

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBAHAJINAGAR.



CIRCULAR NO.SU/ B.Sc./NEP/54/2023

It is hereby inform to all concerned that, the syllabus prepared by the Board of Studies & Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology the **Academic Council at its meeting held on 30 November 2023 has accepted the Following Syllabi as per Norms of National Education Policy - 2020** under the Faculty of Science & Technology run to the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith:-

Sr.No.	Courses	Semester
1.	B.A./B.Sc. Statistics	Ist and IInd semester
2.	B.A./B.Sc. Mathematics	Ist and IInd semester
3.	B.Sc.Forensic Science	Ist and IInd semester
4.	Bachelor of Computer Application	Ist and IInd semester
5.	B.Sc. Information Technology	Ist and IInd semester
6.	B.Sc.Automobile Technology	Ist and IInd semester
7.	B.Sc.Electronics	Ist and IInd semester
8.	B.Sc.Networking & Multimedia	Ist and IInd semester
9.	B.Sc.Fisheries Science	Ist and IInd semester
10.	B.Sc.Botany	Ist and IInd semester

This shall be effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajanagar
431 004.

REF.NO.SU/2023/19911-19

Date:- 20.12.2023.

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**Deputy Registrar,
Academic Section.**

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] **The Director, Board of Examinations & Evaluation, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.**
- 2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar
- 3] The Programmer [Computer Unit-1] Examinations, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.
- 4] The Programmer [Computer Unit-2] Examinations, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.
- 6] The Public Relation Officer, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.
- 7] The Record Keeper, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
CHHATRAPATI SAMBAJINAGAR



FACULTY OF SCIENCE & TECHNOLOGY

3 Years B.Sc. Degree /
4 Years B.Sc.(Hons.)
& 4 Years B.Sc. (Hons with Research) Programme

As Per National Education Policy- 2020

Course Structure and Curriculum

(Outcome Based Credit System)

Subject: B.Sc (Information Technology)

To be implemented from academic Year 2024-25

Program Educational Objectives

PEO1

Develop proficiency as Information Technology expert with an ability to create a wide range of IT based applications for Industries, Government or other work environments.

PEO2

Attain the ability to adapt quickly to new environments and technologies, assimilate new information systems

PEO3

Posses the ability to think logically and capacity to understand technical problems with information systems.

PEO4

Posses the ability to collaborate as team members and team leaders to facilitate cutting edge technology solutions for information system and thereby providing improved functionality

Program Specific Outcomes

1. PSO1

Ability to design, develop implement computer programs and use knowledge in various domains to identify research gaps and hence provide solution to new ideas and innovations

2. PSO2

Work with and communicate effectively with professionals in various fields and pursue lifelong professional development in Information Technology

AS PER NEP 2020

Faculty of Science
Course Structure (First Year)
B.Sc. Information Technology Three/Four Year Under Graduate Degree Program
Semester-I

Course Type	Course Code	Course Name	Teaching Scheme (Hrs. /Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory	IT/DSC1/C100	Computer Fundamentals	2		2		2+2+2=06
	IT/DSC2/C101	Operating System-I	2		2		
	IT/DSC3/C102	Practical Based on IT/DSC1/C1 & IT/DSC2/C2		4		2	
Generic Elective (GE) / Open Elective (OE) (Choose any one from pool of courses)	IT/GE1/C103	A. Fundamentals of Mathematics OR B. Google Workspace-I OR C. Principles of Internet	2		2		2+2=04
	IT/GE2/C104	A. Digital Electronics OR B. Basics of HTML OR C. Basics of Computer Hardware	2		2		
VSC (Choose any one from pool of courses)	IT/VSC1/C105	A. Programming in C - I OR B. Python Programming- I OR C. R Programming- I		4		2	2+2=04
SEC (VSEC) (Choose any one from pool of courses)	IT/SEC1/C106	A. Programming Methodology OR B. Basic of Excel OR C. Open Source Tools	2		2		
AEC, VEC, IKS (Ability Enhancement Course)	IT/AEC1/C07	Communication in English- I (Linguistic Approach) (Common Across faculty)	2		2		2+2+2=06
	IT/VEC1/C108	Constitution of India (Common across faculty)	2		2		
	IT/IKS1/C109	Indian Knowledge System (Common across faculties)	2		2		
OJT, FP, CEP, CC, RP	IT/IKS1/C110	Health and Wellness (Common across faculty)		4		2	02
			16	12	16	06	22 Credits

AS PER NEP 2020

Faculty of Science
Course Structure (First Year)
B.Sc. Information Technology Three/Four Year Under Graduate Degree Program
Semester-II

Course Type	Course Code	Course Name	Teaching Scheme (Hrs. /Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major	IT/DSC4/C150	Data Structure	2		2		2+2+2=06
	IT/DSC5/C151	Operating System-II	2		2		
	IT/DSC6/C152	Practical Based on IT/DSC4/C12 & IT/DSC5/C13		4		2	
Minor	IT/M1/C153	Fundamentals of Databases	2			2	02
Generic Elective (GE) / Open Elective (OE) (Choose any one from pool of courses)	IT/GE3/C154	A. Numerical Method B. Google Workspace-II C. Introduction to Web Technology	2		2		2+2=04
	IT/GE4/C155	A. 8086 Microprocessor B. Web Designing using CSS C. Basics of Networking	2		2		
VSC (Choose any one from pool of courses)	IT/VSC2/C156	A. C Programming- II B. Python Programming- II C. R Programming - II		4		2	2+2=04
SEC (VSEC) (Choose any one from pool of courses)	IT/SEC2/C157	A. Web Commercial Elements B. Advance Excel C. Logical Reasoning	2		2		
AEC, VEC, IKS (Ability Enhancement Course)	IT/AEC2/C158	Communication in English- II (Soft Skill Development) (Common Across faculty)	2		2		2+2+2=04
	IT/VEC2/C159	Environmental Education (Common across faculty)	2		2		
OJT, FP, CEP, CC, RP	IT/CC2/C160	Yoga Education / Sports and fitness (Common across faculty)		4		2	02
			16	12	16	06	22 Credits

Semester: I
Course Code: IT/DSC1/C100
Course Title: Computer fundamentals
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 hour

Prerequisite:

1. Students must be able to understand and represent concepts in English language.
2. Students must be aware of the computer systems and how to use them.
3. Students must be capable of performing practices without any difficulties.

Course Objectives: After going through the course students must be capable of the following.

1. Explain the concept of computer functions.
2. Understand different peripheral devices.
3. Basics use of computer systems in day to day life.

Course Outcomes

1. Knowledge of computer fundamental, CPU and its functionalities.
2. Understanding of block diagram of hardware peripherals.
3. Understanding the concepts of software and its types.
4. Understanding the number of system and its conversion between different numbers of systems.
5. Understanding the computer based application such as email and video conferencing.

Unit-I: Computers systems introduction(15 Hours)

Computer system: characteristics and capabilities. Computer software and hardware: Computer Block Diagram , Types of Computers: Analogue, Digital, Hybrid, General and Special Purpose Computers. Generation of Computers. Computer Systems: Micros, Minis & Main-frames. Systems Examples such as IBM servers, Network servers, personal computers, think pads, tablets, etc.

Classification of computer systems: Parallel computers, distributed and clouds. Examples systems such as Enterprise resource planning (ERP), Amazon web services AWS, etc. generation of computers from first to fifth. Internet and its applications.

Unit-II: Memory and input output devices.

(15 Hours)

Memory types: (primary and secondary) RAM, ROM, PROM, EPROM, Merits and Demerits of all, Secondary storage devices: Floppy disk, compact disk, Hard drives, pen drives, DVD, Tape drives, DAT, Input devices: Keyboard, mouse , joystick, touch screen, OMR, OBR, OCR, Light pen, thumb Scanners, smart cards.

Output devices: LCD, Plasma Display, Printers, Plotters, Digitizers

Textbook

1. fundamentals by B. Ram BPB publications
2. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition.
3. Introduction to Information Technology, V. Rajaraman, PHI, Second Edition.

Online Resources

1. Onlinecourses.npte.ac.in
2. Geeksforgeeks.com

Reference Book

1. Fundamental of Information Technology, ChetanShrivastava, Kalyani Publishers.
2. Computers Today, Suresh K Basandra, Galgotia Publications

Semester: I
Course Code: IT/DSC2/ C101
Course Title: Operating System-I
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

There are no prerequisites for this course

Course Objectives:

- 1.This course OPERATING SYSTEMS is an essential part of any Computer-Science education.
- 2.The purpose of this course is to understand the mechanisms of the Operating Systems like Process Management, Process Synchronization, Memory Management, File System
- 3.Implementation, Storage Structures used in OS and Protection Principles. How effectively the OS is utilizing the CPU resources with the help of these mechanisms.

Course Outcomes:

- 1.Gain knowledge of System Software, Program and Process.
- 2.Understand Types of Operating System, Basic functions of O.S. and Evolution of O.S.
- 3.Understand the concept of Process, Process Control Block and Threads.
- 4.Understand the CPU scheduling Non-Pre-emptive and Pre-emptive Scheduling algorithms
Understand the concept of Synchronization and Deadlock.

Unit-I: Introduction to Operating Systems

(15 Hours)

Introduction to Software: Definition, Classification of software, Operating system as the main component of system software, Program and Process.
Operating System Fundamental: O.S. as a resource manager, Structure of O.S., Types of O.S.- Single user and multiuser O.S., Basic functions of O.S., Characteristics of modern O.S. Evolution of O.S.: Early systems, Simple batch systems, Multiprogramming batch systems, Time sharing system, Operating system for Personal Computers, workstations and Hand held devices, Parallel systems, Distributed systems, Real time systems, Advantages and Disadvantages of each system.

Unit-II: Processes and Threads(15 Hours)

Concept of Process: Process States, Process Control Block, Operations on Processes, Threads.

CPU Scheduling: Types of schedulers, Criteria for scheduling, Non-Pre-emptive Scheduling Algorithms - First-come First-served Scheduling and Shortest Job First Scheduling, Pre-emptive Scheduling Algorithms- Priority Scheduling, Round Robin.

Inter Process Communication and Synchronization:

Concurrent and dependent process, need for synchronization, introduction of Critical Section and Semaphores, method of inter process communication, process synchronization, synchronization problem. Deadlocks: Concept of Deadlock, Deadlock Modeling, Methods for Handling Deadlock. Introduction to Memory management.

Textbooks:

- 1."Operating System", By S.R. Sathe & Anil S. Mokhade, MacMillan Publication.
2. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, Modern Operating System, 3rd Edition, Pearson Education 2007.

Online Resources:

https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf

Reference Books:

1. G. Nutt, Operating System: A Modern Perspective, 2nd Edition Pearson Edition 1997.
2. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.

3. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Semester: I

Course Code: IT/ DSC3/C102

Course Title: Lab course

Total Credits: 02

Contact Hours:

Marks: 50

Prerequisite: Students must be able to perform the task based on lectures.

Students must be able to understand concepts clearly and represent them as required

Course Objectives:

1. Students must be able to perform simple task concerning computers.

2. Students must be able to explain practically concepts being computer systems functionality

Specific Tool Used for Practical: Computers and its hardware such as peripheral connecting devices, Windows OS, Linux

Sample List of experiments but not limited to, on the course IT/DSC1/C1

(Minimum 10)

1. Computer components and input output devices (recommended: hardware insides the CPU).
2. Connect internet using wifi with computers.
3. Navigating desktop using anydesk application.
4. Resume building using word (insertion of tables, creation, deletion, editing, etc).
5. Creating employee database with name, mobile number, email, address etc using excel sheet.
6. Email account creation on different platforms, such as Gmail, LinkedIn, etc.
7. Email communication using parameters such as CC, BCC and schedule options.
8. Creating online meeting using Google meet and Zoom.
9. Creation of user and their password on computer systems.
10. Resetting computer password using CMOS battery.
11. Connecting peripheral devices such as pocket hard disk, printer, projector.
12. Power point presentation on projector using wireless mouse.

Sample List of experiments but not limited to, on the course IT/DSC2/C2

List of Practical

(Minimum 10)

1. Installing an Operating System: Install a popular operating system (e.g., Windows, Linux, or macOS) on a virtual machine or spare computer.
2. File Management: Learn how to create, copy, move, and delete files and directories in your chosen OS.
3. User and Group Management: Create and manage user accounts and groups on your OS. Explore permissions and access control.
4. Process Management: Use task manager or command-line tools to monitor running processes. Try to start, stop, or prioritize processes.
5. File System Permissions: Set up file and directory permissions to restrict or allow access to specific users or groups.
6. Shell Commands: Learn essential command-line operations. Perform tasks like navigating directories, creating files, and searching for files.
7. System Monitoring: Explore tools like Task Manager (Windows), top (Linux), or Activity Monitor (macOS) to monitor system resource usage.
8. Network Configuration: Configure network settings, including IP addresses, DNS, and proxies, to understand network connectivity.
9. Software Installation and Updates: Install software, update packages, and manage

- software repositories using package managers (e.g., apt, yum, or Homebrew).
10. Backup and Restore: Learn how to create backups of important files and restore them in case of data loss.

<p>Semester: I Course Code:IT/GE1/C103-A Course Title: Fundamentals of Mathematics Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 1 Hour</p>
<p>Prerequisite: Basics of mathematics:</p>
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Develop students' ability to think logically and critically, and to construct and write mathematical proofs. 2. Teach the principles of set theory, including set operations, subsets, and Venn diagrams. 3. Introduce graph theory and its applications. Cover topics like graph representations, connectivity, and graph algorithms. 4. Explore Matrices. Discuss their properties and applications.
<p>Course Outcomes</p> <ol style="list-style-type: none"> 1. Formulate mathematical models 2. Select appropriate numerical methods 3. Implement numerical algorithms 4. Evaluate the accuracy of solutions 5. Solve optimization problems 6. Apply computational mathematics to real-world scenarios
<p>Unit-I: 1. Set Theory- (15 Hours) Basic Definitions: Set, Finite set, Infinite set, Singleton Set, Empty set, Subset, Proper Subset, Universal set, Power set, Venn diagram . Operations on set: Union of sets, Intersection of Sets, Complement of a set, Equality of two sets, Disjoint sets, Difference of two sets, Symmetric Difference, Cartesian Product; explanation of each using Venn-diagram and simple examples.</p>
<p>Unit-II: Graph Theory, Matrices(15 Hours) Introduction: Graph Definition & Terminologies, Application of Graph, Finite & Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex and Null Graph. Matrix Representation of Graph: Incidence & Adjacency Matrix. Path & Circuits: Isomorphism, Walks, Paths and Circuits, Connected Graphs, Disconnected Graphs and Components, Euler Graphs. Operations on Graph: Union, Intersection & Ring Sum. Directed Graph Introduction to Matrices, Types of Matrices: Row Matrix, Column Matrix, Square Matrix, etc, Matrix Notation and Terminology, Matrix Size, Order, and Dimension, Addition and Subtraction of Matrices, Scalar Multiplication of Matrices, Operation on Matrices</p>

Textbook

1. "Discrete Mathematical Structures" by Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, Pearson Education Asia.
2. "Elements of Discrete Mathematics" by C.L. Liu, Tata McGraw-Hill

Reference Book:

1. "Discrete Mathematics" by Dr. Bembalkar.
2. "Graph Theory" by Narsingh Deo.

Semester: I
Course Code: IT/GE1/ C103-B
Course Title: **Google Workspace - I**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

1. Basic computer literacy and internet navigation skills
2. Experience with productivity software like Office/Docs

Course Objectives:

1. Learn to use Gmail for efficient email communication
2. Collaborate on documents and files in Google Drive
3. Create and manage events in Google Calendar
4. Build and administer team sites in Google Sites

Course outcomes:

1. Google Workspace is an innovative and flexible solution that helps people and organisations increase productivity, communication and collaboration like no other.
2. It brings together the resources that companies need to face current and future challenges, being composed of a wide set of applications.

Unit-I: Introduction to Google workspace (15 Hours)

Overview of core services and features, Account setup and management, Creating accounts, org units, groups, Billing and licensing, Admin console basics, Navigating the admin console, Setting up security and compliance, Interface walkthrough, Key pages and navigation, Customizing user settings.

Gmail

Writing and replying to emails, Drafts, signatures, canned responses, Attachments, Adding, previewing, limiting size, Labels and filters, Creating, applying, managing, Search, Basic search, operators, shortcuts, Settings and customization, Themes, layouts, inbox types, Google Calendar, Creating and editing events, Inviting guests, adding details, Calendar settings, Time zones, working hours, default reminders, Sharing calendars, Make public, share with individuals, Views and navigation.

Unit-II: Google Drive (15 Hours)

Uploading files and folders, Drag and drop, file browser, Organizing with folders, Sharing files, Link sharing, add collaborators, Doc types and conversions, Offline access and sync, Google Docs, Creating and formatting docs, Apply fonts, styling, page layout, Collaborating in real-time, Chats, comments, version history, Importing and exporting docs, Add-ons for Docs

Google Sheets: Worksheets and workbooks, Entering and formatting data, Formulas and functions, SUM, AVERAGE, IF, VLOOKUP, Charts and graphs, Create from data, Customize and edit, Collaborating on spreadsheets, Google Slides, Creating and editing slides, Applying themes and layouts, Collaborating on presentations, Chats, comments, version history, Running and presenting slides.

Google Forms: Creating forms, Question types, presentation, Customizing form design, Viewing and analyzing responses, Summary charts and graphs, Using form data elsewhere, Google Sites, Choosing site theme, Adding and editing pages, Page types, web parts, layouts, Applying navigation menus, Embedding content, Docs, slides, calendars, YouTube

Textbook

- Hands on G Suite for Administrator – by Cesar Anton Dorantes Packt Publishing

Online Resources

- <https://youtube.com>

Reference Book

- Google workspace user guide by Balaji Iyer

Semester: BSc IT First Semester
Course Code: IT/GE1/ C103-C
Course Title: Principles of Internet
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

1. Knowledge of operation of computer system.

Course Objectives:

1. Student will be able to configure internet connection on computer systems
2. Students will have deep learning about various network and internet concepts.

Course Outcomes:

1. Discuss elementary Internet concepts and history
2. make a successful Internet connection
3. demonstrate simple principles of Internet Protocol (IP) addressing
4. use and customize a web browser
5. use e-mail to send and receive message
6. use File Transfer Protocol (ftp) to perform file downloading and uploading

Unit-I: Basics of Internet (15 Hours)

What is Internet, Evolution of Internet ,Advantages of Internet , Disadvantages of Internet , Basic WWW Concepts, ISP, ISP in India , Types of connectivity: Dial-Up, ISDN, DSL, VSAT, Leased Line, Cellular, Broadband, Proxy Server, Type of Proxies, Uses of Proxy USENET, GOPHER, WAIS, ARCHIE, VERONICA, IRC, IETF, W3C , What is Search Engine, Different Types of Search Engines, Searching the Web: Searching on Chrome, Microsoft Bing Search Web Server-introduction to web server, functions and various web servers,

Unit-II: Introduction to Search Engines (15 Hours)

Emergence of Internet, Local Area Network (LAN) Wide Area Network (WAN), Emergence of World Wide Web (WWW), SEO, What is E-commerce, E-Commerce Overview, Features, Traditional Commerce v/s E-Commerce, E-Commerce -Advantages, E-Commerce -Disadvantages, E-Commerce - Business Models

Web based E-mail, Mail Servers, Mail Protocols, Free E-mail Services

Advanced Application of Internet

Traditional Marketing: Traditional Marketing Methods, Digital Marketing, Digital Marketing method, Importance of the digital marketing, E-marketing strategies, E-branding: Components of E-Branding, E-BRANDING AND ITS FEATURES, E-BRANDING DISTRIBUTION CHANNELS, Browsing Behaviour Model, Information Security issues: Threats and Risks in E-security, Risk Management Internet banking, Digital Certificate, Types of digital certificates, Secure Electronic Transaction (SET), Secure Hypertext Transfer Protocol (SHTTP)

Textbook

1. Computer Network by Andrew S. Tanenbaum

2. E- Commerce and Applications by Pandey and Pandey
3. Fundamentals of E-Commerce. By Sivani Arora

Semester: 1

Course Code: IT/GE2/C104-A

Course Title: **DIGITAL ELECTRONICS**

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 40

Periods: 1 Hour

Prerequisite:

1. Basic Mathematics.
2. Physics.
3. Basic Electronics.

Course Objectives:

1. To teach students the fundamentals of number systems (binary, decimal, octal, hexadecimal) and how to convert between them, providing a strong numerical foundation for digital electronics.
2. To impart a solid understanding of Boolean algebra, logic gates (AND, OR, NAND, NOT, etc.), and their applications in digital circuit design.
3. To enable students to design and analyze combinational logic circuits, including adders, sub-tractors, multiplexers, and demultiplexers.
4. To introduce students to flip-flops (RS, JK, T, D) and sequential logic, emphasizing their role in memory and sequential circuit design.
5. To educate students about counters, both asynchronous and synchronous, as well as shift registers, and their practical usage in counting and data storage applications.

Course Outcomes:

1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
2. To understand and examine the structure of various number systems and its application in digital design.
3. The ability to understand, analyze and design various combinational and sequential circuits.
4. Ability to identify basic requirements for a design application and propose a cost effective solution.

Unit-I: Number Systems and Logic gates: (15Hours)

Binary , Decimal, Octal, Hexadecimal Number System, Conversion within Binary. Octal, Hexadecimal & Decimal Number System, Binary Arithmetic : Binary addition, subtraction. Theorems of Boolean Algebra: Complementation, commutative, AND, OR, Associative, Distributive, Absorption laws, De morgan's theorems, Logic Gates : AND, OR, NAND, NOT, Ex-OR, Ex-NOR

Combinational and Arithmetic Logic Circuits

Half Adder & Full Adder, Half Subtractor & Full Subtractor, BCD to Decimal decoder, Multiplexer & Demultiplexer, FlipFlops : RS FF, JK FF, T FF, D FF

Unit-II: Counters & Shift Registers: (15Hours)

Introduction: Asynchronous Counter & Synchronous counter, Modulus Counter, MOD-12 counter, BCD counter, Introduction of Shift Registers, Serial- in serial -out, Serial-in parallel-out, Parallel-in serial-out, parallel-in parallel-out

Textbook :- Digital Electronics and Micro-Computers-R.K.Gaur, Dhanpat Rai Publication

Online Resources :- <https://www.javatpoint.com/>

Reference Book :- DigitalElectronicsandLogic Design-N.G.Palan, TechnovaPublication

Semester : I

Course Code: IT/GE2/ C104-B

Course Title: Basics of HTML

Total Credits: 04

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 1 Hour

Prerequisite: No

Course Objectives: The syllabus for a basic HTML (Hypertext Markup Language) course typically focuses on providing students with a fundamental understanding of web development.

Course Outcomes:

1. Insert a graphic within a web page.
2. Create a link within a web page.
3. Create a table within a web page.
4. Insert heading levels within a web page.
5. Insert ordered and unordered lists within a web page.

Unit I : Introduction to HTML

(15 Hours)

Understanding the Web and HTML

Introduction to the World Wide Web and web technologies, History and evolution of HTML.

Basic structure of an HTML document, Text editors and web development tools.

HTML Elements and Tags

Headings, paragraphs, and text formatting, Lists (ordered and unordered), Hyperlinks and anchors, Images and multimedia.

HTML Semantic Elements

Semantic HTML elements and their importance, Header, nav, article, section, aside, and footer tags.

Unit-II : Advanced HTML

(15 Hours)

HTML Forms and Tables

Creating web forms, Basic table structure, HTML entities and character encoding.

HTML Forms and Input Types

Form controls and input types, Form validation and attributes, Form accessibility.

HTML Multimedia and Embedding Content

Audio and video elements, Iframes for embedding content, Best practices for multimedia on the web.

Textbook :

"HTML and CSS: Design and Build Websites" by Jon Duckett

"Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics"

by Jennifer Niederst Robbins

Online Resources :

Website: <https://www.w3schools.com/>

Website: <https://developer.mozilla.org/>

Reference Book :

"Smashing CSS: Professional Techniques for Modern Layout" by Eric Meyer

Semester: I
Course Code: IT/GE2/ C104-C
Course Title: Basics of Computer Hardware
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

Passed 10+2 class examination with Science and Mathematics or with vocational subject in same sector or its equivalent. Student should know English read and write skills

Course Objectives:

- 1.To learn the computer Hardware parts
- 2.To earn the knowledge to install it.

Course Outcomes:

1. Identify the hardware components of a computer.
2. Lists the hardware components such as processor, memory, disk, main board, etc.
3. Explains the features (speed, capacity, etc.)
4. Explains the relationships between the components of a computer and how data are transferred among the components.

Unit-I: (15 Hours)

Computer fundamentals, What is computer, History of Computer, Types of Computer, Components of Computer, Evolution of Computer

Input Devices, Output Devices, Audio Input and Output Devices, An Introduction to Storage Device, Temporary and Permanent Storage Devices- Hard Discs, Solid state drives, pen drive, SD Card, Compact Disc, DVD, An Overview of Computer Memory- Register, cache, RAM, ROM, Memory Management, Measurement of Memory Units

Unit-II: (15 Hours)

Working of CPU, Evolution and Development of Microprocessors, Cooling Mechanism of Computer Components, Components of Motherboard, Multimedia, Basic Elements, Multimedia System, Computer Hardware & Software, What is Operating System, what is network, what is Client and Server, internet, Steps to assemble Computer

Textbook – PC Hardware: The complete Reference – McGraw Hill publication- by Craig Zacker , John Rourke

Online Resources – www.javatpoint.com

Reference Book – Computer hardware – by V. Mishra

Semester: I
Course Code: IT/VSC1/ C105-A
Course Title: **Programming in C-I**
Total Credits: 02
Contact Hours: 60 (Clock Hours)

Prerequisite:

Passed 10+2 class examination with Science and Mathematics or with vocational subject in same sector or its equivalent. Student should know English read and write skills

Course Objectives:

- 1.To provide complete knowledge of C language to students.
- 2.Develop logic which will help them to create programs, applications in C.

Course Outcomes:

- 1.Develop a C program.
- 2.Control the sequence of the program and give logical outputs.
- 3.Implement strings in your C program.
- 4.Store different data types in the same memory.
- 5.Manage I/O operations in your C program.

Hands on Based on Following curriculum

Basic Elements, constants, variables and data types

Character set, C Token, Identifier & Keywords, Variables, Constant and its types. Integer constant, floating point constant, character constant, string constants.

Data Types: *int, char, float, double*. Declaration & Initialization, Type modifier: long, short, signed & unsigned

Operators and Expressions:

Arithmetic, Relational, Logical, Unary operators: Increment & decrement Assignment and Conditional operator. Operator Precedence & Associativity of Operators

C Program & I/O statements.

I/O: Introduction, Formatted Input/Output function: *scanf&printf*, Escape sequence characters. Library functions: General & Maths.

Control and Iterative Statements:

Decision Making and Branching:

If statement: Simple if, nested if, if-else, else if ladder, Switch statement, The conditional expression (? : operator), goto statement

Decision Making and Looping:

while loop, *do-while* loop, and *for* loop

Jumps in loops:

break & continue statement, *goto* statement

Arrays

Introduction, Declaration and initialization, Accessing array elements, Memory representation of array. Types of arrays: One dimension and multidimensional arrays, character array,

Character arrays and string: Introduction , reading and writing strings

Text Books:

- 1.Let us C: Y.P. Kanetkar [bpb publication]
- 2.Programming in C : E. Balaburuswamy [Tata macgraw hill]

OnlineResources:

https://www.tutorialspoint.com/cprogramming/cprogramming_tutorial.pdf

Reference Books:

1. Programming in C: Goterfried[Shaums' Series]
- 2.C: The complete Reference :Herbert Schildt[M C GrawHill]
- 3.Spirit of“C” : Moolish Kooper.
- 4.Programming in C - A Practical Approach: Ajay Mittal

Semester: I
Course Code: IT/VSC1/ C105-B
Course Title: Python Programming - I
Total Credits: 02
Contact Hours: 60 (Clock Hours)

Prerequisite:

1. Basic understanding of programming concepts
2. Experience with any programming language

Course Objectives:

1. Learn Python syntax, data structures, control flow, and fundamental programming techniques
2. Use functions and modules to structure Python code effectively
3. Implement string, list, and dictionary operations in Python programs
4. Read and write data from files in Python
5. Write documented Python programs that follow best practices

Course Outcomes:

1. Develop a Python program.
2. Control the sequence of the program and give logical outputs.
3. Implement strings in your Python program.
4. Store different data types in the same memory.
5. Manage I/O operations in your Python program

Hands on based on following curriculum

Introduction to Python

Interpreted vs compiled languages, Features of Python , Python interpreter and IDEs , Basic Data Types, Numbers, strings, Booleans, Type conversion, Variables, Naming rules, Assignment

Operators

Arithmetic, comparison, logic, Operator precedence, Expressions and Statements, Expression evaluation,

Control flow statements

Conditionals, if, elif, else, Conditional expressions

Iterative statements

Range function, For loop, while loop

Functions

def statement, Parameters and arguments, Return values, Scope, Built-in functions

Strings

String literals, properties, String indexing and slicing, String methods, Formatting and output

Python Data Structure

Set Introduction to set

Lists Indexing, slicing lists, List methods, Iterating over lists

Tuple Indexing, Tuple methods, iterating over tuple

Dictionary Working with dictionary methods, nested dictionary

Textbook

Python for Everybody: Exploring Data in Python 3 by Charles Severance

Online Resources

<https://pynative.com/>

Reference Book

Python: The Complete Reference by Martin C. Brown

Semester: I
Course Code: IT/VSC1/C105-C
Course Title: R Programming – I
Total Credits: 04
Contact Hours: 60 (Clock Hours)

Prerequisite:

1. Basic computer skills and a willingness to learn; no prior programming experience required.

Course Objectives:

1. To provide students with a foundational understanding of R programming, data analysis, and data visualization.
2. To enabling them to perform basic data manipulation, visualization, and analysis tasks in R and prepare them for more advanced topics in subsequent semesters

Course Outcomes:

1. Explain critical R programming concepts.
2. Demonstrate how to install and configure RStudio.
3. Apply OOP concepts in R programming.
4. Explain the use of data structure and loop functions.

Hands on based on following curriculum

Introduction to R and RStudio What is R and RStudio? , Installing R and RStudio , Basic R syntax and data types , Using R scripts and RMarkdown

Data Structures in R Vectors, matrices, and arrays , Lists and data frames , Factors and dates , Indexing and subsetting

Data Manipulation with dplyr Data frames and tibbles , Filter, arrange, and select , Mutate, summarise, and group_by , Chaining operations

Data Visualization with ggplot2 Introduction to data visualization , Scatter plots, bar charts, and line graphs , Customizing plots . Saving and exporting plots

Control Structures and Functions If statements and loops , Writing custom functions , Function arguments and return values , Applying functions to data

Working with Data from Files Reading and writing data from/to files , Excel, CSV, and other formats, Web scraping and API access , Data cleaning and tidying

Textbooks :

1. **"R for Data Science" by Hadley Wickham and Garrett Golemund:** This is a popular and highly regarded book that focuses on using R for data analysis. It covers data manipulation, visualization, and introductory statistics.

2. **"R Graphics Cookbook" by Winston Chang:** If you want to emphasize data visualization with ggplot2, this book is an excellent resource. It provides practical examples and recipes for creating a wide range of plots.

Online Resources:

1. <https://www.r-project.org/>
2. <https://education.rstudio.com/>
3. <https://www.edx.org/>

Reference Books:

1. **"R for Data Science" Authors:** Hadley Wickham and Garrett Golemund
2. **"R Programming for Data Science" by Roger D. Peng:**

Semester: I Sem
Course Code: IT/SEC1/C106-A
Course Title: Programming Methodology
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

There are no prerequisites for attending this course.

Course Objectives:

1. Learn to develop simple algorithms and flow charts to solve a problem.
2. Develop problem solving skills coupled with top down design principles.
3. Learn about the strategies of writing efficient and well-structured computer algorithms/programs.
4. Develop the skills for formulating iterative solutions to a problem.

Course Outcomes:

1. Be familiar with fundamental programming concepts and methodology (variables, assignments, conditions, branches, loops, functions, recursions, structures);
2. Be familiar with and appreciate good programming practice, and apply it to follow-up courses;

Unit-I: Algorithm & Flowchart(15 Hours)

Algorithm: Definition, Characteristics, Advantages and disadvantages, basic features and properties of algorithm.

Flow-Chart

Definition, Principles of flowcharting, Flowcharting symbols, Data flow diagram, flowchart. Advantages

Introduction to Programming Environment

Introduction to Programming, Definition of program and programmer, features of good programming language, Bugs and Debugging.

Programming Techniques

Programming approaches: Types of programming methodologies, Procedural Programming, Functional Programming, Structural Programming, Modular Designing, Logical Programming -Top Down Designing, Bottom Up Designing.

Unit-II: Programming Languages(15 Hours)

History of languages, Classification of computer language: Types of Programming Languages-Machine Languages, Assembly Languages, High Level Languages, low level language, Structure

Language, Object oriented Language, control structures, decision control structures, selection control structures, loop control structures, Assembler, Linker, Loader, Interpreter & Compiler

Textbook:

1. Fundamentals of Computer V. Rajaraman
2. Programming Logic and Design, Comprehensive By Joyce Farrell

Online Resources:

1. https://www.tutorialspoint.com/programming_methodologies/programming_methodologies_tutorial.pdf
2. <https://ocw.snu.ac.kr/sites/default/files/NOTE/7991.pdf>

Reference Book:

Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson, 2015.

Semester: I
 Course Code: IT/SEC1/ C106-B
 Course Title: Basic of Excel
 Total Credits: 02
 Contact Hours: 30 (Clock Hours)
 Marks: 50
 Periods: 1 Hour

Prerequisite:

1. Basic knowledge of Handling Desktop, Software etc.

Course Objectives:

1. On successful completion of the course, the students will be able in Fundamentals of Excel helps Students to learn how to start working with MS-EXCEL right from basics to Tables.
 2. To understand the various templates and printing of their work.
 3. The course aims to understand the most extensive tool used for many analysis in general and in Business Analytics in Particular, this module will equip students with hands-on skills on excel operations.

Course Outcomes:

1. Enter and edit data.
 2. Modify a worksheet and workbook.
 3. Work with cell references.
 4. Learn to use functions and formulas.

Unit-I: Introduction to MS-Excel (15 Hours)

Basics of MS-Windows – Desktop, Icon, creating, saving, and using of different documents and applications, MS- Office: Installing, Customizing, and Using different applications and tools in MS-Office package, Basics of MS-Word, Basics of MS Power Point. Spreadsheets basics, Need for Spreadsheets, Work-Book, Work –Sheet, Parts of a MS-Excel Work-Sheet-Program area, Work area, Contents of Title-Bar, Manu-Bar, Contents of Manu Ribbons, Meaning of Cell- Cell address, Formula-Bar, Row Numbers, Column-Letters, Quick Access to Tool-Bar, Office Button, Floating Frames, Adding Work-Sheets in Sheet Tab, Status-Bar., and other features of Excel.

Unit-II: Work-Sheet and Work-Book Operation (15 Hours)

Selecting Cell and Range of Cells, Merging of Cells, Entering and Saving Data in the Cell, Named Cells, Need of Naming Cells, Entering, Storing, Copying Formula, Using different Arithmetic and logical Operators in Formula, Moving Cell with contents, Copying and Pasting of Cell and Cell Content, Freezing Cells, Editing of Cell Contents, using Cell Formatting Options – Editing Cell Size (increasing Column and Row size of a cell)

Tables And Formatting

Text Alignment, using Border, Comments option usage in Cell, Editing and Deleting Comments, Fill, Formatting Fonts, Text Warping, Text Rotate, Using Auto-fit to Adjust Rows and Columns Using of Short, Cuts and Short-Cut Manu, Clear Contents in a Cell, Adding, Deleting and Copying Work-Sheet with in a Work-Book, Renaming a File or Work-Sheet, Inserting Multiple Work-Sheet at a time, Formatting a Work-Sheet Automatically, Sorting Textual & Numerical DATA, Sort Dates or Times, Sort by Cell Colour, Font Colour, or by icon, Sort by a custom list, Sort Rows, sort by more than column or row and other issues in sorting.

Textbook

1. Rajkumar S and Nagarajan G and Naveen Kumar M, Fundamentals of MS Excel, Jayvee International Publications, Bangalore.
2. Microsoft Excel Latest Version Inside Out – Mark Doge and Craig Stinson – PHI Learning Private Limited, New Delhi – 110001.

3. Excel 2013 Bible; John Walkenbach, Wiley

Online Resources:-NPTEL, SWAYAM MOOCS etc.

Reference Book

1. Financial Analysis and Modeling using Excel and VAB: Chandan Sengupta, Wiley
2. Excel Data Analysis – Modeling and Simulation: Hector Guerreor, Springe
3. Microsoft Excel 2013: Data Analysis and Business Modeling: Winston, PHI
4. Excel Functions and Formulas: Bernd Held, BPB Publications.

Semester: I
Course Code: IT/SEC1/C106-C
Course Title: Open Source Tools
Total Credits: 01
Contact Hours: 30 (Clock Hours) 1Hrs/Week
Marks: 50
Periods: 1 Hour

Prerequisite:

Anyone from a computer science or information technology background.

Course Objectives:

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

Course Outcomes:

1. Ability to install and run open-source operating systems.
2. Ability to gather information about Free and Open Source Software projects from software releases and from sites on the internet.
3. Ability to build and modify one or more Free and Open Source Software packages.

Unit-I: Introduction to Open sources, Need of Open Sources, Open Source -Principles, Standard Requirements, Advantages of Open Sources, Free Software -FOSS, Open Source Licenses - GPL, LGPL, MIT etc. Copyrights, Patents, Contracts & Licenses and Related Issues, Application of Open Sources. Open Source Operating Systems, Linux Distribution software

Unit-II: Programming Tools: Version Control Systems, Git, SVN vs Git, Bug Tracking Systems (Trac, BugZilla, GitLab), OpenSource CSS Framework, Bootstrap, Tailwind
Case Studies: Apache, Berkeley Software Distribution, Mozilla(Firefox), Libre Office, GNU Compiler Collection, Google Opensource

Textbook: KailashVadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt. Ltd 2012, 1st Edition.

Online Resources: <https://opensource.org/>
<https://opensource.com/>
<https://itsfoss.com/>
https://freeopensourcesoftware.org//index.php/Main_Page

Reference Book Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.

Semester II

Semester: II
Course Code: IT/DSC4/C150
Course Title: Data Structures
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

Basic understanding of C programs & arrays, hands on experience in decision making and looping constructs of C programming language will be a huge benefit.

Course Objectives:

1. To provide fundamental knowledge of data structures and how they are organized/arranged in computer memory.
2. To provide knowledge on how data structures are implemented and processed.
3. To familiarize with basic techniques of algorithm analysis.
4. To equip with the implementation techniques of complex algorithms of insertion, deletion and modification of data stored in various data structures.
5. To provide knowledge of the basic functioning of searching and sorting algorithms.

Course Outcomes:

1. Implement basic data structures such as arrays and linked list.
2. Programs to demonstrate searching, sorting algorithms

Unit-I: Data Structures & Algorithm Analysis:(15 Hours)

Data Structures: Basic terminologies and definitions, Introduction to linear and non-linear data structures.

Arrays : Need for Arrays, Linear Arrays, representation of linear arrays (row-major order, column-major order), Traversing, insertion, modification, deletion in linear array, merging linear arrays. 2-dimensional arrays introduction, representation of 2-dimensional array, sparse matrices.

Unit-II: Searching & Sorting:(15 Hours)

Need for Searching and sorting, Linear search, binary search, bubble sort, selection sort, insertion sort, merger sort, quick sort, radix sort.

Textbook:

1. Data Structures using C, by Seema Threja, 2nd Edition, Oxford Press.
2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill

Online Resources:

NPTEL, SWAYAM MOOCS etc.

Reference Book:

1. Data Structures using C, by Seema Threja, 2nd Edition, Oxford Press.
2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill
3. Fundamentals of Data Structures in C, by Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed

Semester: II
Course Code: IT/DSC5/ C151
Course Title: Operating System-II
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:
Knowledge of Basics concepts of Operating Systems

Objective:

1. Understand the different memory management techniques.
2. Understand process concurrency and synchronization.
3. Understand the concepts of input/output, storage and file management
4. Understand the different memory management techniques.
5. Understand process concurrency and synchronization.
6. Understand the concepts of input/output, storage and file management

Course Outcomes:

1. This course will introduce the core concepts of operating systems, such as memory management, file systems, input and output device management and security.
2. The goal of the programming assignments is to give students some exposure to operating system code.

Unit-I: Memory Management(15 Hours)

Address Binding, Logical Vs. Physical address space, Memory Allocation Strategies- Fixed and Variable Partitions, Paging, Segmentation, Virtual Memory.

Memory Management and File Systems

Introduction: Dedicated devices, Shared devices and Virtual devices, Pipes, Buffer, I/O System Components: I/O Devices, I/O Hardware, Interrupts, Application I/O Interface.

Unit-II: Disk Management(15 Hours)

Concept of File, File Operation, Directory Structure, File Allocation Methods- Contiguous and Non-Contiguous allocation method, Secondary Storage Structure: Disk fundamental, Disk Scheduling FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, Disk management.

Textbooks:

1. "Operating System", By S.R. Sathe & Anil S. Mokhade, MacMillan Publication.
2. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, Modern Operating System, 3rd Edition, Pearson Education 2007.

Online Resources:

NPTEL, SWAYAM MOOCS etc.

https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf

Reference Books:

1. G. Nutt, Operating System: A Modern Perspective, 2nd Edition Pearson Edition 1997.

Semester: I Sem

Course Code: IT/DSC4/C152

Course Title: **Lab course (Based on Data Structure and Operating System II)**

Total Credits:

Contact Hours:

Marks: 50

Prerequisite: Basic understanding of C programs & arrays, hands on experience in decision making and looping constructs of C programming language will be a huge benefit.

Course Objective:

- 1.To provide knowledge on how data structures are implemented and processed.
- 2.To familiarize with basic techniques of algorithm analysis.
- 3.To equip with the implementation techniques of complex algorithms of insertion, deletion and modification of data stored in various data structures.
- 4.To provide knowledge of the basic functioning of searching and sorting algorithms.
- 5.Understand the different memory management techniques, Understand process concurrency and synchronization, Understand the concepts of input/output, storage and file management

Specific Tool Used for Practical :C Language

Sample List of Practical based on IT/DSC4/C150

1. Write a program using DIV(J,K) which reads a positive integer $N > 10$ and determines whether or not N is a prime number.
2. Write a program which counts the number of particular character/word in the String.
3. Write the programs for traversing of n item using the array.
4. Write the programs for insertion and deletion of n item using the array.
5. Implement Linear search algorithm using C.
6. Implement binary search algorithm using C.
7. Implement Bubble sort using C.
8. Implement insertion sort using C.
9. Implement selection sort using C.
10. Implement radix sort using C.

Sample List of Practical, but not limited to, on IT/DSC5/C151

- 1.Program to implement memory management: First fit, Best fit, Worst fit
- 2.Program to implement file allocation technique linked list
- 3.Program to implement FIFO Page replacement technique
- 4.Program to implement LRU Page replacement technique
- 5.Program to implement Optimum Page replacement algorithm
- 6.Program to implement SSTF(Shortest Seek Time First) disk scheduling algorithm
- 7.Setting user name, password at user level
- 8.Installation of any two peripheral devices
- 9.Study of Android Development Framework
- 10.Study of Android Program Development Architecture

Semester: II
Course Code:IT/M1/C153
Course Title: Fundamentals of Databases
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite: Relational Algebra and Set Theory:

Objective:

1. Gain a solid grasp of what a database is, its importance in modern information systems, and the role it plays in data management.
2. Learn how to design and create a database schema, including defining tables, relationships, and constraints, using entity-relationship diagrams and normalization techniques.
3. Develop a working knowledge of SQL (Structured Query Language) to query and manipulate data in a relational database, including SELECT, INSERT, UPDATE, and DELETE statements.

Course Outcomes:

1. Understand the basic principles of database management systems.
2. Draw Entity-Relationship diagrams to represent simple database application scenarios
3. SQL queries for a given context in relational database.
4. Discuss normalization techniques with simple examples.
5. Describe transaction processing and concurrency control concepts

Specific Tool Used for Practical :MYSQL / SQL Server

**List of Practical
(Minimum 10)**

1. To study database schema.
2. Draw Schema Diagram for Library Management System.
3. Draw Schema Diagram for Hospital Management System.
4. Draw Schema Diagram for Hotel Management System.
5. Draw Schema Diagram for University System.
6. To study E R Diagram, its symbols and components.
7. To study degree of relationship and connectivity.
8. Draw E. R. Diagram for Hospital Management System and Hotel Management System.
9. Draw E R Diagram for Library Management System and Banking System.
10. Practical Based on DDL Commands Create, Alter, Drop.
11. Practical Based on DML Commands Insert, Update, Delete.

Textbook:

1. Database System Concepts (Sixth Edition)AviSilberschatz, Henry F. Korth, S. Sudarshan
2. An Introduction to Database Systems by Bipin C. Desai

Online Resources:

Reference Book:

1. Easy Oracle SQL: Get Started Fast Writing SQL Reports with SQL*Plus By John Garmany

Semester: II
Course Code: IT/GE3/C154-A
Course Title: Numerical Method
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:
Basic Arithmetic and Algebra concepts

Course Objectives: To enable the students to,
1. Find the errors and types of errors.
2. Find the Rank and adjoint of the Matrix.
3. Find the solution of Gauss elimination and Gauss Seidel method.
4. Find the solution of Interpolation using different methods.

Course Outcomes:
1. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
2. Analyse and evaluate the accuracy of common numerical methods.

Unit-I: (15 Hours)

Mathematical Modeling, Characteristics, Error in Calculation, Significant Error, Absolute, Percentage Relative Error, Chopping off and Rounding off Error, Truncation Error, Propagation Error, Matrix, Matrix Operations, Determinant of Square Matrix, Cofactor, Adjoint of Matrix, Rank of Matrix, Introduction and Matrix Notation of set of Equations, Gauss Elimination Method, Gauss Seidel Method, Matrix Inversion Method

Unit-II:(15 Hours)

Introduction to Interpolation and Polynomial Interpolation, Newton-Gregory Forward Difference Interpolation Formula, Newton-Gregory Backward Difference Interpolation Formula, Newton's divided Difference Interpolation, Lagrange's Interpolation

Textbook: "Numerical Computational Methods" - Dr.P.B.Patil, Narosa Publication House.

Reference Book: Numerical methods-E.Balagurusamy
Numerical methods -S.C.Chapra, R.P.Canale-McGraw Hill

Semester: II
Course Code: IT/GE3/ C154 -B
Course Title: **Google Workspace-II**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

1. Completion of basic Google Workspace course
2. Familiarity with core Workspace services

Course Objectives:

1. Configure domain and user settings in Admin console
2. Automate workflows with macros, add-ons and Apps Script
3. Manage security and compliance features
4. Analyze usage metrics and adopt best practices

Course outcomes:

1. Google Workspace is an innovative and flexible solution that helps people and organisations increase productivity, communication and collaboration like no other.
2. It brings together the resources that companies need to face current and future challenges, being composed of a wide set of applications.

Unit-I:

(15 Hours)

Gmail advanced

Canned responses, Email templates and campaigns, Signatures and out of office, Advanced filtering and segmentation, Integration with Calendar, Drive, Tasks, Email automation tools, Google Calendar advanced, Multiple calendar management, Create, share, overlay calendars, Calendar integration, Sync external calendars, Event automation, Recurring events, invites, notifications

Google Drive advanced

Integrating cloud storage, Backup, and sync, desktop sync, file stream, Templates, Creating from Docs, Sheets, Slides, Migrating from other systems, Add-ons for Drive, Scan documents, converting files, managing workflows, Google Docs advanced, Creating templates, Add-ons, EasyBib, Docs Slides merger, page automation, Macros for workflow automation, Version control, and releases

Unit-II:

(15 Hours)

Google Sheets advanced, Data validation rules, Limit input types, set criteria, Connecting data sources, Import from Drive, Calendar, other Sheets, Array formulas, Conditional formatting, Apps Script fundamentals, Edit menus, simple functions

Google Slides advanced

Presenter tools, Notes, timer, audience Q&A, Publishing and sharing, Download, email, present live, Integrating slides, Embed in sites, attaching to calendar event, Animation and transitions, Google Sites advanced, Advanced page formatting, HTML/CSS, custom web parts, SEO optimization, Site management and administration, Members, permissions, activity,

Admin console, User management, Add, update, deactivate users, Security and compliance, Access controls, encryption, retention, Billing and usage monitoring, Reports, Active users, admin logs, storage, Deployment and adoption, Rollout planning and training, Integrating with LDAP, SSO, Ongoing enablement, Support, community, resources

Textbook

1. Hands-on G Suite for Administrator – by Cesar Anton Dorantes Packt Publishing

Online Resources

1. <https://youtube.com>

Reference Book

1. Google Workspace user guide by Balaji Iyer

Semester: BSc IT Second Semester
Course Code: IT/GE3/ C154-C
Course Title: **Introduction to Web Technology**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

1. Knowledge of basic Computer operation

Objective:

1. Student will be able to develop static web page.
2. Student will be able to design web page.
3. Student will be able to design and develop static website

Course Outcomes:

1. Analyze a web page and identify its elements and attributes. Create web pages using XHTML and Cascading Style Sheets.
2. Build dynamic web pages using JavaScript (Client side programming).
3. Create XML documents and Schemas.

Unit-I: HTML & Forms (15 Hours)

Introduction to HTML, WWW, W3C, Web publishing, Structure of HTML Program, Common HTML Head tag elements, Common HTML body tag elements, Physical and Logical tags, Heading tags, Text formatting tags, HTML tags and attributes for List(Ordered list, Unordered list, Definition list), HTML tags and attributes for table(Regular table, Irregular table), iframe tag, HTML Form, Internal document linking and external document linking, adding image to web page, adding audio and video to web page. Web servers, Web browsers, Communication between web browser and web server.

Unit-II: CSS

(15 Hours)

Introduction to style sheet, Syntax of CSS, Selectors and types of selectors, Inline CSS, Embedded CSS, External CSS, CSS Properties: Color Property, background property, animation property, border property, font property, list property, CSS Box Model.

Java Script

Introduction to Java Script: Basic concepts, syntax and usage, Control structures and functions: variables, data types, operators, control structures, functions and arrays.

Textbook

1. Web Technologies by Uttam K.
2. Learning Web Design : A Beginners Guide to HTML, CSS, Java Script and Web Graphics by Jennifer Neiderst Robbin

Online Resources

1. W3school.com

Reference Book

1. Head First HTML and CSS : A learner's Guide

Semester: 2
Course Code: IT/ GE4/ C155-A
Course Title: **8086 Microprocessor**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 40
Periods: 1 Hour

Prerequisite:

1. Course Digital Electronics.

Course Objectives:

- 1.To get knowledge of internal architecture of 8086 microprocessor
- 2.Understand different addressing modes.
- 3.Learn assembly language instructions to construct an ALP.

Course Outcomes:

- 1.Describe the architecture & organization of 8085 & 8086 Microprocessor.
2. Understand and classify the instruction set of 8085/8086 microprocessor
- 3.Distinguish the use of different instructions and apply it in assembly language programming.

Unit-I: Introduction to Microprocessor and Microcomputer: (15 Hours)

Microprocessor based personal computer system.
Block diagram of microprocessor.
Modern computer memory map, I/O Space.
The Microprocessor buses.
Computer Data formats.
ASCII Unicode.

Unit-II: Microprocessor and its architecture: (15 Hours)

8086 internal architecture.
Real Mode & Protected Mode Memory Addressing. Memory Paging.
Pin out and Pin function of 8086 microprocessor.

Addressing Modes and Instructions:

Data addressing modes.
Program memory addressing modes.
Stack memory addressing modes.
BCD and ASCII-arithmetic.
Data transfer instructions: XCHG, LAHF & SAHF
Arithmetic-instructions: Addition, subtraction and comparison.

Textbook

- 1.The Intel Microprocessors: Architecture, programming and interfacing- By Barry B. Brey
- 2.Microprocessors and Interfacing: Douglas Hall.

Online Resources

- 1.<https://www.javatpoint.com/>

Reference Book

- 1."Microprocessor Architecture, Programming, and Applications with the 8085" by Ramesh S. Gaonkar

Semester : II**Course Code:** IT/GE4/ C155-B**Course Title:** Web Designing using CSS**Total Credits:** 04**Contact Hours:** 30 (Clock Hours)**Marks:** 50**Periods:** 1 Hour**Prerequisite:** No**Objective :**

1. Web designing using CSS (Cascading Style Sheets) is an important aspect of creating visually appealing and user-friendly websites.

2. CSS is used to control the layout, design, and presentation of web pages.

Course Outcomes:

1. Author webpages with well-structured HTML and correct CSS layout/styling patterns.

2. Personalize web pages using text formatting, graphics, audio, and video elements.

Unit I :Advanced HTML and CSS**(15 Hours)****CSS Basics :**

Introduction to Cascading Style Sheets (CSS), Inline, internal, and external CSS, Selectors and properties.

CSS Layout and Box Model

Box model and its properties, CSS layout models (flexbox and grid), Positioning and float.

Unit-II : CSS**(15 Hours)****CSS Styling and Responsive Design**

Typography and text styling, Backgrounds and borders

CSS Transitions and Animations

Transitioning CSS properties, Creating basic animations with CSS

Advanced CSS Techniques**CSS Flexbox**

Understanding the flexbox layout model, Building flexible and responsive page layouts.

CSS Grid Layout

Introduction to the CSS grid layout system, Creating complex grid-based page layouts .

Textbook :

1. "Web Design with HTML, CSS, JavaScript, and jQuery Set" by Jon Duckett

2. "CSS Secrets: Better Solutions to Everyday Web Design Problems" by Lea Verou

Online Resources :

1. <https://www.w3schools.com/>

2. <https://developer.mozilla.org/>

Reference Book :

1. "Smashing CSS: Professional Techniques for Modern Layout" by Eric Meyer

Semester: II
Course Code: IT/GE4/ C155-C
Course Title: Basics of Networking
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

Passed 10+2 class examination with Science and Mathematics or with vocational subject in same sector or its equivalent. Student should know English read and write skills

Objective:

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes:

1. Explain basic concepts, OSI reference model, services and role of each layer of OSI model TCP/IP, networks devices and transmission media
2. Analog and digital data transmission
3. Apply channel allocation, framing, error and flow control techniques.
4. Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.

Unit-I:

(15 Hours)

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

Unit-II:

(15 Hours)

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video

Textbook – Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PH

Reference Book –

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

Semester: II sem
Course Code: IT/VSC2/ C156-A
Course Title: Programming in C-II
Total Credits: 02
Contact Hours: 60 (Clock Hours)

Prerequisite:

Passed 10+2 class examination with Science and Mathematics or with vocational subject in same sector or its equivalent. Student should know English read and write skills

Course Objectives:

- 1.To develop modular applications in C using functions
- 2.To develop applications in C using pointers and functions
- 3.To do input/output and file handling in C

Course outcomes:

1. Repeat the sequence of instructions and points for a memory location
2. Apply code reusability with functions and pointers
3. Understand the basics of file handling mechanisms
4. Explain the uses of pre-processors and various memory models

Hands on based on following curriculum

Functions

Introduction, types of functions. Defining functions, Arguments, Function prototype, actual parameters and formal parameters, Calling function, Returning function results, parameter passing mechanism: call by value & Call by reference, Recursion.

Structure & Union

Structure: Introduction, Declaration and initializing structure, Accessing structure members, Nested structures, Arrays of structure, *typedef* statement.

Unions: Declaration, Difference between structure and union.

Pointers:

Introduction, The Address (&) Indirection(*) Operators, Declaration and initialization of pointers. Pointer expression and pointer arithmetic, Pointer to pointer, Dynamic Memory Allocation in C using malloc(),calloc(),free() and realloc().

Storage classes, Preprocessors & String handling Functions:

Storage classes: Scope, visibility and lifetime of variable, block and file scope, auto, extern, static and register storage classes.

String handling functions:

strlen(),strcpy(), strcmp(), strcat(),strupr(), strlwr(),gets(), puts()

Preprocessor Directives:

File inclusion and conditional compiler directives, Macro substitution, #define, #if, #ifdef, #else, #elif, #endif

File handling

Introduction, Opening & closing a file, Input/Output operations on files, text and binary files, getc(), putc() function. fprintf() and fscanf() function, fread() and fwrite() function. Writing and reading records from text file and binary file, Appending, modifying and deleting a record from file, Random access functions fseek(), rewind(), flushall(), remove(), rename() functions

Text Books

- 1.Let us C: Y.P. Kanetkar[bpb publication]
- 2.Programming in C: E. Balaburuswamy[Tata macgraw hill]

Reference Books

- 3.Programming in C: Goterfried[Shaums' Series]
4. C: The complete Reference:Herbert Schildt[M C GrawHill]

<p>Semester: II Course Code: IT/VSC2/ C156 -B Course Title: Python Programming - II Total Credits: 02 Contact Hours: 60 (Clock Hours)</p>
<p>Prerequisite: 1. Completion of basic Python programming course 2. Knowledge of Python data types, control structures, functions</p>
<p>Objective: 1. Learn advanced Python programming techniques like OOP concepts- Implement object-oriented 2. Learn inheritance with python programming 3. Creating of threads, GUI design</p>
<p>Course outcomes: 1. Obtain basic summary statistics from data files 2. Manipulate and extract data from pandas DataFrames 3. Write Python code according to standard style guidelines 4. Understand Thread, Tkinter</p>
<p>Hands on based on following curriculum Introduction to OOP Introduction OOP Concepts, Objects, classes, abstraction, encapsulation, Benefits of OOP vs procedural programming, Python classes and instances, Python class, syntax, Creating objects from classes, Instance attributes and methods, <code>__init__</code> constructor method, self parameter, - Special methods like <code>__str__</code>, <code>__eq__</code> etc. Iterators and Generators, <code>__iter__</code> and <code>__next__</code> dunder methods, Generator functions with yield, Generator expressions, Creating custom iterable classes</p> <p>Inheritance Types of Inheritance in Python, Inheriting from base classes, Overriding, extending methods, Multiple inheritance, <code>super()</code> for calling parent methods</p> <p>Introduction to Threads Process vs thread, Benefits of multithreading, Threading module, Starting threads using Thread class</p> <p>Creating Threads Subclassing Thread class, Using target parameter, Arguments to threads, Thread naming</p> <p>Introduction to Tkinter Tkinter basics, Creating root window, Basic widgets - labels, buttons, frames, <code>pack()</code> method, <code>grid()</code> method, <code>place()</code> method, Layout positioning and sizing</p>

Textbook

1. Python for Everybody: Exploring Data in Python 3 by Charles Severance
2. "Python Object-Oriented Programming" by Steven F. Lott - Good coverage of OOP concepts and design principles with examples.
3. "Python 3 Object-Oriented Programming" by Dusty Phillips - Focused on OOP techniques in Python 3 with lots of examples.
4. "Learning Python" by Mark Lutz - Detailed introduction to Python including a full OOP section.

Online Resources

<https://pynative.com/>

Reference Book

1. "Fluent Python" by Luciano Ramalho - In-depth guide for experienced Python programmers. Great OOP examples.
2. "Effective Python" by Brett Slatkin - Best practices for writing Pythonic code. Has a section on OOP.
3. "Python Cookbook" by David Beazley - Solutions to common programming problems using Python and OOP.

Semester: 02
Course Code: IT/VSC2/C156-C
Course Title: R Programming - II
Total Credits: 04
Contact Hours: 60 (Clock Hours)

Prerequisite:

Proficiency in basic R programming and data analysis skills, as covered in Semester 1 or equivalent prior experience.

Course Objectives:

1. Build upon the foundational R programming knowledge from Semester 1 and delve into advanced topics such as statistical analysis, data modeling, package development, and machine learning using R.

Course Outcomes:

1. Develop your own R package
2. Confidently use advanced formatting types
3. Use Data Visualization
4. Use Data Modelling

Unit-I: (15 Hours)

Introduction to statistical analysis:

Descriptive statistics , Hypothesis testing , Regression analysis

Data Visualization with Advanced ggplot2

Advanced ggplot2 techniques , Heatmaps , faceting , and themes , Interactive visualizations with Shiny , Exporting high-quality graphics

Data Modeling with R

Linear and logistic regression , Time series analysis , Clustering and dimensionality reduction , Model evaluation and validation

Unit-II: (15 Hours)

R Package Development

Creating R packages , Documentation and unit testing , Version control with Git , Publishing packages on CRAN

R in Big Data and Machine Learning

Introduction to big data with R , Parallel computing and data.table , Introduction to machine learning with caret , Feature engineering and model selection

Final Projects and Presentations

Students work on individual or group projects, Project presentations and peer reviews, Final exam and assessment

Textbook :

"Advanced R" by Hadley Wickham

Online Resources:

- 1) <https://www.coursera.org/> and <https://www.edx.org/>
- 2) <https://adv-r.hadley.nz/>
- 3) <https://www.r-bloggers.com/>

Reference Book:

Title: "Advanced R" Author: Hadley Wickham

Semester : II**Course Code:** BCA/SEC2/ C157-A**Course Title:** Web Commercial Elements**Total Credits:** 02**Contact Hours:** 30 (Clock Hours)**Marks:** 50**Periods:** 1 Hour**Prerequisite:** No

Course Objective :The subject aims to provide students with a comprehensive understanding of the various elements and strategies involved in conducting commercial activities on the web.

Course Outcomes:

- 1.Understand a variety of Web-based sources for accessing information including various methods of Internet searching, communications, commercial transactions and utilities.
- 2.Discuss basic Internet security and privacy issues.
- 3.Understand how databases are created and used.
- 4.Understand and demonstrate appropriate uses of technology including basic proficiency, decision-making, and information evaluation

Unit I: Fundamentals of Web Commercial Elements(15 Hours)**Introduction to Web Commerce**

What is web commerce?, E-commerce vs. traditional commerce,
Types of web commerce (B2B, B2C, C2C, etc.), Historical overview of e-commerce.

Website Design Principles

User experience (UX) and user interface (UI) design,Principles of effective website design
Responsive web design,Accessibility and usability.

Building a Web Commercial Presence**Payment Systems and Security**

Payment gateways and options, SSL certificates and secure connections,
Fraud prevention and security best practices,Compliance with data protection regulations
(e.g., GDPR)

Unit II :(15 Hours)**Creating a Business Website**

Choosing a domain name and hosting, Content management systems (e.g., WordPress),
Custom vs. template-based websites, Website development and customization.

E-commerce Management and Growth**Online Store Setup**

E-commerce platforms (e.g., Shopify, WooCommerce), Product catalog management,
Shopping cart and checkout processes,Inventory and order management.

Customer Engagement and Support

Customer relationship management (CRM), Live chat and customer support tools,
Managing customer reviews and feedback, Building trust and loyalty.

Textbook :

- 1."E-Commerce 2021" by Kenneth C. Laudon and Carol Guercio Traver.
- 2."Web Development and Design Foundations with HTML5" by Terry Felke-Morris

Online Resources :

- 1.Website: <https://www.w3schools.com/>
- 2.Website: <https://learndigital.withgoogle.com/digitalgarage>

Reference Book :

1. "Digital Marketing for Dummies" by Ryan Deiss and Russ Henneberry

Textbook

1. Microsoft Excel Latest Version Inside Out – Mark Doge and Craig Stinson – PHI Learning Private Limited, New Delhi – 110001.
2. Excel 2013 Bible ; John Walkenbach, Wiley
3. Financial Analysis and Modeling using Excel and VAB: Chandan Sengupta, Wiley

Online Resources :- NPTEL, SWAYAM, MOOCS**Reference Book**

1. Excel Data Analysis – Modeling and Simulation: Hector Guerreor, Springer
2. Microsoft Excel 2013: Data Analysis and Business Modeling: Winston, PHI
3. Excel Functions and Formulas: Bernd Held, BPB Publications.

Semester: II
Course Code: IT/SEC2/ C157-B
Course Title: **ADVANCED EXCEL**
Total Credits: 02
Contact Hours:30
Marks: 50

Prerequisite: Dekstop/Laptop having MS-EXCEL

Course Objective: Enhance the practical knowledge and implement the things which is thought in basic & advance excel.

Specific Tool Used for Practical :Dekstop PC/ Laptop with MS-EXCEL.

Unit 1

Practical Based on Ratios & Proportions, Discount, Simple Interest.
Practical Based on algebraic, trigonometric and statistical functions in excel.
Practical Based on NESTED IF condition.
Practical Based on Future Value (FV)& FV SCHEDULE.
Practical Based on Modified Internal Rate of Return (MIRR).
Practical Based on Logical Functions.(AND, FALSE, IF, IFERROR, NOT, OR, TRUE)

Unit 2

Practical Based on Lookup Functions. (Vlookup and Hlookup)
Practical Based on Mathematical Functions (ROUND, COUNT, COUNIF, MIN, MAX, ROUND, INT, SQRT)
Practical Based on Statistical Functions (AVERAGE -MEAN, MEDIAN, MOD, STDEV, VAR, RSQ, DEVSQ, COVAR)
Practical Based on (Inferential Statistics - CHISQ.TEST, FTEST, TTEST, ZTEST)

Semester: II Sem
Course Code: IT/SEC2/C157-C
Course Title: Logical Reasoning
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 1 Hour

Prerequisite:

1. Prerequisites for a logical reasoning course is basic understanding of high school-level mathematics, including algebra and geometry, is recommended.

Objective: Learning objectives for a course on logical reasoning should encompass a range of skills and knowledge that students will acquire during the course. Here are some common learning objectives for a logical reasoning course

Course Outcomes:

- 1.Explains proposition.
- 2.Explains reasoning.
3. Use appropriate reasoning types in the proving process
- 4.Use appropriate types of reasoning in problem solving process.

Unit-I: (15 Hours)

Logical Reasoning and verbal reasoning , What Is Logic and Logical Reasoning?, Arrangement Pattern Reasoning, Blood Relation Reasoning, Linear Arrangement Reasoning, Calendar Reasoning, Circular Arrangement Reasoning

Unit-II: (15 Hours) Problem Solving And Reasoning, Seating Arrangement Reasoning, Coding Decoding, Statement And Assumption Reasoning, Analogy, Pattern Matching, Classifications, Mirror Images & Reflection, Rotations & Symmetry, Cube and Dice, Water Images

Textbook:

1. A Modern Approach To Logical Reasoning : R.S. Aggarwal
2. Logical Reasoning and Data Interpretation for the CAT: Nishit K. Sinha, 2016

Online Resources

1. <https://www.indiabix.com/logical-reasoning/questions-and-answers/>
2. <https://www.javatpoint.com/reasoning>

Reference Book

1. A Modern Approach to Verbal & Non-Verbal Reasoning: R.S. Aggarwal, 2018