri, U. Shamkant B. Navathe.

#### **REFERENCE BOOKS:**

- 1. The Unified modelling language Reference Manual, Grady Booch, James Rumbaugh, Ivar Jacobson.
- Computer Organization Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
- 3. Computer Systems Architecture M.Moris Mano, IIIrd Edition, Pearson/PHI

BCA21R256	EXPLORATORY DATA ANALYSIS USING	L	Τ	Р	X	С		
	PYTHON	4	0	0	0	4		
Course Category: Pr	Course Category: Program Elective/DSE							
Course Type : Theory								

#### **COURSE OBJECTIVES**

Objective: The course aims to make the student acquainted with general computer programming concepts like conditional execution, loops, Python programming language syntax, semantics, and the runtime environment, as well as with general coding technique. The course also helps to understand about how to handle data and to visualize data using various Python packages and tools.

#### COURSE OUTCOME(S)

CO1: Give basic knowledge about python variables, operators and data types

**CO2:** Helps to get an idea about python control structures

**CO3:** To be aware of python complex data types

CO4: Familiarize with Python files, databases and advanced python objects.

**CO5**: Get an overall idea about various python packages and GUI programming along with thorough understanding of data and its formatting.

# Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					W
CO2		S				
CO3			S			
CO4					S	
CO5			S	Μ		

## UNIT I

Introduction to Python: Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types: int, float etc.

## UNIT II

Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.

## UNIT III

Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.

#### UNIT IV

Advanced Python Objects, map(),Advanced Python Lambda and List Comprehensions, Advanced Python Demonstration: The Numerical Python Library (NumPy), The Series Data Structure, Querying a Series, The DataFrame Data Structure, DataFrame Indexing and Loading, Querying a DataFrame, Indexing Dataframes, Missing Values.

### UNIT V

Understanding the Python Packages for Data Science- SciKit Learn, MatPlotLib, Importing and Exporting Data in Python, Getting Started Analyzing Data in Python, Understanding the Data, Dealing with Missing Values in Python, Data Formatting in Python

### **TEXT BOOKS:**

- 1. Wesley J. Chun, —Core Python Applications Programming<sup>II</sup>, 3rd Edition, Pearson Education, 2016
- 2. Jeeva Jose &P.SojanLal, —Introduction to Computing and Problem Solving with PYTHONI, Khanna Publishers, New Delhi, 2016

### **REFERENCE BOOKS:**

- 1. Downey, A. et al., "How to think like a Computer Scientist: Learning with Python", John Wiley, 2015
- John Zelle, —Python Programming: An Introduction to Computer Sciencel, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1590282410.

BCA21R351	MACHINE LEARNING FOR REAL-	L	Т	Р	Х	С	
	WORLD APPLICATION	3	0	2	3	5	
Course Category:	Course Category: Program Elective/DSE						
Course Type : Theory with Practical							

## PREREQUISITE

Basic knowledge of Mathematics and Statistics, Linear Algebra: Matrices and Vectors Calculus: Differentiation, Partial Derivatives and Gradient Statistics: Descriptive Statistics, Normal Distribution, Probability Python Basic Programming Data Processing using NumPy, SciPy, Matplotlib and Pandas Basic usage of Scikit, Scikit-learn packages in Python Completing the course "TCS iON Industry Honour

Certification – Artificial Intelligence for Real-World Application" is highly recommended.

#### **COURSE OBJECTIVES**

This course aims to make the students understand the advance concepts of Machine learning

### **COURSE OUTCOME(S)**

CO1: Fundamentals of statistics

CO2: Demonstrate the concepts of supervised learning

CO3: Demonstrate the concepts of Data preparation

CO4: Design of Data sample

**CO5:**.Ability to create programs on machine learning algorithms.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		М	S			М
CO3	М	S			S	
CO4			L			
CO5		S		L		S

#### Mapping of Course Outcome(s):

#### UNIT – I:

Basics of Statistics - Linear algebra - Mathematical statistics

#### UNIT – II:

Basics of Machine Learning – Introduction - Supervised learning

#### UNIT – III:

Machine Learning Methodology - (CRISP DM) -Data understanding - Data preparation

### UNIT – IV:

Key Concepts in Machine Learning - Data sample, Model selection

## $\mathbf{UNIT} - \mathbf{V}$ :

Machine Learning Algorithms with Real-Life Use Cases - Unsupervised algorithms-Classification algorithms

### **TEXT BOOKS**:

- Aggarwal, Charu, Linear Algebra and Optimization for Machine Learning, ISBN 978-3-030-40344-7, Springer, 2019.
- 2. Sudipto Banerjee (Author), Anindya Roy, Linear Algebra and Matrix Analysis for Statistics, CRC Press: Taylor & Francis Group, A Chapman & Hall Book, 2014.
- 3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.
- 4. Tom Mitchell, "Machine Learning", McGraw Hill, 1997.
- Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

## **REFERENCE BOOKS**:

- Andreas Muller, Introduction to Machine Learning with Python: A Guide for Data Scientists Paperback – 1 January 2016.
- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, 2007
- Andriy Burkov, The Hundred-Page Machine Learning Book, Publisher: Andriy Burkov, ISBN: 9781999579548, 1999579542, Edition 1,2019.

- 4. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, 2011.
- 5. Chris Pal, Ian Witten, Eibe Frank, Mark Hall, Data mining machine learning tools and techniques, 2011.

BCA21R352	D Duo quo munin a fon Data Saianasa	L	Τ	Р	X	С	
	R Programming for Data Sciences	4 (	0	0	0	4	
<b>Course Category</b> :	Program Elective/DSE						
Course Type : Theory							

## **COURSE OBJECTIVES**

Data Science with R gives a student necessary skill to apply the R programming language through practical examples in order to extract valuable knowledge from data. The goal of this course is to help the student learn the most important tools in R programming language that will allow him/her to practice data science.

# COURSE OUTCOME(S)

CO1: Learn the basic syntax of R programming language

CO2: Pre-process raw data in R for further analysis.

CO3: Conduct exploratory data analysis using R

**CO4**: Create insightful visualizations to identify patterns from data.

**CO5**: Use statistical estimates to make meaningful predictions from data.

M	lappin	g of	Course	Outcome(	(s):	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					Μ
CO2		S				
CO3				S		
CO4			S			W
CO5		Μ			S	

# UNIT 1

Introduction to data science, Knowledge discovery in databases, The Data Science Process – data collection, pre-processing, transformation and modeling, data mining, interpretation and evaluation. The R Programming Language- Basic concepts, definitions and notations, R as a calculator, Identifiers, constants, R data types, R- Objects: Vectors, Lists, Matrices, Arrays, Factors, Data Frames; Atomic and Recursive Variables, R-Operators.

#### UNIT 2

Conditional statements and Control structures, Looping constructs and Loop control statements. Function in R Programming- Components of a Function, Built in and user defined Functions, Vector and Matrix manipulation functions, R -strings and string manipulation functions.

#### **UNIT III**

Scoping rules in R, Package in R- Installing and Loading Packages in R, using help, access functions from packages. Getting Data In and Out of R - Importing data from excel, Working with data from files, importing larger Data Sets, loading data from databases, Working with structured and unstructured data, Reading from URL, Storing data using R functions.

#### **UNIT IV**

Exploring data- Using summary statistics, Visually inspecting data - Histograms and Density plots, Dot Plots, Line Charts, Pie Charts, Boxplots, Scatterplots, saving and exporting results. R for managing data-Data cleansing, Treating missing values, data transformations, sampling data for modeling- test and training splits, creating sample groups, Data reduction.

#### UNIT V

R for Basic Statistics- Descriptive Statistics: arithmetic mean, median, Measure of dispersion -Minimum and Maximum values, quantiles, percentiles, IQR, standard deviation, variance. Linear regression – using linear and logistic regression and making predictions. Characterizing prediction quality. Using correlation to find relations between variables –Pearson, Kendall and Spearman tests.

#### **TEXT BOOKS:**

 Data Science with R: A Step By Step Guide with Visual Illustrations & Examples, Andrew Oleksy.

2. Practical Data Science with R, Nina Zumel and John Mount, Dreamtech/Manning, 2014

3. R Programming for Data Science, Roger D. Peng, Lean publishing, 2015.

## **REFERENCE BOOKS:**

1. R for Data Sciencel, Hadley Wickham and Garett Grolemund, , O'Reilly, 2017

2. Data Mining for Business Analytics: Concepts, Techniques and Applications in RI,

Galit Shmueli, et al, Wiley India, 2018.

	INTRODUCTION TO DATA SCIENCE		Т	Р	X	С	
BCA21R353			0	0	0	5	
Course Category: Program Elective /DSE							
Course Type : Theory							

# **COURSE OBJECTIVE(S)**

To provide an overview of a new language R used for data science., To introduce students to the R programming environment and related eco-system and thus provide them with an in-demand skill-set, in both the research and business environments, To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R

## COURSE OUTCOME(S)

**CO1**: Install and use R for simple programming tasks

CO2: Extend the functionality of R by using add-on packages .

**CO3**: Extract data from files and other sources and perform various data manipulation tasks on them

**CO4**: Extract data from files and other sources and perform various data manipulation tasks on them Code statistical functions in R

CO5: Use R Graphics and Tables to visualize results of various statistical operations on data.

# MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	М			L		Μ
CO2		S		S		
CO3			M			L

CO4	S		L	М	
CO5		М		М	

### UNIT I: DATA SCIENTIST'S TOOL BOX

Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio

#### **UNIT II: R PROGRAMMING BASICS**

Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling

### **UNIT III : GETTING AND CLEANING DATA**

Obtaining data from the web, from APIs, from databases and from colleagues in various formats ,basics of data cleaning and making data —tidy.

## UNIT IV: EXPLORATORY DATA ANALYSIS

Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize highdimensional data.

#### **UNIT V: REPRODUCIBLE RESEARCH**

Concepts and tools behind reporting modern data analyses in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.
#### **TEXT BOOKS**

- Rachel Schutt., & Cathy O'Neil, Doing Data Science: Straight Talk from the Frontiline, 2<sup>nd</sup> Edition, Schroff/O'Reilly, 2013.
- Foster Provost &Tom Fawcett, Data Science for Business What You Need to Know About Data Mining and Data-Analytic Thinking. 1<sup>st</sup> Edition, O'Reilly, 2013.

#### **REFERENCE BOOKS**

1. Ian Ayres, Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart 1st Edition, EricSeigel,2013.

## DISCIPLINE SPECIFIC ELECTIVES (CYBER SECURITY STREAM)

## BCA21R161 INFORMATION SECURITY-PRACTIONER'S PERSPECTIVE 3

L	Т	Р	X	С
3	0	2	3	5

Course Category: Program Elective /Discipline Specific Elective

Course Type : Theory with Practical

#### PREREQUISITE

Basic concepts of Information Systems, Computer Networks and Software Development is required for taking up this course.

#### **COURSE OBJECTIVES**

To introduce the information technology and security techniques.

To study the security functional requirements.

To learn the security assurance requirements.

To be familiar with protecting of the profile and the target security issues.

To evaluate and analyze the security techniques.

#### COURSE OUTCOME(S)

**CO1**: Understand the basics of information technology and security techniques.

**CO2:** Identify the security functional requirements.

**CO3:** Apply the security assurance requirements.

**CO4:** Analyze and validate the protection profile and target the criteria of security.

**CO5:** Apply the Security evaluation techniques.

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1		Μ				
CO2	S		Μ	Μ		

CO3	S		L
CO4		S	
CO5			L

#### **UNIT - I: INTRODUCTION TO BASIC SECURITY SERVICES**

Introduction to Basic Security Services Computer security concepts, Confidentiality and integrity, Security architecture for open systems, Computer security trends, Network mapping using ICMP (internet control message protocol) queries, TCP (transmission control protocol) pings, TCP (transmission control protocol) and UDP (user datagram protocol) port scanning, FTP (file transfer protocol) bounce scanning, Vulnerability scanning, System and network penetration, denial-of-service - defence and response

## UNIT – II: UNIT – III: PROTOCOLS ATTACKS AND DEFENCE

Mechanisms - Network layer - Transport layer - Application Layer

#### **UNIT – III: MALICIOUS SOFTWARE**

Malicious Software - Types of malicious software (malware), Propagation - infected content, viruses, vulnerability exploit, worms and propagation social engineering - spam email, Trojans, Payload system corruption, attack agent - zombie, bots, information theft - keyloggers, phishing, spyware, stealth - backdoors, rootkits

#### UNIT – IV:

Cryptographic Tools

#### **UNIT - V: TOPICS IN SECURITY**

Cryptographic Tools - Security auditing - security auditing architecture, security audit trail, implementing -Legal and ethical aspects - cyber crime and computer crime, intellectual property, privacy, ethical issues

#### **Text Book:**

- [1].Information Technology Security techniques Evaluation criteria for IT security, INTERNATIONAL STANDARD, ISO/IEC 15408-1, First edition 1999-12-01
- [2].Information Technology Security techniques Evaluation criteria for IT security, INTERNATIONAL STANDARD, ISO/IEC 15408-2, First edition 1999-12-01
- [3].Information Technology Security techniques Evaluation criteria for IT security, INTERNATIONAL STANDARD, ISO/IEC 15408-3, First edition 1999-12-01
- [4].Information Technology Security Evaluation Criteria (ITSEC) by IBM ICE Publications.
- [5]. William Stallings (2006), Cryptography and Network Security: Principles and Practice, 4thedition, Pearson Education, India.
- [6]. Michael E Whiteman and Herbert J Mattord-Principles of Information Security, Vikas Publishing House, New Delhi,2003.
- [7]. Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata Mc Graw hill, India.
- [8]. Micki Krause, Harold F, Tipton, -Handbook of Information Security Management, Vol 1-2 CRCPress LLC,2004.
- [9].Stuart McClure, Joel Scrambray, George Kurtz, Hacking Exposed, Tata McGraw-Hill, 2003.

	BIOMETRIC SYSTEMS		Т	Р	X	С				
BCA21R162		5	0	0	0	5				
Course Category:	Program Elective /DSE									
Course Type : Theory										

#### **COURSE OBJECTIVES**

To understand the basics of Biometrics and its functionalities To learn the role of biometric in the organization To expose the concept of IRIS and sensors

#### **COURSE OUTCOME(S)**

CO1: Identify the various Biometric technologies.

**CO2:** Design of biometric recognition for the organization.

**CO3:** Develop simple applications for privacy.

CO4: Understand the need of biometric in the society

**CO5:** Understand to develop applications with biometric security

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S				S	
CO2		S				Μ
CO3				Μ		
CO4		Μ				W
CO5	Μ			W		

#### UNIT I INTRODUCTION

Person Recognition – Biometric systems –Biometric functionalities: verification, identification – Biometric systems errors - The design cycle of biometric systems – Applications of Biometric systems – Security and privacy issues.

#### UNIT II FINGER PRINT AND FACIAL RECOGNITION

FINGERPRINT: Introduction – Friction ridge pattern- finger print acquisition :sensing techniques ,image quality –Feature Extraction –matching –indexing. FACE RECOGNITION: Introduction –Image acquisition: 2D sensors ,3D sensors- Face detection- Feature extraction - matching.

#### **UNIT III IRIS AND OTHER TRAITS**

Design of an IRIS recognition system-IRIS segmentation- normalization – encoding and matching- IRIS quality –performance evaluation –other traits- ear detection –ear recognition – gait feature extraction and matching –challenges- hand geometry –soft biometrics.

#### **UNIT IV BEHAVIORAL BIOMETRICS**

Introduction –Features- classification of behavioral biometrics –properties of behavioral biometrics – signature –keystroke dynamics –voice- merits –demerits –applications- error sources-types –open issues –future trends.

#### UNIT V APPLICATIONS AND TRENDS

Application areas: surveillance applications- personal applications –design and deployment -user system interaction-operational processes – architecture –application development –design validation-disaster recovery plan-maintenance-privacy concerns.

#### **Text Book:**

- 1. James wayman, Anil k. Jain , Arun A. Ross , Karthik Nandakumar, —Introduction to Biometrics II, Springer, 2011
- 2. John Vacca "Biometrics Technologies and Verification Systems" Elsevier 2007
- James Wayman, Anil Jain, David MAltoni, Dasio Maio (Eds) "Biometrics Systems Technology", Design and Performance Evalution. Springer 2005

#### **References:**

- Khalid saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotr panasiuk, mariusz Rybnik and soharab H.Sgaikh, —New Directions in Behavioral Biometrics, CRC Press 2017
- 2. Paul Reid "Biometrics For Network Security "Person Education 2004
- 3. Shimon K.Modi, —Biometrics in Identity Management :concepts to applications<sup>II</sup>, Artech House 2011

		L	Τ	Р	X	С				
BCA21R163	<b>BIOMETRIC IMAGE PROCESSING</b>	5	0	0	0	5				
Course Category:	Program Elective /DSE									
Course Type : Theory										

#### **COURSE OBJECTIVES**

To understand the basics of Image processing To model and visualize the transformation of image To understand the evolution of object detection

#### COURSE OUTCOME(S)

**CO1**: Understand the need of biometric in image processing

CO2: Work on the internals Technologies of biometric

CO3: Mine the behavior of the users in the biometric field

CO4: Predict the possible next outcome of the image processing

**CO5**: Mine the opinion of the user

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
C01	S					W
CO2		S				

CO3		S			
CO4				S	
CO5		S	Μ		

#### UNIT I IMAGE PROCESSING FUNDAMENTALS

Introduction- images-sampling and frequency –Domain processing-basic image processing operations-point operators –group operations –other statistical operators –mathematical morphology

#### UNIT II FEATURE EXTRACTION

Low level Feature Extraction: Edge Detection- phase congruency- localized feature extractiondescribing image motion. High Level Extraction: Thresholding and subtraction – Template matching- feature extraction by low level features- Hough transformation.

#### **UNIT III OBJECT DETECTION**

Object Detection- Boundary descriptors –Region descriptors –moving object detection –tracking moving features- Moving extraction and description-Texture description –classification - segmentation.

#### **UNIT IV 3D BIOMETRIC**

Classification of 3D biometric imaging methods -3D biometric Technologies- 3D palm print capturing systems-3D information in palm print- Feature Extraction from 3D palm print – matching and fusion –security applications.

#### UNIT V APPLICATIONS

Mobile Biometrics- Biometric Application Design –Biometric Technologies issues- Biometrics in society –privacy and Biometrics –Ethics and Technology usage – human factors

**Text Book:** 

- 1. Amine Nail -Ali and Regis Fournier "Signal and Image Processing for Biometrics" John wiley and sons,2012
- 2. David Zhang, Guangming, 3D Biometrics Systems and Applications Lu, Springer 2013.

#### **References:**

- 1. Julian Ashbourn, Biometrics In The New World , Springer 2014.
- 2. Mark S.Nixon, Alberto S.Aguado, Feature Extraction and image processing for computer vision, Third Edition, , Elsevier 2012.
- 3. Scott E Baugh "Digital Image Processing and analysis" 2nd Edition CRC Press 2010
- 4. Tinku Acharya and Ajoy K Ray "Image Processing Principles and Applications" John wiley and sons 2005

BCA21R163	PRACTICAL APPROACH TO CYBER	L	Т	Р	X	С					
	SECURITY	5	0	0	0	5					
Course Category:	Course Category: Program Elective /DSE										
Course Type : The	Course Type : Theory										

#### UNIT I

Need for Cyber Security and Security Mindset ,Threat Modeling and Security Architecture

Basics of Cryptography

Historical overview, asymmetric/symmetric ciphers, hash functions, Digital signature, certificate, transport layer security (TLS)

#### **UNIT II WEB SECURITY**

Web Attacks and Defences, How internet and web works: underlying techniques recap, SQL injection attacks and mitigation, Cross-site scripting (XSS) attacks and defences, Cross-site request forgery (CSRF) attacks and defences, Web tracking and web privacy

## **UNIT III NETWORK SECURITY**

Network threat model, Tools of the trade: ping, nmap, traceroute, wireshark, tcpdump, Protocol attacks: blind spoofing, SYN flooding, DDoS attacks and defences, Botnets and crimeware, VPN and firewalls

## UNIT IV AUTHENTICATION AND ACCESS CONTROL

Authentication and Access Control & Database Encryption Access control models, Passwords: attacks and defences, OAuth 2.0, Multi-factor authentication, Biometrics Encrypted file systems, Application-level encryption

## UNIT V USABLE SECURITY

Design Principles Behavioural nudging for users, Security notifications Security in Practice Security auditing, Compliance

	CYBER CRIME INVESTIGATIONS AND DIGITAL FORENSICS		Т	Р	X	С			
BCA21R165			0	0	0	5			
<b>Course Category</b> :	Course Category: Program Elective /DSE								
Course Type : Theory									

#### **COURSE OBJECTIVES**

To study about cyber crime categories

Awareness about various hacking, cracking and attacks.

To study about various investigation strategies

#### COURSE OUTCOME(S)

CO1: Knowledge about Cyber crime issues and conquer techniques

**CO2**: Analysis about investigation, Encryption and Decryption Methods.

CO3: Familiarity in Open source Digital Forensics Platform and tools

**CO4:** Understand the need of biometric in the society

**CO5:** Understand to develop applications with biometric security

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					W
CO2			S			
CO3		S				
CO4				Μ	S	
CO5			S			Μ

UNIT I INTRODUCTION

Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

#### **UNIT II CYBER CRIME ISSUES**

Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation ,Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

#### **UNIT III INVESTIGATION**

Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

#### **UNIT IV DIGITAL FORENSICS:**

Introduction to Digital Forensics, Open Source Examination Platform - Using Linux and Windows as the Host, Disk and File System Analysis, Media Analysis Concepts, Sleuth Kit, Partitioning and Disk Layouts, Special Containers, Hashing, Forensic Imaging, Internet Artifacts, Browser & Mail Artifacts, File Analysis, Image, Audio, Video, Archives, Documents, Graphical Investigation Environments, PyFLAG, Fiwalk, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition.

#### UNIT V LAWS AND ACTS

Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC, Electronic Communication Privacy ACT, Legal Policies.

#### **Text Book:**

 Bernadette H Schell, Clemens Martin, —Cybercrimel, ABC – CLIO Inc, California, 2004.

Understanding Forensics in IT -, NIIT Ltd, 2005

2. Cory Altheide and Harlan Carvey, —Digital Forensics with Open Source Tools Elsevier publication, April 2011

#### **References:**

- Kevin Mandia, Chris Prosise, Matt Pepe, —Incident Response and Computer Forensics
  —, TataMcGraw -Hill, New Delhi, 2006.
- 2. Nelson Phillips and Enfinger Steuart, —Computer Forensics and Investigations<sup>II</sup>, Cengage Learning, New Delhi, 2009.
- 3. Robert M Slade, Software Forensics, Tata McGraw Hill, New Delhi, 2005.

BCA21R166	CONTEXT AWARE COMPUTING		Τ	Р	Х	С			
			0	0	0	5			
Course Category: Program Elective /DSE									
Course Type : Theory									

#### **COURSE OBJECTIVES**

To understand the concept of context, representation and modeling of context, context ontology and architecture.

To know the technologies for sensing context, location tracking services.

To understand the need for and categories of context aware middleware systems.

## COURSE OUTCOME(S)

CO1:Understand the concept of context, representation and modeling of context, context ontology and architecture.

CO2: Gain knowledge on communication the technologies for sensing and transporting context data and location tracking services.

CO3: Understand the categories of context aware middleware systems to realize mobile services

CO4:Gain knowledge on UI techniques for contextual information, reconfiguration and context triggered actions

CO5:Able to apply context aware computing to ubiquitous applications and implement context data change management.

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>
CO1	S					Μ
CO2		S				
CO3				S		
CO4			S			W
CO5		Μ			S	

#### UNIT I

Context Definition. Types of Context -Identity (Who), - Activity (What), Time (When), Location (Where), reasoning (Why). Representation of Context. Modeling of context: key-value, graphical, object oriented, logic based, and ontology based models. Context ontology - SOCAM architecture .Context Interpreter.

#### UNIT II

Sensing location information. Location tracking: Technologies- GPS, GSM, Assisted GPS, Wi-Fi, Ultra wideband. Metrics- accuracy, reliability, security considerations- buying new devices, coordinating service with infrastructure, Killer app. Sensing user's state and surroundings.

#### UNIT III

Context Aware Middleware- Categorizing Middleware Taxonomy of Context-Aware Middleware. Middleware Systems: Categorization of Context-Aware Middleware Systems-Mobi PADS, Middle Where. Gaia meta Operating Systems-Context File System.

#### UNIT IV

Proximate Selection Contextual Info -UI techniques. Automatic Contextual Reconfiguration-Add, removes, or alters components based on context. Contextual Commands- parameterize commands with context-filtered values- universal remote control. Context-triggered Actions-Expressiveness of language for rules, Accuracy of context information.

#### UNIT V

Case study-How does context-aware computing fit in with ubicomp. What sensors, infrastructure, are necessary. Fallback condition. How to describe the context that you are in now-location, physiological state, emotional state, etc. Challenges in Implementing a Context-Aware System- How to represent context internally- Storage, Data structures and algorithms. How frequently does the system need to be updated on context changes- How often to poll? How often to change behavior.

#### **Text Book:**

- 1. Anind K Dey, "Context Aware Computing", IEEE 2009.
- Bill Schilit, Norman Adams, and Roy Want, Context-Aware Computing Applications, IEEE Mobile Computing Systems and Applications, 1994.
- 3. Satyanarayana, "Challenges in Implementing a Context-Aware System", CMU,2001

#### **References:**

- 1. Satyanarayanan, "Pervasive Computing: Vision And Challenges", IEEE Personal Communications, 2001.
- 2. T.J.Watson Tom Erickson, "Context-aware computing", IBM Research Center, 2002.
- Waltenegus Dargie, "Context Aware Computing and Self Managing Systems", CRC Press, 2009.

		L	<b>T</b> 0	Р	X	С
BCA21R261	APPLIED CLOUD COMPUTING	3	0	2	3	5
Course Category: P Course Type : Theor	rogram Elective /DSE					

#### PREREQUISITE

Basic concepts of any DBMS software is required for this course.

#### **COURSE OBJECTIVES**

- To articulate the main concepts, key technologies, strengths, and limitations of cloud computing
- ➤ To learn how to use Cloud Services.
- ➢ To implement Virtualization

#### COURSE OUTCOME(S)

- **CO1**: Understand the basics of information technology and security techniques.
- **CO2:** Identify the security functional requirements.
- **CO3:** Apply the security assurance requirements.
- CO4: Analyze and validate the protection profile and target the criteria of security.
- **CO5:** Apply the Security evaluation techniques.

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S			S		
CO2			S			Μ
CO3	L				S	
CO4		Μ		Μ		
CO5			L	Μ		L

#### **UNIT - I: INTRODUCTION TO THE CLOUD**

Evolution of information technology (IT) and business computing models, Definition of cloud computing, business drivers for the cloud, Essential characteristics, Cloud computing vs cluster computing vs grid computing,

Cloud computing architecture, Service and deployment models, Benefits, risks and challenges of cloud computing

#### **UNIT – II: CLOUD COMPUTING STACK & CLOUD SERVICES**

Comparison with traditional computing architecture (client/server), Services provided at various levels, types of cloud services - public, private and hybrid, Role of networks in cloud computing, Service models (XaaS), Deployment models - public cloud, private cloud, hybrid cloud, community cloud Infrastructure as a service (IaaS), Platform as a service (PaaS),Software as a service (SaaS)

#### **UNIT – III: SERVICE MANAGEMENT IN CLOUD COMPUTING**

Service management - service level agreements (SLAs), billing and accounting, Service improvement and roadmap

#### **UNIT – IV: CLOUD SECURITY**

Infrastructure security, Network level security, Host level security, Application level security, Data security and storage Jurisdictional issues - data location identity, Access management, access control trust, reputation, risk authentication in cloud computing

#### **UNIT - V: CASE STUDIES**

Kubernetes (K8s) - Amazon Web Services (AWS) Database Migration Service - cloud extract, transform, load (ETL), Amazon SageMaker - platform to build, train and deploy machine learning models quickly,Cloud-based analytic databases - Amazon Redshift, Snowflake and Google BigQuery

#### **TEXT BOOKS:**

- [1].Mastering Cloud Computing"- Foundations and Applications Programming, Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, , MK publications, 2013.
- [2].Enterprise Cloud Computing: Technology, Architecture, Applications, Gautam Shroff by Cambridge University Press, 2010.
- [3].Cloud computing a practical approach Anthony T.Velte, Toby J. Velte Robert Elsenpeter TATA McGraw- Hill, New Delhi, 2010.
- [4].Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online Michael Miller Que, 2008.
- [5]. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
- [6].Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011.
- [7].Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.
- [8].Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, WileyIndia, 2010.

	OPERATING SYSTEMS SECURITY	L	Т	Р	С
BCA21R262		5	0	0	5
Course Category: Pro	gram Elective /DSE				
Course Type : Theory					

#### **COURSE OBJECTIVES**

Study the basic concepts and functions of operating systems.

Understand the structure and functions of OS.

Learn about Processes and memory management schemes.

#### **COURSE OUTCOME(S)**

**CO1**: Compare and contrast various memory management schemes.

**CO2**: Design and Implement a prototype file systems.

CO3: Discuss the various synchronization, and memory management issues.

CO4: Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of

Distributed operating system.

**CO5**: Discuss the various Security issues.

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S				W	
CO2		S				Μ
CO3				S		
CO4		S				
CO5				Μ	S	

#### UNIT I FUNDAMENTALS OF OPERATING SYSTEMS

Overview – Operating system concepts – Functions – Structure of Operating system – Types of operating system – Dead lock Prevention, Recovery, Detection and Avoidance

#### **UNIT II PROCESS MANAGEMENT**

Introduction to processes – Process Scheduling - Threads-CPU Scheduling objectives, criteria – Types of scheduling algorithms – Performance comparison – Inter process communications-Synchronization – Semaphores.

#### UNIT III MEMORY MANAGEMENT

Single contiguous allocation – Partitioned allocation – Paging – Virtual memory concepts – Swapping – Demand paging – Page replacement algorithms – Segmentation.

#### UNIT IV DEVICE AND FILE MANAGEMENT

Principles of I/O hardware – I/O software – Disks – Disk Scheduling Algorithms--File Systems - Files and Directories- File System Implementation - Allocation Methods.

#### **UNIT V SECURITY ISSUES**

Protection in General Purpose Operating Systems: protected objects and methods of protection – memory and address protection – control of access to general objects – file protection Mechanisms – user authentication - Designing Trusted Operating Systems.

#### **Text Book:**

- 1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
- Andrew S. Tanenbaum, —Modern Operating Systems<sup>II</sup>, Second Edition, Addison Wesley, 2001.
- 3. Charles Crowley, —Operating Systems: A Design-Oriented Approach<sup>II</sup>, Tata McGraw Hill Education<sup>II</sup>, 1996.

#### **References:**

1. Charles P. Pleeger, "Security in Computing", Prentice Hall, New Delhi, 2009

- D M Dhamdhere, —Operating Systems: A Concept-Based Approach<sup>II</sup>, Second Edition, Tata McGraw-Hill Education, 2007.
- Michael Palmer, Guide to Operating Systems Security, Course Technology Cengage Learning, New Delhi, 2008.
- 4. William Stallings, —Operating Systems Internals and Design Principles<sup>I</sup>, 7th Edition, Prentice Hall, 2011.

	TRUST MANAGEMENT IN E-COMMERCE	L 7 5 (		Р	С
BCA21R263		5	0	0	5
Course Category: Pro	ogram Elective /DSE				
Course Type : Theory					

#### **COURSE OBJECTIVES**

Ecommerce business models and Digital Payments systems

Knowledge about Ecommerce security Environment

To study about Ecommerce mechanisms and trusted computing Platform.

#### **COURSE OUTCOME(S)**

CO1: Awareness about threats in Ecommerce.

CO1: Knowledge about B2C,B2B,C2C,Business models

CO1: Deep Knowledge about Types of Payment

CO4:Gain knowledge on UI techniques for contextual information, reconfiguration and context triggered actions

CO5:Able to apply context aware computing to ubiquitous applications and implement context data change management.

Mapping of Course Outcome(s):

CO/PO	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2		S				W
CO3			S			
CO4					S	Μ
CO5		Μ		S		

#### UNIT I INTRODUCTION TO E-COMMERCE

Introduction to E-Commerce – Network and E-Commerce – Types of E-Commerce – Ecommerce Business Models: B2C, B2B, C2C, P2P and M-commerce business models – Ecommerce Payment systems: Types of payment system – Credit card E-Commerce - transactions– B2C E-Commerce Digital payment systems – B2B payment system.

#### **UNIT II E-COMMERCE SECURITY**

Security and Encryption: E-Commerce Security Environment – Security threats in E-Commerce environment – Policies, Procedures and laws.

#### **UNIT III TRUST IN E-COMMERCE**

Inter-organizational trust in E-Commerce: Need – Trading partner trust – Perceived benefits and risks of E-Commerce – Technology trust mechanism in E-Commerce – Perspectives of organizational, economic and political theories of inter-organizational trust – Conceptual model of inter-organizational trust in E-Commerce participation.

#### UNIT IV TRUSTED COMPUTING PLATFORM

Introduction to trusted computing platform: Overview – Usage Scenarios – Key components of trusted platform – Trust mechanisms in a trusted platform.

#### **UNIT V TRUST MODELS**

Trusted platforms for organizations and individuals – Trust models and the E-Commerce domain.

#### **Text Book:**

- 1. Kenneth C. Laudon and Carol Guercio Trave, —E-Commerce Business Technology Societyl, 12th Edition Pearson Education, 2016.
- 2. Pauline Ratnasingam, —Inter-Organizational Trust for Business-to-Business E-Commercell, IRM Press, 2005.

#### **References:**

1. Siani Pearson, et al, —Trusted Computing Platforms: TCPA Technology in Context Prentice Hall PTR, 2002.

BCA21R264	ADVANCED CYBER SECURITY - AN ADVANCED	L	Т	Р	X	С
BCA21R264	APPROACH	2	0	2	3	4
Course Categor Course Type : 7	ry: Program Elective /Discipline Specific Elective Theory with Practical					

#### PREREQUISITE

Cyber Security Fundamentals

#### **COURSE OBJECTIVES**

- $\blacktriangleright$  To introduce the basic concepts of cyber security
- > To acquire knowledge on cyber threats and attacks
- > To become aware of significant security technologies and tools
- > To impart knowledge on cipher methods and cryptographic algorithms
- > To explore various protocols for establishing secured communication

#### COURSE OUTCOME(S)

CO1: Understand the basic concepts, need, approaches, principles and components of security.

CO2: Explain the various cyber threats and attacks.

CO3: Describe the various Security Technologies and Tools.

**CO4:** Apply the knowledge to Measure the performance and troubleshoot cyber security systems.

**CO5:** Explore the significant aspects of cyber security.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1		S		Μ		
CO2	Μ					Μ
CO3			L			
CO4		L		S	Μ	
CO5			Μ			S

#### Mapping of Course Outcome(s):

#### UNIT - I: DATA, APPLICATION AND ENDPOINT SECURITY

Importance of application security, Open Web Application Security Project (OWASP) top 10 web application, vulnerabilities, Secure Software Development Life Cycle (SSDLC) Data security, data security controls, Endpoint security, host/endpoint security

#### UNIT - II: IDENTITY AND ACCESS MANAGEMENT (IAM)

Authorization, authentication, Access control, access control models, Privilege levels, IAM lifecycle, identity and access management process and activities

#### **UNIT – III: PHASES OF A CYBER ATTACK**

Reconnaissance: adversary identifies and selects a target, Weaponize: adversary packages an exploit into a payload designed to execute on the targeted computer/network, Deliver: adversary delivers the payload to the target system, Exploit: adversary code is executed on the target system, Install: adversary installs remote access software that provides a persistent presence within the target environment system, Command and control: adversary employs remote access mechanisms to establish a command and control channel with the compromised device, Act on objectives: adversary pursues intended objectives such as data exfiltration, lateral movement to other targets

#### **UNIT – IV: SECURITY PROCESSES IN PRACTICE FOR BUSINESSES**

Key security business processes, Corporate security governance, IT strategy management, Portfolio, program, project management, Change management, Supplier (third-party management), Problem management, Knowledge management, Information security management, Business Continuity Planning (BCP), IT operations management, Overview of top 20 security controls

#### **UNIT - V: INFORMATION SECURITY STANDARDS**

Information security standards - need, ISO/IEC 27000 standard series, ISO/IEC 27001, ISO/IEC 27002, ISO/IEC 27005,ISO/IEC 27006, SP 800 standard series, SP 800 -12, Standard of Good Practice (SoGP), Control Objectives for Information and Related Technology (COBIT), BSI IT-Grundschutz baseline protection, BSI Standard 100-1,BSI Standard 100-2, BSI Standard 100-3

#### **Text Book:**

- [1].Michael E. Whitman, Herbert J. Mattord," Principles of Information Security", CENGAGE Learning, 4th Edition.
- [2]. William Stallings," Cryptography and Network Security Principles and Practice", Pearson Education, 7th Edition.
- [3]. Atul Kahate," Cryptography and Network Security", Mc Graw Hill, 4th Edition.

	BIOMETRIC SECURITY	L	Τ	Р	С
BCA21R265		5	0	0	5
Course Category: Pro	ogram Elective /DSE				
Course Type : Theory					

#### **COURSE OBJECTIVES**

To understand the fundamentals of biometric security

To acquire knowledge on standard algorithms and protocols used to provide confidentiality, integrity and authenticity

#### COURSE OUTCOME(S)

CO1: Implement basic security algorithms required by the biometric system.

CO2: Analyze the vulnerabilities in biometric system and hence be able to design a security Solution.

CO3:Analyze the possible security attacks in complex real time systems and their effective Countermeasures

CO4: Identify the security issues in the network and resolve it.

CO5: Formulate research problems in the biometric security field

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2		S		Μ		
CO3			S			
CO4					S	W
CO5		Μ		S		

#### **UNIT I ATTACKS IN BIOMETRIC**

Adversary attacks-attacks at the user Interface-Attacks on the biometric processing, Attacks on template database –system security analysis – spoofing and mimicry attacks

#### UNIT II BIOMETRIC AUTHENTICATION PROTOCOLS

Introduction-biometric based secure cryptographic protocols – biometrics based cryptographic key Regeneration and sharing – Biometrics based session key generation and sharing protocol – performance evaluation strategies.

#### UNIT III BIOMETRIC CRYPTOGRAPHY

Protection of biometric data –biometric data shuffling scheme- experimental results –security analysis - cryptographic key Reservation - cryptographic key with biometrics-Revocability in key generation system-Adaptations of Generalized key Regeneration scheme –IRIS Biometrics – Face Biometrics –Extension of Key Regeneration scheme.

#### UNIT IV BIOMETRIC DATA PROTECTION

Biometric data – Concept of personal data – Data protection and privacy – Security criteria for Biometric system – Adoption of security – Revocation procedures – Security and organizational aspects of biometric system.

#### UNIT V BIOMETRIC MULTI MODAL AND APPLICATIONS

Integration – Multiple traits – Multiple snapshots – Score fusion methods – Applications – Board Security – Identification cards – Biometrics on smart cards – Overview of local and global structure – Mechanism for on card comparison – Off card and On card alignment – Smart textile sensors – Bio signals – Biometrics and intelligence services.

#### **Text Book:**

- 1. Anind K Dey, "Context Aware Computing", IEEE 2009.
- 2. Bill Schilit, Norman Adams, and Roy Want, Context-Aware Computing Applications, IEEE Mobile Computing Systems and Applications, 1994.

3. Satyanarayana, "Challenges in Implementing a Context-Aware System", CMU,2001

#### **References:**

- 4. Satyanarayanan, "Pervasive Computing: Vision And Challenges", IEEE Personal Communications, 2001.
- 5. T.J.Watson Tom Erickson, "Context-aware computing", IBM Research Center, 2002.
- 6. Waltenegus Dargie, "Context Aware Computing and Self Managing Systems", CRC Press, 2009.

		L	Т	Р	X	С	
BCA21R266	AI ENHANCED CYBER THREATS	5	0	0	0	5	
Course Categor	y: Program Elective /DSE						
Course Type : Theory							

#### **Course Objectives:**

- To understand the knowledge in solving AI problems
- To study the fundamentals of Cyber security
- To learn and analyze the impact of AI on cyber security
- To secure the web with AI and develop the Web Application Security
- To study the cyber threats

#### **Course Outcomes:**

- CO1: Understand the knowledge in solving AI problems
- CO2: Study the fundamentals of Cyber security
- CO3: Learn and analyze the impact of AI on cyber security
- CO4: Secure the web with AI and develop the Web Application Security

CO5: Study the cyber threats

#### MAPPING OF COURSE OUTCOME(S):

CO/P O	PO 1	PO 2	PO 3	РО 4	РО 5	PO 6
CO1	S		М			L
CO2		М			L	
CO3	S		L			М
CO4	М			S		М

CO5	S	М	М	

#### **UNIT 1 INTRODUCTION AND PROBLEM SOLVING**

Introduction - Understanding AI Basics - History of AI - Intelligent agent - Types of agents -Structure - Problem solving agents - Uninformed search strategies - Searching with partial Information. Fundamentals of AI for Security- deep learning fundamentals from a security perspective - cyber security space problem solution

#### UNIT II FUNDAMENTALS OF CYBER SECURITY

Identity, authentication, confidentiality, privacy, anonymity, availability and integrity-Exploring cryptographic algorithms together with major attacks- Exploring high-level security protocols- biometric authentication - Compliance and security assessment - introduction to penetration testing - Active Directory Security Assessment (ASDA) and cyber insurance risk assessment.

#### UNIT III IMPACT OF AI ON CYBER SECURITY

Threat hunting in memory, file system and network data - introductory analysis of malicious programs - cyber threat hunting and digital investigation --detailed analysis of real-world case studies - unusual and non-virulent types of malwares: KNN (K - Nearest Neighbours) for threat visualisers, Isolation Forest for anomaly detection, LSTM for multi-vector correlation, DBSCAN for riskware detection and fraud, LSTM (Autoencoder) for endpoint protection

#### UNIT IV SECURE WEB AND APPLICATION

Securing web with AI - making websites secure using AI techniques for injection - using regular expressions and identifying patterns and matching with existing scores - Applications using statistical patterns and Bayesian statistics -Web Application Security, Injection, Broken authentication, Sensitive data exposure, XML External Entities (XXE), Broken access control,

Security misconfiguration, Cross-Site Scripting (XSS), Insecure deserialization, Using components with known vulnerabilities and Insufficient logging and monitoring.

#### UNIT V CYBER THREATS

Future of AI in Advancing Security and Promoting, Artificial Intelligence vs. Data Analytics, Applying AI to cybersecurity, Some early AI adopters, AI Use by Adversaries, Using Artificial Intelligence Tools to Enhance Security, Deep learning applications, Cyber Security Threats and Development of Secure Software, Securing IOT Infrastructure, Secure AI Development, Large scale deployment of AI algorithms on production, End-to-end case study for a secure IoT application in a develops ecosystem

#### Text Book(s)

- Enhanced Methods in Computer Security, Biometric and Artificial Intelligence Systems, Jerzy Peja and rzej Piegat Technical University of Szczecin, Poland, 1<sup>st</sup> Edition, Springer, 2014.
- Rhodes-Ousley, Mark. Information Security: The Complete Reference, 2<sup>nd</sup> Edition, Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2019.

#### **Reference Book(s)**

- Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5<sup>th</sup> Edition, Pearson Education, 2015
- 2. George K.Kostopoulous, Cyber Space and Cyber Security, 1<sup>st</sup> Edition, CRC Press, 2014.

BCA21R361		L	Τ	Р	X	С				
	BIG DATA ON CLOUD	3	0	2	3	5				
Course Category: Program Elective/DSE										
Course Type : Theory with Practical										

#### PREREQUISITE

Hands-on experience in Object-Oriented Programming (OOP) is required or essential.

#### **COURSE OBJECTIVES**

This course aims to make the students understand the advance concepts of Machine learning

#### COURSE OUTCOME(S)

- CO1: Fundamentals of statistics
- CO2: Demonstrate the concepts of supervised learning
- **CO3:** Demonstrate the concepts of Data preparation
- CO4: Design of Data sample
- **CO5:**.Ability to create programs on machine learning algorithms.

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		М	S			М
CO3	М	S			S	
CO4			L			
CO5		S		L		S

# UNIT – I: INTRODUCTION TO BIGDATA, DATA EXTRACTION AND KNOWLEDGE PROCESSING

What is Bigdata?, Why Bigdata is important?, Characteristics & Benefits of Bigdata processing, Data storage technologies, Storing data on Amazon S3 : HDFS & Object storage such as S3,Map/Reduce, Hive, Sqoop, Spark, Data extraction process, Different data extraction tools : Open source tools such as Sqoop, Enterprise tools Informatica, Talend, Azure Data Factory, AWS Glue, Change Data Capture (CDC), Distributed data processing, Different data processing engines, ETL using Amazon Glue, Data processing using Amazon EMR, Data querying using Amazon Athena, Redshift data warehouse, Hands-on session on Sqoop, Hive, Spark, Association rule mining, apriori algorithm, noise and outlier detection, data pre-processing techniques, Sampling techniques, Similarity/dis-similarity measures used for big data

## UNIT – II: CLASSIFICATION, CLUSTERING, IN-MEMORY COMPUTATION AND REAL TIME DATA PROCESSING

Supervised learning, Unsupervised learning, Collaborative Filtering, Big data analytics, Streaming data clustering, Feature extraction, Sub-space clustering, Introduction to in-memory computation Advantages , In-memory computation using Spark, Spark Context, RDD & DataFrames, Transformations & Actions,Data Lineage , Real-time vs Batch processing, Advantages of real-time data processing , Real-time data processing tools, Real-time streaming use cases, Real-time streaming using Amazon Kinesis , Real-time streaming using Spark streaming

#### UNIT - III: NoSQL DB

Introduction to NoSQL, Advantages & what problem it solves?, RDBMS vs NoSQL, NoSQL Categories (Document, Key-Value, Wide Column,Graph), Popular NoSQL DBs

#### **UNIT – IV: DATA GOVERNANCE**

What is Data governance and how to achieve it?, Purpose of data governance, Metadata management, Data quality, Privacy & security, Introduction to data orchestration using AWS Data Pipeline

#### UNIT - V: DATA ARCHITECTURE, MODELLING, BI AND DATA VISUALIZATION

What is data architecture?, Key characteristics of modern data architecture, Enterprise data architecture, What is data modeling?, Why data modeling is required?, Conceptual, Physical & Logical data model, What is BI & data visualization?, Benefits of BI, Types of

visualizations,Most commonly used Visualization tools, Introduction to Tableau, Tableau data sources, Connecting Tableau to Redshift, Worksheets, Operators & Functions, Sorting & Filtering, Tableau charts

#### **TEXT BOOKS:**

- Seema Acharya, Subhashini Chellappan, Big Data and Analytics –Willey, India ISBN 13 9788126554782, 2018
- Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing McGraw Hill Education, 2013.

#### **References:**

- 1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, , Cloud Computing: A Practical Approach –McGraw Hill Professional Publications, 2009. [ISBN: 0071626956]. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, 2007

BCA21R362	NETWORK AND WIRELESS SECURITY		Т	Р	С	
		5		0	5	
Course Category: Program Elective /DSE						
Course Type : Theory						

#### **COURSE OBJECTIVES**

To understand the network intrusion detection & prevention mechanisms

To understand the countermeasures of various information security attacks

#### COURSE OUTCOME(S)

CO1: describe the fundamentals of wireless networks.

CO2: analyze the security issues in wireless LAN and MAN.

CO3: explain the security architecture and protocols in Bluetooth and VANET.

CO4: describe the security vulnerabilities in wireless mesh network.

CO5: analyze the security architecture and routing protocols for wireless sensor networks.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					W
CO2		S				
CO3			S			
CO4					S	
CO5	Μ			S		Μ

#### Mapping of Course Outcome(s):

#### **UNIT I SECURE WIRELESS NETWORK**

Overview of security issues in wireless networks - Security architecture of cellular communication networks- Security technique in GSM, 3G, LTE networks - Security issues in femto cell – Mobile devices.

#### UNIT II SECURITY IN WIRELESS LAN AND WIRELESS MAN

Introduction to wireless LAN -current state of WLAN security- communication security- Access point security- other issues- Introduction to wireless man- Wimax- Security goals and solutions - Security vulnerabilities, Threads and counter measures.

#### UNIT III SECURITY IN BLUERTOOTH AND VANET

Bluetooth- Introduction- primer-security solutions-security vulnerabilities, threads and counter measures- VANET- introduction - Security architecture framework- Secure communication protocol-Privacy enhancing and secure positioning.

#### UNIT IV SECURITY IN WIRELESS MESH N/W AND RFID

Wireless mesh networks- characteristics- security vulnerabilities-defense mechanisms-security standards and products- RFID- network primer-security requirements- hardware and protocol based solutions- Advanced protocol based security- Commercial security.

#### UNIT V SECURITY IN WIRELESS SENSOR NETWORKS

Introduction- key management- secure routing protocol- location privacy protection- Secure data aggregation- security architecture- cryptographic approach- Trust management- location privacy

#### **Text Book:**

- 1. Lei Chen"Wireless Network Security-Theories and Applications" Springer, 2013.
- 2. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.
- William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, Second Edition, 2007.

#### **References:**

- 1. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
- 2. Behrouz A. Fourcuzan," Cryptography and Network security" Tata McGraw-Hill, 2008

BCA21R363	CYBER LAWS AND SECURITY POLICIES		Т	Р	X	С
		5	0	0	0	5
Course Category: Program Elective /DSE						
Course Type : Theory						

#### **COURSE OBJECTIVES**

To understand the fundamentals of wireless security.

To understand the security issues in bluetooth and Wi-Fi.

#### **COURSE OUTCOME(S)**

**CO1:** explain the basic information on cybercrime.

**CO2:** describe cyber laws for various crime activities.

CO3: identify the security policies for cyber issues.

**CO4:** analyze the role of organization for securing cyberspace.

**CO5:** explain the need for security in organizations.
Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2		S				W
CO3					S	
CO4			S		Μ	
CO5	Μ			S		

#### UNIT I INTRODUCTION TO CYBER CRIME

Introduction, Forgery, Hacking, Software Piracy, Computer Network intrusion - Category of Cybercrime - Cybercrime Mobile & Wireless devices - Tools and Methods used in Cybercrime - Phishing & Identity Theft.

#### **UNIT II CYBER LAW**

Power of Arrest without Warrant under the IT act, 2000: A Critique - Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals – Jurisdiction in the cyber world – Battling Cyber Squatters and Copyright Protection – E-Commerce taxation – Digital signatures, certifying authorities and E-Governance – Indian Evidence Act – Protection of Cyber Consumers in India

#### UNIT III CYBER AND INFORMATION SECURITY POLICY

Cyber governance issues – Cyber user issues – Cyber conflict issues – Cyber management issues – Cyber infrastructures issues - Introduction - Corporate policies - Tier 1, Tier 2 and Tier3 policies - process management - planning and preparation - developing policies – asset classification policy - developing standards.

#### UNIT IV SECURING CYBERSPACE

The private sector role in securing cyberspace - National governments and their role in securing cyberspace - International law's role in securing cyberspace - Privacy, surveillance and the law Cyber War and Strategy - Authentication and Identity - Current legislative and policy initiatives

#### UNIT V ORGANIZATIONAL AND HUMAN SECURITY

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security - Role of information security profession

#### **Text Book:**

- 1. Reich, Pauline C, "Law, Policy, and Technology: Cyberterrorism, Information Warfare, and Internet Immobilization", IGI Global, 2012.
- Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey Schmidt, "Cyber Security Policy Guidebook", John Wiley & Sons, 2012.

#### **References:**

- 1. VivekSood, "Cyber Law Simplified", Tata Mcgraw Hill, 2001.
- 2. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
- 3. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer verlag, 1997.

# DISCIPLINE SPECIFIC ELECTIVES (ARTIFICIAL INTELIGENCE STREAM)

	Artificial Intelligence for Real-World		Т	Р	X	С
BCA21R171 Application		2	0	2	3	4
Course Category:	Major Elective					
Course Type : Theo	bry with practical					

# **COURSE OBJECTIVES**

To understand the fundamental theory and concepts of Artificial Intelligence for Real-World Application.

# **COURSE OUTCOME(S)**

**CO1:** Examine the role of OOps

CO2: Implement the concepts of AI.

**CO3:** Analyze the various Intelligent systems.

**CO4:** Apply AI algorithm to engineering Optimization problem

**CO5:** Analyze Network and graph concepts in AI

## Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2	S		S		S	
CO3		Μ		Μ		Μ
CO4	S		S		S	
CO5		W		W		

#### UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE (AI)

History of AI, Tools to be used for AI programming and its overview, What is cognitive science and the problem of perception, Applications of AI

#### **UNIT II SEARCH & RESONING**

Intelligent agents, uninformed search, Search Techniques 1 - search space, state space search, Search Techniques 2 - heuristic search, and pattern-directed search, Planning, control strategies and implementation, constraint satisfaction, Problem solving by heuristic search, A\* algorithm, AO\* algorithm, Adversarial search, game playing Proposition and first-order logic, Rule-based systems, semantic net, conceptual graph, inference and deduction, Resolution refutation, answer extraction, Reasoning under uncertainty probabilistic reasoning, belief networks

#### UNIT III MACHINE LEARNING

Basic concepts, Linear models, perceptrons, Introduction to supervised learning and k-nearest neighbors (KNN), decision trees, Advanced models - support vector machine (SVM), ensemble classifiers, Introduction to unsupervised learning and clustering methods.

Deep Learning

Introduction to neural networks, Backpropagation, Training neural nets using keras, Regularization, batch normalization, dropout, Introduction to convolutional neural networks (CNN), Introduction to natural language processing (NLP) and toolkits

#### UNIT IV TIME SERIES ANALYSIS

Introduction to time series, Stationary time series, Smoothing time series, Autocorrelation functions, Autoregressive integrated moving average (ARIMA) models, Signal transformations, Deep learning and time series analysis

#### **UNIT V TENSOR FLOW**

Introduction to TensorFlow, Convolutional neural networks with TensorFlow, Using TensorFlow for implementing regression and clustering methods

BCA21R172	COMPUTATIONAL INTELLIGENCE	L	Τ	Р	X	С			
		4	0	0	0	4			
Course Category: Major Elective									
Course Type : Theory with practical									

## **COURSE OBJECTIVES**

1. To understand the fundamental theory and concepts of neural networks, neuromodeling, several neural network paradigms and its applications.

2. To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.

3. To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems

## **COURSE OUTCOME(S)**

**CO1:** Examine the role of Soft computing techniques and their applications.

CO2: Implement the concepts of fuzzy sets and fuzzy logic .

CO3: Analyze the various Neural Network Architectures.

**CO4:** Apply genetic algorithm to engineering Optimization problem

CO5: Analyze Neural Network, Fuzzy logic and Genetic Algorithm in Hybrid

Intelligent Systems techiques

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					

CO2	S		S		S	
CO3		Μ		Μ		Μ
CO4	S		S		S	
CO5		W		W		

#### UNIT I INTRODUCTION

Conventional Artificial Intelligent system-symbolic processing-expert systems-pitfallsHard Vs Soft computing techniques-Constituents of soft computing-Special featuresHybrid system

## UNIT II FUZZY SETS AND LOGIC

Fuzzy sets-Operation on fuzzy sets-fuzzy relation-Fuzzy rules and fuzzy reasoningFuzzy Inference systems-Defuzzification-Fuzzy Logic Control-Fuzzy clustering-Fuzzy Decision Making-Applications of Fuzzy logic.

## UNIT III ARTIFICIAL NEURAL NETWORKS

Overview of Biological neuro system-Mathematical Model of Neurons-Learning rulesLearning paradigms-Supervised, unsupervised and reinforcement learning-Perceptron networks-Training rules-multilayer perception –back propagation algorithmsassociative memories-Hop field networks-Boltzmann machine-Self Organising MapAdaptive Resonance theory

## UNIT IV EVOLUTIONARY COMPUTATION

Robustness of traditional optimization and search techniques-The goals of optimization-Introduction to evolutionary programming-Evolutionary strategyComparison –Genetic Algorithm- binary and real representation schemes, selection methods, crossover and mutation operators for binary and real coding – constraint handling methods –Applications.

## UNIT V HYBRID INTELLIGENT SYSTEMS

Adaptive Neuro Fuzzy Inference Systems(ANFIS)-Architecture-Hybrid Learning Algorithm-Parameter Identification-Rule Based Structure identification-Input SelectionInput Space partition-Neuro fuzzy control-Genetic algorithm for fuzzy system designNeural network training using GA.

# **TEXT BOOKS:**

1. J.S.R.Jang, C.T.Sun and E.Mizutani,"Neuro Fuzzy and Soft Computing", PHI Learning private Limited, 2010.

2. S.N.Sivanandam and S.N.Deepa, Principles of Soft computing, Wiley India Edition, 2nd Edition, 2013.

# **REFERENCE BOOKS:**

1. Timothy J.Ross,"Fuzzy Logic with Engineering Applications",McGraw-Hill,2004.

2. Goldberg,Genetic Algorithm in search,Optimization and Machine learning,Addison Wesley,1998.

		L	Τ	Р	X	С				
BCA21R173	NATURAL LANGUAGE PROCESSING	4	0	0	0	4				
Course Category: Major Elective										
Course Type : Theory										

# **COURSE OBJECTIVES :**

To provide students an introduction to computational linguistics, from morphology (word formation) and syntax (sentence structure) to semantics (meaning), and natural language processing applications such as parsing, machine translation, generation and dialog system

## **COURSE OUTCOMES :**

CO1: Examine the speech and language processing

CO2: Determine the language syntax Grammars equivalence and normal forms.

CO3: Recognize Syntax-Driven semantic analysis

CO4: Identify natural language generation.

CO5: Build Language similarities and differences for Usability and system development.

Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2	S		S		S	
CO3		Μ		Μ		Μ
CO4	S		S		S	
CO5		W		W		

# UNIT I INTRODUCTION

Introduction: Knowledge in speech and language processing – Ambiguity – Models and Algorithms – Language, Thought and Understanding. Regular Expressions and automata: Regular expressions – Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology – Finite-State Morphological parsing – Combining FST lexicon and rules – Lexicon-Free FSTs: The porter stammer – Human morphological processing

#### **UNIT II SYNTAX**

Constituency – Context-Free rules and trees – Sentence-level constructions – The noun phrase – Coordination – Agreement – The verb phase and sub categorization – Auxiliaries – Spoken language syntax – Grammars equivalence and normal form – Finite-State and Context-Free grammars – Grammars and human processing. Parsing with Context-Free Grammars - Parsing as search – A basic Top-Down parser – Problems with the basic Top-Down parser – The early algorithm – Finite-State parsing methods

#### UNIT III SEMANTIC Syntax-Driven semantic analysis – Attachments for a fragment of

**English** – Integrating semantic analysis into the early parser – Idioms and compositionality – Robust semantic analysis. Lexical semantics: relational among lexemes and their senses – WordNet: A database of lexical relations – The Internal structure of words – Creativity and the lexicon.

#### UNIT IV NATURAL LANGUAGE GENERATION

Introduction to language generation – Architecture for generation – Surface realization

– Discourse planning – Other issues

#### **UNIT V MACHINE TRANSLATION**

Language similarities and differences – The transfer metaphor – The interlingua idea: Using meaning – Direct translation – Using statistical techniques – Usability and system development.

#### **TEXT BOOK:**

1. Daniel Jurafsky and James Martin H., Speech and Language Processing, Pearson Education, Singapore Pvt. Ltd., 2009.

#### **REFERENCE BOOK:**

1. Steven Bird Ewan kelwin and Edward Looper, Natural Language Processing with python, Pearson Education, 2003.

BCA21R174 Machine Learning for Real world Applications		L	Т	Р	Х	C				
DCA2IRI74		3	0	2	3	5				
Course Category: : Discipline Specific Elective										
Course Type: Theory										

# **COURSE OBJECTIVES:**

This course introduces several fundamental concepts and methods for machine learning. The objective is to familiarize the audience with some basic learning algorithms and techniques and their applications, as well as general questions related to analyzing and handling large data sets.

# UNIT I BASICS OF STATISTICS

Linear algebra Mathematical statistics

# UNIT II BASICS OF MACHINE LEARNING

Introduction, Supervised learning, Unsupervised learning, Reinforcement learning

# UNIT III MACHINE LEARNING METHODOLOGY (CRISP DM)

Data understanding Data preparation, Exploratory data

# UNIT IV KEY CONCEPTS IN MACHINE LEARNING

Data sample, Model selection, Regression algorithms, Model validation, Model deployment, Imbalance in data

# Unit V MACHINE LEARNING ALGORITHMS WITH REAL-LIFE USE CASES

Unsupervised algorithms Classification algorithms

BCA21R175	VIRTUAL REALITY	L	Т	Р	X	С			
		5	0	0	0	5			
Course Category: Major Elective									
Course Type : Theory									

# **COURSE OBJECTIVES :**

- 1. To understand the fundamentals of virtual reality
- 2. To understand geometric modeling and Virtual environment
- 3. To study about Virtual Hardware and Software
- 4. To develop Virtual Reality applications

# **COURSE OUTCOMES :**

CO1: Understand the basic concept and framework of virtual reality

CO2: Elucidate the concept of principles and multidisciplinary features of virtual reality

CO3: Compare the different technology for user interaction and perception in virtual reality

CO4: Analyze how to managing large scale VR environment in real time.

CO5: Apply VR system framework and development tools.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					
CO2	S		S		S	
CO3		Μ		Μ		Μ
CO4	S		S		S	
CO5		W		W		

# Mapping of Course Outcome(s):

# UNIT I - INTRODUCTION TO VIRTUAL REALITY

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics –Flight Simulation – Virtual environments –requirement – benefits of virtual reality- Historical development of VR : Introduction – Scientific Landmark -3D Computer Graphics :Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modeling 176 CS-Engg&Tech-SRM-2013 – Illumination models – Reflection models – Shading algorithms- Radiosity – Hidden Surface Removal – Realism-Stereographic image.

#### **UNIT II - GEOMETRIC MODELLING**

Geometric Modeling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances –Picking – Flying – Scaling the VE – Collision detection - A Generic VR system: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR Systems.

#### **UNIT III - VIRTUAL ENVIRONMENT**

Animating the Virtual Environment: Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – linear and nonlinear translation - shape & object – free from deformation – particle system- Physical Simulation : Introduction – Objects falling in a gravitational field – Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft.

#### **UNIT IV-VR HARDWARES & SOFTWARES**

Human factors : Introduction – the eye - the ear- the somatic senses - VR Hardware : Introduction – sensor hardware – Head-coupled displays –Acoustic hardware – Integrated VR systems-VR Software: Introduction –Modeling virtual world –Physical simulation- VR toolkits – Introduction to VRML.

#### **UNIT V - VR APPLICATION**

Virtual Reality Applications: Introduction – Engineering – Entertainment – Science – Training – The Future: Introduction – Virtual environments – modes of interaction.

#### **TEXT BOOK**

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007.

# REFERENCES

1. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.

2. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, 2nd Edition, 2006.

3. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application, and Design", Morgan Kaufmann, 2008.

	BIO INSPIRED INTELLIGENCE TECHNIQUES		Т	Р	X	С					
BCA21R176			0	0	0	5					
Course Category:	Major Elective										
Course Type : Theo	Course Type : Theory										

#### **COURSE OBJECTIVES**:

To introduce students various schemes for classification, search, learn and optimization based on bio-inspired mechanisms

## **COURSE OUTCOMES:**

CO1:Explore the benefits and limitations of bio-inspired approaches.

CO2:Extract basic principles from intelligent systems in nature that can be applied to engineering.

CO3:Critically analyze the use of cellular systems

CO4:Differentiate the different models of immune systems

CO5: Apply bio-inspired AI to engineer solutions for real world applications.

#### Mapping of Course Outcome(s):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S				Μ	
CO2			S			
CO3	S				S	
CO4		L				Μ
<b>CO5</b>			Μ		L	

## UNIT I EVOLUTIONARY SYSTEMS

Evolutionary Systems – Artificial Evolution - Genetic Representations - Evolutionary Measures - Types of Evolutionary Algorithms - Schema Theory - Evolutionary Computation-Representation- Selection- Reproduction - Genetic Algorithms - Canonical Genetic Algorithm – Crossover- Mutation - Control Parameters – Applications - Genetic Programming - Tree-Based Representation – Building Block Genetic Programming –Applications. Evolutionary Programming – Basics –Operators – Strategy Parameters -Evolutionary Programming Implementations

#### UNIT II NEURAL AND FUZZY SYSTEMS

Neural Networks - Biological Nervous Systems - Artificial Neural Learning -Architecture. Unsupervised Learning - Self-Organizing Feature Maps. Supervised Learning – Types- Learning Rules. Radial Basis Function Networks. Reinforcement Learning – Model Free - Neural Networks and Reinforcement Learning. Fuzzy Systems- Fuzzy Sets – Logic and Reasoning – Controllers- Rough Sets.

#### UNIT III CELLULAR AND DEVELOPMENT SYSTEMS

Cellular Systems - The Basic Ingredients - Cellular Automata -Modeling - Classic Cellular Automata – Other Cellular Systems – Computation - Artificial Life - Complex Systems - Analysis and Synthesis of Cellular Systems. Developmental Systems - Potential Advantages of a Developmental Representation -Rewriting Systems - Synthesis of Developmental Systems -Evolution and Development – Defining Artificial Evolutionary Developmental Systems -Evolutionary Rewriting Systems – Developmental Programs and Processes

#### UNIT IV IMMUNE SYSTEMS AND COLLECTIVE SYSTEMS

Natural Immune systems - Classical View -Working -Constituents of Biological Immune Systems - Immunity Types - Learning the Antigen Structure - The Network Theory - The Danger Theory –Artificial Immune Systems - Algorithms - Classical View Models - Clonal Selection Theory Models – Network Theory Models - Danger Theory Models - Applications and Other AIS models Applications- Biological Self-Organization - Particle Swarm Optimization - Basics -Social Network Structures – Variations - Basic PSO Parameters - Optimization - Applications.

Ant Colony Optimization – Cemetery Organization and Brood Care - Division of Labor – Applications

#### **UNIT V BEHAVIORAL SYSTEMS**

Behavioral Systems - Behavior in Cognitive Science - Behavior in Artificial Intelligence – Behavioral Systems – Behavior Based Robots –Evolution - Co-evolution - Learning and Self Reproduction of Behavioral Systems. Cultural Algorithms - Culture and Artificial Culture -Cultural Algorithm – Belief Space – Fuzzy Cultural Algorithms – Applications. Co-evolution – Types - Competitive and Cooperative Co-evolution.

#### **TEXTBOOKS**:

 Claudio Mattiussi, Dario Floreano "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies" (Intelligent Robotics and Autonomous Agents series), MIT Press, 2008
 Andries P. Engelbrecht, "Computational Intelligence: An Introduction", 2nd Edition, Wiley; 2007

3. Russell C. Eberhart, Yuhui Shi Computational Intelligence: Concepts to Implementations, Morgan Kaufmann; 1 edition 2007.

DCA 21D271	APPLICATION OF DEEP LEARNING AND	L	Т	Р	X	С			
BCA21R271	NEURAL NETWORKS	3	0	2	3	5			
Course Category: Major Elective									
Course Type : Theo	ory with Practicals								

#### PREREQUISITE

1. Mathematics- Linear Algebra: Matrices and Vectors Calculus: Differentiation, Partial Derivatives and Gradient Statistics: Normal Distribution, Probability.

2. Python Basic Programming Data Processing using NumPy, Scipi, Matplotlib and Pandas

Basic usage of Scikit, Scikit-learn packages in Python

3. Completing the course "TCS iON Industry Honour Certification - Machine Learning for Real-World Application" is highly recommended

## **Course Outcomes(CO):**

At the end of the course, students will able to

CO1. understand the concept of machine learning

CO2. Understand the Neural learning concepts

CO3. formulate the deep learning concepts

CO4. Able to understand the laser technology

CO/PO	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>
CO1	S					М
CO2		S	М			L
CO3		S		L		
CO4			M	S	S	
CO5	M			L		S

#### **UNIT I PRELEMINARIES**

Introduction - Machine learning

#### UNIT II BASICS OF NEURAL NETWORKS

Artificial neural networks - Popular networks - Popular tools -Case studies: The human brain

#### **UNIT III DEEP NEURAL NETWORKS - 1**

Introduction to Deep Learning (DL) -Convolutional Neural Networks (CNN) -. Modern CNN architectures - Image classification using CNN

## **UNIT IV DEEP NEURAL NETWORKS - 2**

Recurrent Neural Networks (RNN) & LSTM - Word vector representations - Sentiment analysis - Sentence classification - Application in Natural Language -Processing (NLP)

#### **UNIT V EMERGING TRENDS**

Attention mechanisms and memory networks - Embeddings from LASER

	21R272 INTRODUCTION TO ROBOTICS		Τ	Р	X	С			
BCA21R272			0	0	0	5			
Course Category: Program Elective/DSE									
Course Type : Theo	ory								

## **Course Outcomes(CO):**

At the end of the course, students will able to

CO1. understand the concept of robotic and its applications in engineering,

CO2. carryout the coordinate transformation with respect to robotic systems,

CO3. formulate the mathematical relations for forward and inverse kinematic analysis and trajectory generation of robotic manipulator,

CO4. determine forces at end effector and select the actuator and sensor for a robot in a specific job task.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		S	М			L
CO3		S		L		
CO4			M	S	S	
CO5	Μ			L		S

## **UNIT I ROBOT TECHNOLOGY**

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components.

## UNIT II ROBOT MOTION ANALYSIS AND CONTROL

Robot arm kinematics, forward & inverse kinematics solutions, Trajectory design,

Introduction to robot arm dynamics, introduction to mobile robots.

#### UNIT III ACTUATORS AND SENSORS IN ROBOT

AC/DC motors, stepper motors and servo motor, Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors,

## UNIT IV TYPES OF END EFFECTORS AND DESIGN

End effectors, Classification, Force analysis and Gripper design.

#### UNIT V EXTERNAL SENSORS

External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

#### **TEXT BOOKS:**

1 Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall

2 Mittal and Nagrath, Robotics & Control, Tata McGraw-Hill Publishing Company Ltd., New Delhi

3 John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi
4 M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata
McGraw Hill Education Pvt. Ltd

		L	Т	Р	X	C
BCA21R273	INTERNET OF THINGS	5	0	0	0	5
Course Category: Pro	gram Elective /DSE					
Course Type : Theory						

#### **COURSE OBJECTIVES**

To study the paradigm of objects interacting with people, information systems, and with other objects via network communications.

#### **OUTCOMES:**

Upon completion of the course, the students will be able to

- CO1: Identify and design the new models for market strategic interaction
- CO2: Design business intelligence and information security for WoB
- CO3: Analyze various protocols for IoT
- CO4: Design a middleware for IoT
- CO5: Analyze and design different models for network dynamics

# MAPPING OF COURSE OUTCOME(S):

CO/P	PO	PO	PO	PO	PO	PO
0	1	2	3	4	5	6
CO1	S					
CO2		S		L		М
CO3			S			
CO4	L				S	
CO5		М		S	М	S

#### UNIT I

IOT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

#### UNIT II

IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security.

#### UNIT III

IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

#### UNIT IV

WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture StandardizationforWoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals andBusiness Intelligence.

#### UNIT V

IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc

#### **Text Book:**

 Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1<sup>st</sup> Edition, CRC Press, 2012.

- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", 1<sup>st</sup> Edition, Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", 1<sup>st</sup> Edition, Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things Key applications and Protocols", 2<sup>nd</sup> Edition, Wiley, 2012.

	CONVERSATIONAL EXPERIENCES	L	Т	Р	X	С				
BCA21R274		5	0	0	0	5				
Course Category: P	rogram Elective /DSE		L							
Course Type : Theor	Course Type : Theory									

# UNIT I FUNDAMENTALS OF CONVERSATIONAL SYSTEMS & FOUNDATIONAL BLOCKS FOR PROGRAMMING

Introduction, General chatbot architecture, Underlying technologies, Introduction to popular chatbot frameworks and channels, An overview of ethical and legal considerations in Artificial Intelligence (AI) Basic Python programming concepts, Node basics, Coding best practices

# UNIT II NATURAL LANGUAGE PROCESSING (NLP)

Introduction, Lexical knowledge networks, Lexical, syntactic and semantic analysis, part-ofspeech tagging, word sense disambiguation, Information extraction, sentiment analysis, NLP using Python, Application of NLP in chatbots

#### UNIT III BUILDING CHATBOTS/CONVERSATIONAL AI SYSTEMS

Fundamentals of conversational systems, Chatbot framework and architecture, conversational flow and design, intent classification, dialogue management strategies, Natural Language Generation (NLG), Introduction to top players in market, Smart speakers, Security and ethics, Building a voice/chatbot, Affective NLG, Conversational question answering

# UNIT IV ARTIFICIAL INTELLIGENCE (AI), MACHINE LEARNING (ML) & COMPUTER VISION IN CONVERSATIONAL TECHNOLOGIES

Recap of ML and AI concepts, Voice Translation, Emotion analysis, Text Search solutions for conversational systems Introduction, Libraries, development platforms, and datasets, Image filtering and transformations, convolutional neural networks, object detection, segmentation and tracking, 3D computer vision, mathematics for computer vision, ML for computer vision, Introduction to OpenCV, Building a vision bot

#### **UNIT V CONTACT CENTRES**

Introduction to contact centres ,Case studies and trends

Conversational Analytics and Testing

Conversational analytics, User level Testing of Conversational Experiences (CE) systems, Testing frameworks in CE

Future - Where Are We Headed?

Summary, An overview of robots and sensory applications, Extended Reality (XR) technologies in conversational systems, XR-Commerce, An overview of future technologies and market innovations

	SOFT COMPUTING	L	Т	Р	X	C			
BCA21R275		3	0	0	0	3			
Course Category: Program Elective /DSE									
Course Type : Theor	y								

# **OBJECTIVE(S)**

Understand the concept of neuro-fuzzy concepts, knowledge representation using genetic algorithms.

# COURSE OUTCOME(S)

**CO1**: Apply various soft computing frame works.

- **CO2**: Analyze types of learning algorithms
- **CO3:** Design of various neural networks
- **CO4**: Understanding fuzzy logic
- **CO5**: Apply genetic programming

## MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S		М			L
CO2		М			L	
CO3	S		L			М
CO4	М			S		М
CO5	S		М		М	

**UNIT I: Artificial neural network** 

Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications. Fuzzy logic: Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations: cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non- iterative fuzzy sets. Genetic algorithm-Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

#### UNIT II

BAM, Hopfield networks, iterative auto associative memory network & iterative associative memory network – unsupervised learning networks: Kohonen self organizing feature maps, LVQ – CPnetworks, ART network.

#### **UNIT III: Single layer networks, Perceptrons**

Adaline, Mutilayer Perceptrons Supervised Learning, Back-propagation, LM Method, Radial Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Learning Vector Quantization, Hebbian Learning. Recurrent neural networks. Adaptive neuro-fuzzy information; systems (ANFIS), Hybrid Learning Algorithm.

#### **UNIT IV: Membership functions**

Features, fuzzification, methods of membership value assignments- Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures, fuzzy measures – measures of fuzziness -fuzzy integrals aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems- overview of fuzzy expert system-fuzzy decision making.

#### UNIT V

Genetic algorithm and search space – general genetic algorithm – operators – Generational cycle – stopping condition – constraints – classification genetic programming – multilevel optimization – real life problem- advances in GA.

#### **Text Books**

- J.S.R.Jang, C.T. Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing,1<sup>st</sup> Edition, PHI Pearson Education - 2018.
- S.N.Sivanandam and S.N.Deepa, Principles of Soft Computing, 2<sup>nd</sup> Edition, Wiley India Pvt Ltd - 2015.

#### **Reference Books**

- S.Rajasekaran and G.A.Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications, Prentice-Hall of India Pvt. Ltd. -2009.
- 2. George J. Klir, Ute St. Clair, Bo Yuan, Fuzzy Set Theory: Foundations and Applications, Prentice Hall, 2007.

BCA21R276	RIG DATA ANALYTICS		Τ	Р	X	С				
DUA21K2/0	DIQ DATA ANALT INS	5	0	0	0	5				
Course Category	Course Category: Program Elective/DSE									
Course Type : Theory										

## **COURSE OBJECTIVES:**

To know the fundamental concepts of big data and analytics.

To explore tools and practices for working with big data

To learn about stream computing.

To know about the research that requires the integration of large amounts of data

#### **COURSE OUTCOMES:**

Upon completion of the course, the students will be able to:

CO1: Work with big data tools and its analysis techniques

CO2: Analyze data by utilizing clustering and classification algorithms

CO3:Learn and apply different mining algorithms and recommendation systems for large volumes of data

CO4:Perform analytics on data streams

CO5: Learn NoSQL databases and management.

## MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	М				L	М

CO2		S		М		
CO3			S			М
CO4		М			М	
CO5	L			S		М

#### UNIT I INTRODUCTION TO BIG DATA

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model

## UNIT II CLUSTERING AND CLASSIFICATION

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier.

## UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation-Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

## UNIT IV STREAM MEMORY

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

#### UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive—Sharding—Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

#### **TEXT BOOKS:**

- Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", 1<sup>st</sup> Edition, Cambridge University Press, 2012.
- David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2<sup>nd</sup> Edition, Morgan Kaufmann/El sevier Publishers, 2013.

#### **REFERENCES:**

- EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", 1<sup>st</sup> Edition, Wiley publishers, 2015.
- Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", 3<sup>rd</sup> Edition, Wiley Publishers, 2015.

 Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", 2<sup>nd</sup> Edition, Cambridge University Press, 2010.

BCA21R371	NATURAL LANGUAGE	INGUAGE         L         T         P         2           ING         5         0         0         0					
DCA2IR5/1	PROCESSING	5 0 0 0					
Course Category: Pro	gram Elective/DSE						
Course Type : Theory							

#### **UNIT I INTRODUCTION**

What is Natural Language Processing?, Building your Corpus; elements in balanced corpus,

TreeBank, PropBank, WordNet, VerbNet, Tokenization, N-grams, Stemming and

Lemmatization, Synsets and Hypernyms

# **UNIT II PART OF SPEECH TAGGING, PARSING & SEMANTICS**

Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions, Named Entity Recognition (NER), Unification, probabilistic parsing, TreeBank, Meaning representation, Semantic analysis, lexical semantics, WordNet

## UNIT III WORD SENSE DISAMBIGUATION AND DISCOURSE

Definition, Selectional restriction, machine learning approaches, dictionary based approaches, Reference resolution, constraints on co-reference , algorithm for pronoun resolution, text coherence, discourse structure,

## UNIT IV RECENT ADVANCES AND APPLICATIONS

Sentiment Analysis, Machine Translation, Summarization, Multimodal Processing

## UNIT V INFORMATION RETRIEVAL

Vector space model, homonymy, polysemy, synonymy, improving user queries, Different NLP related problems like named entity recognition, part of speech tagging, sentiment analysis, summarization, machine translation etc.

BCA21B372	HUMAN COMPUTER	IPUTER         L         T         P         Σ           ΓΙΟΝ         5         0         0         5				
DCA2IR5/2	INTERACTION					
Course Category: Program Elective/DSE						
Course Type : Theory						

## **Course Objectives:**

To learn the foundations of Human Computer Interaction and become familiar with the design technologies for individuals and persons with disabilities.

#### **Course Outcomes**

Upon completion of the course, the students should be able to:

- CO 1: Design effective dialog for HCI
- CO 2: Design effective HCI for individuals and persons with disabilities.
- CO 3: Assess the importance of user feedback.
- CO 4: Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- CO 5: Develop meaningful user interface.

## MAPPING OF COURSE OUTCOME(S):

CO/P	PO	PO	PO	PO	PO	PO
0	1	2	3	4	5	6
CO1	S				L	
CO2		S		S		S
CO3	L			S		
CO4			S			
CO5				S		М

## **UNIT I FOUNDATIONS OF HCI**

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. – Case Studies

#### **UNIT II DESIGN & SOFTWARE PROCESS**

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

#### **UNIT III MODELS AND THEORIES**

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

#### **UNIT IV MOBILE HCI**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. – Case Studies

#### **UNIT V WEB INTERFACE DESIGN**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies

#### **TEXT BOOKS:**

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
- Brian Fling, —Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)

 Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009. (UNIT-V)

BCA21R373	DATA ANALYTICS & REPORTING	L	Т	Р	Х	С
<b>DC</b> 11211375						5
Course Catego						
Course Type:	Theory					

**Pre-requisite:** Basic Knowledge about data analytics

#### **COURSE OBJECTIVES:**

This course aims to familiarize the students with the basic concepts of data analytics and data reporting and equipping the learners with using tools and techniques for data reporting.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S				Μ	
CO2			S			
CO3	S				S	
CO4		L				Μ
CO5			Μ		L	

#### **Unit 1: Introduction**

Introduction: Introduction to Data Science and Analytics Data, features Preprocessing on data

#### **Unit 2: Handling Data Sources**

Different types of data sources: structured, unstructured and Semi structured data Relational databases: normal forms, transactional data, Structured Query Language (SQL).

#### **Unit 3: Exploratory Data Analysis (EDA)**

Models and Techniques Regression models: linear and nonlinear, logistic, variable transformation, spinning of variables, population stability index and characteristic analysis

## **Unit 4: Reporting Fundamentals**

Anatomy and types of reports, Top-down approach: Drill down reports and dashboards. Reports for Data Analysis: Descriptive analysis and its reports: Key Performance Indicator (KPI) dashboard sand periodic reports Diagnostic analysis and detailed drilldown reports

## **Unit 5 Data Reporting Tools**

Data Reporting Tools: Graphs and Charts: Types and implementation Tables: Varieties and its usage in standard reports

## SKILL ENHANCEMENT COURSES

BCA21B201	SOFTWARE TESTING LABORATORY	L	Τ	Р	X	С	
DCA21K291	SOFTWARE LESTING LADORATORI	0	0 4	4	0	2	
Course Catego	Course Category: Program Elective / Skill						
Course Type : Laboratory							

## **COURSE OBJECTIVES**

- To learn about different type of applications and testing, along with the purpose of automation testing.
- To gain insight into the evolution of Selenium
- To get an overview of Selenium nd its components and compare commonly used automation tool with Selenium automation tools. Explore the features and use of Selenium-WebDriver
- To record and importing tests with Selenium IDE
- To learn data driven testing using TestNG

## **Course Outcomes (COs)**

CO1. Understand Selenium Architecture and its components

CO2. Work with Selenium RC

CO3. Understand Selenium WebDriver

**CO 4**. Use WebDriver advanced features e.g. taking screenshots, handling cookies and managing exceptions

**CO5**. Create Data driven, Keyword driven and Hybrid test framework 6. Record and importing tests with Selenium IDE andWrite Test cases using TestNG

## MAPPING OF COURSE OUTCOME(S):

CO/P	PO	PO	PO	PO	PO	PO
0	1	2	3	4	5	6
CO1	S				L	
-----	---	---	---	---	---	---
CO2		S			L	
CO3	L		М	S		Μ
CO4			S			
CO5	М				S	S

## LIST OF PROGRAMS

- 1. Write a test case based on controls
- 2. Test data in a flat file.
- 3. Manual test case to verify student grade
- 4. Write and test a program to select the number of students who have scored more than 60 in any one subject(or all Subjects)
- 5. Write a program that checks whether the number is even or odd. Run code coverage tool and find the amount of code being covered.
- 6. Write and test a program to login a specific web page.
- 7. Write and test a program to get the number of list items in a list / combo box.
- 8. Write a program that take three inputs (a,b &c) that represent the sides of a triangle, and the output is one of the below four:
  - a. Not a triangle
  - b. Scalene triangle
  - c. Isosceles triangle
  - d. Equilateral triangle

9. Write a program that determines the nature of roots of a quadratic equation. Output should be one of the following:-

- Not a quadratic equation.
- Complex roots
- Real roots
- Single roots

I. Generate test cases using Boundary Value Analysis, Equivalence Class Partitioning and Decision Table Testing.

II. Generate test cases using Basis path testing.

III. Run code coverage tool

10. Write a program that checks whether the number is even or odd. Run code coverage tool and find the amount of code being covered.

11. Use LoadUI load testing tool to test the web application performance.

BCA21R202	ANDROID PROGRAMMING LABORATORY		Т	Р	X	С				
DCA2IR272			0	4	0	2				
Course Category	Course Category: Program Elective / Skill									
<b>Course Type</b> : La	aboratory									

### **COURSE OBJECTIVES**

• To compare the differences between Android and other mobile development environments.

• To learn the Object-oriented features of Kotlin and APIs for Android Development.

- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android

• To design and develop useful Android applications with compelling user. interfaces .by using, extending, and creating your own layouts and Views and using Menus.

#### COURSE OUTCOMES (COS)

Upon completion of this course the students will be able to:

CO1: Analyze the Architecture and features of Android with another Mobile Operating System.

CO2: Evaluate the standard of Kotlin language for developing Android Applications

CO3: Apply knowledge for creating user Interface and develop activity for Android App.

CO4: Evaluate the user interface architecture of Android for developing Android Apps

CO5: Understand the implementation of SQLite database operations with Android.

#### MAPPING OF COURSE OUTCOME(S):

CO/P	PO	PO	PO	PO	PO	PO
0	1	2	3	4	5	6
CO1	М				М	
CO2		S			М	
CO3			М	М		
CO4	S		L		S	
CO5				S		S

#### LIST OF PROGRAMS

1. Create an Android Application for implementing Button control.

2. Create an android program for implementing progress bar control.

3. Create an Android application for creating login page for checking Loginid and Password

4. Create an Android application for implementing Spinner control in Android Application

5. Create an Android application for implementing context menu.

6. Create an Android Application with list of any three courses in your college and on selecting a particular course HoD of that course should appear at the bottom of the screen.

7. Create an Android application with three option buttons with three color names and When the particular color is selected, the background color of the App should change.

8. Create an Android Application for drawing any image on screen

9. Create an Android application for implementing date picker control.

10. Create an Android application for creating sub menu.

BCA21D301	BCA21R391 .NET PROGRAMMING LABORATORY		Т	Р	X	С			
DCA2IN371			0	4	0	2			
Course Category: Program Elective / Skill									
<b>Course Type</b> : L	aboratory								

### **Course Objective(s)**

Students will gain the ability to implement the algorithms in C#.net, VB.net and ASP.net.

#### **Course Outcome(s)**

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

- CO 1. Create Simple application using web controls
- CO 2. Create ASP.NET Pages & Adrotator Control
- CO 3. Understand the Use of calendar control, Treeview control & Validation controls

CO 4. Analyze the use of Query textbox and Displaying records & Display records by using database

CO 5. Inserting record into a database & Deleting record into a database

### MAPPING OF COURSE OUTCOME(S):

CO/P O	PO 1	PO 2	PO 3	РО 4	РО 5	PO 6
C01	S			L	М	
CO2		М	S			S

CO3	S			М		
CO4		S			М	
CO5	L		S			М

## LIST OF PROGRAMS

- 1. Write a program for Arithmetic Calculator using Windows Application
- 2. Implement Windows Form based application using controls like menus, dialog and tool tip, dropdown, radio and selection button etc.
- 3. Implement Master Form with Windows application.
- 4. Use Dataset, Data Reader, XML Reader & Data Sources (SQL, Object & XML) with Any Windows or Web Application
- 5. Use Data Controls like Data List
- 6. Use Grid View, Detail View, Repeater and List, Bound Control
- 7. Implement web application using ASP.NET with web controls.
- 8. Write a code for web application to provide input validations using Input Valuators.
- 9. Create a Web application that illustrates the use of themes and master pages with Site-Map.
- 10. Implement printing of GDI+ with windows application.

BCA21R392	HUMAN COMPUTER INTERACTION	L	Т	Р	X	С		
DCA2IK3)2	LABORATORY	0	0	4	0	2		
Course Categor	Course Category: Program Elective / Skill							
Course Type: L	aboratory							

### **COURSEOBJECTIVE(S):**

This course is designed to learn how to program to design the UI interface, Identify the tools for designing interactive systems, Apply the design principles in real time applications, Analyze the design requirements for different users/environments

### COURSEOUTCOME(S):

After completing this course, the student will be able to

- CO1 Able to work with user interface
- CO2 Design web page to perform human computer interaction
- CO3 Understand the windows based UI design
- CO4 Develop multimedia based user interface design
- CO5 Understand the windows based layout test.

## MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		S	М			L
CO3		S		L		
CO4			М	S	S	
CO5	M			L		S

#### LAB PROGRAMS

- 1. Writing program in XML and creates a style sheet in CSS and displays the document in internet explorer.
- 2. Using jQuery find all text areas, and makes a border. Then adds all paragraphs to the jQuery object to set their borders red.
- 3. Using jQuery add a new class to an element that already has a class.
- 4. Using jQuery insert a DOM element after all paragraphs.
- 5. Using jQuery add the class "w3r\_font\_color" and w3r\_background to the last paragraph element.
- Create a simple jQuery UI Date picker. Now pick a date and store it in a textbox. Initialize the Date picker and specify a text to display for the week of the year column heading.
- 7. Write a program of Inline- Editor using Angular JS.
- 8. Write a program of Order Form using Angular JS.
- 9. Write a program of Navigation -Menu using Angular JS.
- 10. Design a UI for ATM Interface
- 11. Design a prototype of a TV remote Control Panel
- 12. Design a UI prototype of an Automatic vending machine for Drinks
- 13. Create an interactive player prototype using ProtoPie
- 14. Design a Mobile banking application using balsamiq design software
- 15. Design a Web Interface for Online banking system

BCA21R393	<b>COMPUTER FORENSICS</b>	L	Т	Р	X	С			
DCA2IR575	LABORATORY	0	0	4	0	2			
Course Category	Course Category: Program Elective / Skill								
Course Type: La	boratory								

#### **COURSEOBJECTIVE(S):**

This course is designed to learn Computer Forensics Fundamentals

### **COURSEOUTCOME(S):**

After completing this course, the student will be able to

CO1: Understand the basic concepts of computer forensics fundamentals

CO2: Apply the features of evidence collection and data seizure

CO3: Analyse Computer forensic analysis and validation

CO4: Understand the current computer forensic tools

CO5: Understand Working with windows and dos systems

#### MAPPING OF COURSE OUTCOME(S):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	М					М
CO2		М		S		
CO3			М		L	
CO4	S				M	
CO5		M		L		S

#### List of Experiments

- 1. Study of Computer Forensics and different tools used for forensic investigation
- 2. How to Recover Deleted Files using Forensics Tools
- Study the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt.
- 4. How to Extract Exchangeable image file format (EXIF) Data from Image Files using Exifreader Software
- 5. How to make the forensic image of the hard drive using EnCase Forensics.
- 6. How to Restoring the Evidence Image using EnCase Forensics
- 7. How to Collect Email Evidence in Victim PC
- 8. How to Extracting Browser Artifacts
- 9. How to View Last Activity of Your PC
- 10. Find Last Connected USB on your system (USB Forensics)
- 11. Comparison of two Files for forensics investigation by Compare IT software
- 12. Live Forensics Case Investigation using Autopsy

BCA21D304	OPEN SOURCE PROGRAMMING	L	Т	Р	X	С
DCA21K374	LABORATORY	0	0	4	0	2
Course Category: Pro	ogram Elective / Skill					
Course Type : Labora	atory					

## **COURSEOBJECTIVE(S):**

This course is designed to use PHP and MySQL to effective development of dynamic web sites for user on the Internet.

### COURSEOUTCOME(S):

After completing this course, the student will be able to

**CO1:** Understand the basic concepts of PHP

- CO2: Create programs using arrays and control structures
- **CO3:** Create PHP program using functions
- **CO4:** Write stored procedures and functions in MySQL
- CO5: Develop Programs using SQL.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S					М
CO2		S		S	L	
CO3			S			L
CO4			Μ	S		
CO5		Μ				S

MAPPING OF COURSE OUTCOME(S):

#### List of Programs

- 1. Create a PHP page using functions for comparing three integers and print the largest number.
- 2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
- 3. Write a program to check whether the given number is prime or not.
- 4. Create a PHP page which accepts string from user After submission that page displays the reverse of provided string.
- 5. Write a PHPscript that checks whether a passed string is palindrome or not? (Apalindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
- 6. Write a PHPscript that removes the whitespaces from a string. Sample string : 'The quick " " brown fox'

- 7. Write a PHP script that checks if a string contains another string.
- 8. Write a simple PHP program to check that emails are valid.
- 9. Create a HTML Form and Insert Data Into The Database Using PHP

10. To make use of transaction control statement viz rollback, commit and save point using SQL Function.