DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/ B.Sc./NEP/52/2023

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.Sc. Home Science	Ist and IInd semester
2.	B.Sc. Biotechnology	Ist and IInd semester
3.	B.Sc.Agrochemical and Fertilizer	Ist and IInd semester
4.	B.Sc. Geology	Ist and IInd semester
5.	B.Sc. Computer Science	Ist and IInd semester
6.	B.Sc. Microbiology	Ist and IInd semester
7.	B.Sc.Analytical Chemistry	Ist and IInd semester
8.	B.Sc.Environmental Science	Ist and IInd semester
9.	B.Sc.Dairy Science and Technology	Ist and IInd semester
10.	B.Sc. Chemistry	Ist and IInd semester
11.	B.Sc. Polymer Chemistry	Ist and IInd semester
12.	B.Sc. Biochemistry	Ist and IInd semester
13.	B.Sc. Bioinformatics	Ist and IInd semester
14.	B.Sc. Physics	Ist and IInd semester
15.	B.Sc.Instrumentation Practice	Ist and IInd semester
16.	B.Sc. Non Conventional and Conventional Energy	Ist and IInd semester
17.	B.Sc. Horticulture	Ist and IInd semester
18.	B.Sc. Forensic Science & Cyber Security	Ist and IInd semester
19.	B.Sc.Industrial Chemistry	Ist and IInd semester
20.	B.Sc.Zoology	Ist and IInd semester

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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 Sambhajinagar
431 004.
REF.NO.SU/2023/19381-89
Date:- 15.12.2023.

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

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CHHATRAPATI SAMBHAJINAGAR

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.(Computer Science)

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

(To be implemented from Academic Year -2024-2025)

Program Educational Objectives

PEO1
Develop proficiency as Information Technology expert with an ability to creat wide range of IT based applications for Industries, Government or other wor 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
Ability to design, manage, and query relational databases, as well as understand non-relational data storage.

3. PSO3
Ability in designing and developing dynamic web applications, including the use of web technologies, frameworks, and content management systems.

AS PER NEP 2020

Faculty of Science
Course Structure (First Year)
B.Sc. Computer Science 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	CS/DSC1/C100	Problem Solving Techniques	2		2		2+2+2=06
	CS/DSC2/C101	Programming Fundamentals using C	2		2		
	CS/DSC3/C102	Practical Based on CS/DSC1/C100 & CS/DSC2/C101		4		2	
Generic Elective (GE) / Open Elective (OE) (Choose any one from pool of courses)	CS/GE1/ C103	A. Computer Fundamentals OR B. Computational Mathematics OR C. Principles of Internet	2		2		2+2=04
	CS/GE2/ C104	A. Digital Electronics-I OR B. MS Word OR C. Basics of Computer Hardware	2		2		
VSC (Choose any one from pool of courses)	CS/VSC1/ C105	A. Introduction to Linux OR B. Introduction to Python Programming OR C. R Programming-I		4		2	2+2=04
SEC (VSEC) (Choose any one from pool of courses)	CS/SEC1/ C106	A.HTML Programming OR B.Basic of Multimedia OR C. Open Source Tools	2		2		
AEC, VEC, IKS (Ability Enhancement Course)	CS/AEC1/ C107	Communication in English- I (Linguistic Approach) (Common Across faculty)	2		2		2+2+2=06
	CS/VEC1/ C108	Constitution of India (Common across faculty)	2		2		
	CS/IKS1/ C109	Indian Knowledge System (Common across faculties)	2		2		
OJT, FP, CEP, CC, RP	CS/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. Computer Science 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	CS/DSC4/C150	Operating System-I	2		2		2+2+2=06
	CS/DSC5/C151	Advance Programming in C	2		2		
	CS/DSC6/C152	Practical Based on CS/DSC4/C150 & CS/DSC5/C151		4		2	
Minor	CS/M1/C153	DBMS	2		2		02
Generic Elective (GE) / Open Elective (OE) (Choose any one from pool of courses)	CS/GE3/ C154	A. Information Security OR B. Numerical Method OR C. Web Technology	2		2		2+2=04
	CS/GE4/ C155	A. Digital Electronics-II OR B. MS Excel OR C. PC Maintenance	2		2		
VSC (Choose any one from pool of courses)	CS/VSC2/ C156	A. Advance Linux OR B. Python Programming- II OR C. R Programming-II		4		2	2+2=04
SEC (VSEC) (Choose any one from pool of courses)	CS/SEC2/ C157	A. Javascript OR B. Advance Multimedia OR C.Logical Reasoning	2		2		
AEC, VEC, IKS (Ability Enhancement Course)	CS/AEC2/ C158	Communication in English- II (Soft Skill Development) (Common Across faculty)	2		2		2+2+2=04
	CS/VEC2/ C159	Environmental Education (Common across faculty)	2		2		
OJT, FP, CEP, CC, RP	CS/CC2/ C160	Yoga Education / Sports and fitness (Common across faculty)		4		2	02
			16	**12**	**16**	**06**	**22 Credits**

B.Sc. (Computer Science)

Semester I

(NEP-2020)

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. Of. Lectures/Hours/ semester
DSCC	Theory	2	2	30

Course Code: **CS/DSC1/C100**

Title of the Course: **Problem Solving Techniques**

Course Objectives

1. To Know the Basics of Programming and how to use programming in day to day Applications.
2. Learn how to solve common types of computing problems & how to apply logic to develop solutions.
3. Learn data types and control structures of C
4. Learn to map problems to programming features of C.
5. Learn to write good portable C programs.

Course Outcomes

After Compilation of Course (Problem Solving Techniques), Students will be able to:-

CO 1 : Appreciate and understand the working of a digital computer.
CO 2 : Analyze a given problem and develop an algorithm to solve the problem.
CO 3 : Improve upon a solution to a problem.
CO 4 : Use the 'C' language constructs in the right way.

Title of the Course: **Problem Solving Techniques**	Total Hrs : 30
UNIT 1	15 Hrs
Techniques of Problem SolvingConcept of problem solving, Problem definition, Program design, Flowcharting, decision table, algorithms, Structured programming conceptsProgramming methodologies viz. top-down and bottom-up programming	
UNIT 2	15 Hrs
Debugging, Types of errors in programming, Documentation, Problem solving techniques using various, flowcharts and algorithms. Decision making and branching if-statement – if, if- else, else-if ladder, nested if else, switch case statement, break statement, Decision making and looping - while, do, do- while statement , for loop, continue statement,	

Books Recommended :

1. Let us C-Yashwant Kanetkar.
2. Programming in C- Balguruswamy
3. The C programming Lang., Pearson Ecl – Dennis Ritchie
4. Structured programming approach using C-Forouzah&Ceilberg Thomson learning publication.

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No.Of. Lectures/Hours/ semester
DSCC	Theory	2	2	30

Course Code: **CS/DSC1/C101**

Title of the Course: **Programming Fundamentals using C**

Course Objectives

- To study about algorithms, flowcharts and programs.
- To solve problems through logical thinking.

Course Outcomes

After Compilation of Course (**Programming Fundamentals using C**) Students will be able to :

CO 1 : To clearly understand the logic of the problem.

CO 2 : To analyze the given problem and write the algorithm, flowchart.

CO 3 : To write structured C programs, this is the foundation of any programming language.

Title of the Course: **Programming Fundamentals using C**	**Total Hrs:30**
UNIT 1 Introduction to C programming	15 Hrs
C Compiler – TURBO C / gcc Compiler, Geany IDE History of C- Character set - Structure of a C program - constants, variables and keywords. Expressions – Statements – Operators – Arithmetic, Unary, Relational and logical, Assignment, Conditional. Library functions. Data Input and output – Single character input, getchar, getch, getc – Single character output putchar, putc, Formatted I/O scanf, printf, gets,puts.Branching: goto Statement, condition: if, if..else, switch.	
UNIT 2	15 Hrs
Looping: while, do-while, for, nested control structures, break, continue statement.Arrays: definition, processing, types - One and Two dimensional arrays. String, string operations, arrays of strings.	

Books Recommended:

1. Byron Gottfried, JitenderChhabra ,Programming with C, 3rd Edition. Tata McGraw-Hill, 2010.
2. Balagurusamy E., Programming in ANSI C, 6 Edition,Tata McGraw-Hill,2012.
3. Deitel H M and Deitel P J, C - How to Program, 5 Edition, Prentice-Hall, 2006.
4. SmarajitGhosh, All of 'C',2 Edition, 2009.
5. M. T. Somashekara, Problem Solving with C, PHI, 2009.

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. Of Lectures/ Hours/ semester
DSCC	Practical	2	4	60

Course Code: CS/DSC1/C102

Title of the Course: Practical Based on CS/DSC1/C100 & CS/DSC2/C101

Course Objectives

- To solve problems through programming

Course Outcomes

In this course, you will learn about:

1. Programming basics and the fundamentals of C
2. Data types in C
3. Mathematical and logical operations
4. Using if statement and loops
5. Arranging data in arrays

Course Code: CS/DSC1/C102	**Course Title :Practical Based on CS/DSC1/C100 & CS/DSC2/C101**
Sample List of experiments to be carried out based on the course **CS/DSC1/C100 & CS/DSC2/C101** Note: Implement any three programs from each unit.	

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No.Of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: **CS/GE1/C103-A**

Title of the Course: **Computer Fundamentals**

Course Objectives

To impart basic introduction to computer hardware, components, computer number system. How the CPU works, fundamental about algorithms and flowchart as well as different types of software.

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 computerbased application such as email and video conferencing.

Title of the Course: **Computer Fundamentals**	Total Hrs:30
Unit 1	15 Hrs
1. **Fundamentals of Computer System** Characteristics & features of Computers. Components of Computers. Organization of Computer. 2. **Computer Generation**& Classification Generation of Computers: First to Fifth Classification of Computers: Distributed & Parallel computers 3. **Computer Memory Memory Cell & Organization** Types of Memory (Primary And Secondary): RAM, ROM, PROM, EPROM, advantages and disadvantages of each. Secondary Storage Devices (FD, CD, HD, Pen drive, DVD, Tape Drive, DAT)	
Unit 2	15 Hrs
4. **I/O Devices** Input Devices: Touch screen, OMR, OBR, OCR, Light pen,Scanners Output Devices: Digitizers, Plotters, LCD, Plasma Display, Printers 5. **Processor** Structure of Instruction, Description of Processor, Processor Features RISC & CISC	

Books Recommended:

1. Fundamentals of Information Technology; By Chetan Srivastava, Kalyani Publishers
2. Fundamentals of Computers: By V.Rajaraman, PHI Publication, IVth Edition.
3. Fundamentals of Programming: By Raj K.Jain, S.Chand Publication
4. Computer Fundamental By B.Ram, BPB Publication.

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: BCA/GE1/C103-B Title of the Course: Computational Mathematics

Course Objectives

1. To develop mathematical modeling skills
2. To teach numerical methods
3. To enhance programming skills
4. To promote critical thinking
5. To address optimization problems

Course Outcomes

By the end of the course, students should be able to:

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

Syllabus- Course: Title: Computational Mathematics	Total Hrs:30
Unit 1	15 Hrs
Overview of Computational Mathematics Understanding the role of computation in mathematics Historical perspective and significance in modern mathematics Numerical Methods Introduction to numerical analysis Root-finding methods, interpolation, and approximation Error analysis and stability of algorithms Linear Algebra in Computation Matrix operations and linear system solving Eigenvalue and eigenvector computations Applications in science and engineering	
Unit 2	15 Hrs
Optimization Techniques Introduction to optimization problems Unconstrained optimization: gradient descent and Newton's method Constrained optimization: linear and nonlinear programming Monte Carlo Simulation Basics of Monte Carlo methods Random number generation and sampling techniques Applications in probabilistic modeling and risk assessment	

Reference Books

1."Numerical Analysis" by Richard L. Burden and J. Douglas Faires
2."Numerical Recipes: The Art of Scientific Computing" by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery
3."A First Course in Numerical Analysis" by Anthony Ralston and Philip Rabinowitz
4."Introduction to the Numerical Solution of Markov Chains" by William J. Stewart
5."Numerical Linear Algebra" by Lloyd N. Trefethen and David Bau III

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No.Of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE1/C103-C **Title of the Course: Principles of Internet**

Course Objectives

1.Introduce the basic infrastructure of the Internet, including networks, servers, routers, and the global backbone.
2.Familiarize students with essential Internet protocols and standards, such as TCP/IP, DNS, HTTP, and SMTP.
3.Explore the principles of Internet governance, regulatory bodies, and policies affecting the Internet's use and operation.
4.Examine common security threats and best practices for securing online activities and data, including encryption, firewalls, and cybersecurity measures.

Course Outcomes

By the end of the course, students should be able to
1.Describe Internet History and Evolution
2.Understand Internet Infrastructure
3.Explain Internet Protocols
4.Discuss Internet Governance and Regulation

Title of the Course: Principles of Internet	Total Hrs:30
Unit 1	15 Hrs
Introduction to the Internet and its Foundations Introduction to the Internet Historical development and significance of the Internet Overview of the Internet's infrastructure and architecture Key terminology: IP addresses, domains, and web protocols Internet Protocols and Standards Understanding the OSI and TCP/IP models Exploring common Internet protocols (HTTP, FTP, SMTP, etc.) Domain Name System (DNS) and its role in web addressing Internet Governance and Regulation The role of ICANN, IETF, and other governing bodies Internet policies, regulations, and digital rights Net neutrality and cybersecurity Web Technologies and Internet Applications World Wide Web (WWW) The structure of web pages and URLs HTML, CSS, and JavaScript: fundamentals and usage Web development tools and platforms	
Unit 2	15 Hrs

Web Browsing and Search Engines Web browsers and their features Effective web searching techniques Introduction to SEO (Search Engine Optimization) Internet Security and Privacy Internet threats and vulnerabilities Encryption and secure communication Best practices for online privacy Internet and Society E-Commerce and Online Business Principles of e-commerce and online business models Payment gateways and online transactions Case studies of successful online businesses Social Media and Online Communication Social networking platforms and their impact Online communities and digital communication Social media etiquette and the role of influencers Emerging Trends and Future of the Internet Internet of Things (IoT) and its applications Artificial intelligence and machine learning on the Internet Ethical considerations and the future of Internet technology	

Reference Books

1. "Internet Technologies Handbook: Optimizing the IP Network" by Cisco Systems

2. "The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works" by Douglas E. Cor

3. "The Master Switch: The Rise and Fall of Information Empires" by Tim Wu

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE2/C104-A **Title of the Course: Digital Electronics-I**

Course Objectives

To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits

Course Outcomes

By the end of this course, the students will be able to:

1. Understand the concepts of digital electronics
2. Understand the basic working of different logic gates and laws of Boolean algebra, De Morgan theorem, NOR & NAND logi simplification of circuits.
3. Understand the concepts of K-maps and designing of logic circuits.
4. Understand and design different controlling circuits used in digital electronics.

Syllabus- Course1: Title: Digital Electronics	Total Hrs:30
Unit 1	10 Hrs
1. Number Systems and Arithmetic Number System: Decimal, Octal, Hexadecimal & Binary Number System Conversion within Binary, Octal, Hexadecimal & Decimal Number System. Binary Arithmetic : Binary addition, subtraction, multiplication & division Binary subtraction using 1' complement, 2's complement method. Hexadecimal arithmetic: Addition, subtraction, multiplication & division 2. Boolean Algebra and Logic Gates Postulates of Boolean Algebra, Theorems of Boolean Algebra: Complementation, commutative, AND, OR, Associative, Distributive, Absorption laws, De morgan's theorems Reducing Boolean expressions, Logic Gates AND, OR, NOT, Ex-OR, Ex-NOR NAND as Universal building block Logic diagrams of Boolean expressions Boolean expressions for logic diagrams 3. Minimization Techniques Introduction, Minterms and Maxterms K-Map, K-map for 2 variables, K-map for 3 variables, K-map for 4 variables	
Unit 2	10 Hrs

4. Combinational and Arithmetic Logic Circuits Half Adder & Full Adder Binary parallel Adder Half Subtractor, Full Subtractor Adder/Subtractor in 2's complement system BCD to Decimal decoder, 2: 4 demultiplexer , 4 line to 1 line multiplexer 5. Flip Flops Introduction: RS FF, Clocked RS FF, D FF , Triggering, preset and clear JK FF, T FF, Race around condition Master slave FF 6. Counters Introduction: Asynchronous/ ripple counter Modulus Counter, MOD-12 counter Synchronous counter: Synchronous serial & synch parallel counter BCD counter, Ring counter	

Reference Books

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

2. Digital Electronics and Logic Design - N.G.Palan, Technova Publication

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE2/C104-B **Title of the Course: MS-Word**

Course Objectives

To acquire the basic knowledge of digital documentation

Course Outcomes

The students will be able to explain the general concepts of the Word processors
The students will be able to do application with the window elements of the Word Program
The students will be able to do text processing
The students will be able to apply the applications about page design and print
The students will be able to apply format menu in MS Word

Title of the Course: MS-Word	Total Hrs:30
Unit 1	15 Hrs
1. Create and Manage Documents & Format Text, Paragraphs, and Sections & Create Tables and Lists Create a Document Navigate Through a Document Format a Document Customize Options and Views for Documents Print and save documents Insert Text and Paragraphs Format Text and Paragraphs Order and Group Text and Paragraphs 2. Create a Table, modify a Table, Create and Modify a List	
Unit 2	15 Hrs
3. Create and Manage References & Insert and Format Graphic Element Create and Manage Reference Markers Create and Manage Simple References Insert Graphic Elements Format Graphic Elements Insert and Format SmartArt Graphics 4.Manage document options and settings & Design advanced documents Manage Documents and Templates Prepare Documents for Review Manage Document Changes Perform Advanced Editing and Formatting Create Styles Create and Manage Indexes Create and Manage References Manage Forms, Fields, and Mail Merge Operations	

Reference Books

Word 2023: A Step-by-Step Concise Practical Guide to Master Microsoft Word 2023Helen Brooks, 2022

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE2/C104-C Title of the Course: Basics of Computer Hardware

Course Objectives

- Identify and describe the two types of computer system units.
- Identify different parts of a computer.
- Describe the function of different computer parts.

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.

Title of the Course: Basics of Computer Hardware	Total Hrs:30
Unit 1	10 Hrs
Introduction to Computer Hardware** 1.1 What is Computer Hardware? 1.2 Historical Overview of Computer Hardware 1.3 Components of a Computer System 1.4 Central Processing Unit (CPU) and its functions 1.5 Memory and Storage Devices 1.6 Input and Output Devices 1.7 Motherboard and System Architecture 1.8 Booting and BIOS/UEFI Peripherals and Expansion Devices 2.1 Keyboards and Mice 2.2 Monitors and Display Technology 2.3 Printers and Scanners 2.4 External Storage Devices 2.5 Expansion Cards and Slots 2.6 USB and Other Ports 2.7 Networking Hardware (Routers, Modems, etc.) 2.8 Sound Cards and Audio Devices	
Unit 2	10 Hrs

Maintenance and Troubleshooting** 3.1 Computer Maintenance Best Practices 3.2 Software and Hardware Updates 3.3 Common Hardware Problems and Solutions 3.4 Diagnosing and Troubleshooting Hardware Issues 3.5 Data Backup and Recovery 3.6 Preventing Overheating and Dust Accumulation 3.7 Hardware Security and Anti-static Precautions 3.8 Emerging Trends in Computer Hardware	

Reference Books

1. "Upgrading and Repairing PCs" by Scott Mueller

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No.Of. Lectures/Hours/ semester
VSC	Practical	2	4	60

Course Code: CS/VSC1/C105-A

Title of the Course: Introduction to Linux

Course Objectives

To introduce students the basic knowledge of open source operating system such as Linux.
To acquaint students about implementation of execution of Linux commands.

Course Outcomes

1. To acquaint students with various Linux commands and installation of open source operating system.
2. To cultivate implementation skill of open source operating system.
3. To develop skills in managing commands with I/O redirection and piping.
4. To prepare students for future courses having technical operating system knowledge.

Title of the Course: Introduction to Linux	Total Hrs:60

Hands on Based on Following curriculum

Unit 1 Introduction to Linux
Introduction to UNIX/Linux - History, Linux versions, Install Linux O.S. Linux Features, The structure of Linux System, The Linux File System , File permissions, login procedure, error corrections, working with directories.

Unit 2 Commands in Linux
Examining ordinary file commands, file management commands, status information commands, working with Text commands.

Unit 3 I/O Redirection and Piping
controlling running program commands, input output redirection and pipes, Unix communication commands, && and || constructs,

Reference Books

1. Introduction to Linux and Shell Scripting by Amalorpavam G M.T. Somashekara, K.R. Venugopal
2. Linux: The Complete Reference, Sixth Edition by Richard Petersen
3. Linux and shell programming for beginners (English, Paperback, Poornimha J)

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
VSC	Practical	2	4	60

Course Code: cs/VSC1/C105-B **Title of the Course: Introduction to Python Programming**

Course Objectives

1.Introduce students to the basic concepts of programming, including variables, data types, control structures, and functions.
2.Familiarize students with the syntax and structure of the Python programming language, including variables, data types, and con statements.
3.Teach students how to write simple Python programs, covering input/output, arithmetic operations, and decision-making constr
4.Introduce fundamental data structures in Python, such as lists, dictionaries, and tuples, and how to work with them.
5.Teach the creation and use of functions and modules to promote code reusability and organization.

Course Outcomes

By the end of the course, students should be able to:
1.Write Basic Python Programs
2.Understand Python Syntax
3.Implement Data Structures
4.Develop Functions and Module

Title of the Course: Introduction to Python Programming	Total Hrs:60

Hands on based on Following curriculum

Unit 1
Introduction to Python
1.1 What is Python?
1.2 History and Evolution of Python
1.3 Installing Python and Setting Up the Environment
1.4 Your First Python Program
1.5 Variables, Data Types, and Basic Input/Output
1.6 Control Structures (if statements, loops)
1.7 Functions and Modular Programming
1.8 Lists and Tuples

Unit 2
Intermediate Python Programming
2.1 Dictionaries and Sets
2.2 File Input/Output (I/O)
2.3 Exception Handling

Unit 3
Modules and Libraries
3.1 Working with Modules and Libraries
3.2 Object-Oriented Programming (OOP) in Python
3.3 Classes and Objects
3.4 Inheritance and Polymorphism

Reference Books

1. "Python Crash Course" by Eric Matthes (for beginners)
2. "Python for Data Analysis" by Wes McKinney

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No.Of. Lectures/Hours/ semester
VSC	Practical	2	4	60

Course Code: CS/VSC1/C105-C **Title of the Course: R Programming- I**

Course Objectives

1.Provide students with an overview of R, its history, and its significance in data analysis, statistics, and data science.
2.Teach the basic syntax of R, including variables, data types, and data structures like vectors, data frames, and lists.
3.Instruct students on how to import data from various file formats (e.g., CSV, Excel) and export results to external files.
4.Introduce techniques for data manipulation, such as subsetting, filtering, and transforming data frames.

Course Outcomes

By the end of the course, students should be able to:
1.Use R for Data Analysis
2.Understand R Syntax
3.Import and Export Data
4.Manipulate Data

Title of the Course: R Programming- I	Total Hrs:60

Hands on based on Following curriculum

Unit 1
Introduction to R Programming
1.1 What is R Programming?
1.2 History and Evolution of R
1.3 Installing R and Setting Up the Environment
1.4 Your First R Script
1.5 Variables, Data Types, and Basic Data Structures (vectors, matrices)

Unit 2
Data Manipulation using R
2.1 Data Import and Export
2.2 Basic Data Manipulation and Exploration
2.3 Control Structures (if statements, loops)
2.4 Functions and Modularity in R
2.5 Working with Packages and Libraries

Unit 3
Data Analysis and Visualization
3.1 Data Frames and Data Tables
3.2 Data Cleaning and Preprocessing
3.3 Descriptive Statistics and Data Visualization
3.4 Basic Plotting (bar charts, scatter plots, histograms)
3.5 Advanced Data Visualization (ggplot2)

Reference Books

1."R for Data Science" by Hadley Wickham and Garrett Grolemund (for data analysis)

2."An Introduction to Machine Learning" by Alpaydin, Mehmedali (for machine learning)

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/SEC-1/C106-A **Title of the Course: HTML Programming**

Course Objectives

1. Introduce students to the fundamentals of web development and the role of HTML in creating web content.
2. Teach students the syntax, structure, and elements of HTML, including tags, attributes, and document structure.
3. Emphasize the use of semantic HTML to create meaningful and accessible web pages.

Course Outcomes

By the end of the course, students should be able to:

1.Develop simple web pages using HTML, incorporating text, links, and images.
2.Demonstrate a solid understanding of HTML syntax, including tags and attributes.
3.Employ semantic HTML elements to structure web content in a meaningful and accessible way.
4.Format text content using headings, paragraphs, lists, and emphasis tags effectively.
5.Create hyperlinks to navigate within web pages and link to external resources.

Title of the Course: HTML Programming	Total Hrs:30
Unit 1	15 Hrs
Introduction to HTML 1.1 What is HTML? 1.2 History and evolution of HTML 1.3 HTML Document structure 1.4 Basic HTML tags and elements 1.5 Creating a simple HTML document 1.6 Text formatting and structure with HTML 1.7 Adding comments and whitespace HTML Elements and Attributes 2.1 Heading and paragraph tags 2.2 Lists (Ordered and Unordered) 2.3 Links and anchors 2.4 Images and multimedia 2.5 Tables and forms	
Unit 2	15 Hrs
2.6 Semantic HTML: Headers, footers, sections, and articles 2.7 HTML attributes and their usage 2.8 HTML forms and input elements Advanced HTML Topics 3.1 HTML5 and its new elements 3.2 Working with iframes and embedded content 3.3 HTML metadata and SEO best practices 3.4 HTML and CSS: Styling web pages 3.5 HTML and JavaScript: Basic interaction 3.6 Responsive web design and mobile considerations 3.7 Web accessibility and best practices 3.8 HTML validation and debugging tools	

Reference Books

1. HTML and CSS Design and Build Websites" by Jon Duckett

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Course No	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
1	GE	Theory	2	2	30

Course No.1 Course Code: CS/SEC1/C106-B Title of the Course: Basic of Multimedia

Course Objectives

1.Provide students with a fundamental understanding of image editing concepts, terminology, and principles.
2.Familiarize students with popular image editing software, such as Adobe Photoshop, GIMP, or other relevant tools, and teach the how to use these applications effectively.
3. Teach various techniques for improving image quality, including color correction, contrast adjustment, sharpening, and noise reduction.

Course Outcomes

By the end of the course, students should be able to

1. Navigate and Use Image Editing Software
2. Enhance Image Quality
3. Manipulate Images Creatively
4. Create Original Artwork

Title of the Course: Basic of Multimedia	Total Hrs:30
Unit 1	15 Hrs
Fundamentals of Image Editing Introduction to Image Editing Overview of image editing and its applications Key concepts: resolution, color modes, and image formats Introduction to popular image editing software (e.g., Adobe Photoshop) Image Enhancement and Correction* Adjusting brightness, contrast, and exposure Color correction and manipulation Removing noise and artifacts Image Retouching and Restoration* Basic retouching techniques (blemish removal, skin smoothing) Restoring old or damaged photographs Non-destructive editing methods Advanced Image Editing Techniques Selections and Layers Creating selections and masks Working with layers for non-destructive editing Combining images and compositing	
Unit 2	15 Hrs

Filters and Special Effects Applying artistic and creative filters Adding text and typography to images Creating custom brushes and patterns Image Compositing and Manipulation Advanced techniques for image manipulation Creating surreal or fantasy images Specialized compositing and blending modes Digital Imaging Projects and Practical Applications Photo Editing Projects Student-led image editing projects Critique and feedback on editing work Discussing best practices and creative approaches Digital Imaging in Media and Advertising Understanding image editing in advertising and media Discussing ethical considerations Guest lecture from industry professionals	

Reference Books

1. "Adobe Photoshop CC Classroom in a Book" by Andrew Faulkner and Conrad Chavez

2. "The Adobe Photoshop Lightroom Classic CC Book" by Martin Evening

3. "Photoshop for Photographers" by Martin Evening

B.Sc. Semester-I

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
SEC	Theory	2	2	30

Course Code: CS/SEC1/C106-C Title of the Course: Open Source Tools

Course Objectives

1.Define open source software and its principles, including the four essential freedoms.
2.Introduce students to a range of popular open source software applications and tools used in various domains, such as operating systems, office suites, graphics editing, and programming.
3.Teach students how to install, configure, and maintain open source software effectively, focusing on both desktop and server applications.

Course Outcomes

By the end of the course, students should be able to:
1.Identify and Explain Open Source Principles
2.Use Common Open Source Tools
3.Collaborate with the Open Source Community
4.Develop with Open Source Tools

Title of the Course: Open Source Tools	Total Hrs:30
Unit 1	15 Hrs
Introduction to Open Source and Key Concepts 1.1 What is Open Source Software? 1.2 History and Philosophy of Open Source 1.3 Licensing and Legal Aspects 1.4 Benefits and Challenges of Open Source 1.5 Popular Open Source Initiatives and Communities 1.6 Open Source Tools vs. Proprietary Software 1.7 Setting Up Open Source Development Environments 1.8 Version Control Systems (e.g., Git) Common Open Source Tools and Applications 2.1 Text Editors and Integrated Development Environments (IDEs) 2.2 Office Suites (e.g., LibreOffice) 2.3 Graphics and Design Tools (e.g., GIMP, Inkscape) 2.4 Web Browsers (e.g., Mozilla Firefox) 2.5 Content Management Systems (e.g., WordPress)	
Unit 2	15 Hrs

2.6 Email Clients and Communication Tools (e.g., Thunderbird) 2.7 Virtualization and Cloud Computing (e.g., VirtualBox, Docker) 2.8 Data Analysis and Visualization Tools (e.g., R and Python) 2.9 Collaboration and Project Management (e.g., JIRA and Trello) Open Source in Specific Domains 3.1 Open Source in Education 3.2 Open Source in Healthcare 3.3 Open Source in Government and Public Services 3.4 Open Source in Research and Scientific Computing 3.5 Open Source in Web Development 3.6 Open Source in Embedded Systems and IoT 3.7 Open Source in Security and Privacy 3.8 Open Source Licensing and Compliance	

Reference Books

1."The Cathedral & the Bazaar" by Eric S. Raymond

2."The Art of Community" by Jono Bacon

3."Open Sources: Voices from the Open Source Revolution" by Chris DiBona, Sam Ockman, and Mark Stone

4."The Linux Command Line" by William E. Shotts Jr.

B.Sc. (Computer Science)

Semester II

(NEP-2020)

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Course No	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
1	DSCC	Theory	2	2	30

Course Code: CS/DSC4/C150 **Title of the Course: Operating System-I**

Course Objectives

To introduce students the basic functioning of operating systems as resource manager and its salient features.
To acquaint students about Process States, CPU Scheduling, Inter Process Communication, Synchronization, Deadlocks.

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 Synchroniza and Deadlock.

Title of the Course: Operating System-I	Total Hrs:30
Unit 1	15 Hrs
Introduction to Operating System: 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.Concept of Process: Process States, Process Control Block, Operations on Processes, Threads.	
Unit 2	15 Hrs
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. Memory management.	

Reference Books

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.

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

5. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.

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

B.Sc. Semester-II
Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
DSCC	Theory	2	2	30

Course Code: CS/DSC5/C151 **Title of the Course: Advance Programming in C**

Course Outcomes

In this course, you will learn about:

1. **Implementing pointers**
2. **Manage I/O operations in your C program**
3. **Repeat the sequence of instructions and points for a memory location**
4. **Apply code reusability with functions and pointers**
5. **Explain the uses of pre-processors and various memory models**

Title of the Course: Advance Programming in C	**Total Hrs:30**
Unit 1	**15 Hrs**
Top down approach of problem solving, standard library functions, passing values between functions, scope rules of functions, calling convention, return type of functions, call by value and call by reference, recursive functions. **Storage Classes** **Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Structures and Unions**	
Unit 2	**15 Hrs**
Defining a structure, Declaring Structure variables, accessing structure members, structure initialisation, copying and comparing structure variables, operation on individual members, arrays of structures, arrays within structures, structures and functions, union, size of structure, bit fields. **Understanding pointers, accessing the address of a variable, declaring pointer variables, initialization of pointer variables, accessing a variable through its pointer, chain of pointers, pointer expression,pointer increment and scale factor, pointer and arrays, pointers and character strings, array of pointers, pointers as function arguments, functions returning pointers, pointers to functions, pointers and structures.**	

Reference Books

1. E. Balagurusamy, "Programming with ANSI-C", Fourth Edition,2008, Tata McGraw Hill.

2. R.G. Dromey, "How to solve it by Computer", Pearson Education, 2008.

3. Kanetkar Y, "Let us C", BPB Publications, 2007.

4. Hanly J R &Koffman E.B, "Problem Solving and Programm design in C", PearsonEducation, 2009.

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Course No	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
1	DSCC	Practical	2	4	60

Course Code: CS/DSC6/C152 **Title of the Course: Practical Based on CS/DSC4/C150 & CS/DSC5/C151**

Course Objectives

Course Outcomes

Course Code: CS/DSC1/C152	**Course Title : Practical Based on CS/DSC4/C150 & CS/DSC5/C151**
Sample List of experiments to be carried out based on the course **CS/DSC4/C150 & CS/DSC5/C151** Note : Implement any fifteen practical based on curriculum	

B.Sc. Semester-II

Subject: B.C.A. Science

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
Minor	Theory	2	2	30

Course Code: CS/M1/C153 **Title of the Course: DBMS**

Course Objectives

1.Learn what is data, database and DBMS
2.Understand the basics of database designing.
3.Lear different SQL statements

Course Outcomes

1.Design a database.
2.Normalize a database.
3.Create a database perform various operations on database.

Title of the Course: DBMS	Total Hrs:30
Unit 1	15 Hrs
Introduction to Databases, Types of Data, Record and Files, File based System, What is database system, application and purpose of database system, Three-Level of data abstraction, instance and schema, data independence, database users, structure of a DBMS, Advantages and disadvantages of DBMS.	
Unit 2	15 Hrs
Database Design, Design Phases, Normal Forms INF,2NF, 3NF and BCNF. ER-Model entity set, relationship set, attributes, constraints, ER-Diagram basic structure, mapping cardinality, Roles, weak entity set. Symbols used in ER-notations. ERD Issues, 12 Codd's rules SQL: SQl Languages DDL, DML, DCL, TCL, DDL Statements to Create and Manage Tables using Create & Alter, Manipulating Data using Insert, Update & Delete Statement., Retrieving Data Using SQL Select, Restricting and Sorting Data, Using SingleRow functions, Conversion Functions and Conditional Expressions, Aggregated Data Using Group Function, Displaying data	

Reference Books

1. Database system concepts(6th edition) AviSilverschatz, Henry F. Korth, S.Sudarshan 2. An introduction to database systems by B C. Desai

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE3/C154-A **Title of the Course: Information Security**

Course Objectives

To provide the student with an overview of the field of Information Security and Assurance. Students will be exposed to tl spectrum of Security activities, methods, methodologies, and procedures

Course Outcomes

1. Identify and prioritize information assets.
2. Identify and prioritize threats to information assets.
3. Define an information security strategy and architecture.
4. Plan for and respond to intruders in an information system.
5. Describe legal and public relations implications of security and privacy issues.

Title of the Course: Information Security	Total Hrs:30
Unit 1	15 Hrs
Introduction, Definition of security, Assessing security, Security terminology , Historical developments, Structure of security, Introduction to Information Security, The Needfor Security , Legal, Ethical, and Professional Issues in Information SecurityRisk Management and Special requirements such as Emanation Security/TEMPEST Standards, Planning for Security, Rainbow Series Reports for DOD; FIPS for all Federal Govt;	
Unit 2	15 Hrs
DHS and CNSS guidance: Firewalls & VPNs Cryptography: Applications of cryptography,Terminology, Evolution of cryptography, Caesar ciphers, one-time pads, Operation of DES, AES ,Public-key cryptosystems, Topics in Information Systems Security, Minimum privilege ,Compartmentalization , Dual controls ,Security perimeters, Trustworthy software, proof of design correctness, Single-points-of-failure, Covert channels, Inference	

Reference Books

1. The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws Marcus Pinto, 2007
2. Applied Cryptography Bruce Schneier, 1993
3. Principles of Information Security Michael E. Whitman, 2002

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE3/C154-B **Title of the Course: Numerical Method**

Course Objectives

1.A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology, state important facts resulting from their studies.
2.A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
3.Students get familiar with numerical analysis.

Course Outcomes

1.Different number theory algorithms.
2.Calculate approximate value for using approximation techniques.
3.Solve numerical problems using different numerical methods.
4.Write algorithms of different numerical techniques.

Title of the Course: Numerical Method	Total Hrs:30
Unit 1	15 Hrs
Introduction: Mathematical Modeling, Characteristics, Error in Calculation, Significant Error, Absolute, Percentage Relative Error, Chopping off and Rounding off Error, Truncation Error, Propagation Error. Divisibility Theory in the Integer: Early Number Theory. The division Algorithm. Greatest Common divisor. The Euclidean Algorithm Numerical Solutions of Transcendental Equations: Introduction and Matrix Notation of set of Equations	
Unit 2	15 Hrs
Gauss Elimination Method Gauss Seidal Method Matrix Inversion Method Introduction and Polynomial Interpolation Newton-Gregory Forward Difference Interpolation Formula Newton-Gregory Backward Difference Interpolation For	

Reference Books

1."Numerical Analysis" by Richard L. Burden and J. Douglas Faires:

2."Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale:

3."Numerical Recipes in C: The Art of Scientific Computing" by William H. Press, Saul A. Teukolsky, et al.:

4."Numerical Mathematics" by Alfio Quarteroni and Riccardo Sacco:mula

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours/semester
GE	Theory	2	2	30

Course Code: CS/GE3/C154-C **Title of the Course: Web Technology**

Course Objectives

1.Provide an overview of web design principles, the role of CSS in web development, and its significance in creating attractive and u friendly websites.
2.Introduce students to the basic syntax and rules of CSS, including selectors, properties, and values.
3.Teach how to apply CSS styles to HTML elements, including text formatting, color, and background properties.
4.Explain the concepts of layout and positioning in web design, covering techniques such as floats, positioning, and the CSS box mo

Course Outcomes

By the end of the course, students should be able to:

1.Apply CSS for Web Design
2.Understand CSS Syntax
3.Style HTML Elements
4.Layout and Positioning
5.Design Responsive Websites

Title of the Course: Web Technology	Total Hrs:30
Unit 1	15 Hrs
Introduction to Web Design and CSS 1.1 What is Web Design and its Importance 1.2 History and Evolution of CSS 1.3 CSS and the Box Model 1.4 CSS Selectors and Properties 1.5 Styling Text, Fonts, and Colors 1.6 Backgrounds and Images in CSS 1.7 Working with CSS Classes and IDs 1.8 Introduction to Responsive Web Design 1.9 CSS Validation and Debugging Tools Advanced CSS Techniques 2.1 CSS Layout and Positioning 2.2 Flexbox and Grid Layout 2.3 CSS Transitions and Animations	
Unit 2	15 Hrs

2.4 CSS Pseudo-classes and Pseudo-elements 2.5 CSS3 Features (e.g., gradients, shadows) 2.6 Custom Fonts and Icons 2.7 CSS Best Practices and Optimization 2.8 Cross-Browser Compatibility and Vendor Prefixes Web Design Projects and Emerging Trends 3.1 Creating a Multi-Page Website Layout 3.2 Styling Forms and User Interfaces 3.3 CSS for Navigation Menus and Buttons 3.4 Web Typography and Layout Challenges 3.5 CSS for Mobile and Tablet Devices 3.6 CSS Frameworks (e.g., Bootstrap)	

Reference Books

1. "CSS: The Definitive Guide" by Eric A. Meyer and Estelle Weyl

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/GE4/C155-A **Title of the Course: Digital Electronic-II**

Course Objectives

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

Course Outcomes

Upon successful completion of the course, the students will be able to:
1.Functional block diagram of 8086 microprocessor
2.Functions of each pin of 8086 microprocessor
3.Use of instructions in different addressing modes Write an assembly language program.

Title of the Course: Digital Electronic-II	Total Hrs:30
Unit 1	10 Hrs
Introduction to Microprocessor and Microcomputer: Microprocessor based personal computer system. Block diagram of microprocessor based computer system. Modern computer memory map, I/O Space. The Microprocessor, buses. Computer Data formats, ASCII Unicode, BCD. Microprocessor and its architecture: 8086 internal architecture. Real Mode & Protected Mode Memory Addressing.	
Unit 2	10 Hrs
Memory Paging. Pinout and Pin function of 8086 microprocessor. Addressing Modes: Data addressing modes. Program memory addressing modes. Stack memory addressing modes.	

Reference Books

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

2. Microprocessors and Interfacing: Douglas Hall.

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
SEC	Theory	2	2	30

Course Code: CS/GE4/C155-B **Title of the Course: MS Excel**

Course Objectives

To teach students how to use complex Excel formulas and functions to solve sophisticated problems and automate tasks.

Course Outcomes

After completion of the Advanced Excel course you will be able to:

1. Use advanced functions and productivity tools to assist in developing worksheets.
2. Manipulate data lists using Outline, Autofilter and PivotTables.
3. Use Consolidation to summarise and report results from multiple worksheets.

Title of the Course: MS Excel	Total Hrs:30
Unit 1	15 Hrs
Basics of Excel Spreadsheets and Formulas Excel Sorting and Filtering Data Working with Data Ranges, Sorting by One Column, Sorting by Colors or Icons, Sorting by Multiple Columns, Sorting by a Custom List, Filtering Data, Creating a Custom AutoFilter, Using an Advanced Filter, Working with Tables, Creating a Table, Adding and Removing Data, Working with the Total Row, Sorting a Table, Filtering a Table, Removing Duplicate Rows of Data, Formatting the Table, Using Data Validation, Summarizing a Table with a PivotTable, Converting to a Range, Working with the Web and External Data, Inserting a Hyperlink	
Unit 2	15 Hrs
Creating a Web Page from a Workbook, Importing Data from an Access Database or TextFile, Importing Data from the Web and Other Sources, Working with Existing Data Connections, Working with Objects, Inserting Clip Art, Inserting Pictures and Graphics Files, Formatting Pictures and Graphics, Inserting Shapes, Formatting Shapes, Resize, Move, Copy ,and Delete Objects, Applying Special Effects to Objects, Grouping Objects, Aligning Objects, Flipping and Rotating Objects, Layering Objects, Inserting Smart Art, Working with Smart Art Elements, Formatting Smart Art, Using Word Art, Inserting an Embedded Object, Inserting Symbols	

Reference Books

1. Excel 2019 Bible, Michael Alexander, 1th edition, Wiley.

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Course No	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
1	GE	Theory	2	2	30

Course No.1 Course Code: CS/GE4/C155-C Title of the Course: PC Maintenance

Course Objectives

1.Provide an overview of the importance of maintaining personal computers, including hardware and software components.
2.Familiarize students with the various hardware components of a PC, including the CPU, RAM, hard drive, graphics card, and motherboard.
3.Teach students how to perform software maintenance tasks, such as updating operating systems, drivers, and applications.

Course Outcomes

By the end of the course, students should be able to:
1.Understand PC Maintenance
2.Identify Hardware Components
3.Perform Software Maintenance
4.Protect Against Viruses and Malware
5.Implement Data Backup and Recovery

Title of the Course: PC Maintenance	Total Hrs:30
Unit 1	15 Hrs
Introduction to PC Maintenance and Basic Troubleshooting 1.1 What is PC Maintenance? 1.2 The Importance of PC Maintenance 1.3 Basic Computer Components and Their Functions 1.4 Common PC Issues and Symptoms 1.5 Troubleshooting Methodology 1.6 Operating System Maintenance 1.7 Disk Cleanup and Defragmentation 1.8 Managing Software Updates 1.9 Introduction to PC Security and Antivirus Software 1.10 Backup and Recovery Procedures Hardware Maintenance and Upgrades 2.1 Preventive Maintenance for Hardware 2.2 Cleaning and Dust Control 2.3 Managing Hardware Drivers 2.4 Memory (RAM) Testing and Upgrades 2.5 Hard Drive Maintenance and SMART Monitoring	
Unit 2	15 Hrs

2.6 Cleaning and Replacing Input Devices (e.g., Keyboard, Mouse) 2.7 Display Maintenance and Cleaning 2.8 Basic Network Troubleshooting 2.9 Expanding and Upgrading PC Components 2.10 BIOS/UEFI Updates and Configuration Advanced PC Maintenance and Troubleshooting 3.1 Advanced Troubleshooting Techniques 3.2 Diagnosing and Resolving Hardware Failures 3.3 Dealing with Overheating and Fan Maintenance 3.4 Replacing and Upgrading Power Supply Units (PSUs) 3.5 Understanding System Restore and Recovery Options 3.6 Data Backup Strategies and Recovery Tools 3.7 Preventive Measures Against Malware and Viruses 3.8 Networking and Internet Connectivity Issues	

Reference Books

1."CompTIA A+ Certification All-in-One Exam Guide" by Mike Meyers

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Course No	Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours/ semester
1	VSC	Practical	2	4	60

Course Code: CS/VSC2/C156-A **Title of the Course: Advanced Linux**

Course Objectives

- Accessible to all, regardless of language and physical ability.
- To do the study of advanced Linux O.S.
- To understand the Installation of Linux O.S.

Course Outcomes

1. To learn all the principles used to develop the Linux/Ubuntu O.S. software are based on the principles of Open Source software development.
2. To do the study a free operating system and is backed by a huge open source community.
3. Recognize users, security, and privacy settings in Ubuntu/Linux O.S.

Title of the Course: Advanced Linux	Total Hrs:60

Hands on based on following curriculum

Unit 1 Linux/Ubuntu Overview

Graphics interface- Benefits, Screen attributes: icons and bars, Mouse vs. keyboard input, Features of Ubuntu, Difference between ubuntu and windows O.S., Advantages and disadvantages of ubuntu and windows O.S. Release Cycle of Ubuntu, Distributions of Ubuntu, ubuntu server, Kubuntu, Linux Mint, ubuntu installation – system requirement. Download ISO image file of ubuntu and burn it on DVD drive or USB stick. Install ubuntu on system. Ubuntu Desktop Components-Desktop Icons, Desktop Panels,The Application Menu, The Places Menu, The System Menu, The Shortcut Icons. Desktop – various Destops, Gnome, KDE Plasma, Cinnamon , LXQt Desktops.

Unit 2 Panels & Menu

Introduction, Top/bottom edge panel, Applet – Menu bar, Notification area, Clock, Volume Control, Window list applet, workspace switcher applet, Moving a panel, Panel properties, General Properties Tab, Hiding a panel, Adding a new panel, Deleting a panel, panel objects, locking panel, Launchers, Adding a launcher to a panel, modifying a launcher, launcher properties, Buttons- fource quit button, lock screen button, logout button, Run button, search, Show desktop button. Menu-edit, creat, add new items, properties, move up/down, lock to panel.

Unit 3 Working with files.

Introduction, spatial mode, browse mode, opening files, searching for files, managing files and folders, using removable media, writing Cds and DVDs, Navigating remote server, caja preferences, Extending Caja, dolphin file manager, Installation, Tools and utilities – running application, taking screenshots, preferences – appearance, window, keyboard, mouse. Network, Printer, Software Boutique, user and groups.

Reference Books

1. Official Ubuntu Book, 9th edition by by Mattew Helmke, Elizabeth Joseph, Jose Rey
2. Beginning Ubuntu Linux: From Novice to Professional (Third Edition) by Keir Thomas - Apress; Bk&CD-Rom edition (June, 2008)
3. Linux Bible : Boot Up to Fedora, KNOPPIX, Debian, SUSE, Ubuntu , and 7 Other Distributions by Christopher Negus - Wiley; 2 edition (January 31, 2006)
4. Ubuntu Unleashed by Andrew Hudson, Paul Hudson - Sams; 1st edition (August 29, 2006)
5. Ubuntu for Non-Geeks, 3rd Edition: A Pain-Free, Project-Based, Get-Things-Done Guidebook by Rickford Grant

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
VSC	Practical	2	4	60

Course Code: CS/VSC2/C156-B **Title of the Course: Python Programming- II**

Course Objectives

1.Introduce students to the basic concepts of programming, including variables, data types, control structures, and functions.
2.Familiarize students with the syntax and structure of the Python programming language, including variables, data types, and con statements.
3.Teach students how to write simple Python programs, covering input/output, arithmetic operations, and decision-making constr
4.Introduce fundamental data structures in Python, such as lists, dictionaries, and tuples, and how to work with them.

Course Outcomes

By the end of the course, students should be able to:
1.Write Basic Python Programs
2.Understand Python Syntax
3.Implement Data Structures
4.Develop Functions and Module

Title of the Course: Python Programming- II	Total Hrs:60

Hands on based on following curriculum

Unit 1: Advanced Python Concepts and Libraries
1.1 Advanced Data Types (e.g., sets, dictionaries, namedtuples)
1.2 List Comprehensions and Generator Expressions
1.3 Decorators and Metaprogramming
1.4 Context Managers and the `with` Statement
1.5 Iterators and Generators
1.6 Functional Programming in Python
1.7 Concurrency and Parallelism (e.g., multiprocessing, threading)
1.8 Profiling and Optimization Techniques
1.9 Regular Expressions in Python
1.10 Advanced Python Standard Library Module

Unit 2: Object-Oriented Programming and Design Patterns
2.1 Review of OOP Principles in Python
2.2 Inheritance and Polymorphism
2.3 Design Patterns (e.g., Singleton, Factory, Observer)
2.4 Building Python Classes and Modules
2.5 Exception Handling and Custom Exception Classes
2.6 Advanced Topics in Object-Oriented Programming
2.7 Pythonic Design and Code Patterns
2.8 Testing and Test-Driven Development (TDD)
2.9 Introduction to Code Documentation (e.g., Docstrings)

Unit 3: Python Web Development and Data Science
3.1 Web Development Frameworks (e.g., Flask, Django)
3.2 Building RESTful APIs with Python
3.3 Database Integration and ORMs
3.4 Web Security and Authentication
3.5 Data Manipulation with NumPy and Pandas
3.6 Data Visualization with Matplotlib and Seaborn
3.7 Machine Learning with Scikit-Learn

Reference Books: 1."Fluent Python" by Luciano Ramalho

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
VSC	Practical	2	4	60

Course Code: CS/VSC2/C156-C **Title of the Course: Python Programming- II**

Course Objectives

1.Provide students with an overview of R, its history, and its significance in data analysis, statistics, and data science.
2.Teach the basic syntax of R, including variables, data types, and data structures like vectors, data frames, and lists.
3.Instruct students on how to import data from various file formats (e.g., CSV, Excel) and export results to external files.
4.Introduce techniques for data manipulation, such as subsetting, filtering, and transforming data frames.

Course Outcomes

By the end of the course, students should be able to:
1.Use R for Data Analysis
2.Understand R Syntax
3.Import and Export Data
4.Manipulate Data

Title of the Course: Python Programming- II	Total Hrs:60
Hands on based on following curriculum Unit 1 : Statistical Analysis 1.1 Statistical Analysis with R (t-tests, ANOVA, correlation) 1.2 Exploratory Data Analysis (EDA) 1.3 Handling Missing Data 1.4 Working with Dates and Times Unit 2: Advanced Topics in R 2.1 Data Mining and Machine Learning in R 2.2 Introduction to Regression Analysis 2.3 Clustering and Dimensionality Reduction 2.4 Text Mining and Natural Language Processing Unit 3 Web Scrapping and Database 3.1 Web Scraping with R 3.2 Interactive Visualizations (Shiny) 3.3 Introduction to R Markdown and Reporting 3.4 Connecting R to Databases 3.5 Version Control and Collaboration with Git and GitHub Note: Hands on based on above topics	

Reference Books

1."R for Data Science" by Hadley Wickham and Garrett Grolemund (for data analysis)

2."An Introduction to Machine Learning" by Alpaydin, Mehmedali (for machine learning)

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours/ semester
SEC	Theory	2	2	30

Course Code: CS/SEC2/C157-A **Title of the Course: Javascript**

Course Objectives

1. Provide students with an understanding of what JavaScript is, its history, and its role in web development.
2. Teach the basic syntax, data types, and language features of JavaScript, including variables, operators, and control structures.
3. Explain how to create functions, understand function scope, and use functions to organize and modularize code.
4. Introduce the DOM and its role in manipulating HTML and CSS to create dynamic web pages.
5. Teach students how to handle user interactions and events in web applications using JavaScript.

Course Outcomes

By the end of the course, students should be able to:

1. Write JavaScript Code
2. Understand JavaScript Syntax
3. Create and Use Functions
4. Manipulate the DOM
5. Handle Events

Title of the Course: Javascript	Total Hrs:30
Unit 1	15 Hrs
Introduction to JavaScript Programming 1.1 What is JavaScript? 1.2 History and Evolution of JavaScript 1.3 Setting Up a JavaScript Development Environment 1.4 Basic JavaScript Syntax 1.5 Variables, Data Types, and Operators 1.6 Conditional Statements (if, else if, else) 1.7 Loops (for, while, do...while) 1.8 Functions and Scope 1.9 Handling User Input and Events 1.10 Debugging JavaScript Code Advanced JavaScript Concepts and DOM Manipulation 2.1 Working with Arrays and Objects 2.2 DOM (Document Object Model) Introduction 2.3 Accessing and Manipulating DOM Elements 2.4 Event Handling and Event Listeners 2.5 Asynchronous JavaScript (Callbacks, Promises)	
Unit 2	150 Hrs

2.6 Error Handling and Exceptions 2.7 Local Storage and Cookies 2.8 Modern JavaScript (ES6 and Beyond) 2.9 Interactive Web Forms with JavaScript 2.10 Building Responsive Web Layouts with JavaScript JavaScript Applications and Frameworks 3.1 Introduction to JavaScript Libraries (e.g., jQuery) 3.2 Introduction to Front-End Frameworks (e.g.Angular) 3.3 Building Interactive Web Applications 3.4 AJAX and Fetch API 3.5 Working with JSON Data 3.6 Cross-Origin Resource Sharing (CORS) 3.7 JavaScript for Web Animation and Graphics 3.8 Introduction to Node.js and Server-Side JavaScript 3.9 Building Simple Server-Side Applications 3.10 JavaScript Best Practices and Code Optimization	

Reference Books

1. "Eloquent JavaScript" by Marijn Haverbeke

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
GE	Theory	2	2	30

Course Code: CS/SEC2/C157-B **Title of the Course: Advance Multimedia**

Course Objectives

1.Provide an overview of the video editing process, including its history, principles, and importance in various media industries.
2.Introduce students to popular video editing software applications, such as Adobe Premiere Pro, Final Cut Pro, and DaVinci Resolv
3.Teach fundamental video editing techniques, including cutting, trimming, transitions, and effects.
4.Instruct students on how to create and manage timelines, sequences, and projects effectively.

Course Outcomes

By the end of the course, students should be able to:
1.Understand Video Editing Concepts:
2.Proficiently Use Video Editing Software:
3.Apply Basic Video Editing Techniques:
4.Create and Manage Timelines
5.Edit Audio:

Title of the Course: Advance Multimedia	Total Hrs:30
Unit 1	15 Hrs
Introduction to Video Editing 1.1 What is Video Editing? 1.2 History and Evolution of Video Editing 1.3 The Role of Video Editors 1.4 Introduction to Video Editing Software (e.g., Adobe Premiere Pro, Final Cut Pro, DaVinci Resolve) 1.5 Understanding Video Formats and Resolutions 1.6 Importing and Organizing Media 1.7 Basic Editing Tools and Functions 1.8 Trimming and Cutting Footage 1.9 Working with Timelines and Sequences Basic Video Editing Techniques 2.1 Adding Transitions and Effects 2.2 Working with Audio (Sound Editing) 2.3 Color Correction and Grading 2.4 Text and Graphics Overlay	
Unit 2	15 Hrs

2.5 Creating Montages and Storytelling 2.6 Keyframing and Animation 2.7 Exporting and Rendering Videos 2.8 Project Management and File Organization Advanced Video Editing and Final Projects 3.1 Advanced Editing Techniques (e.g., multicamera editing, advanced transitions) 3.2 Working with Green Screens (Chroma Key) 3.3 Advanced Color Grading and Correction 3.4 Sound Design and Audio Effects 3.5 Video Compression and Export Settings 3.6 Collaboration and Sharing Work 3.7 Final Projects: Student-led video editing projects 3.8 Emerging Trends in Video Editing	

Reference Books

1."The Technique of Film and Video Editing: History, Theory, and Practice" by Ken Dancyger

2."In the Blink of an Eye" by Walter Murch

3."The Visual Story: Creating the Visual Structure of Film, TV and Digital Media" by Bruce Block

4."Adobe Premiere Pro Classroom in a Book" by Maxim Jago

B.Sc. Semester-II

Subject: B.Sc. (Computer Science)

Discipline Specific Course(DSC)

Type of Course	Theory/Practical	Credits	Instruction hour per week	Total No. of. Lectures/Hours/ semester
SEC	Theory	2	2	30

Course Code: CS/SEC2/C157-C **Title of the Course: Logical Reasoning**

Course Objectives

1.Familiarize students with the concept of logical reasoning and its significance in decision-making and problem-solving.
2.Help students identify common logical fallacies and errors in reasoning in everyday arguments and discussions.
3.Introduce the principles of deductive reasoning, including syllogisms and propositional logic.
4.Teach students inductive reasoning techniques, such as generalization, analogy, and causal reasoning.
5.Enhance students' critical thinking skills by teaching them to evaluate arguments, evidence, and the validity of reasoning.

Course Outcomes

By the end of the course, students should be able to:

1.Apply Logical Reasoning
2.Identify Logical Fallacies
3.Use Deductive Reasoning
4.Apply Inductive Reasoning
5.Demonstrate Critical Thinking

Title of the Course: Logical Reasoning	Total Hrs:30
Unit 1	15 Hrs
Fundamentals of Logical Reasoning 1.1 What is Logical Reasoning? 1.2 Importance of Critical Thinking and Logic 1.3 Deductive and Inductive Reasoning 1.4 Analyzing and Evaluating Arguments 1.5 Identifying Assumptions and Premises 1.6 Logical Fallacies and Errors in Reasoning 1.7 Propositional Logic and Truth Tables 1.8 Predicate Logic and Quantification 1.9 Venn Diagrams and Set Theory 1.10 Problem-Solving Strategies Advanced Logical Reasoning 2.1 Conditional Statements and Implication 2.2 Logical Equivalence and Contrapositive 2.3 Inference and Proof Techniques 2.4 Logical Reasoning in Mathematics 2.5 Critical Thinking in Real-World Scenarios	

Unit 2	15 Hrs
2.6 Causal Reasoning and Causation 2.7 Decision Making and Rational Choice 2.8 Abductive Reasoning and Hypothesis Testing 2.9 Game Theory and Strategic Thinking 2.10 Ethical Reasoning and Moral Dilemmas Practical Applications and Problem-Solving 3.1 Logical Reasoning in Science and Research 3.2 Legal Reasoning and Argumentation 3.3 Logical Reasoning in Computer Science 3.4 Reasoning in Business and Economics 3.5 Problem-Solving in Everyday Life 3.6 Preparing for Logical Reasoning Tests (e.g., LSAT, GMAT) 3.7 Brain Teasers and Puzzles	

Reference Books

1."Critical Thinking: A Concise Guide" by Tracy Bowell and Gary Kemp