સૌરાષ્ટ્ર યુનિવર્સિટી

એકેડેમિક વિભાગ

યુનિવર્સિટી કેમ્પસ, યુનિવર્સિટી રોડ, રાજકોટ-૩૬૦૦૦૫

ફોન નં.(૦૨૮૧)૨૫૭૮૫૦૧ એક્સટે. નં.૨૦૨, ૩૦૪ ફેક્સ નં.(૦૨૮૧)૨૫૭૬૩૪૭ ઈ-મેઈલ : academic@sauuni.ac.in

નં.એકે/વિજ્ઞાન/૨૪૦૪૦૨૬/૨૦૨૪

તા.૨૬/૦૬/૨૦૨૪
બી.સી.એ

વંચાણે લીધા

(૧) ગુજરાત સરકાર દ્વારા પ્રકાશિત થયેલ Standard Operating Procedure Implementation of National Education Policy - 2020 Gujarat State જુલાઈ-૨૦૨૩

(૨) આ વિભાગના પરિપત્રાંક નં.એકે/૯૦૮૮૨/૨૦૨૪ તા.૧૦/૧૦/૨૦૨૩

(૩) આ વિભાગના પરિપત્રાંક નં.એકે/૯૯૫૬૮/૨૦૨૪ તા.૦૮/૦૧/૨૦૨૪

(૪) આ વિભાગના પરિપત્રાંક નં.એકે/૨૪૦૧૫૮૩/૨૦૨૪ તા.૧૫/૦૪/૨૦૨૪

(૫) આ વિભાગની તા.૨૧/૦૬/૨૦૨૪ની નોંધ પર મળેલ આદેશ
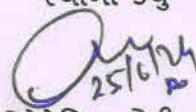
પરિપત્ર:-

સૌરાષ્ટ્ર યુનિવર્સિટીની વિજ્ઞાન વિદ્યાશાખા હેઠળની સ્નાતક કક્ષાના બી.સી.એ ના અભ્યાસક્રમ ચલાવતી સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓને આથી જાણ કરવામાં આવે છે કે, ચેરમેનશ્રી, દ્વારા બી.સી.એ સેમેસ્ટર-૦૩અને ૦૪ નો ઉપરોક્ત સંદર્ભોને ધ્યાને લઈને SOP મુજબનો અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસ સમિતિ, વિજ્ઞાન વિદ્યાશાખા, એકેડેમિક કાઉન્સિલ તથા બોર્ડ ઓફ મેનેજમેન્ટની બહાલીની અપેક્ષાએ મંજૂરી આપવા માન.કુલપતિ સાહેબને ભલામણ કરેલ જે માન.કુલપતિશ્રીએ મંજૂર કરેલ છે. જેથી સંબંધિત તમામે તે મુજબ તેની અમલવારી કરવી તેમજ ઉપર દર્શાવ્યા મુજબનાં આ વિભાગના SOP ની અમલવારી અંગેના તમામ વિષયોમાં થીયરી અને પ્રેક્ટીકલનો સમાવેશ CCE તથા SEE માટે કરવામાં આવેલ પરિપત્રોનું ચુસ્તપણે પાલન કરવાનું રહેશે.

(મુસદ્દો કુલસચિવશ્રીએ મંજૂર કરેલ છે.)

સહી/-
(એ.એસ.પારેખ)
કુલસચિવ

બિડાણ:- ઉક્ત અભ્યાસક્રમ (સોફ્ટ કોપી)

રવાના કર્યું

એકેડેમિક ઓફીસર

પ્રતિ,

(૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની બી.સી.એ વિષય ચલાવતી સ્નાતક કક્ષાની સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓ તરફ

નકલ જાણ અર્થે રવાના:-

૧. માન.કુલપતિશ્રી/કુલસચિવશ્રીના અંગત સચિવ

નકલ રવાના (યોગ્ય કાર્યવાહી અર્થે):-

૧. પરીક્ષા વિભાગ   ૨. પી.જી.ટી.આર.વિભાગ   ૩. જોડાણ વિભાગ

SAURASHTRA UNIVERSITY

RAJKOT – INDIA

CURRICULAM

of

4 Year UG Programme

Bachelor of Computer Application (Honours)

&

Bachelor of Computer Application
(Honours with Research)

(Semester - 3 and Semester – 4)

To be effective from June – 2024

B.C.A. (Honours) & B.C.A. (Honours with Research)
(Semester - 3 and Semester - 4)
Saurashtra University
To be effective from June – 2024

B.C.A. SEM 3

Sr. No.	Type of Course	Course Title	Credit	CCE	SEE	Total
1	MAJOR	CS-15: C++ and Object Oriented Programming	4	50	50	100
2	MAJOR	CS-16: RDBMS Using Oracle	4	50	50	100
3	MAJOR	CS-17: Content Management System Using Wordpress	4	50	50	100
4	MDC	CS-18: Practical Based on CS -15, CS -16, CS -17	4	50	50	100
5	AEC	CS-19: Open Source Tools	2	25	25	50
6	SEC	CS-20: Network Technology and Administration	2	25	25	50
7	IKS	CS-21: Constitutional Values and Fundamental Duties	2	25	25	50
			22	**300**	**250**	**550**

B.C.A. SEM 4

Sr. No.	Type of Course	Course Title	Credit	CCE	SEE	Total
1	MAJOR	CS-22: Programming with Java	4	50	50	100
2	MAJOR	CS-23: Programming with C#	4	50	50	100
3	MAJOR	CS-24: Operating Systems Concepts with Unix/Linux	4	50	50	100
4	MINOR	CS-25: Practical Based on CS-22, CS –23, CS-24	4	50	50	100
5	AEC	CS-26: Fundamentals of IoT	2	25	25	50
6	SEC	CS-27: Web Searching Technology and Optimization	2	25	25	50
7	VAC	CS-28: Digital Empowerment	2	25	25	50
			22	**300**	**250**	**550**

CCE = Continuous and Comprehensive Evaluation, SEE = Semester End Evaluation

B.C.A. (Semester – 3)

Sr. No.	Type of Course	Course Title	Credit
1	MAJOR	**CS-15:** C++ and Object-Oriented Programming	4
2	MAJOR	**CS-16:** RDBMS Using Oracle	4
3	MAJOR	**CS-17:** Content Management System Using Wordpress	4
4	MDC	**CS-18:** Practical Based on CS -15, CS -16, CS -17	4
5	AEC	**CS-19:** Open Source Tools	2
6	SEC	**CS-20:** Network Technology and Administration	2
7	IKS	**CS-21:** Constitutional Values and Fundamental Duties	2
		Total Credits of Semester 3	**22**

CS-15: C++ and Object Oriented Programming		

Objectives:
- To provide OOP concepts, Input / Output data management, arrays in C++, functions, classes, objects, pointers and much more.
- Object-Oriented features, which allow the programmer to create objects within the code.

Prerequisites:
- Concepts of OOPs and their implementation.

Unit No.	Topic	Detail

1	**Principles of Object Oriented Programming Tokens, and Control Statements**	• Procedure – oriented programming
		• Object oriented programming paradigm
		• Basic concepts of object-oriented Programming
		• Benefits of object-oriented programming
		• Application of object-oriented programming
		• What is C++?
		• Application of C++
		• Input/output operators
		• Structure of C++ program
		• Introduction of namespace
		• Tokens:
		    keywords,
		    identifiers,
		    basic data types,
		    user- defined types,
		    derived data types,
		    symbolic constants,
		    type compatibility,
		    declaration of variables,
		    dynamic initialization of variables,
		    reference variables
		• Operators in C++:
		    ▪ scope resolution operator,
		    ▪ member referencing operator,
		    ▪ memory management operator,
		    ▪ manipulators
		• Control structures
		    ▪ Conditional control structure:
		      simple if, if…else , nested if else, switch etc.
		    ▪ Looping control structure:
		      for, while , do…while

	Functions in C++	• The main function • Call by reference

		• Return by reference • Inline function • Default arguments • Const arguments • Functions overloading
2	**Classes and Objects, Constructor and Destructor**	• C structures revisited • Specifying a class • Local Classes • Nested Classes • Defining member functions, nesting of Member functions, private member function, making outside function inline • Arrays within a class • Memory allocation for objects • Static data member • Static member functions • Arrays of objects • Objects as function arguments • Friendly functions • Returning objects • Const member function • Pointer to members
		• Characteristics of constructor • Explicit constructor • Parameterized constructor • Multiple constructor in a class • Constructor with default argument • Copy constructor • Dynamic initialization of objects • Constructing two dimensional array • Dynamic constructor • MIL, Advantage of MIL • Destructors
3	**Operator Overloading and type conversion, Inheritance**	• Concept of operator overloading • Overloading unary and binary operators • Overloading of operators using friend Function • Manipulation of string using operators • Rules for operator overloading • Type conversions • Comparison of different method of conversion • Defining derived classes • Types of inheritance (Single, Multiple, Multi-level, Hierarchical, Hybrid) • Virtual base class & Abstract class

		• Constructors in derived class • Application of Constructor and Destructor in inheritance • Containership, Inheritance V/s Containership
4	**Pointer, Virtual Functions and Polymorphism, RTTI Console I/O Operations**	• Pointer to Object • Pointer to derived class • this Pointer • Rules for virtual function • Virtual function and pure virtual function • Run Time Type Identification (RTTI) • C++ Streams • C++ Stream Classes • Unformatted and formatted I/O operations • Use of Manipulators.

5	**Working with Files, Exception Handling, Introduction to Template STL**	• File Stream Classes
		• Opening and closing a file
		• Error Handling
		• File Modes
		• File Pointers
		• Sequential I/O operations
		• Updating a file (Random access)
		• Command Line Arguments
		• Overview of Exception Handling
		  • Need for Exception Handling
		  • various components of exception handling
		• Introduction to templates
		  • Class templates and Function templates
		  • Member function templates
		  • Overloading of template function
		  • Non-type Template argument
		• Introduction to STL
		  • Overview of iterators, containers

Seminar   -   5 Lectures
Expert Talk   -   5 Lectures
Test   -   5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:
▪ Complete Reference C++ by Herbert Schildt McGraw Hill Publications
▪ Computer Science- A Structured approach using C++ by Forouzan, Gilburg, THOMSON
▪ Object Oriented Programming in C++ - E.Balagurusamy, BPB
▪ Object Oriented programming in C++ by Robert Lafore, Pearson Education
▪ Mastering C++ - Venugopal
▪ The C++ Programming Language by Bjarne Stroustrup, Pearson Education

- Object Oriented Programmin in C++ - Robaret Laphore
- Let us C++ - Yashvant Kanitkar, BPB

Course Outcomes:

- Understand the concept and underlying principles of Object-Oriented Programming.
- Understand implementation issues related to object-oriented techniques.
- Apply the techniques of object-oriented programming to solve real problems
- Analyze, apply and write programs that make appropriate use of object-oriented functionality such as classes, overloading and inheritance
- Implement the file handling techniques for back-end storage problems solutions

CS-16: RDBMS Using ORACLE

Objectives:
- To provide the basic concept, theory and practices in design and implementation of DBMS.
- To be able to handling different type of data transaction by using SQL commands.

Prerequisites:
- Theoretical as well as practical knowledge of database management system.

Unit No.	Topic	Detail
1	**DBMS Overview, SQL, SQL *PLUS**	• Introduction to DBMS and RDBMS • Dr. E. F. Codd Rules • Importance of E. R. Diagram in RDBMS • Normalization • Introduction to SQL • SQL Commands and Datatypes • Introduction to SQL *PLUS • SQL *PLUS formatting commands • Operator and Expression • SQL v/s SQL *PLUS

2	**Managing Tables and Data, Data Control and Transaction Control Command**	• Creating, Altering & Dropping tables
		• Data Manipulation Command like Insert, update, delete
		• Different type of constraints and applying of constraints
		• SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operators like IN, ANY, ALL, BETWEEN, EXISTS, LIKE
		• Join (Inner join ,outer join, self join)
		• subquery, minus, intersect, union
		• Built in functions
		    Numeric Functions: abs, ceil, cos, decode, exp, floor, greatest, least, log, max, min, rem, round , sin, sqrt, tan, trunc
		    Character Functions: chr, concat, initcap, lower, lpad, ltrim, replace, rpad, rtrim, substr, trim, upper
		    Date Functions: add_months, last_day, next_day, months_between, round (date), sysdate, trunc (date), systimestamp, to_date, to_char
		    Aggregate Functions: Sum, Count, AVG, MAX, MIN
		• Creating user & role
		• Grant, Revoke command
		• What is transaction?
		• Starting and Ending of Transaction Commit, Rollback,

		SavePoint
3	**Other Oracle Database Objects, Concurrency control using lock**	• View • Sequence • Synonyms • Database Links • Overview of Index and their types • Cluster • Snapshot • Locks, Overview of Locking Issues, Lock types
4	**Introduction to PL/SQL, Advanced PL/SQL**	• SQL v/s PL/SQL • PL/SQL Block structure • Language construct of PL/SQL (Variable, Basic and Composite Data Type, Conditions, Looping etc.) • %Type and %Rowtype • Using Cursor (Implicit, Explicit) • Exception Handling • Creating and Using Procedure • Package • Trigger • Creating Objects • Object in Database – Table • PL/SQL Tables, Nested Tables, Varrays
5	**Oracle Database Structure**	• Instance Architecture • Creating and Altering Database • Opening and shutdown Database • Initialization Parameter • Control Files, Redo Log Files • Concept of Tablespace • Rollback Segment • Import • Export • SQL *Loader

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures (Managing a Multitenant Environment using Oracle 12c)
Test   - 5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:

- Oracle Database 12c The Complete Reference (Oracle Press) by Bob Bryla , Kevin Loney – Oracle Press
- Oracle Database 12c SQL – Jason Price – Oracle Press
- Oracle Database 12c PL/SQL Programming by McLaughlin – Oracle Press
- SQL, PL/SQL The programming - Lang.Of Oracle Ivan Bayross – BPB

Course outcomes:

- Describe the fundamentals of data design and relation database concepts
- Design entity-relationship diagrams to represent database application scenarios
- Develop relational database
- Apply normalization techniques on relational database
- Describe the knowledge of transaction processing and various concurrency problems
- Apply knowledge of SQL queries to perform various database related operations
- Develop various PL/SQL programs

CS-17: Content Management System using WordPress

Objectives:
- Learn how to create custom themes and pages
- Work with custom post types and taxonomies
- In detail knowledge of the WordPress CMS backend
- Working with widgets and widget areas
- Working in default cms functions and extending its core

Prerequisites:
- Basic knowledge of web development and CMS

Unit No.	Topic	Detail
1	**Introduction, Installation & Configuration**	• What is Content Management System (CMS)? - Introduction of Wordpress - Features of Wordpress • Advantages & Disadvantages of Wordpress - Installation of Wordpress. - Wordpress Directory & file structure. - Dashboard overview - How to add, edit and delete page, category, post, tag. - Add new media file (image, pdf, doc etc.) & attach to post page. or • Gutenberg Introduction - Gutenberg Blocks (Paragraph, Heading, Subheading, Quote, Image, Cover Image, Gallery, Video, Audio, Columns, Code, List, Button, Embeds) • User Roles and Capabilities. - Setting (General, writing, Reading, Discussion, Media, Permalinks) • Updating Wordpress - One-click Update - Manual Update • Database Structure
2	**Theme**	• What is Theme? • How to install & activate theme • Theme Customize Options (Site Identity, Menus, Widgets, HomePage Settings, Additional CSS)
3	**Widget**	• What is widget & widget areas? • Widget Management - Available Widgets (Archive, Calendar, Categories, Navigation Menu, Meta, Pages, Recent Comments, Recent Posts, RSS, Search, Tag Cloud, Text, Image Gallery, Video, Audio, Custom HTML) • Inactive Sidebar (not used)

		• Inactive Widgets

	Plugin	• What is plugin?
		• How to install and activate plugin
		• Useful plugins for website
		  - SEO Yoast
		  - Contact Form 7
		  - WooCommerce
		  - WP Super Cache
		  - Regenerate Thumbnails
		  - Advanced Custom Fields
		  - All-in-One WP Migration
		  - Custom Post Type Widgets
		• Inactive Sidebar (not used)
		      Inactive Widgets

4	**Theme Development**	• Anatomy of a Theme: header.php, footer.php and sidebar.php
		
		• Template Files
		(style.css, index.php, page.php, home.php, archive.php, single.php, comments.php, search.php, attachment.php, 404.php, category.php, tag.php, author.php, date.php)
		
		• The Loop (have_posts (), the_post())
		
		• Template Tags
		  o General tags
		(wp_head(), get_footer(), get_header(), get_sidebar(), get_search_form(), bloginfo(), wp_title(), single_post_title(), wp_footer(), comments_template(), add_theme_support(), get_template_directory_uri(), body_class())
		
		  o Author tags
		(the_author(), get_the_author(), the_author_link(), get_the_author_link(), the_author_meta(), the_author_posts())
		
		  o Category tags
		(category_description(), single_cat_title(), the_category())
		
		  o Link tags
		(the_permalink(), get_permalink(), home_url(), get_home_url(), site_url(), get_site_url())
		
		  o Post tags
		(the_content(), the_excerpt(), the_ID(), the_tags(), the_title(), get_the_title(), the_date(), get_the_date(), the_time(), next_post_link(), previous_post_link(), posts_nav_link(),

		post_class()) o Post Thumbnail tags (has_post_thumbnail(), get_post_thumbnail_id(), the_post_thumbnail(), get_the_post_thumbnail()) o Navigation Menu tags (wp_nav_menu()) o Conditional Tags (is_archive(), is_category(), is_front_page(), is_home(), is_page(), is_single(), is_search(), is_attachment(), is_active_sidebar()) • functions.php file
5	**Advanced Development**	• Advanced Functions - add_action(), add_filter(), add_shortcode(), do_shortcode(), register_nav_menu() • Custom Post Types - Register_post_type(), register_taxonomy(), Display custom post type & taxonomy • Widget Area - register_sidebar(), dynamic_sidebar()

Seminar   -   5 Lectures
Expert Talk   -   5 Lectures
Test   -   5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:
- Build Your Own Wordpress Website: An ultimate guide for small business owners paperback by Wordpress Genie
- Teach Yourself VISUALLY Wordpress paperback – by George Plumley 3rd Edition.
- Wordpress for Beginners: A visual step-by-step guide to Mastering Word press Paperback – by Dr. Andy Williams.
- Wordpress to Go: How to build a Wordpress website on your own domain, from scratch, Even if you are a complete beginner paperback – by Sarah Mcharry (Author)

Course outcomes:
- Work with and configure the cms backend
- Know when to use a custom post type or custom field
- Extend the Wordpress cms core to match requirements
- Create stunning dynamic themes

	CS – 18 Practical Based on CS - 15, CS- 16 and CS -17	

Objectives:
- To apply theoretical concepts through practical application.
- To develop practical skills in various aspects of OOP, DBMS and framework usages like WordPress.

Prerequisites:
- Knowledge of OOP
- Knowledge of DBMS
- Knowledge of Basic Web Development

No	Topics	Details
1	**Functions in C++, Classes, Inline Function, Friend Function, Special Member Function**	➢ Practically implementation of C++ and OOP which includes: • Inline Function • Default Arguments • Return by Reference • Friend Function • Private Member Function • Constructor • Multiple Constructor in a class • MIL
2	**Inheritance, Compile Time Polymorphism, Run Time Polymorphism, Exception Handling**	➢ Practically implementation of C++ and OOP which includes: • Inheritance • Operator Overloading • Type Conversion • Virtual Base Class • Virtual Function • Pure Virtual Function • Manipulators • Exception Handling

3	**DML Commands, Constraints, Joins, Subquery, Built-in Functions**	➢ Practically implementation of RDBMS Using Oracle which includes: • DDL, DCL, DML and TCL Statements • Constraints • Joins • Subquery • Built-in Functions • View
4	**Sequence, PL/SQL Objects**	➢ Practically implementation of RDBMS Using ORACLE which includes: • Sequence • PL/SQL Block • Cursor • Trigger • Package • Nested Table
5	**CMS using WordPress**	➢ Designing of Web site in WordPress which includes: • Post • Pages • Plugins • Theme Creation • Widgets • Working with Functions.php • Shortcode • Custom Post Types

Course Outcomes:

- Able to get knowledge about a comprehensive understanding of Object-Oriented Programming and their features.
- Able to gain practical experience in designing WordPress website including posts, pages, theme creation etc.
- Student will able to implement RDBMS features like procedure, trigger, view and other PL/SQL objects
- Student will get practical skills in OOP, WordPress website design, and implementation of RDBMS features using Oracle.

	CS – 19 Open Source Tools	

Objectives:
- Understanding Open Source Philosophy
- Identify and explore a range of open source tools.
- Understand the collaborative nature of open source development and the role of communities.
- Learn how to contribute to open source projects through code contrictions, documentation, bug reporting etc.

Prerequisites:
- Basic Computer Skills
- Basic knowledge of Version Control

No	Topics	Details

1	**Open Source Softwares**	• Understanding Open Source Software
		   • Definition
		   • Principles
		   • History and evolution
		• Open-Source Licensing
		   • Overview
		   • Rights and responsibilities of users and developers under open source licenses
		   • Contracts & licenses and related issues
		• Application of Open sources
		• Open Sources Operating System:
		   • FEDORA
		   • UBUNTU

2	**Open Source Development and Collaboration**	• Version Control with Git
		   • Introduction to version control systems.
		   • Git fundamentals, repositories, commits, branches and merges
		• Open Source Project Management
		   • Overview of Project Management Methodologies (Agile)
		   • Tools for Project Planning, Task Tracking and Team Collaboration (Trello)
		   • Contributing to open source projects: Issue Tracking, Pull Requests, Code Reviews.

3	**Case Studies**	• Apache • Linux Operating System

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures
Test   - 5 Lectures

Total Lectures 30 + 15 = 45

Reference Books:
- "Producing Open Source Software: How to Run a Successful Free Software Project" by Karl Fogel
- "Git Pocket Guide: A Working Introduction" by Richard E. Silverman
- "The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr, and George Spafford
- KailashVadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt. Ltd 2012, 1st Edition.
- Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.

Course Outcomes:
- Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves
- Use appropriate open source tools based on the nature of the problem
- Write code and compile different open-source software.

		CS – 20 NETWORK TECHNOLOGY AND ADMINISTRATION

Objectives:
- Build an understanding of the fundamental concepts of computer networking.
- Familiarize with the basic taxonomy and terminology of the computer networking area and advanced networking.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

Prerequisites:
- Basic knowledge of computer networking.

No	Topics	Details
1	**Basics of Network, Network Models and LAN Sharing**	• Network concepts o What is network? o Use of network • Network model: peer – to – peer, client – server • Network Services o File service, o Print service, o Comm. service, o Data base service, o Security service, o Application service • Network Access Methods o CSMA / CD, o CSMA / CA, o Token passing, o Polling • Network Topologies: Bus, Ring, Star, Mesh, Tree, Hybrid • Advanced Network Topologies Ethernet, CDDI, FDDI • Communication Methods o Unicasting, o Multicasting, o Broadcasting • OSI reference model with 7 layers • TCP/IP network model with 4 layers
2	**Transmission Media Multiplexing & Switching Concepts Network devices**	• Transmission Media o Types of Transmission media o Guided media o Co – Axial Cable, Twisted Pair Cable, o Crimping of Twisted pair cable, Fiber Optic Cable • Unguided media o Infrared, Laser, Radio, Microwave, Bluetooth tech.

		- Different Frequency Ranges - Multiplexing & De-multiplexing - Multiplexing Types - FDM, - TDM, - CDM, - WDM - Switching Tech. - Circuit Switching, - Message Switching, - Packet Switching - CABLE NETWORK DEVICES - LAYER1 DEVICES - LAN CARD, - MODEM, - DSL & ADSL - HUB(Active, Passive, Smart hub), REPEATER - LAYER2 DEVICES - SWITCH(Manageable, non- manageable) - BRIDGE(Source route, Transactional) - LAYER3 DEVICES - ROUTER, - LAYER3 SWITCH - BROUTER, - GATEWAY, - Network Printer - WIRELESS NETWORK DEVICES - Wireless switch, - Wireless router, - ACCESSPOINT
3	**Network Protocols and IP Addressing**	- Packets &Protocols - Conn. Oriented protocols –TCP & connection less Protocols - UDP - TCP/IP STACK, HTTP, FTP, SMTP, POP3, SNMP, - TELNET, ARP, RARP, IPX/SPX, AppleTalk, - NetBIOS Name PROTOCOL - L2CAP, RFCOMM Protocol - What is ip address? - Types of ip address - ipv4 - Class structure, subneting, super netting - ipv6 - Basic structure of ipv6

		o Implementation of ipv6
		• Migration from ipv4 to ipv6

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures
Test   - 5 Lectures

Total Lectures 30 + 15 = 45

Reference Books:
- Networking Essential - Glenn Berg Tech. Media
- MCSE Self-Paced Training Kit (Server 2003) Data Communication and Networking - B A Forouzan
- Networking Essential - Glenn Berg Tech. Media
- MCSE Self-Paced Training Kit (Server 2003)
- Data Communication and Networking - B A Forouzan

Course outcomes:
- Understand various types of computer networks
- Enumerate the layers of the OSI model and TCP/IP
- Understand principles of LAN design such as topology and configuration
- Apply transmission media and various networking devices to establish networks
- Compare and Analyze various spread spectrum and multiplexing techniques
- Understand network industry trends such as: Routing Protocols, IP Addresses, Error Detection

CS – 21 Constitutional Values and Fundamental Duties		

Objectives:
- Enrich students with knowledge and relevance of the Constitution.
- Develop awareness about Duties and Values
- Inculcate a sense of Constitutionalism in thought and action.

Prerequisites:
- Fundamentals of constitution.

No	Topics	Details
1	The Constitution of India – an Introduction	• Federal Republic, Rule of Law, Separation of Powers • Sovereignty, Democracy • Secularism and Sarva Dharma Sama Bhava
2	Fundamental Duties	• Understanding Fundamental duties and their constitutional significance • Fundamental duties – Article 51A [(a) – (k)] • Analysis of UCCA • Overview of Article 370 and its implications
3	Constitutional Values	• Justice: Social, Political, Economic • Liberty: Thought, Expression, Belief, Faith, Worship • Equality: Equality before law & equal application of laws

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures
Test   - 5 Lectures

Total Lectures 30 + 15 = 45

Reference Books:
- Durga Das Basu, et al., introduction to the Constitution of India (LexisNexis, 26th edn, 2022().
- Mahendra Pal Singh, V. N. Shukla's Constitution of India, (Eastern Book Company, Laucknow, 13th revised edn. 2017)
- Leila Seth, We, the Children of India: The Preamble to Our Constitution (New Delhi, Puffin Books, Penguin Books India, 2010)

Course Outcomes:
- Understand the Constitution and its relevance.
- Appreciate the values and goals embedded in Constitution.
- Recognise the importance of fundamental duties enshrined in the Constitution.
- Apply the spirit of fundamental values and duties in everyday national life.

B.C.A. (Semester – 4)

Sr. No.	Type of Course	Course Title	Credit
1	MAJOR	**CS-22:** Programming with Java	4
2	MAJOR	**CS-23:** Programming with C#	4
3	MAJOR	**CS-24:** Operating Systems Concepts with Unix/Linux	4
4	MINOR	**CS-25**: Practical Based on CS-22, CS – 23, CS-24	4
5	AEC	**CS-26:** Fundamentals of IoT	2
6	SEC	**CS-27:** Web Searching Technology and Optimization	2
7	VAC	**CS-28:** Digital Empowerment	2
		Total Credits of Semester 4	**22**

CS-22: Programming with Java

Objectives:
- To provide fundamental concepts of Object-Oriented Programming and familiar with Java environment and its applications.
- To be able to understand control structures, classes, methods and argument passing and iteration graphical user interface basics programming and documentation style.

Prerequisites:
- Basic knowledge of object-oriented approach in programming with basic skills using Java.

Unit No.	Topic	Detail
1	**History, Introduction and Language Basics, Classes and Objects**	• History and Features of Java • Java Editions • JDK, JVM and JRE • JDK Tools • Compiling and Executing basic Java Program • Java IDE (NetBeans and Eclipse) • Data Type (Integer, Float, Character, Boolean) • Java Tokens: Keyword, Literal, Identifier, Whitespace, Separators, Comments, Operators: • Operators: Arithmetic, Relational, Boolean Logical, Bitwise Logical, Assignment, Unary, Shift, Special operators • Java Keywords (assert, strictfp, enum) • Type Casting - Decision Statements (if, switch) • Looping Statements (for, while, do..while) • Jumping Statements (break, continue, return) • Array (One Dim., Rectangular, Jagged) • Command Line Argument Array
		• OOP Concepts (Class, Object, Encapsulation, Inheritance, Polymorphism) • Creating and using Class with members • Constructor • finalize() method • Static and Non-Static Members • Overloading (Constructor & Method) • Varargs, IIB (Instance Initialization Block) in Java

2	**Inheritance, Java Packages**	• Universal Class (Object Class)
		• Access Specifiers (public, private, protected, default, private protected)
		• Constructors in inheritance
		• Method Overriding
		• Interface, Object Cloning,
		• Nested and Inner Class
		• Abstract and Final Class
		• Normal import and Static Import
		• Introduction to Java API Packages and imp. Classes
		    o java.lang,
		    o java.util
		    o java.io,
		    o java.net
		    o java.awt,
		    o java.awt.event
		    o java.applet,
		    o java.swing
		• java.lang Package Classes (Math, Wrapper Classes, String, StringBuffer)
		• java.util Package Classes (Random, Date, GregorianCalendar, StringTokenizer, Collection in Java
		• Vector, HashTable, LinkedList, SortedSet, Stack, Queue, Map
		• Creating and Using UserDefined package and sub-package

3	**Exception Handling, Threading and Streams (Input and Output)**	• Introduction to exception handling • try, catch, finally, throw, throws • Creating user defined Exception class - Thread and its Life Cycle (Thread States) • Thread Class and its methods • Synchronization in Multiple Threads (Multithreading) • Deamon Thread, Non-Deamon Thread
		• Stream and its types (Input, Output, Character, Byte) • File and RandomAccessFile Class • Reading and Writing through Character Stream Classes (FileReader, BufferedReader, FileWriter, BufferedWriter) • Reading and Writing through Byte Stream Classes (InputStream, FileInputStream, DataInputStream, OutputStream, FileOutputStream, DataOutputStream) • StreamTokenizer Class • Piped Streams, Bridge Classes: InputStreamReader and OutputStreamWriter • ObjectInputStream, ObjectOutputStream
4	**JavaFx Basics and**	• Basic Structure of JAVAFX program,

	Event-driven programming and animations	• Panes, • UI Control and Shapes, • Property binding, • the Color and the Font class, • the Image and Image-View class, • layout panes and shapes, • Events and Events sources, • Registering Handlers and Handling Events, • Inner Classes, anonymous inner class handlers, • mouse and key events, • listeners for observable objects, • animation
5	**JavaFx UI controls and multimedia**	• Labeled and Label • Button • Checkbox • Radiobutton • Textfield • Textarea • Combobox • Listview • Scrollbar • Slider • Video and Audio

Seminar	-	5 Lectures
Expert Talk	-	5 Lectures
Test	-	5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:
▪ Java: A Beginner's Guide – Jul 2014 by Herbert Schildt
▪ Java Programming (Oracle Press) by Poornachandra Sarang
▪ Java The Complete Reference, 8th Edition – by Herbert Schildt
▪ Ivor Horton's "Beginning Java 2" JDK 5 Edition, Wiley Computer Publishing.
▪ Ken Arnold, James Gosling, David Holmes, "The Java Programming Language", Addison-Wesley Pearson Education
▪ JavaFx A Beginners Guide by J. F. DiMarzio, McGraw Hill Computing
▪ Getting Started with JavaFx by Oracle:
  https://docs.oracle.com/javase/8/javafx/JFXST.pdf
▪ James Gosling, Bill Joy, Guy Steele, Gilad Bracha, "The Java Language Specifications", Addison-Wesley Pearson Education (3rd edition) Download at
  http://docs.oracle.com/javase/specs/

Course outcomes:

- Understand basic concepts and Java Programming Constructs
- Demonstrate Object Oriented Programming Concepts using JAVA
- Develop robust application by demonstrating professionally acceptable coding
- Design attractive user interface using AWT

CS-23: Programming with C#

Objectives:
- Demonstrate knowledge of object-oriented concepts design, user experience and functional requirements C# .Net Application.

Prerequisites:
- Basic knowledge of C# programming language and .Net environment.

Unit No.	Topic	Detail
1	**.NET Framework, and Visual Studio IDE, Language Basics**	- Introduction to .Net Framework - Features / Advantages - CLR, CTS and CLS - BCL / FCL / Namespaces - Assembly and MetaData - JIT and types - Managed Code and Unmanaged Code - Introduction to .NET Framework and IDE versions - Different components (windows) of IDE - Types of Projects in IDE: Console, Windows, Web, Setup, etc. - Data Types: Value Type & Reference Type - Boxing and UnBoxing - Operators: Arithmetic, Relational, Bitwise, etc. - Arrays: One Dimensional, Rectangular, Jagged - Decisions: If types and switch case - Loops: for, while, do..while, foreach
2	**Class and Inheritance, Property, Indexer, Pointers, Delegates, Event, Collections**	- Concept of Class, Object - Encapsulation, Inheritance, Polymorphism - Creating Class and Objects - Methods with "ref" and "out" parameters - Static and Non-Static Members - Constructors - Overloading Constructor, Method and Operator - Inheritance - Sealed Class & Abstract Class - Overriding Methods - Interface inheritance - Creating and using Property - Creating and using Indexer - Creating and using Pointers (unsafe concept) - Creating and using Delegates (Single / Multicasting) - Creating and using Events with Event Delegate - Collections: ArrayList, HashTable, Stack, Queue, SortedList

		and their differences.
3	**Windows Programming**	• Creating Windows Application • MessageBox class with all types of show() method • Basic Introduction to Form and properties • Concept of adding various Events with event parameters • Different Windows Controls o Button, o Label o TextBox, o RadioButton o CheckBox, o ComboBox o ListBox, o PictureBox o ScrollBar, o TreeView • Menu: MenuStrip, ContextMenuStrip, ToolStrip o Timer o Panel and GroupBox • Dialog Boxes o ColorDialog, o FontDialog, o SaveFileDialog o OpenFileDialog • MDI Concept with MDO Notepad • Concept of Inheriting Form

4	**Database Programming with ADO .NET**	- Concept of Connected and Disconnected Architecture - Data Providers in ADO.NET - Connection Object - Connected Architecture: - Command, - DataReader - Disconnected Architecture: - DataAdapter, - DataSet, - DataTable, DataRow, DataColumn, - DataRelation, DataView Data Binding - GridView Programming
5	**User Controls (Components), Crystal Reports, Setup Project**	- Creating User Control with Property, Method, Event - Using User Control in Windows, - Creating Crystal Reports , Types of Reports - Report Sections - Formula, Special Field and Summary in Report - Types of Setup Projects - Creating Setup Project

Seminar	-	5 Lectures
Expert Talk	-	5 Lectures
Test	-	5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:
- Pro C# 5.0 and .NET 4.5 Framework (By: Andrew Troelse)
- Head First C# - (By: Jennifer Greene, Andrew Stellman)
- C# 5.0 Unleased – (By: Bart De Smet)
- Adaptive Code Via C# - (By: Gary McLean Hall)
- C# .NET Programming Black Book – Steven Holzner – Dreamtech Publications
- Introduction to .NET Framework – Wrox Publication
- Microsoft ADO .NET – Rebecca M. Riordan, Microsoft Press

Course outcomes:
- Use the Microsoft Visual Studio development environment to create a windows application
- Understand the basics of object-oriented programming, CLR and .NET framework
- Demonstrate C# programming constructs to solve given problem
- Perform CRUD operations in windows application
- Use the trace and debug utility that are provided with Visual Studio .NET
- Develop, configure and deploy windows application

	CS-24: Operating Systems Concepts with Unix / Linux

Objectives:
- To provide the basic feature, function and interface with the hardware and application software to run the computer smoothly.

Prerequisites:
- Basic knowledge of operating system and it's functionality along with its types

Unit No.	Topic	Detail
1	**Introduction, Process and Thread, Process Scheduling**	• Meaning of OS • Functions of OS • Features of OS • OS Types (User Point of View) • OS Types (Features Point of View)

		• Process Definition
		 • Process States
		 • Process State Transitions
		 • Process Control Block
		 • Context Switching
		 • Threads
		    o Concept of multithreads
		    o Benefits of threads
		    o Types of threads

		• Types of Schedulers • CPU Scheduling Algorithms • FCFS • SJN • Round Robin • Priority Base Non-Preemptive • Priority Base Preemptive
2	**Deadlocks, Memory Management**	• Deadlocks: Definition • Deadlock Prevention • Deadlock Avoidance • Deadlock Detection • Physical Memory and Virtual Memory • Memory Allocation • Internal and External fragmentation • Contiguous Memory Allocation • Noncontiguous Memory Allocation • Virtual Memory Using Paging • Virtual Memory Using Segmentation

3	**Getting Started with Unix, Unix Shell Command**	- Unix Architecture - Unix Features - Types Of Shell (C, Bourn, Korn) - Unix File System - Types Of Files - Ordinary Files - Directory Files - Device Files - Unix File & Directory Permissions
		- Connecting Unix Shell : Telnet - Login Commands passwd, logout, who, who am i, clear,uname - File / Directory Related Command ls, cat, cd, pwd, mv, cp, ln, rm, rmdir, mkdir, chmod, chown, chgrp, find, more, less, head, tail, wc, touch, stat, alias, type - Operators in Redirection & Piping <, >, <<, >>, | - Finding Patterns in Files grep, fgrep, egrep - Working with columns and fields cut, paste, join - Tools for sorting :sort, uniq - Comparing files : cmp, comm, diff - Changing Information in Files: tr, sed - Examining File Contents : od - Tools for mathematical calculations: bc, factor - Monitoring Input and Output :tee, script - Tools For Displaying Date and Time: cal, date - Communications : telnet, ping - Process Related Commands: ps, sleep
4	**Text Editing with vi and nano Editor, Shell Programming**	- Introduction of vi editor - Modes in vi - Switching mode in vi - Cursor movement - Screen control commands - Entering text, cut, copy, paste in vi editor - Introduction of nano editor
		- Shell Keywords - Shell Variables - System variables PS2, PATH, HOME,LOGNAME, MAIL, IFS, SHELL, TERM, MAILCHECK

		• User variables set, unset and echo command with shell variables • Positional Parameters • Interactive shell script using read and echo • Decision Statements o if then fi o if then else fi o if then elif else fi o case esac • test command • Logical Operators • Looping statements o for loop o while loop o until loop o break, continue command • Array • Function • Various shell script examples
5	**Getting Started with Linux, Linux Booting, Linux Admin (Ubuntu)**	• History of Linux • GNU, GPL Concept • Open Source & Freeware • Structure and Features of Linux • Installation and Configuration of Linux o Using with Ubuntu • Startup, Shutdown and boot loaders of Linux
		• Linux Booting Process o LILO Configuration o GRUB Configuration
		• Creating Linux User Account and Password • Installing and Managing Samba Server • Installing and Managing Apache Server • Configure Ubuntu's Built-In Firewall • Working with WINE

Seminar   -   5 Lectures
Expert Talk   -   5 Lectures
Test   -   5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:
- Operating System Concept, Abraham Silberschatz, Peter B. Galvineg Gagne, Wiley-Indian Edition, 9th Edition

- Operating Systems, Internals and Design Principles, William Stallings, Seventh Edition
- Unix Shell Programming – Y. Kanetkar – Bpb Publications
- Unix Concepts and Applications – Sumitabha Das
- The complete reference Linux, Richard Petersen, McGraw Hill, Sixth Edition

Course outcomes:
- Understand design and implementation aspects of modern operating system
- Acquire knowledge of four major OS components: process management, memory management, file systems, and input/output mechanisms
- Analyze and compare various process scheduling algorithms
- Learn the concepts, design, and structure of the UNIX operating system
- Design shell scripts using various UNIX utilities

Hands-On (Not to be asked in the examination):
- Installation of Unix / Linux
- User and Group Creation
- Demo of Various Applications available in Unix / Linux like Star Office, Games and other productivity tools
- Demo of GNOME, KDE Desktops in Linux

No	Topics	Details
	CS – 25 Practical Based on CS - 22, CS- 23 and CS -24	
	Objectives:	

Objectives:
- To apply theoretical concepts through practical applications.
- To develop practical skills in various aspects of JAVA, C# .Net and Shell Scripting

Prerequisites:
- Knowledge of Object Oriented Programming
- Knowledge of DBMS
- Knowledge of computer operating

No	Topics	Details
1	**JAVA Basics with OOP Concepts**	➢ Practically implementation of Java Program which includes: • Java Array • Command Line Argument Array • OOP concepts • Java Access Specifiers and Inheritances • IIB and VARARGs in JAVA • Java Packages
2	**JAVA Exception Handling, Threading and JAVAFx**	➢ Practically implementation of Java Program which includes: • Exception Handling • Threading • Classes of JavaFx • JavaFx UI Controls • JavaFx Listeners, Event Handlers • JavaFx Multimedia
3	**C# Basics**	• Practically implementation of C# program which includes: • Jagged Array • Keywords in C# (Ref, out) • Indexers • Delegates • Collections
4	**C# GUI and ADO .NET**	• Practically implementation of C# program which includes: • Windows Controls • Dialog Controls • MDI Form • Connected Architecture • Disconnected Architecture

5	**Unix Shell Script**	• Unix Shell script which includes:
		  • Redirection and piping
		  • File and directory related command
		  • Finding Pattern in Files
		  • Positional Parameters
		  • Decision, Looping Statements in Script
		  • Logical Operators in Script

Course Outcomes:
- Able to get knowledge about a comprehensive understanding of Object Oriented Programming and their features.
- Student will get practical skills in GUI Development, clear the basics of OS, and implementation of shell scripting too.

	CS – 26 FUNDAMENTALS OF IoT	

Objectives:
- Understand the fundamental concepts and principles of the Internet of Things.
- Explore the architecture, components and technologies used in IoT systems.
- Learn about different communication protocols and standards for IoT.
- Gain insights into the design considerations and challenges in developing IoT solutions.
- Acquire practical skills in designing and implementing IoT systems.

Prerequisites:
- Basic knowledge of computer networks and protocols
- Familiarity with programming languages such as C / C++

Unit No.	Topic	Detail
1	**Introduction to IoT**	• Introduction to the Internet of Things (IoT) • History and Evolution of IoT • Key Concepts and Definitions • Applications and Use Cases of IoT • Challenges and Opportunities in IoT
2	**IoT Architecture and Technologies**	• Conceptual Framework • IoT Architecture Overview • Technology behind IoT • Sources of the IoT • M2M Communication • IoT Examples

3	**Hardware for IoT**	• Sensors
		 • Digital Sensors
		 • Actuators
		 • Radio Frequency Identification (RFID) Technology
		 • Wireless sensor networks
		 • Overview of IoT supported Hardware platforms:
		     o Arduino
		     o Netduino

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures
Test   - 5 Lectures

Total Lectures 30 + 15 = 45

Reference Books:
- "Internet of Things (A Hands-on Approach)" b Arshdeep Bahga and Vijay Madisetti
- "Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry" by Maciej Kranz
- "Designing Connected Products: UX for Consumer Internet of Things" by Claire Rowland, Elizabeth Goodman, Martin Charlier, Ann Light, and Alfred Lui

Course Outcomes:
- Explain the concept and significance of the Internet of Things in various domains.
- Describe the architecture and components of IoT systems, including sensors, actuators, and communication protocols.
- Analyze different IoT communication protocols and select appropriate protocols for specific IoT applications.
- Identify design considerations and challenges in developing scalable and secure IoT solutions.

	CS – 27 WEB SEARCHING TECHNOLOGY AND OPTIMIZATION	

Objectives:
    1. Understand basic of search engines and reflecting
    2. Understand SEO objectives and defining site audience.
    3. Apply and Implement SEO friendly website with all SEO concept.
    4. Understand keyword research and apply it for website developments.
    5. Understand the new trends of digital technologies.

Prerequisites:
    Basic knowledge of SEO, search engine and E-commerce.

No	Topics	Details
1	**Search Engine Basics and Understanding SEO Objectives**	• The Mission of Search Engines & Market Share • Human Goals of Searching & Determining Searcher Intent • How People Search & How Search Engines Drive Commerce • Eye Tracking & Click Tracking: Natural vs. Paid • Understanding Search Engine Results & Algorithm-Based Ranking Systems • Determining SEO Objectives & Setting Goals • Understanding Audience & Finding Niche • Major Elements of Planning & Identifying Competitors
2	**Implementing SEO-friendly Website**	• Making Site Accessible to Search Engines • Creating Optimal Information Architecture • Root Domains, Subdomains, and Microsites • Optimization of Domain Names/URLs & Keyword Targeting • Content Optimization & Duplicate Content Issues • Controlling Content with Cookies and Session IDs • Content Delivery and Search Spider Control • Redirects & Content Management System (CMS) Issues • Optimizing Flash & Best Practices for Multilanguage/Country Targeting
3	**Keyword Research and Tracking Results**	• Theory Behind Keyword Research & Traditional Approaches • Site Content Analysis & Keyword Research Tools • Determining Keyword Value & Leveraging the Long Tail • Opportunities in Vertical Search & Optimizing for Different Types • Tracking Results & Measuring Success • Measuring Search Traffic & Tying SEO to Conversion and ROI • Competitive and Diagnostic Search Metrics • Performance indicators for Long Tail SEO & Future Trends

		in SEO

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures
Test   - 5 Lectures

Total Lectures 30 + 15 = 45

Course outcomes:
- Understand the main elements that help a website rank organically and in the paid search space in Google.
- Learn how to perform keyword research using Google's free tools.
- Learn how to develop landing pages that are search engine friendly.
- Learn how to carry out inbound linking practices.

Reference Books:

- The Art of SEO : Mastering Search Engine Optimization By Eric Enge, Stephan Spencer, Rand
- Fishkin, Jessie C Stricchiola, O'Reilly Media, 3rd Edition October, 2015
- Google SEO Bible, Beginner's Guide to SEO, ISBN-978-1700098733, moaml mohmmed, 2019
- SEO Warrior: Essential Techniques for Increasing Web Visibility By John I Jerkovic, O'Reilly Media, November, 2009

	CS – 28 Digital Empowerment	
Objectives:		

Objectives:
- Understand the digital world and need for digital empowerment
- Create awareness about Digital India
- Explore, communicate and collaborate in cyberspace
- Building awareness on cyber safety and security

Prerequisites:
- Basic computer literacy and familiarity with Operating System..

Unit No.	Topic	Detail

1	**Digital Inclusion and Digital Empowerment**	• Needs and Challenges
		• Vision of Digital India:
		    ○ DigiLocker
		    ○ E-Hospitals
		    ○ E-Pathshala
		    ○ SHIM
		    ○ E-Kranti (Electronic Delivery of Services)
		    ○ e-Health Campaigns
		• Public utility portals of Govt. of India such as RTI, Health, Finance, Income Tax filing, Education

2	**Communication and Collaboration in the Cyberspace**	• Electronic Communication: electronic mail, blogs, social media • Collaborative Digital platforms • Tools / Platforms for online learning • Collaboration using file sharing, messaging, video conferencing
3	**Towards Safe and Secure Cyberspace**	• Online security and privacy • Threats in the digital world: Data breach and Cyber Attacks • Blockchain technology • Security Initiatives by the Govt. of India

Seminar   - 5 Lectures
Expert Talk   - 5 Lectures
Test   - 5 Lectures

Total Lectures 30 + 15 = 45

Suggested Books, References and Online Resources
- David Sutton, "Cyber Security: A Practitioner's guide", BCS Learning & Development Limited, UK, 2017
- https://www.mha.gov.in/document/downloads/cyber-safety-handbook
- Rodney Jones and Christoph Hafner – "Understanding digital Literacies: A practical Introduction", Routledge Books, 2nd Edition, 2021.

- https://www.digitalindia.gov.in
- https://www.digilocker.gov.in
- https://www.cybersafeindia.in
- https://www.meity.gov.in/cyber-suraskshit-bharat-programme

Course Outcomes:

- Use digital services in daily life.
- Develop skills to communicate and collaborate in cyberspace using social platforms, teaching / learning tools.
- Understand the significance of security and privacy in the digital world.
- Evaluate ethical issues in cyber world.